Health Finance in Rural Henan: Low Premium Insurance Compared to the Out-of-Pocket System*

Sukhan Jackson, Adrian C. Sleigh, Li Peng and Liu Xi-Li

ABSTRACT China's health reforms of the 1980s led to privatization of rural health care with adverse impact on farmers. A decade later a new rural co-operative medical scheme (RCMS), was piloted throughout many provinces to promote better equity. Although many schemes later collapsed owing to inadequate funding, some continue to the present. This article compares such a scheme with the out-of-pocket system in Henan province. We study the township hospitals, focusing on cost of services, utilization rates and impact of RCMS on hospitals' financial sustainability. Our results derive from monthly hospital records and a survey of four hospitals in two adjacent counties, one county with low-premium RCMS and the other with the out-of-pocket system.

All hospitals charged for preventive activities (such as antenatal care, immunization), an unfortunate consequence of limited government support. It was not clear that on average, the total cost of individual patient visits in RCMS hospitals was lower than non-RCMS hospitals. Farmers were generally unaware of their insurance entitlements, except the catastrophic illnesses for which there was a real benefit from refund of US$100 or more. Although the effect of the RCMS on hospital charges was unclear it was notable that the utilization rates in RCMS areas were twice those in non-RCMS.

We conclude that RCMS hospitals were better funded because of re-imbursements from the insurance scheme and therefore were more viable as sources of good health care. Thus, health care could become more equitable under RCMS than the out-of-pocket system. China is now beginning to test a revised form of RCMS with pooling at the county level, increased premiums (10 *yuan* per person) and increased government funding. However, it must be followed closely to determine the effect on rural services and health care costs for farmers.

Rural Health Services in Post-Maoist China

How can China provide equitable health care to its rural citizens, who make up 70 per cent of its huge population? The rural co-operative medical system of the 1960s and 1970s guaranteed China's rural residents almost universal access to basic preventive and curative health care. By 1975 such insurance coverage reached 85 per cent of the rural population.[1] But the abolition of collective farming and communes after 1982 resulted in the collapse of the co-operative medical system that was

* Financial support has come from an Australian Research Council Large grant for 2001–2004.

1. The World Bank, *Financing Health Care. Issues and Options for China* (Washington DC: The World Bank), 1997), p. 1.

https://doi.org/10.1017/S0305741005000081 Published online by Cambridge University Press

independently funded by each commune and supplemented by a small fee from individual farmers. Gu Xing-Yuan and Tang Sheng-Lan in 1995 estimated that by the early 1990s, 93 per cent of rural residents and 14 per cent of urban residents had to pay out of their pockets, and the co-operative medical system continued in only 7 per cent of rural China, in the relatively rich areas.[2]

Yuanli Liu *et al.*, writing on health finance in China, lament that "social development has not gone hand in hand with economic development, especially in rural health care."[3] There is concern that the market and privatization will lead to higher medical costs and lower accessibility for patients. A World Bank report[4] published in 1997 referred to a 1992–93 survey which found that 41 per cent of people referred to a hospital for care did not go because of excessive costs and inability to pay. Recent discussions in the newspapers indicate that the situation has not changed for the better. The Ministry of Health in 2002 reported that many sick farmers were hesitant to seek medical treatment for fear of high costs, and more than one-third of sick farmers did not seek medical treatment at all, with grave implications for rural health. The excessive cost of treatment for a serious illness makes many families destitute.[5]

Since the 1980s, Chinese economic growth has been rapid and literacy rates improved greatly. However, as W.C.L. Hsiao and Yuanli Liu observe, "economic growth does not necessarily translate into better health and better health care for all."[6] Several others also noted the adverse impact of China's market reforms on health care services; they all suggested that the government should play a larger role in health financing to ensure equitable access to services.[7] Some blame the degradation of health services on the fiscal decentralization that delegated health financing to local governments; because of resource constraints, local governments transferred this responsibility to the health providers who in turn passed it on to the consumers.[8]

2. Gu Xing-Yuan and Tang Sheng-Lan, "Reform of the Chinese health care financing system," in Peter A. Berman (ed.), *Health Sector Reform in Developing Countries: Making Health Development Sustainable* (Boston MA: Harvard University Press, 1995), pp. 235 and 241.

3. Yuanli Liu, William CL Hsiao, Qing Li, Xingzhu Liu and Minghui Ren, "Transformation of China's rural health care financing," *Social Science & Medicine*, Vol. 41, No. 8 (1995), p. 1085.

4. The World Bank, *Financing Health Care*, p. 25.

5. "Rural health care critical," *China Daily*, 17 September 2002, p. 4; and Andreas Wilkes, Yu Hao, Gerald Bloom and Gu Xingyuan, *Coping with the Cost of Severe Illness in Rural China*, Working Paper 58, Institute of Development Studies, University of Sussex, 1997.

6. William CL Hsiao and Yuanli Liu, "Economic reform and health – lessons from China," *Health and Development*, January–April 1997, p. 25.

7. For example, *ibid.*; Gu and Tang, "Reform of the Chinese health care financing system," pp. 233–246; The World Bank, *Financing Health Care,* p. 16.

8. For example, Shenglan Tang and Gerald Bloom, "Decentralising rural health services: a case study in China," *International Journal of Health Planning and Management*, Vol. 15, No. 3 (2000), pp. 189–200.

We need to realize that China's health system is managed by 30 separate provincial health authorities. Each provincial-level government (including Beijing, Chongqing, Shanghai and Tianjin) allocates funds from its budget to finance health care within each province, but the central government in Beijing nevertheless promulgates its national health policies to the provinces. The provincial health bureau normally allocates to the township hospitals the capital resources for investment in new buildings, staff housing and modern equipment. Funds from local taxes raised by county-level and township-level governments can be used to assist the provision of primary health care in rural areas.

After 1985, institutional health providers such as hospitals had to become financially self-sufficient. China's health institutions are mostly public-owned but government funding is reduced so that hospitals are expected to earn a proportion (varying from place to place) of their incomes from patient payments for services and from medicine sales. The World Bank report published in 1997 estimated that overall, government subsidies to total hospital operating costs were small, amounting to no more than 15 per cent.[9] So many hospitals (especially at county and township levels) generate funds by providing commercial services such as medical examinations and X-rays, which are compulsory for certain employees. For example, those working in restaurants, cafes, hairdressing salons and cinemas must undergo X-rays for the detection of tuberculosis, and food handlers must have periodic stool examinations to check for typhoid and other gastrointestinal infections. There are many other ways for hospital service providers to boost income by inducing demand. For example, they can offer unnecessary injections and intravenous treatments, request excessive laboratory tests, and over-prescribe drugs, a problem exacerbated by the recurring price hikes of pharmaceuticals dispensed by hospitals.[10] And they can charge for preventive services like antenatal care and immunization.

Within China, dissatisfaction with privatization in health services is beginning to emerge in the public domain and there is awareness that some of the difficulties may be linked to government perception of health care funding as a social expenditure rather than an investment in human resources. Indeed, health finance has always competed with other pressing welfare needs in Chinese government budgets, but the health lobby has fared badly. Allocation of funds to the health sector as a percentage of state expenditure has fallen, for example, from 3.1 per cent in 1985 to 2.54 per cent in 1995 and further down to 2.27 per cent in 1997. Of China's total investment in capital construction, the percentage of capital investment in health services accounted for 1.68 per cent in 1985, fell to 0.99 per cent in 1995 but rose slightly to 1.05 per cent in 1997.[11]

9. The World Bank, *Financing Health Care*, p. 44.
10. William C.L. Hsiao and Yuanli Liu, "Economic reform and health – lessons from China," pp. 24–25.
11. Zhang Wen Kang (ed.), *1999 Yearbook of Health in the People's Republic of China* (Beijing: Renmin weisheng chubanshe, 1999), pp. 283–84.

Another undesirable effect of China's health reforms, as noted by W.C.L. Hsiao and Yuanli Liu,[12] is the growing rural–urban gap in protection against the financial risks from illness. The 1997 World Bank report[13] estimated that in 1993 only 10 per cent of the rural population was insured compared with 50 per cent of the urban population. Henderson *et al*. provide an eight-province household survey that showed coverage and benefits were not standardized among the provinces: the probability of being insured depended on where one lived and worked.[14] These inequities are substantial and have become public knowledge; for example, the *China Daily*[15] in 2002 reported that only 20 per cent of the government's total public health spending in the 1990s went to the rural health system that served 70 per cent of the total population.

Xingzhu Liu and W.C.L. Hsiao make the point that, as with health care elsewhere in the world, efficiency and cost escalation is a concern but there are causal factors that are specific to China.[16] They suggest that cost increases could be attributed to changes in hospital financing and payment policy that unintentionally provide incentives for adopting high-tech medicine and excessive use of expensive drugs. In addition, growth in rural incomes and the changing patterns of disease, with fewer infections and more chronic illnesses, is changing demand for services in ways that boost the use of high-cost technology.

Recent Health Reforms

The complexity of the Chinese health care system has been well documented,[17] especially the various sub-systems prevailing for residents of urban and rural areas, and the government sector including civil servants and university students. Various measures are being taken to improve the social security safety net of people disadvantaged by reformist changes, including changes in the health sector. A recent development was the State Council's decision to establish, on a national scale, a basic medical insurance scheme for urban employees beginning in 1998. It was an attempt to cover all urban employees working in enterprises under state, collective and private ownerships, in enterprises with foreign investment, government departments, and various institu-

12. Hsiao and Liu, "Economic reform and health – lessons from China," pp. 24–25.
13. The World Bank, *Financing Health Care*, p. 3.
14. Gail Henderson, Jin Shuigao, John Akin, Li Zhiming, Wang Jianmin, Ma Haijiang, He Yunan, Zhang Xiping, Chang Ying and Ge Keyou, " Distribution of medical insurance in China," *Social Science & Medicine*, Vol. 41, No. 8 (1995), pp. 1119–30.
15. "Rural health care critical," *China Daily*, 17 September 2002, p. 4.
16. Xingzhu Liu and William CL Hsiao, "The cost escalation of social health insurance plans in China: its implication for public policy," *Social Science & Medicine*, Vol. 41, No. 8 (1995), pp. 1095–1101.
17. See for example, Hsiao and Liu, "Economic reform and health – lessons from China," pp. 24–25; Yuanli Liu *et al*., "Transformation of China's rural health care financing," pp. 1085–93; Gu and Tang, "Reform of the Chinese health care financing system," pp. 233–246; and Ho Lok Sang, "Market reforms and China's health care system," *Social Science & Medicine*, Vol. 41, No. 8 (1995), pp. 1065–72.

tions including those of a non-commercial nature.[18] In the richer cities, protection is extended to groups not covered by the basic medical insurance scheme; for example, the Beijing government introduced medical insurance for some of the uninsured including 400,000 self-employed individuals and free-lance workers.[19]

In the rural areas, where farmers are self-employed, the current method of health finance is normally the out-of-pocket system. Rural health care delivery is organized into three tiers. The first and lowest tier is the village clinic (run privately by health workers commonly called "village doctors"). The second is the township public hospital (also called township medical centre) offering outpatient and inpatient services on a fee-for-service basis – this is the focus of our article. Lastly, the county public hospital is normally the highest level of referral for the inpatient treatment of rural residents because very few farmers can afford the prices at big-city hospitals.[20]

In 1994 the central government took a new policy direction on rural health financing in an attempt to redress the cheerless situation of rural health care. The move was prompted by China's experiments in community financing. The well-known ones were: the 1989–90 Sichuan Rural Health Insurance Experiment; the WHO-assisted rural health insurance pilots that began in 1994 in 14 counties (of Beijing, Henan, Jiangsu, Zhejiang, Jiangxi, Hubei and Ningxia); and various types of community financing implemented in 30 poor counties.[21] By 1995 several provinces were experimenting with the new Rural Co-operative Medical Schemes (RCMS) as a second-generation reform in health finance (considering the reforms of the 1980s as the first generation). It was suggested that by the year 2000 most rural counties should have reformed their health finance by collecting annual prepayments from the local population to set up their own community health insurance, optimistically described by Ho Lok Sang[22] as an indication that China was adopting a form of prepaid financing closely related to those in Western countries. Unfortunately, this did not happen. But strong ideological support from the central government was evident in 1996 when the Ministry of Health held a national conference in Henan to promote RCMS; many provincial conferences followed that year and RCMS experiments were further implemented in selected counties.[23] The momentum continued in 1997 when a total of 350 counties in 22 provinces (including autonomous regions and municipalities) joined the RCMS experiments.[24]

However many of these counties, without adequate financial resources and continued political support, dropped out one by one although some

18. Zhang Wen Kang (ed.), *1999 Yearbook of Health in the People's Republic of China*, pp. 21–22.
19. "Health reform covers all," *China Daily*, 20 November 2001, p. 3.
20. The World Bank, *Financing Health Care*, p. 18.
21. *Ibid*. pp. 49–52.
22. Ho Lok Sang "Market reforms and China's health care system," pp. 1065–72.
23. 1997 *Zhongguo jingji nianjian* (*Almanac of China's Economy*) (Beijing: Zhongguo nianjian chubanshe, 1997), p. 398.
24. 1998 *Almanac of China's Economy*, p. 409.

RCMS were revived or managed to continue to the present. There are several studies on RCMS but they mostly relate to China's initial launching of the above-mentioned RCMS experiments. Published works in the English language specifically on China's RCMS are not abundant and there are even fewer updates on the present schemes that have continued for many years after the initial launch.

One of the earliest reports on China's RCMS is the World Bank's *Financing Health Care, Issues and Options for China* (1997).[25] It provides useful summaries of studies (most of them not easily accessible) on the three above-mentioned RCMS experiments. It summarizes the results of the 1993–95 study of 30 poor counties (by a network of Chinese universities and Harvard University) which stated it was impossible to obtain sufficient revenue from poor households alone and funding should come from multiple sources. More details of the earliest RCMS are found in the work of Carrin *et al*.,[26] who conducted a mid-term evaluation of the WHO-assisted schemes, in order to assess the extent of protection afforded to rural households in the burden of illness costs. They found that protection was low because of high co-payment of more than 50 per cent and the small range of insured products; but they remained hopeful because population coverage appeared to be large.[27] Another early assessment was made by Yu Hao *et al*.[28] who conducted a case study of Wuzhuan township in Guangxi province in 1994–95; they found that benefits generated by the RCMS were small because of the low premiums. Both reports by Carrin *et al.* and Yu Hao *et al.* recommend more funding support from the government to provide equitable health care to rural citizens. Bloom and Tang Shenglan[29] focus on the government's role in these pilot RCMS, and also stress the need for government subsidies and additional resources.

The co-operative medical systems in the communes during the 1960s and 1970s were financed by household premiums, collective welfare funds and upper-level government subsidies. The welfare funds collapsed when the communes disappeared and government subsidies did not close the gap when the RCMS experiments began in the 1990s. Nevertheless, the new RMCS struggled on with varying success. At present, grave concerns for equity and accessibility in rural health continue as the central government renewed the push for RCMS throughout China. Indeed the State Council on 19 October 2002 issued important regulations

25. The World Bank, *Financing Health Care.*

26. Guy Carrin, Aviva Ron, Yang Hui, Wang Hong, Zhang Tuohong, Zhang Licheng, Zhang Shuo, Ye Yide, Chen Jiaying, Jiang Qicheng, Zhang Zhaoyang, Yu Jun and Li Xuesheng, "The reform of the rural cooperative medical system in the People's Republic of China: interim experience in 14 pilot counties," *Social Science & Medicine*, Vol. 48 (1999), pp. 961–972.

27. *Ibid*. p. 971.

28. Yu Hao, Henry Lucas, Gu Xing-Yuan and Shu Bao-Gang, *Financing Health Care in Poor Rural Counties in China: Experiences from a Township-Based Co-operative Medical Scheme*, Working Paper 66, Institute of Development Studies, University of Sussex, 1998.

29. Gerald Bloom and Tang Shenglan, "Rural health prepayment schemes in China: towards a more active role for government," *Social Science & Medicine*, Vol. 48 (1999), pp. 951–960.

for improving the work of rural health (Document No. 13) and pledged more help for RCMS from central and local government finances as from 2003.[30] Our comparison of an RCMS county with another under the out-of-pocket system in Henan enhances understanding of this second-generation health reform and lays the groundwork for understanding the prospects of health care and its finance in rural China today.

RCMS in Henan Province

We address the question of whether RCMS can deliver more equitable health care than the out-of-pocket system in terms of achieving, first, lower patient costs, secondly, better utilization rates and thirdly, better hospital finance. The experiences of RCMS managers, and householder (consumer) impressions and opinions, were also studied but will be reported elsewhere. Compared with the earlier RCMS studies (see above), our study is about the present situation and is more detailed. For example, unlike the case study of one township in Guangxi by Yu Hao *et al.*, our study included four townships. Furthermore, we investigated the effects of an RCMS on township hospital finances. And to our knowledge no other study has compared the RCMS with the out-of-pocket system. We report the current situation of an RCMS still operating in the new millennium and contrast that with the out-of-pocket system, and we use primary data collected in two counties in rural Henan. We focus on township hospitals because they are the lowest level in the rural health system where farmers can seek treatment from college-trained medical practitioners, in contrast to village clinics staffed by health workers with usually six months' to two years' training.

We first note the socio-economic background of the two study counties of Gongyi (RCMS) and Yanshi (out-of-pocket system). Then, for two out-of-pocket and two RCMS townships, we compare patient costs and utilization rates using a cross-sectional sample survey of inpatient and outpatient services and charges and hospital monthly records of patient attendance over two years. Finally, we consider the financial sustainability of the two RCMS hospitals, assess the achievements of community financing in Henan province, and comment on the latest reforms and prospects for success.

Methodology

Study counties. We chose two adjacent counties with similar economic profiles – Gongyi (in Zhengzhou administration area) and Yanshi (in Luoyang administration area) (see Table 1). These counties each have populations of about 800,000 and more than 80 per cent are farmers. Both had incomes of less than 6,000 *yuan* per capita/year. Birth rates were

30. "Improve rural health care," *China Daily*, 1–2 December 2001, p. 4; and Chinese Ministry of Health http://www.moh.gov.cn/zhgl/zcxx/1200211010001.htm, visited on 31 January 2003.

https://doi.org/10.1017/S0305741005000081 Published online by Cambridge University Press

Table 1: **Gongyi and Yanshi Counties, 2001 Selected Statistics**

	Gongyi county 2001		*Yanshi county 2001*	
	Total	*Increase from 2000*	*Total*	*Increase from 2000*
Population	781,945	5.4/1,000	820,589	6.8/1,000
GDP	11,078.02 million *yuan*	13.5%	8,848.94 million *yuan*	9.9%
Average annual per capita income	5,616 *yuan*	11.8%	5,550 *yuan*	4.3%
Average net farmer income	3,424 *yuan*	8.1%	2,716 *yuan*	4.1%
Birth rate	10.6/1,000		12.9 /1,000	
Death rate	5.2/1,000		6.1/1,000	
M:F sex ratio	100:97		100:97	

Notes:
Gongyi county has 18 townships (largest 118,260 population, smallest 6,138 population). Yanshi county has 17 townships (largest 70,878 population, smallest 13,070 population).

Sources:
Gongyi Statistical Yearbook, 2001, pp. 1, 3, 6; *Yanshi Statistical Yearbook*, 2002, pp. 40, 49, 51.

low and similar (11–13 per 1,000/year) and approximately double the death rates (5–6 per 1,000/year); male–female ratios were reported to be similar at 100:97.[31] Overall, the annual population growth rates of Gongyi and Yanshi in 2001 were at 5.4 and 6.8 per 1,000 respectively. In Gongyi county, we studied two townships under the RCMS: Beishankou (population 43,078) and Zhanjie (population 35,375). In Yanshi county under the out-of-pocket system, the two chosen townships were Guxian (population 60,134) and Licun (population 72,893). Townships were chosen on the basis of relative locations – one close and one far from each county town to incorporate geographical factors that could influence health services in the area. Unusual townships were not considered.

Data collection. In 2001, the first year of our study, we interviewed provincial-level health bureau officials in Zhengzhou, the capital city of Henan province. These officials managed provincial policy on health system finance and were knowledgeable of RCMS. In addition, on three field visits to the two study counties in 2001 and 2002, we interviewed county-level health officials and heads of the four township hospitals, and met associated township doctors and other personnel including those in the pharmaceutical section.

31. Gongyi Statistical Bureau, *2001 Gongyi shi tongji nianjian* (*Gongyi Statistical Yearbook*), 2001, pp. 1, 3, and 6; Yanshi Statistical Bureau, *2002 Yanshi tongji nianjian* (*Yanshi Statistical Yearbook*), 2002, pp. 40, 49 and 51.

We collected primary data from two sources. The first was the hospital monthly records on the number of patients treated, the type and number of services provided, and the financial flows. These data were recorded on our behalf by account clerks for 24 months, January 2001 to December 2002. The records of the RCMS hospitals also contained information on discounts to members and reimbursements to the hospitals.

The second data source was a patient survey conducted in August 2001 in the four study hospitals to collect information on the costs and types of treatment. A pilot survey carried out earlier in April 2001 enabled us to modify logistics and finalize the questionnaires. Our sample consisted of all 852 outpatients seeking treatment in the four township hospitals during a three-day period (428 in Gongyi, 424 in Yanshi), and all 115 inpatients treated at those four hospitals in August 2001 (59 in Gongyi, 56 in Yanshi). We distributed research forms to the doctors and paid them to record information on patients' background, complaints, investigations, diagnoses and treatment. Separate forms were used for the inpatients.

Studying outpatient costs in the township hospitals was complicated because of the unusual Chinese method of certified sequential payments as diagnosis and treatment proceed. After the doctors clinically evaluate their illnesses outpatients must pay in advance for other services. So they temporarily leave their doctors in the consulting rooms to pay at the account section for any diagnostic investigation required, proceed to have the investigation done, and return to the doctor with the result. The doctor then prescribes the therapies and drugs, the patients pay again, show the chits to the dispensary, and receive the treatments. It is not unusual for some patients to depart with the drug prescriptions but without purchasing the medicines or other treatment in the hospital. They either skip the treatment or purchase it elsewhere.

We dealt with the complexity in the following way. We employed research clerks and located them at the point-of-payment in the hospital. They remained on the inside of the "hole-in-the-wall" as money was collected and chits issued for each service category. Thus we collected the data on the serial charges levied for each patient as the visit progressed, noting each service or drug given, and finally we combined the information into an itemized invoice and total cost for each individual. For analysis (in this report) we focused on the routine charges and the fees for Western and traditional drugs, and on total patient costs. All the information was computerized with a single record created for each patient and the data analysed by EpiInfo, Excel and SPSS.

RCMS in Gongyi County

History. Henan province was one of the earliest areas to undertake the RCMS experiment, beginning in 1994. The provincial government encouraged every prefecture to implement RCMS in at least one of its counties and a total of 17 prefectures joined in. By 1995, Henan had a

https://doi.org/10.1017/S0305741005000081 Published online by Cambridge University Press

total of 4.56 million rural residents who joined the schemes;[32] and residents would enrol if their administrative village head agreed to join. RCMS membership peaked in 1997 with 30 per cent of Henan townships participating, but it slowly fell by a third over the next two years because of what senior provincial officials described to us as "management problems" and "inadequate support by local governments." Many Henan RCMS broke down, including that in Gongyi county, but in 1999 it was revived due to strong local government support. In 2001, 87 per cent of the rural population of Gongyi was covered by RCMS (compared to only 18 per cent for Henan)

Finance. The basic principle of all RCMS is that they receive some financial support from local governments (county and township). In 2001 and 2002, the Gongyi county government contributed one *yuan* per head (totally about 800,000 *yuan* per year) and participating township governments contributed 2–3 *yuan* per head. RCMS members paid a low premium of 2–5 *yuan* per person. This created a total pre-payment of 4–9 *yuan* or around US$1 per head.

Management. The RCMS management committees functioned at three levels: county (Gongyi), township and administrative village. Administrative villages represent 3–9 natural villages. Risks were pooled at the township level across populations typically of 30–50 thousand but ranging from as few as 6,000 up to as many as 120,000. In practice the township pooling involved population subsets as some administrative villages did not join. Participating townships managed their own RCMS, employing a finance officer and several accounts clerks.

Subscriptions and re-imbursement. Premiums are hard to collect in rural areas where most people are not wage earners because they farm the land. In past years RCMS premiums were collected after the annual harvest payments. But recent national reforms are introducing a single agricultural tax to replace a multiplicity of burgeoning local fees and levies paid by farmers.[33] This aggravates RCMS premium collection difficulties because after 2003 membership must be voluntary for each household. Farmers can refuse to join if they are not convinced of the benefits even if their village is participating.

Co-payments. Re-imbursements were given to members as discounts on medical services, diagnostic procedures and bed fees, but not drugs. The township hospital recovered the discounts given by claiming periodic reimbursements from its RCMS.

Among the insured (RCMS) patients co-payments were always high, at least 90 per cent of the cost of hospital services. The RCMS in our study

32. *1996 Zhongguo jingji nianjian* (*Almanac of China's Economy*) (Beijing: Zhongguo nianjian chubanshe), 1996, p. 397.

33. "Reform to cut farmers' burden," *China Daily*, 5 September 2002, p. 1.

gave no discounts for drugs which formed a large part of the costs for each outpatient visit; and they gave only a 10 per cent discount at the point-of-payment for the other items of treatment. Less than 60 per cent of the sampled patients brought the membership cards issued to them. So many failed to receive any discounts at all, and for those who did the amounts were very modest

Catastrophic illness assistance. In our study areas illnesses were regarded as catastrophic if the total medical expenses exceeded 1,000 *yuan*. Catastrophic illness costs were partly covered by RCMS, assisted by government collective funds from both county and township levels. The level of government support was population-based, each government (county and township) contributing one *yuan* per person.

In Gongyi county, thresholds and benefits from the RCMS were varied but typically included 20–30 per cent reimbursement for any illness if costs exceeded 1,000–3,000 *yuan*. RMCS official records for July 2001–June 2002 showed that 31 patients with catastrophic illness in Zhanjie received help amounting to 14,221 *yuan*, an average of nearly 460 *yuan* each. For Beishankou, 52 catastrophic illness patients received an average of nearly 670 *yuan* each. Such support was non-existent under the out-of-pocket system in Yanshi county.

Patient's Hospital Costs and Utilization Rates

This section focuses on two aspects for comparing the two health financing systems: patients' hospital costs and utilization rates. First we summarize the socio-economic characteristics of the sampled patients, both outpatients and inpatients, in the four study township hospitals (Appendix 1). We then present results of our cross-sectional patient survey on hospital services and payments (Tables 2a and 2b). Lastly we estimate utilization rates for the four hospitals using hospital monthly records for 2001 and 2002 and township populations (Table 3).

Socio-economic profile of sampled outpatients and inpatients in four township hospitals. The socio-economic characteristics of the sampled patients are summarized in Appendix 1. Males and females were nearly equal in number among the outpatients but female inpatients were slightly higher owing to 26 maternity cases. Interpretation of the gender proportions is later provided in our "discussion and conclusions" section.

The largest number of outpatients in both Gongyi and Yanshi came from the economically productive group of 30–49 years and from the oldest group of 50 years and over. The predominantly agricultural population is illustrated by the greatest percentage of farmers among the outpatients (50 per cent in Yanshi and 47 per cent in Gongyi) and inpatients (>60 per cent in both counties).

Most of the patients are literate; the largest group has been educated to junior high school level. Patients with no formal schooling (12–20 per cent of total patients) were over 60 years. Households were fairly large

https://doi.org/10.1017/S0305741005000081 Published online by Cambridge University Press

Table 2a: **Comparison of Patient Payments at Beishankou (RCMS) and Guxian (non-RCMS) Hospitals, August 2001**

	Gongyi county Beishankou hospital (RCMS) Total outpatients = 227			*Yanshi county Guxian hospital (non-RCMS) Total outpatients = 201*			
Cost items	*N (%)*	*Mean (yuan)*	*Max (yuan)*	*N (%)*	*Mean (yuan)*	*Max (yuan)*	*P value*
Drugs	155 (68)	22.34	122.00	172 (78)	29.67	292.50	*0.027
Operation	0	0	0	3 (1)	41.67	80.00	–
Laboratory	53 (23)	19.52	117.00	59 (27)	19.75	80.00	*0.951
Registration	0	0	0	0	0	0	–
Procedure/ treatment	18 (8)	29.54	116	34 (15)	48.16	320.00	0.235
Other	0	0	0	29 (13)	5.83	64.00	–
Total	185 (82)	27.22	122.00	195 (88)	42.11	401.20	*0.001
	Total inpatients = 30			*Total inpatients = 25*			
Cost items	*N (%)*	*Mean (yuan)*	*Max (yuan)*	*N (%)*	*Mean (yuan)*	*Max (yuan)*	*P value*
Drugs	30 (100)	399.67	3,164.00	25 (100)	387.23	2,946.10	0.941
Operation	9 (30)	393.89	700.00	7 (28)	808.57	1,800.00	0.061
Laboratory	27 (90)	99.70	489.00	18 (72)	77.67	560.00	0.540
Procedure/ treatment/ bed/ registration	28 (93)	360.82	2549.00	8 (32)	233.50	672.00	0.450
Other	5 (17)	157.60	380.00	21 (84)	97.12	800.00	0.482
Total	30 (100)	970.61	6,202.00	25 (100)	825.85	6,778.10	0.675

Notes:
P value is the value for a 2-tailed test of difference in means between Beishankou and Guxian. * indicates the values between RCMS and non-RCMS were statistically significantly different at the 5% level.

with more than four members, and more than 40 per cent of outpatients and inpatients came from households with more than two dependents, implying that aged parents lived with their children as expected in Chinese farming families. We found less than 60 per cent of the patients from the RCMS areas brought their entitlement cards when they sought medical assistance at the participating township hospitals. Thus, many disqualified themselves from the discounts on those allowable items of services.

Patient hospital costs compared for RCMS and out-of-pocket systems. Tables 2a and 2b contain a summary of statistics on hospital costs of the sampled outpatients and inpatients in the four study townships. Beishankou Hospital (RCMS) was compared with Guxian (non-RCMS)

https://doi.org/10.1017/S0305741005000081 Published online by Cambridge University Press

Table 2b: **Comparison of Patient Payments at Zhanjie (RCMS) and Licun (non-RCMS) Hospitals, August 2001**

	Gongyi county Zhanjie hospital (RCMS) Total outpatients = 222			*Yanshi county Licun hospital (non-RCMS) Total outpatients = 202*			
Cost items	*N (%)*	*Mean (yuan)*	*Max (yuan)*	*N (%)*	*Mean (yuan)*	*Max (yuan)*	*P value*
Drugs	119 (59)	26.77	278.70	114 (56)	21.62	115.00	0.218
Operation	2 (1)	9.00	10.00	6 (3)	85.50	170.00	0.063
Laboratory	36 (18)	15.10	45.00	37 (18)	10.95	70.00	0.154
Registration	0	0	0	104 (52)	0.44	0.90	–
Procedure/ treatment	42 (21)	19.10	80.00	51 (25)	17.00	110.00	0.625
Other	4 (2)	4.88	5.50	4 (2)	25.00	30.00	*0.011
Total	154 (77)	29.80	278.70	150 (74)	29.30	334.40	0.916
	Total inpatients = 29			*Total inpatients = 31*			
Cost items	*N (%)*	*Mean (yuan)*	*Max (yuan)*	*N (%)*	*Mean (yuan)*	*Max (yuan)*	*P value*
Drugs	29 (100)	323.92	1320.00	31 (100)	121.65	378.30	*0.003
Operation	5 (17)	276.00	450.00	10 (32)	525.00	830.00	*0.040
Laboratory	28 (97)	76.46	370.00	22 (71)	14.50	35.00	*0.000
Procedure/ treatment/ bed/ registration	29 (100)	222.58	530.00	31 (100)	157.20	673.40	0.087
Other	10 (35)	88.50	800.00	14 (45)	51.36	95.00	0.651
Total	29 (100)	698.43	2,183.00	31 (100)	481.69	1,401.30	0.075

Notes:
P value is the value for a 2-tailed test of difference in means between Zhanjie and Licun.
* indicates the values between RCMS and non-RCMS were statistically significantly different at the 5% level.

because both were located close to their county capitals, Gongyi city and Yanshi city respectively. Zhanjie Hospital (RCMS) was compared with Licun (non-RCMS) because they were further away. We tabulated the health services provided in these hospitals according to the local charge items.

For outpatients, Western drugs were prescribed to the majority of patients in all hospitals and accounted for a large proportion of patient payments, from one-third to two-thirds of total costs. Hospital visits ranged from an average total cost of 27 *yuan* (Beishankou) to 42 *yuan* (Guxian) (Tables 2a and 2b). When we compared Beishankou (RCMS) and Guxian (out-of-pocket), the differences in patient payment for health services were statistically significant for the average total cost (15 *yuan*

https://doi.org/10.1017/S0305741005000081 Published online by Cambridge University Press

Table 3: **Community Utilization of Four Township Hospitals in 2001 and 2002***

	Gongyi county (RCMS)		*Yanshi county (non-RCMS)*	
	Beishankou hospital	*Zhanjie hospital*	*Guxian hospital*	*Licun hospital*
Total population of township	43,078	35,375	60,134	72,893
Persons per household	4.2	3.7	4.2	3.9
Total patient visits in 2001	20,610	24,786	17,902	17,376
Total patient visits in 2002**	22,099	(52,875)	21,774	20,349
Treatment visits per person/year*	0.50	0.70	0.33	0.26
Number of services per visit	5.9	2.3	3.1	3.1

Notes:

*Compiled from the four hospitals' monthly records for 26 December 2000 to 31 December 2002. Estimates are annual averages across the 2 years of observation, except for Zhanjie (2001 average used – see next note).

**Number of visits for Zhanjie in 2002 were inadvertently inflated by including village patrol work by hospital doctors and are not included in calculated average utilization rates given in the text.

higher in Guxian), and for drugs (7 *yuan* higher in Guxian). Zhanjie (RCMS) and Licun (out-of-pocket) were similar with average total costs of 29–30 *yuan* per patient; only the "other" expense item differed significantly for these two hospitals but this involved relatively few patients.

For inpatients, the average total costs were high (Tables 2a and 2b), ranging from 482 *yuan* (Licun) to 971 *yuan* (Beishankou), equivalent to 60–121 days' income for farmers whose per capita net incomes averaged 8 *yuan* per day (Table 1). Again drugs formed a substantial proportion of the total cost. There was no consistent difference between Beishankou and Guxian, and between Zhanjie and Licun, for the average cost of the various itemized services. Overall, the difference in the average total cost was not statistically significant between the RCMS hospitals and their non-RCMS counterparts.

Generally, overall, no significant difference was noted for RCMS and non-RCMS hospital costs. The exception was the higher average total cost for outpatients in Guxian (non-RCMS compared to Beishankou (RCMS).

According to the hospital monthly records for 2001 and 2002 there was substantial variability in the services provided by the four hospitals. Table 3 shows that Beishankou (RCMS) provided twice as many services per patient-visit (5.9) as the other three townships (2.3 to 3.1). We do not know if this reflected a degree of over-servicing, or relative under-servicing in the other three townships, or that Beishankou was better equipped. Overall, in all four hospitals but especially in Beishankou, the

https://doi.org/10.1017/S0305741005000081 Published online by Cambridge University Press

diagnostic and therapeutic services offered were moderately sophisticated, extending far beyond basic primary health care.

Utilization rates. The annual demand for township hospital services in 2001 and 2002 in the two RCMS areas averaged from 0.50 to 0.70 visits per person, about twice the level of 0.26 to 0.33 visits per person noted for the two non-RCMS townships (Table 3). These differences were unlikely to be due to chance ($p < 0.0001$).

The admission rates for inpatients (Tables 2a and 2b) were also quite low according to our August 2001 month-long survey. When townships are compared, admission rates did not vary inversely with costs. Using their total population figures, we calculate that for Guxian (despite having a higher average total cost) the inpatient admission rate of 4.2/10,000 population per month was similar to that for Licun (4.3/10,000). We also calculate that inpatient admission rates/10,000 population per month in the non-RCMS hospitals were substantially lower than those for RCMS hospitals (Beishankou 7.0, Zhanjie 8.2).

Hospital Finances

Given the similar economic conditions between the two counties, the higher utilization rates in Gongyi county (Beishankou and Zhanjie hospitals) cannot be said to come from higher incomes of its population. So we enquired into hospital finances as a possible explanation of differential use. RCMS hospitals would be more attractive if better equipped and maintained. Indeed, the two Gongyi hospitals are better funded as a result of income streams derived from the RCMS. Our interview with the director of Beishankou hospital in early 2001 indicated that he expected to receive that year about 120,000 *yuan* from RCMS subscriptions based on a premium of 3 *yuan* per head, a substantial boost to its annual income from outpatients and inpatients. Similarly the director of Zhanjie hospital informed us that in 2001 about 54,200 *yuan* was expected from RCMS subscriptions based on a premium of 2 *yuan* per person. When we checked these estimates by measuring the monthly hospital incomes using a special form over the whole of 2001 and 2002 we found the income streams into the hospitals from the RCMS re-imbursements were even more substantial, amounting to a large part (10–14 per cent) of the total income for these two hospitals. This income was not available to the two non-RCMS hospitals and they were generally less utilized and with less income relative to the size of the populations they served (Table 4).

It is notable that all the hospitals earn considerable income by charging for preventive activities, including services that are clearly a public good, such as immunization that lowers infection risks for everyone. Doctors from the RCMS hospitals also carried out village patrols (periodic visits to villages to see anyone needing services), financed directly from the insurance fund, so generating more hospital revenues.

https://doi.org/10.1017/S0305741005000081 Published online by Cambridge University Press

Table 4: **Township Hospital Annual Income in 2001 and 2002**

Income source (in yuan)	*Beishankou (RCMS)*	*Guxian (non-RCMS)*	*Zhanjie (RCMS)*	*Licun (non-RCMS)*
Preventive fees	154,169	148,072	228,295	224,703
Village patrols	62,490	–	15,975	–
RCMS reimbursement	430,731	n.a	199,139	n.a
Patient curative fees	2,465,335	2,319,388	1,597,512	1,159,136
Total income	3,112,725	2,467,460	2,040,921	1,383,839

Source:
Compiled from monthly records of the four hospitals in 2001 and 2002.

Table 5: **Preventive Services and Hospital Income, 2001 and 2002**

	Beishankou (RMCS)		*Guxian (non-RCMS)*		*Zhanjie (RCMS)*		*Licun (non-RCMS)*	
Items	*No. of services*	*Income (yuan)*	*No. of services*	*Income (yuan)*	*No. of services*	*Income (yuan)*	*No. of services*	*Income (yuan)*
Ante-natal care	431	4,112	584	1,829	463	0	2,469	3,886
Vaccination	18,587	143,120	27,645	102,598	33,285	200,542	56,295	210,367
School health checks	0	0	9,800	39,200	0	0	1,800	9,000
Public health checks	110	5,650	0	0	393	19,650	0	0
Well-child checks	429	1,287	923	4,445	2,836	8,103	290	1,450
Total	19,557	154,169	38,952	148,072	36,977	228,295	60,854	224,703

Source:
Compiled from monthly records of the four hospitals in 2001 and 2002.

The preventive activities at each hospital varied considerably but they all earned substantial sums by charging for immunization (Table 5). Overall, charging for public health work generates a major income stream and reveals the pressure on the hospital directors to generate funds that they can use to pay for staff and maintain their facility. Relative to population size the RCMS hospitals were earning more than the non-RCMS hospitals from preventive activities.

Discussion and Conclusions

Utilization rate of health services is one indicator of accessibility with implications for the provision of equitable health care. Amongst our four study townships, containing more than 200,000 people, utilization rates of the RCMS hospitals were twice that of the non-RCMS hospitals for both outpatients and inpatients. However, even in the RCMS areas, doctor visit

https://doi.org/10.1017/S0305741005000081 Published online by Cambridge University Press

rates of 0.50–0.70 per person per year remained very low by Western standards (for example, average frequency of doctor consultation per person per year is 3.74 for Slovenia and 3.48 for England and Wales)[34] and even by some Chinese standards (such as 3.7 doctor visits per person per year in Hong Kong).[35]

The apparent gender equity in use of health services in Gongyi (RCMS) and Yanshi (out-of-pocket), including maternity care for mothers, probably disguises a relative access difficulty for women, who would normally be expected to require health services at two or three times the male rate during the reproductive years.

The range of services was not uniform among the hospitals, indicating a degree of market deregulation, substantial autonomy of hospital management, and possibly product differentiation in the quality of care (which was not studied here). The same can be said for the provision of preventive activities to generate income; this was a major activity at all hospitals but there was considerable variation in the patterns of service charges. We are unable to comment on the quality of any of the services because any direct assessment would have been intrusive, requiring appraisal of diagnosis, therapy and outcomes that went beyond our research resources.

For outpatients, hospital cost per visit may partly influence utilization as costs at non-RCMS Guxian were higher than the two RCMS hospitals (Beishankou and Zhanjie). However, non-RCMS Licun hospital had the worst utilization rate despite its relatively low average total cost. To some extent the RCMS hospitals in our sample may have been more efficient than the non-RCMS hospitals and passed on savings to patients. Or they may have been perceived as better run and financed and therefore more attractive to potential users.

For the inpatients in our study, the cost of each hospital stay appeared not to have influenced utilization rates because the difference was negligible between the two health financing systems. Although there were significant differences in the costs of several health services between Zhanjie and Licun, the average total cost was not significantly different.

Insurance claims from RCMS were not a financial benefit for outpatients and most inpatients. We can assume there was no over-utilization (moral hazards) among the insured (RCMS) patients because co-payments were so high and use-rates were so low. Such high co-payments also were noted in previous studies in China[36] and are to be expected

34. Douglas M. Fleming and Danica Rotar Pavlic, "Information from primary care: its importance and value. A comparison of information from Slovenia and England and Wales, viewed from the 'Health 2' perspective," *European Journal of Public Health*, No. 12 (2002), pp. 249–253.

35. C.L. Lam, D.Y. Fong, I.J. Lauder and T.P. Lam, "The effect of health-related quality of life (HRQOL) on health service utilization of a Chinese population," *Social Science and Medicine* Vol. 55 (2002), pp. 1635–46.

36. Carrin *et al*., "The reform of the rural cooperative medical system in the People's Republic of China," pp. 961–972; and Gerald Bloom and Tang Shenglan, "Rural health prepayment schemes in China," pp. 951–960.

for any pre-payment system with premiums set at a very low level (see below).

Financial sustainability of RCMS. The RCMS generated considerable income for the participating hospitals and this probably enabled them to function better and attract more patients. If so, the RCMS stabilized and improved the provision of this important level of health care, a significant benefit of this low-premium scheme to population health.

Only the two lowest levels of government (county and township) contributed to the government collective funds in the RCMS. Individual premiums were low, varying from an annual amount of 3 *yuan* per person in Beishankou to 2 *yuan* in Zhanjie. Despite the relative poverty of the farmers, there is a need to raise the premiums if the community financing is to work effectively to achieve more equitable health care, particularly a higher utilization rate of health services.

An ongoing problem is the collection of premiums from farmers who are self-employed, unlike the urban workers whose premiums are deducted from their wage packets under the labour insurance schemes. Until recently, RCMS premiums were automatically collected from the revenue obtained from the sale of farm produce in July each year. The central government's tax reform to replace local fees with an agricultural tax has rendered illegal the involuntary payment of premiums. Accordingly, Gongyi in 2002 changed to voluntary payment through a new household contract system. Rural families now have the freedom of choice, and with the proposed rise of premiums (from 3 to 10 *yuan* per person in Beishankou) there will be more pressure on RCMS management to make membership more attractive to farmers.

Management of the community-based health insurance schemes will influence the efficiency with which services are provided to the community, that is, giving the best possible services at the lowest cost. Could the existing township-based insurance system be modified to achieve economies of scale associated with bigger risk pooling? We note that although coverage in Gongyi county reached 71 per cent of total population (470,000 members), each RCMS was managed locally at the township level, meaning that each covered a relatively small local population (43,078 in Beishankou and 35,375 in Zhanjie). If the management of each township-based insurance scheme were transferred to the county level there would be just one RCMS financed by a large membership.

This was China's new policy for RCMS as from 2003; and we emphasize the need for mechanisms to guard against corruption that could be a problem in the impersonal setting of a large county-wide insurance system. At the township level, accountability would be more direct and embezzlement was probably less likely in the long run. Nevertheless, the RCMS management committees were making an effort to implement strict accounting practices for handling large amounts of money.

What has community financing achieved in Henan province? The government attempted to provide equitable health care for the rural population with the introduction of RCMS pilots in the 1990s. But the re-imbursements that could make health care more accessible were negligible because of low levels of funding from premiums and government subsidies. Utilization rates of township hospitals remained low but those in RCMS areas were approximately double those prevailing in the out-of-pocket system, perhaps reflecting the better financial state of the RCMS hospitals and the consequent provision of better service.

The most notable family benefit of RCMS is the financial help given to catastrophic illness cases, unavailable under the out-of-pocket system. Although benefits to patients with catastrophic illnesses were relatively modest, they would be extremely helpful to the afflicted families. We are investigating the issue of catastrophe finance in more detail but these data are not yet complete.

Lastly, the RCMS hospitals seemed to have benefited greatly from community financing. Patient flows were higher and costs were lower for those outpatients in our study sample. This may reflect a stabilizing effect of RCMS revenue on hospital finances and could be the most important overall effect of the RCMS on rural health services. As such, the seemingly modest impact of the RCMS noted in our study may actually be most helpful in ensuring the survival of township hospitals. A stable service-oriented township hospital is an essential component of health service provision in China. No area can afford to lose this vital outlet of health expertise.

We conclude that each RCMS has succeeded in creating an operational community-based financing system, managed at the township level. Although low premiums precluded substantive financial benefits to individual consumers, the RCMS probably helped its township hospital survive, remaining accessible for emergency use. The low-premium insurance scheme contributed little to establishing equitable health services for the rural population. This will require community contributions that are substantially higher, complemented by subsidies from higher levels of government. As from 2003, the Chinese government is testing a new voluntary RCMS with higher premiums (10 *yuan* per head), larger subsidies (trebling previous inputs) from various government levels, and risk pooling across greater population numbers at the county level. This is an encouraging advance towards providing equitable health care to rural residents, and needs to be followed carefully as it develops over the next few years in many pilot counties throughout China.

Appendix 1: **Socio-economic Characteristics of Township Hospital Outpatients and Inpatients Sampled in Gongyi (RCMS) and Yanshi (non-RCMS) Counties, August 2001**

	Outpatients				*Inpatients*			
	Yanshi county		*Gongyi county*		*Yanshi county*		*Gongyi county*	
	N = 424	*per cent*	*N = 428*	*per cent*	*N = 56*	*per cent*	*N = 59*	*per cent*
Males	220	51.9	187	43.7	26	46.2	23	39
Females	204	48.1	241	56.3	30	53.6	36	61
Age (years)								
< 1	23	5.4	9	2.1	2	0.5	0	0
1–4	38	9.0	28	6.5	4	7.1	0	0
5–14	44	10.4	32	7.5	7	12.5	2	3.4
15–29	81	19.1	99	23.1	17	30.4	20	34
30–49	120	28.3	135	31.5	13	23.2	18	30.5
50 and over	118	27.8	125	29.2	13	23.2	19	32.2
Occupation								
Worker	24	5.7	46	10.8	0	0	4	6.8
Farmer	212	50	199	46.5	34	60.7	37	62.7
Student	63	15	48	11.2	7	12.5	2	3.4
School drop-out	3	0.7	2	0.5	0	0	1	1.7
Teacher or cadre	23	5.4	33	7.7	2	3.6	1	1.7
Business	12	2.8	18	4.2	2	3.6	0	0
Housewife/ homemaker	15	3.5	39	9.1	3	5.4	9	15.3
No job	10	2.4	16	3.7	2	3.6	4	6.8
Other	62	14.6	27	6.3	6	10.7	1	1.7
Education								
Nil	94	22.2	68	15.9	10	17.9	7	11.9
Primary	102	24	94	22	9	16.1	14	23.7
Junior	178	42	183	42.8	33	59	30	50.9
Senior	32	7.6	56	13.1	3	5.4	6	10.2
Above senior	15	3.5	20	4.7	1	1.8	2	3.4
Persons now living in household								
1 person	10	2.3	16	3.7	1	1.9	3	5.1
2 persons	41	9.7	51	12	4	7.1	8	13.6
3 persons	61	14.4	122	28.5	8	14.3	8	13.6
4 persons	150	35.4	123	28.7	17	30.4	20	33.9
5 and more persons	162	38.1	116	27	26	46.4	19	32.2
Dependents (e.g. child, aged, disabled)								
0 person	56	13.2	73	17.1	4	7.1	11	19.0
1 person	110	25.9	155	36.2	15	26.8	16	27.11

https://doi.org/10.1017/S0305741005000081 Published online by Cambridge University Press

2 persons	171	40.3	130	30.4	20	35.7	20	34.0
3 persons	49	11.6	46	10.8	9	16.1	6	10.2
4 persons	25	6	17	4.0	5	8.9	5	8.5
5 and more persons	12	2.8	7	1.6	3	5.4	1	1.7
Co-operative medical scheme member	0	0	250	58.4	0	0	33	56.0

Notes:
Missing values:
Education – outpatients: 3 in Yanshi, 7 in Gongyi.
Dependents – outpatients: 3 in Yanshi.
Household – inpatients: 1 in Gongyi.

https://doi.org/10.1017/S0305741005000081 Published online by Cambridge University Press