Effective reimbursement rates of the rural health insurance among uncomplicated tuberculosis patients in China

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Abstract

OBJECTIVE   China has established universal health coverage for 830 million rural residents through the rapid expansion of the New Cooperative Medical Scheme (NCMS). This study accesses the effective reimbursement rates of NCMS among patients with tuberculosis (TB) who lived in counties where their schemes covered costs within TB dispensaries and those who did not.

METHODS   We randomly selected 50 patients with uncomplicated TB from each of the eight counties in two provinces. We reviewed all patient clinical charts and conducted face-to-face surveys. Effective reimbursement was measured as the proportion of patients who received reimbursement from NCMS and the average reimbursement rate of total medical costs.

RESULTS   A total of 393 patients with TB were included with 186 from Zhejiang and 206 from Sichuan. In the covered group, only 41% of patients with TB received reimbursements for medical costs in TB dispensary in Zhejiang as compared to 84% in Sichuan, because patients in Zhejiang needed to keep their bills and claim later, while Sichuan had patient medical costs automatically deducted at the point of care. Patients in the covered group had a significantly higher average reimbursement rate compared with those in the uncovered group (13% *vs.* 8% in Zhejiang and 17% *vs.* 12% in Sichuan). For all patients, the biggest cost was due to hospitalisation, and their overall reimbursement rates were low.

CONCLUSION   New Cooperative Medical Scheme has not relieved the financial burden of TB-related medical costs. NCMS should cover costs in TB dispensaries. Measures are also needed to minimise unnecessary hospitalisation, and lower the barriers to claims.

keywords universal health coverage, effective reimbursement, health insurance, tuberculosis, China

Introduction

Many developing countries begin to establish the universal health coverage, that is a health system that provides health care and financial protection to all its citizens (Rodin & de Ferranti 2012). Universal health coverage has gained momentum in China since the start of its comprehensive health reform in 2009 which aimed to provide 'safe, effective, convenient and affordable basic health services' to all rural and urban residents (Steering Committee of China Government 2009). Currently, China has three major public health insurance schemes: the New Rural Cooperative Medical Scheme (NCMS) for farmers, the Urban Employee-based Basic Medical Insurance Scheme for urban residents who have a formal employment and the Urban Resident-based Basic Medical Insurance Scheme for urban residents who are unemployed or do not have formal employment. The three schemes are all publicly supported, but have their own defined premiums, benefit packages and operational guidelines. NCMS is the largest scheme covering nearly all the 830 million farmers in China (Barber & Yao 2011). The scheme is voluntary, requiring households to pay a small part of the premium, but the local government financed the rest majority. NCMS is risk-pooled and managed at the county level, usually covering a population from 200 000 up to 1 million. The scheme aims to provide health protection over catastrophic illnesses so that it normally sets relatively high reimbursement rates for inpatient care but low rates for outpatient services.

The impact of universal health coverage is debatable. A review of empirical studies in low-income countries suggested broader health coverage generally led to better access to health care and reduced health inequities between the rich and poor (Moreno-Serra & Smith 2012). However, universal coverage may not necessarily reduce financial burden of patients in settings where the profit-driven behaviours of health providers are not addressed. Patients often have to pay out-of-pocket for co-payments and user fees, with the thresholds and ceilings set up by the insurance schemes. A study found that the rapid expansion of universal health coverage in China was associated with a 2.5 times increase of hospitalisation rate between 2003 and 2011; while the proportion of families bankrupted due to hospitalisation increased by 20% in the same period (Meng *et al.* 2012). Other studies found that NCMS was linked with increased use of primary care (Babiarz *et al.* 2010), but it did not reduce patient out-of-pocket medical cost (Lei & Lin 2009). Health insurance schemes need to be closely scrutinised in terms of effective reimbursement, that is, the real reimbursed amount out of all related medical costs.

In this study, we explored the effective reimbursement of NCMS among patients with tuberculosis (TB), one of the leading causes of morbidity and mortality in China and other low-middle income countries. China has the second largest burden of TB in the world (WHO 2013). TB DOTS (direct observed treatment short course) programme has been implemented across China since 2002, where patients with TB are diagnosed and treated in county TB dispensaries. China government implemented the free TB treatment policy, which provides first-line anti-TB drugs, two X-ray examinations and all sputum smear tests free of charge in TB dispensaries. However, the free treatment policy is only implemented in TB dispensaries, and it does not cover other medical examinations or medicines beyond the above items. Patients with TB commonly present with non-specific symptoms such as cough and fever, so that patients often visit general health facilities before they are referred to TB dispensaries for TB diagnosis and treatment. NCMS covers general health facilities such as hospitals and village clinics, but only 45% of counties had TB dispensary covered in 2010 (NCTP 2010). One argument is that NCMS does not need to cover TB dispensaries because of the free TB treatment is provided in TB dispensaries. However, patients often have to pay excessive out-of-pocket payments for extra X-rays, blood tests and traditional medicine 'liver protection' drugs both in TB dispensaries and in general hospitals, which is largely due to the income-generating behaviour of health providers (Zhan *et al.* 2004; Long *et al.* 2011a). Previous studies reported that

the lack of health insurance coverage was linked with longer delays and poor treatment results among patients with TB (Xu *et al.* 2005; Yan *et al.* 2007; Wei *et al.* 2009). This study aims to compare the effective reimbursement of NCMS for TB-related medical costs between counties with TB dispensaries covered by NCMS and counties with TB dispensaries not covered by NCMS.

Methods

Research settings

We selected two provinces: Zhejiang, a relatively rich province in east China, and Sichuan, a relatively less developed province in western China. Both provinces had nearly half of the counties with NCMS covering TB dispensaries though all insurance schemes covered the general hospitals. We randomly selected four counties in each province, with two belonging to the covered group (i.e. with NCMS covering TB dispensaries), and two belonging to the uncovered group. Counties selected in each province were comparable in terms of population, economic development and TB notification rates. In the covered group of Zhejiang, reimbursements in TB dispensaries were based on proportions of medical costs, while patients in the covered group in Sichuan received a lump-sum reimbursement package for TB treatment (Table 1).

Study participants

In each county, we randomly selected 50 patients with uncomplicated TB from an available pool of 100–200 in the TB registers according to the inclusion criteria: (i) being patients with new sputum smear-positive or negative pulmonary TB, (ii) been registered in 2009 and successfully completed treatment by August 2010; (iii) having no serious comorbidities such as diabetes, cardiovascular disease, hepatic disease or severe respiratory symptoms. Drug sensitivity tests were not available to patients with TB, but we selected patients who had been successfully treated, so they were not likely to be drug resistant. These criteria were chosen to balance the case-mix of patients for comparability reasons.

Data collection

All patients received face-to-face interviews with a structured questionnaire, covering topics on socio-demographic information, the cost of TB treatment in any health facilities and reimbursed amount from NCMS in each of their treatment episodes. Clinical charts from TB

Table 1 General social economic context and health insurance schemes in research sites in China (2009)

	Zhejiang				Sichuan			
	Covered group		Uncovered group		Covered group		Uncovered group	
	Anji	Tonglu	Changxing	Xinchang	Jianyang	Yanjiang	Renshou	Dongpo
Population (10 000)	46	40	62	44	146	109	158	86
Rural population (10 000, %)	36 (79)	31 (78)	46 (74)	35 (79)	122 (84)	86 (79)	129 (81)	60 (70)
Average rural resident income (RMB)	11 326	10 410	11 751	9965	5000	5004	4461	5602
TB notification rate (10 000)	62	57	67	53	51	79	84	49
Reimbursement rates of the health insurance scheme in TB dispensaries	25–70% with higher rates for higher cost bands. Ceiling at RMB50 000	5–65% with higher rates for higher cost bands. Ceiling, ceiling at RMB50 000	No	No	Family account plus a package of RMB 200 per year	Family account plus a package of RMB 300 per year	No	No
Reimbursement rates of the health insurance schemes for general outpatient visits	Same as above	Same as above	20–80% with higher rates for higher cost bands, ceiling at RMB70 000	15–45% with higher rates for higher cost bands, ceiling at RMB70 000	Family account (RMB 30 per person)	Family account (RMB 30 per person)	Family account (RMB 30 per person)	Family account (RMB 30 per person)
Reimbursement rates of the health insurance scheme for inpatient care	Same as above, a threshold of RMB2000 applies.	Same as above, a threshold of RMB2000 applies.	Same as above, a threshold of RMB2000 applies.	Same as above, a threshold of RMB2000 applies.	35–60% with higher rates for higher cost bands, a threshold of RMB1500 applies. Ceiling at RMB15 000	30–65% with higher rates for higher cost bands, a threshold of RMB 1500 applies. Ceiling at RMB30 000	40–85% with higher rates for higher cost bands, a threshold of RMB1200 applies. Ceiling at RMB30 000	40–85% with higher rates for higher cost bands, a threshold of RMB1200 applies. Ceiling at RMB28 000

1 US dollar = 6.3 RMB in 2009.

dispensaries of all patients were reviewed to collect information regarding TB diagnosis, treatment, costs and the amount covered by NCMS. A team of trained postgraduate students collected the data in December 2010. Research tools were piloted and revised prior to the large-scale investigation. Ethical approval was obtained from the Ethics Committee for Health Management and Policy Studies at the Shandong University and the University of Leeds. Written informed consents were collected from all patients with TB prior to the survey and medical chart review.

Analysis

Statistical analysis was performed by SPSS (19.0). Chi-square tests, one-way analysis of variance and *U*-test were employed to analyse categorical data. Effective reimbursement of the rural health insurance was measured in two dimensions: the proportion of patients who received reimbursement from NCMS and the average reimbursement rate. The average reimbursement rate is defined as the average of each patient's reimbursed amount as a percentage of his or her total medical costs. Binary logistic regression was conducted where the dependent variable was the average reimbursement rate of the total medical costs (1 = >10%, 0 = ≤10%), while the independent variables included province, group, if reimbursed on a lump-sum basis for medical costs in TB dispensaries, gender, age groups (50 years old or not), marital status, education (primary school or higher), annual household income (RMB50 000/USD7936 or higher), hospitalisation, if treated in the TB dispensaries over 240 days, total medical costs (RMB2500/USD397 or higher), medical costs in the TB dispensaries (RMB1000/USD159 or higher) and medical costs in general health facilities (RMB700/USD111 or higher). Backward

stepwise likelihood ratio method was employed to regress with $P < 0.05$ as inclusion criterion and $P > 0.10$ as exclusion criterion. Due to the complexity of patient treatment pathways, we combined medical costs in village clinics, township hospitals and general hospitals together as the costs in general health facilities, so as to differentiate medical costs in TB dispensaries.

A sensitivity analysis was conducted with the assumption that each patient had the same medical costs. In the analysis, we simulated that each patient in the covered group and uncovered group spent the same cost in the TB dispensary and general health facilities. In this stimulation, individual cost is replaced by the average medical cost in the TB dispensary (A) or in the general health facilities (B) of both the covered and the uncovered groups in the province. The individual reimbursement rates in the TB dispensary (C) and general health facility (D) remain unchanged. The adjusted reimbursement rate for each patient is calculated according to $[(A*C) + (B*D)]/(A + B)$.

Results

General information of study participants

We interviewed a total of 393 TB patients with 186 from Zhejiang and 206 from Sichuan. Of them, 52% in Zhejiang and 48% in Sichuan were from the covered group. No significant differences were found between the covered and uncovered groups regarding gender, age, marital status, education level and annual household income ($P > 0.05$, Table 2).

Proportions of patients with TB receiving reimbursement

In Zhejiang, only 41% of patients with TB from the covered group received reimbursements in TB dispensaries.

Table 2 Participants of the surveys in China (2009)

	Zhejiang		Sichuan	
	Covered group	Uncovered group	Covered group	Uncovered group
No. of patients	97	89	98	108
Male, *N* (%)	69 (71)	63 (71)	71 (72)	73 (68)
Age	49	46	50	48
<44, *N* (%)	30 (31)	35 (39)	27 (28)	42 (39)
45–59, *N* (%)	37 (38)	35 (39)	39 (40)	38 (35)
>60, *N* (%)	30 (31)	19 (21)	32 (33)	28 (26)
Married, *N* (%)	74 (76)	64 (72)	78 (80)	91 (84)
Below primary school, *N* (%)	53 (55)	37 (42)	48 (49)	66 (61)
Annual household income (RMB)	17 292	13 353	5171	4704

No significant differences were found between the covered and uncovered groups within each province.
1 US dollar = 6.3 RMB.

X. Wei *et al.* **Effective reimbursement rate for TB in China**

Regarding medical costs in general health facilities, 60% and 58% patients with TB received reimbursements from the covered and uncovered groups in Zhejiang, respectively (*P* > 0.05). Similarly, there were no significant differences regarding the proportion of patients who received reimbursements between the two groups regarding outpatient and inpatient care in general health facilities (*P* > 0.05). Significantly higher proportion of patients with TB received reimbursements in the covered group compared to that in the uncovered group for all medical costs (72% *vs.* 55%, *P* = 0.022), as well as for outpatient costs (63% *vs.* 39%, *P* = 0.002, Table 3).

In Sichuan, 84% of patients with TB from the covered group received reimbursement. Similarly, there was no significant difference between the two groups regarding the proportion of patients who received reimbursement in general health facilities (43% and 55%, *P* > 0.05). However, a higher proportion of patients received reimbursements in the covered group compared to that in the uncovered group regarding all medical costs (87% *vs.* 52%, *P* < 0.001), and the outpatient costs (86% *vs.* 34%, *P* < 0.001, Table 3).

Medical costs and average reimbursement rates

In Zhejiang, the average patient medical cost in the TB dispensary was significantly lower in the covered group compared with that in the uncovered group (RMB931/USD148 *vs.* RMB1660/USD263, *P* < 0.001, Table 4). However, the average reimbursement rate in TB dispensaries was only 5% in the covered group. No differences

were observed regarding medical costs and average reimbursement rates in general health facilities between the covered and uncovered groups (18% *vs.* 14%, *P* > 0.05). Overall, the average medical costs were lower in the covered group compared to those in the uncovered group (RMB4660/USD740 *vs.* RMB5895/USD935, *P* = 0.005). The majority of medical costs in the covered and uncovered groups were spent on inpatient care, which accounted for 74% and 60% of the total medical costs, respectively (*P* > 0.05). While patients with TB in the covered group had significantly higher average reimbursement rates for outpatient costs (11% *vs.* 4%, *P* < 0.001) and total medical costs (13% *vs.* 8%, *P* = 0.002) compared with those in the uncovered group.

On the contrary, the average patient medical cost in the TB dispensary was significantly higher in the covered group as compared to that of the uncovered group (RMB1790/USD284 *vs.* RMB1041/USD165, *P* < 0.001) in Sichuan. The average reimbursement rate in TB dispensaries was higher in Sichuan, but at only 16% in the covered group. Whereas there was no significant difference observed between the two groups regarding medical costs and average reimbursement rates in general health facilities (*P* > 0.05). Overall, the majority of medical costs (43% and 58%) were spent on inpatient care in the two groups. No significant difference was observed between the two groups regarding the average reimbursement rates for inpatient care (23% and 24%). Patients with TB in the covered group had significantly higher reimbursement rate for total outpatient costs (17% *vs.*

Table 3 Proportion of patients with tuberculosis who received reimbursements from the rural health insurance scheme in China

	Zhejiang				Sichuan			
	Covered group		Uncovered group		Covered group		Uncovered group	
	Number of patients	Proportion of patients receiving reimbursement	Number of patients	Proportion of patients receiving reimbursement	Number of patients	Proportion of patients receiving reimbursement	Number of patients	Proportion of patients receiving reimbursement
TB dispensary	97	41	89	0	98	84	108	0
General health facilities	92	60	84	58	90	43	102	55
Outpatient	77	51	71	49	78	31	85	44
Inpatient	35	83	36	69	28	89	38	79
All TB-related treatments	97	72*	89	55	98	87†	108	52
Outpatient	97	63‡	89	39	98	86§	108	34
Inpatient	35	83	36	69	28	89	38	80

The covered group was found significantly higher than the uncovered group in *(χ^2 = 5.895, *P* = 0.022), †(χ^2 = 28.947, *P* < 0.001), ‡(χ^2 = 10.317, *P* = 0.002), and§(χ^2 = 56.127, *P* < 0.001).
1 US dollar = 6.3 RMB.

Table 4 Medical cost and average reimbursement rates for TB treatments in the two Chinese provinces

| | Zhejiang | | | | | | Sichuan | | | | | |
| | Covered group | | | Uncovered group | | | Covered group | | | Uncovered group | | |
	Cost (RMB)	Reimbursement (%)	Average reimbursement rate, %	Cost (RMB)	Reimbursement (%)	Average reimbursement rate, %	Cost (RMB)	Reimbursement (%)	Average reimbursement rate, %	Cost (RMB)	Reimbursement (%)	Average reimbursement rate, %
TB dispensary	931*	38 (4.1)	5†	1660	0	0	1790‡	228 (13)	16§	1041	0	0
General health facilities	3729	877 (23)	18	4235	808 (19)	14	2370	481 (20)	15	2838	820 (29)	21
Outpatient	727	228 (31)	20	726	102 (14)	16	598	118 (20)	14	588	160 (27)	23
Inpatient	3003	649 (22)	22	3508	706 (20)	17	1773	362 (20)	23	2251	660 (29)	24
All TB-related treatments	4660¶	915‖ (20)	13**	5895	808 (14)	8	4161	708†† (17)	17‡‡	3879	820 (21)	12
Outpatient	1657§§	267¶¶ (16)	11‖‖	2387	102 (4.3)	4	2388***	346††† (14)	17‡‡‡	1628	160 (9.8)	8
Inpatient	3003	649 (22)	22	3508	706 (20)	20	1773	362 (20)	23	2251	660 (29)	24

The covered group was found significantly lower than the uncovered group in *(Z = −6.889, P < 0.001), ¶(Z = −2.829, P = 0.005) and §§(Z = −5.170, P < 0.001). The covered group was found significantly higher than the uncovered group in †(Z = −6.795, P < 0.001), ‡(Z = −6.195, P < 0.001), § (Z = −11.720, P < 0.001), ‖(Z = −2.078, P = 0.038), **(Z = −3.151, P = 0.002), ††(Z = −3.421, P = 0.001), ‡‡(Z = −3.385, P = 0.001), ¶¶(Z = −4.410, P < 0.001), ‖‖(Z = −4.182, P < 0.001), ***(Z = −37.048, P < 0.001), †††(Z = −6.030, P < 0.001) and ‡‡‡(Z = −6.782, P < 0.001). 1 US dollar = 6.3 RMB.

8%, P < 0.001) and total medical costs (17% vs. 12%, P = 0.001) compared with those in the uncovered group.

Sensitivity analysis

In the sensitivity analysis, we employed the group average costs to replace individual costs in the TB dispensary and general health facilities. The average reimbursement rate for all medical costs in the covered group remained significantly higher than that in the uncovered group in Zhejiang (14% and 11%, P < 0.003), and in Sichuan (13% and 10%, P < 0.001).

Factors related with average reimbursement rate for total medical costs

A logistic model was conducted to regress the factors influencing the average reimbursement rate. The model showed that males, patients who were married, those from Zhejiang, those in the covered group, patients who had been hospitalised, patients who spent over RMB2500/USD397 on total medical costs or patients who spent less than RMB700/USD111 in TB dispensaries were more likely to have an average reimbursement rate over 10% of their total medical costs (Table 5). Hosmer and Lemeshow goodness of fit test reported a chi-square 12.773 with P value of 0.198, indicating the logistic model fits the data.

Discussion

Our study found that patients with TB covered by the NCMS insurance scheme had a 5% higher reimbursement rate regarding outpatient and total medical costs than those not covered in both Zhejiang and Sichuan. According to the national guideline, patients with uncomplicated TB should be treated in the TB dispensaries under the free treatment policy. One may argue that no health insurance is needed in TB dispensaries because anti-TB medications are provided free of charge to patients. However, studies found that patients with TB still need to pay significant amounts in TB dispensaries for extra examinations and auxiliary traditional medicines to 'improve the liver function' (Long et al. 2011a; Wei et al. 2014). It is debatable whether the use of extra examinations and auxiliary traditional medicines are clinically necessary for patients with uncomplicated TB, as this has to be examined case by case. Nevertheless, reimbursing medical costs on items beyond those covered by the free treatment policy is important to reduce TB patient's financial burden, because these costs did occur for the majority of patients with TB in TB dispensaries (Long et al. 2011a).

Table 5 Significant independent variables in the logistic regression model

Independent variable	β	Standard error	Wald	*P* value	Odds ratio (OR)	95.0% Confident intervals for OR
Province	1.036	0.480	18.382	<0.001	2.673	1.930–5.551
Group	1.567	0.272	33.115	<0.001	2.209	1.272–2.337
Marriage status	0.698	0.233	6.173	0.015	0.565	0.232–0.875
Gender	0.571	0.253	2.761	0.092	0.624	0.246–1.925
If hospitalised	1.927	0.483	6.265	0.009	1.164	2.199–7.832
Total medical cost	0.346	0.392	3.270	0.05	1.287	1.835–3.922
Medical cost in TB dispensaries	−1.728	0.326	18.275	0.05	0.828	0.827–1.997
Constant	2.286	0.488	33.784	<0.001	4.166	

In addition, how medical bills are reimbursed may influence effective reimbursement rate. In Sichuan, 84% of patients with TB in the covered group made their claims because their medical costs were directly deducted at the point of care from a lump-sum package in TB dispensaries. While in Zhejiang, only 41% patients in the covered group claimed their medical costs in TB dispensaries because patients needed to keep the bills and claim later in the NCMS office. Many patients may not know that costs from TB dispensaries are claimable or may simply forget to maintain the bills.

Our study revealed that NCMS has not actually relieved the financial burden of TB-related medical costs, despite the fact that improved government funding to NCMS has improved its benefit package (Meng & Xu 2014) and patient accessibility to primary care facilities (Wagstaff *et al.* 2009). In our study, the average reimbursement rates were strikingly low, that is, around 15% for total medical costs in the covered group despite that up to 87% patients had made their claims. Other studies reported similar rates, for example, around 10–25% patient medical costs were found reimbursable in other rural settings in China (Sun *et al.* 2009; Yi *et al.* 2009). Some studies also reported that NCMS did not reduce patient out-of-pocket costs per episode (Babiarz *et al.* 2010; Yang & Wu 2014). This reflects a number of barriers in China's rural health insurance schemes, such as high co-payment rates for outpatient service, high threshold for inpatient service and low ceilings (Barber & Yao 2011; Meng & Xu 2014). In addition, local governments may reduce reimbursed items when the funding for NCMS was constrained, which may further prevent patients reimbursing their medical costs (Yi *et al.* 2009). By 2011, despite the universal health coverage, over 10% of households in China still experienced catastrophic health expenditure (Meng *et al.* 2012).

The national policy is that TB patients with uncomplicated TB should be treated in TB dispensaries, and do not need to be admitted as inpatients. Although the China National TB Programme has successfully promoted timely referral of TB cases from general hospitals to TB dispensaries (Wang *et al.* 2010), over 20% of uncomplicated patients were still admitted to hospital and spent over 50% of their total medical costs on inpatient care (Long *et al.* 2011a; Sun *et al.* 2012; Wei *et al.* 2013). One possibility is the supplier-induced demand following the introduction of the NCMS. Long and colleagues reported a fourfold increase in caesarean delivery rates between 1998 and 2007 in rural China despite that hospital delivery rates only increased twofold in the same period (Long *et al.* 2011b). The supplier-induced demand may be addressed by implementing the essential medicine formulary, clinical guidelines, auditing and other quality control measurements (Zou *et al.* 2012; Meng & Xu 2014). Otherwise, despite the universal coverage with the NCMS, out-of-pocket payments will continue to be high.

Several limitations need to be borne in mind. First, we conducted the study in two provinces with different economic development levels, which may cofound the findings about the effects of the mode of reimbursement. However, we compared the reimbursement rates within each province to avoid this confounding factor. Second, we only selected four counties in each province, thus our results cannot be extrapolated to the two provinces or China due to great regional variations. Third, the study is subject to recall bias because medical costs in the general health facilities were collected from patient recalls. However, the study was conducted shortly after patient treatment completion to minimise the bias.

Conclusion

The effective reimbursement of NCMS was low for TB treatment. All NCMS schemes should include the cost of TB dispensary care. Measures are also needed to minimise unnecessary hospitalisation for patients with uncomplicated TB.

Acknowledgement

References

Babiarz KS, Miller G, Yi H, Zhang L & Rozelle S (2010) New evidence on the impact of China's New Rural Cooperative Medical Scheme and its implications for rural primary healthcare: multivariate difference-in-difference analysis. *BMJ* **341**, c5617.

Barber SL & Yao L (2011) Development and status of health insurance systems in China. *The International Journal of Health Planning and Management* **26**, 339–356.

Lei X & Lin W (2009) The New Cooperative Medical Scheme in rural China: does more coverage mean more service and better health? *Health Economics* **18** (Suppl. 2), S25–S46.

Long Q, Smith H, Zhang H, Tang S & Garner P (2011a) Patient medical costs for tuberculosis treatment and impact on adherence in China: a systematic review. *BMC Public Health* **11**, 393.

Long Q, Zhang Y, Raven J *et al.* (2011b) Giving birth at a healthcare facility in rural China: is it affordable for the poor? *Bulletin of the World Health Organization* **89**, 144–152.

Meng Q & Xu K (2014) Progress and challenges of the rural cooperative medical scheme in China. *Bulletin of the World Health Organization* **92**, 447–451.

Meng Q, Xu L, Zhang Y *et al.* (2012) Trends in access to health services and financial protection in China between 2003 and 2011: a cross-sectional study. *The Lancet* **379**, 805–814.

Moreno-Serra R & Smith PC (2012) Does progress towards universal health coverage improve population health? *The Lancet* **380**, 917–923.

NCTP (2010) *[Investigation of TB Control and NRCMS in China]*. TB & NRCMS Group, National Center for Tuberculosis Control and Prevention, Beijing.

Rodin J & de Ferranti D (2012) Universal health coverage: the third global health transition? *The Lancet* **380**, 861–862.

Steering Committee of China Government (2009) *[Guidelines for Deepening Health Systems Reform]*. Steering Committee of China Government, Beijing.

Sun Q, Liu X, Meng Q, Tang S, Yu B & Tolhurst R (2009) Evaluating the financial protection of patients with chronic disease by health insurance in rural China. *International Journal for Equity in Health* **8**, 42.

Sun Q, Yin J, Yin X *et al.* (2012) Does the integration of TB medical services in the general hospital improve the quality of TB care? Evidence from a case study in China. *Journal of Public Health (Oxford, England)* **35**(2), 322–328.

Wagstaff A, Lindelow M, Jun G, Ling X & Juncheng Q (2009) Extending health insurance to the rural population: an impact evaluation of China's new cooperative medical scheme. *Journal of Health Economics* **28**, 1–19.

Wang L, Liu X, Huang F, Hennig C, Uplekar M & Jiang S (2010) Engaging hospitals to meet tuberculosis control targets in China: using the Internet as a tool to put policy into practice. *Bulletin of the World Health Organization* **88**, 937–942.

Wei X, Chen J, Chen P *et al.* (2009) Barriers to TB care for rural-to-urban migrant TB patients in Shanghai: a qualitative study. *Tropical Medicine & International Health* **14**, 754–760.

Wei X, Zou G, Yin J, Walley J & Sun Q (2013) Comparing patient care seeking pathways in three models of hospital and TB programme collaboration in China. *BMC Infectious Diseases* **13**, 93.

Wei X, Zou G, Walley J *et al.* (2014) China tuberculosis policy at crucial crossroads: comparing the practice of different hospital and tuberculosis control collaboration models using survey data. *PLoS One* **9**, e90596.

WHO (2013). *Global Tuberculosis Report*. World Health Organization, Geneva.

Xu B, Jiang QW, Xiu Y & Diwan VK (2005) Diagnostic delays in access to tuberculosis care in counties with or without the National Tuberculosis Control Programme in rural China. *International Journal of Tuberculosis & Lung Disease* **9**, 784–790.

Yan F, Thomson R, Tang S *et al.* (2007) Multiple perspectives on diagnosis delay for tuberculosis from key stakeholders in poor rural China: case study in four provinces. *Health Policy* **82**, 186–199.

Yang W & Wu X (2014) Paying for outpatient care in rural China: cost escalation under China's New Co-operative Medical Scheme. *Health Policy Plan* **29**(1), 1–10.

Yi H, Zhang L, Singer K, Rozelle S & Atlas S (2009) Health insurance and catastrophic illness: a report on the New Cooperative Medical System in rural China. *Journal of Health Economics* **18** (Suppl. 2), S119–S127.

Zhan S, Wang L, Yin A & Blas E (2004) Revenue-driven in TB control–three cases in China. *International Journal of Health Planning & Management* **19** (Suppl. 1), S63–S78.

Zou G, Wei X, Walley J, Yin J & Sun Q (2012) Factors influencing integration of TB services in general hospitals in two regions of China: a qualitative study. *BMC Health Services Research* **12**, 21.

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