Manuscript Number:

Title: How effectively can the New Cooperative Medical Scheme reduce catastrophic health expenditure for the poor and non-poor in rural China?

Article Type: Original Research Paper

Keywords: Health Insurance; Catastrophic Health Expenditure; Equity; China.

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Manuscript Region of Origin: CHINA

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Methods: Questionnaire survey was conducted in three counties, with a random sample of 358 poor and 523 non-poor NCMS enrollees who used inpatient services and obtained NCMS reimbursement in 2005.

Results: Majority of NCMS enrollees suffered CHE due to using inpatient services, whilst the occurrence and intensity of CHE was greater among poor inpatients. NCMS reimbursement helped relieve CHE to a certain degree. Poor inpatients benefited more from NCMS than non-poor, but the effects varied among counties. Cost control measures and other medical financial assistance helped reduce inpatients' economic burden.

Conclusions: The objective of NCMS is only partly achieved. However, it has promoted equity in health financing as poor inpatients can acquire more protection than non-poor. Our analysis suggests efforts should be made to strengthen cost containment, improve NCMS design and extend other medical financial assistance to further relieve economic burden of disease.

Suggested Reviewers:

Opposed Reviewers:

Authorship: Luying Zhang and Xiaoming Cheng played important roles in the design of the study and data collection. Luying Zhang produced the first draft of this paper. Xiaoyun Liu, Shenglan Tang, and Rachel Tolhurst contributed to data analysis and interpretation and substantially revised the paper. All authors contributed to and approved the final manuscript.

Title: How effectively can the New Cooperative Medical Scheme reduce catastrophic health expenditure for the poor and non-poor in rural China?

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Introduction

In recent years, there has been a worldwide escalation in health expenditure (Okunade and Suraratdecha, 2000; World Health Organization, 2008). Meanwhile, many developing countries are increasingly relying on user fees to fund healthcare services (Newbrander et al, 2001). As a result, high costs of health services place a heavy burden on patients. Health insurance has been seen as an effective way to contain healthcare costs and reduce economic burdens due to illness (Jakab and Krishnan, 2001; Mills and Bennett, 2002; Ahmed et al, 2005). From the 1950s, China developed a community-based health insurance system called the Cooperative Medical Scheme (CMS) in the rural areas. At one time CMS covered over 90% of the rural population who were therefore able to access basic health services at affordable prices (Bloom and Tang, 1999; Qicheng et al, 1999; Yip and Hsiao, 2008). Unfortunately, CMS collapsed during the transition towards a market-oriented economy at the end of 1970s. Nearly 80% of rural residents were not covered by any form of health insurance by 2003 and had to pay for health care out-of-pocket (Ministry of Health, 2005). Meanwhile, according to China's National Health Surveys in 1998 and 2003, rural residents' health expenditure grew at an annual rate of 11.48%, four times faster than their net income over the same period. High healthcare expenses in the absence of financial protection have impoverished many rural households. Out-of-pocket health payment is taken to be catastrophic when a household must reduce its basic expenditure over a period of time to cope with health costs (Xu et al, 2003). Several studies revealed that 15-22% of poverty stricken families in rural China became poor due to family members' illness (Ministry of Health, 1999). These households often have to borrow money, mortgage or sell assets to pay for healthcare expenses, or just forgo treatment (Devadasan et al, 2007; Wang et al, 2005).

The Chinese government re-established the health insurance system - called the New Cooperative Medical Scheme (NCMS) – for rural residents in 2003, NCMS is a type of health insurance, which is advocated, organized and sponsored by government, with rural residents' voluntary enrolment. One of its prime objectives is to effectively reduce rural people's economic burden of seeking health services and relieve impoverishment through protection against catastrophic health expenditure (CHE). To achieve this objective, the NCMS reimbursement is mainly for hospitalization expenditure.

International experiences have shown that health insurance can provide protection against CHE, though in some countries the effect is partial or limited (Devadasan et al, 2007; Limwattananon et al, 2007; Kawabata, et al, 2002). However, with the exception of several studies published in Chinese (Cui et al, 2006; Sun et al, 2007), there has been very limited empirical evidence available on the equity of NCMS in preventing CHE. This paper aims to fill this knowledge gap by exploring the impact of NCMS on CHE in poor and non-poor households. As NCMS mainly covers inpatient services, this study focuses on hospitalization expenditure.

Methods

Study sites selection and sampling methods

This study is a part of the Health VIII Support Project[1] in China. Three counties which implemented NCMS were selected including Yuexi County in Anhui province, central China; Qianjiang County in Chongqing municipality, southwest China; and Datong County in Qinghai province, northwest China. All the three counties were poor counties verified by the central government.

In order to estimate and compare the economic burden of disease between poor and non-poor NCMS enrollees, the target population in this study was NCMS enrollees who used inpatient services and got reimbursement from NCMS in 2005. In Yuexi and Qianjiang, three townships were randomly selected from each county. Considering the sparse population in Qinghai province, five townships were randomly selected in Datong County. In each township, the NCMS reimbursement database kept in the township health center was used for sampling. First, all the eligible population were extracted from the database and divided into two lists of poor and non-poor. The poor residents were authorized by the local civil affairs department according to local criteria. Then, from each list, a random sample of 50 enrollees was selected using systematic sampling method in each township. 10% were added to the sample in case there were non-responses. As the total number of poor patients in Qianjiang and Datong were less than 150 respectively, all the poor patients were selected. In total, 358 poor inpatients and 523 non-poor inpatients were interviewed.

Data collection

A questionnaire survey was conducted in Oct 2006 among the sampled enrollees by health staff from township health centers. Inpatients were asked to recall information concerning their hospitalization in the previous year (2005). The questionnaire included questions on demographic and socio-economic status (such as age, gender, education, occupation, household income and expenditure), hospitalization expenditure (including direct medical expenses such as inpatient expenditure, self-purchased drug expenditure, and direct non-medical expenses such as transportation and cost occurred by accompanying family members), and reimbursement from NCMS and other sources.

Data analysis

There are various definitions of CHE, ranging from a total health expenditure of more than 10% of annual household income (Pradhan and Prescott, 2002; Ranson, 2002; Wagstaff and Van Doorslaer. 2003), to a total health expenditure exceeding 40% of disposable income (Xu et al, 2003; Filmer et al, 2002)**.** In this research, the most common 10% threshold was

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[1] *Health VIII Support Project is sponsored by the UKs Department for International Development (DFID) to aid implementation of a World Bank-financed effort to improve the access to and quality of basic health services in rural areas in central and western China.*

adopted, with the rationale that if a household spends 10% of its annual household expenditure, it is forced to sacrifice other basic needs, sell productive assets, incur debt or become impoverished.

In this study, out-of-pocket (OOP) payment for hospitalization, including direct medical expenditure and non-medical expenditure, is used to calculate CHE. Since patients need to pay the full expenses out-of-pocket before reimbursement, three scenarios were considered: 1) before reimbursement, 2) after reimbursement from NCMS, and 3) after reimbursement from NCMS and other sources.

To measure the incidence and intensity of CHE, two indicators proposed by The World Bank (O'Donnell et al, 2007) were employed in this research. Head count (H) represents the incidence of catastrophic healthcare payments. In a household, if the health expenditure is T, and total expenditure is x, then T/x represents the share health expenditure accounts for. Define an indicator, E, which equals 1 if $T_i/x_i > 10\%$ and zero otherwise. Then an estimate of the head count is given by

$$H = \frac{1}{N}\sum_{i=1}^{N} E_i,$$

where N is the sample size.

To reflect the intensity of CHE, another indicator, overshoot (O) can be used to capture the average degree by which payments exceed the 10% threshold. Define the household overshoot as $O_i=E_i((T_i/x_i-10\%))$. Then the overshoot is simply the average:

$$O = \frac{1}{N}\sum_{i=1}^{N} O_i.$$

Survey data were double inputted into computer using Epi Data 3.0. SPSS 11.5 and Excel 2007 were employed for data analysis. Where statistical comparisons were made, the significance level was set at 0.05.

Results

This section begins with the study counties' basic information and the sample's social economic characteristics. It then presents the situation of medical expenditure and reimbursement. Finally, indicators for CHE are calculated to demonstrate the extent to which NCMS can provide financial protection for poor and non-poor inpatients.

Study Counties

In terms of economic development status (Table 1), Datong was the least poor and Yuexi was the poorest. Yuexi and Qianjiang initiated NCMS in 2003, while Datong started NCMS at the beginning of 2005. The coverage rates in Yuexi and Datong were above 90%, whilst in Qianjiang it was 56%. Premiums in 2005 in these three counties were all 30 Chinese yuan (CNY) per capita; 10 CNY from individual enrollees and 20 CNY from central and local govern-

ment. NCMS reimbursement policies were different in the three counties as shown in Table 2. Yuexi and Datong employed a so-called 'medical savings account' in NCMS fund. The 10 Yuan from individual premium were put into the medical savings account for reimbursing outpatient expenditure, while the 20 Yuan subsidy from government were put in a risk pool for inpatient expenditure. However, Qianjiang county instead adopted a unified fund for both outpatient and inpatient reimbursement. The deductible rate in Yuexi and Datong was 100-500 CNY in hospitals at different levels while no deductible was applied in Qianjiang. The reimbursement rate in the three counties was between 30% and 50% according to the level of health facilities and medical expenses. Ceilings varied between 800 and 30000 CNY in different level hospitals.

Moreover, Qianjiang has implemented series of cost containment measures in NCMS. In terms of provider payment, the health bureau piloted case-based payment for 31 diseases and set payment ceilings for inpatient services for 547 diseases. To enable equitable access to medicine, an essential drug list was applied in all public health facilities. All the drugs within this list should be purchased in a process known as 'concentrated bidding', which was intended to help reduce the drug prices.

Besides NCMS, subsidies from other sources also help to reduce poor people's economic burden. The Health VIII Support Project and Civil Affair Bureau provided medical financial assistance (MFA) to people in absolute poverty, defined as those whose annual individual income is less than the national poverty line (683 CNY in 2005, equal to 99.85 US dollars). The MFA scheme will pay the premium for the absolutely poor population to ensure their enrollment in NCMS, and provide further financial assistance after they obtain NCMS reimbursement

Table 1 socio-economic status in three counties in China, 2005

Table 2 NCMS policies in three counties in China, 2005

Sample description

Table 3 presents the socio-economic features of the study sample. The proportion of absolute poverty is much higher in Datong than in other two counties (P<0.01). In all three counties, total household income per year in poor families was significantly less than the non-poor families (P<0.01). However, the difference in annual household expenditure between the two groups was only significant in Qianjiang County (P<0.01). In other words, the revenue in poor households was less but their expenditure was almost the same as non-poor households in sampled counties except in Qianjiang. In all counties, the percentage of households who have debt due to illness was higher in the poor (P>0.01), with 76% as an average.

Table 3 Socio-economic features of sampled population, China, 2005

Medical expenditure and reimbursement for hospitalisation

Medical expenditure for impatient services was less than 1800 CNY in Qianjiang County at only 1/3 or 1/4 of those in Yuexi and Datong respectively (Table 4). There was no significant difference in medical expenditure between the poor and non-poor in Yuexi and Qianjiang. However, in Datong County poor patients paid more for hospitalization than the non-poor (P<0.01). Direct non-medical expenditure accounted for 14-24% of the total expenditure for hospitalization. No significant difference in direct non-medical expenditure was identified between the poor and non-poor. The share of total hospitalization expenditure to annual household expenditure was 25-58% among the poor patients, which was significantly more than the share for the non-poor, at 15-38% (P<0.01). The average reimbursement from NCMS was 978 CNY for the poor patients and 625 CNY for the non-poor, accounting for 26% and 25% of their total hospitalization expenditure respectively. The effective reimbursement rate among poor patients was 57.2% in Qianjiang County, higher than the non-poor (44.3%, P<0.01). In Yuexi and Datong, reimbursement rates were less than 26% and the differences between poor and non-poor were not significant.

In addition, people in absolute poverty also received MFA subsidies from the Health VIII Support Project and civil affairs bureau. In Datong, poor patients obtained 1441 CNY subsidies related to healthcare in 2005 from MFA. This was much more than other two counties (P<0.01).

Table 4 Annual expenditure and reimbursement for hospitalization in three counties, China (2005)

Catastrophic health expenditure

Head count reflects the frequency of the occurrence of CHE. Table 5 shows that more than 60% of poor inpatients enrolled in NCMS had CHE due to hospitalization in 2005, with the highest at 99.2% in Datong County. Among non-poor inpatients, this percentage was relatively low, although it was still more than 78% in Yuexi and Datong. In the second scenario, after NCMS reimbursement, Head count decreased greatly in Qianjiang among both poor and non-poor patients (29.2% and 11.2% respectively), while in Yuexi and Datong, the decrease was marginal. In the third scenario, after poor inpatients obtained reimbursement from both NCMS and MFA, there was a further reduction of Head count in Datong (4.2%) and Qianjiang (2.3%). However, influenced by the missing value, the MFA in Yuexi had hardly any effect on lowering Head count.

Table 5 Head count of catastrophic health expenditure in three counties, China, 2005

In addition to head count, intensity of CHE will also have considerable impact on patient's household financial burden. This is measured by overshoot, the average extent to which the CHE is above the 10% threshold (Table 6). Before reimbursement, the overshoot was highest in Datong (47.8% and 28.0% for the poor and non-poor respectively), and lowest in Qianjiang (17% and 8.3%). Table 6 also shows that the overshoot among poor inpatients was

much higher than the non-poor inpatients in all three counties. After NCMS reimbursement, Overshoot reduced 8-11% among poor inpatients and 3-7% among non-poor inpatients. Moreover, in Datong County, reimbursement from MFA was as high as 12.8% of total expenditure. The figure was much lower in Yuexi and Qianjiang (less than 1%).

Table 6 Overshoot of catastrophic health expenditure in three counties, China, 2005

To summarize, before obtaining NCMS reimbursement, the majority of inpatients in three counties experienced CHE. Patients in Qianjiang had lower head count and overshoot than those in the other two counties. The occurrence and intensity was more substantial in poor inpatients than the non-poor group. NCMS reimbursement helped reduce occurrence rate and intensity of CHE, but the effects varied among counties. Poor inpatients benefited more from NCMS than non-poor. MFA also helped relieve inpatients' economic burden, especially in Datong.

Discussion

The study used a cross-sectional survey to examine the impact of NCMS on CHE. To get a reasonable sample size for comparison, the poor and non-poor populations were sampled separately and in different probability. The target population was not the whole rural population, but only those NCMS enrollees who used inpatient services and obtained reimbursement in the year preceding the investigation. Those who were not covered by NCMS and who were too poor to afford healthcare services were not included in this study, but they are presumed to be the most vulnerable population to CHE (Devadasan et al, 2007; Wang et al, 2005). Furthermore, the study only counted direct out-of-pocket expenditure relevant to hospitalization in calculating CHE, and did not include any indirect costs, nor did it include costs for other health services. This may underestimate the real economic burden on patients' households. Despite these limitations, we feel confident that the findings of this study shed light on NCMS's role in providing financial protection to the poor. Here we discuss the findings in terms of the impacts of NCMS, cost containment measures and other financial assistance on relieving CHE.

1. The effect of NCMS
The aim of NCMS is to relieve enrollees' economic burden and protect against CHE. From the study results, NCMS has partly achieved this objective in reducing CHE. The decline of CHE after NCMS reimbursement among the poor was dramatically more than that among the non-poor. However, because of the low benefit level and low reimbursement rate, patients, both poor and non poor, still faced a very high financial burden even after NCMS reimbursement. Limited financial protection was also reported in other health insurances systems such as in India (Devadasan et al, 2007). However, the rural residents in China bear a higher financial burden of healthcare than countries with similar or higher GDP per capita (Hu et al, 2008). For example, compared with CHE indicators in some health insurance schemes in Vietnam (H=15.1%, O=1.39%) and India (H=3.5-23%, O=9%) (Devadasan et al, 2007; O'Donnell et al, 2007), the occurrence and intensity of CHE in China was still much higher

after NCMS reimbursement.

Due to policy design, the low effective reimbursement rate in NCMS greatly contributed to its limited effect on relieving CHE (Zhang et al, 2009). The NCMS benefit package excluded some new and expensive drugs and examinations. But in the fee-for-service payment system, doctors still have strong incentives to prescribe these expensive drugs and examinations (Hu et al, 2008). Thus, the expenditure within the benefit package was much less than actual expenditure. Moreover, even where healthcare expenditure was eligible for reimbursement, policies mandating deductibles, co-payments and ceilings further reduced the proportion of effective reimbursement. As a result, this study shows that enrolees had to pay more than half of their expenditure on inpatient care out of pocket, with co-payment rates ranging from 50% to 65%.

2. Health cost containment on supply side

High costs of health services cause CHE and undermine the effect of any health insurance system in financial protection (Devadasan et al, 2007). The high cost of healthcare in China can be attributed to insufficient financial input by government and the fee-for-service payment mechanism (Yip and Hsiao, 2008; Hu et al, 2008; Blumenthal and Hsiao, 2005; Ramesh, 2008). By the end of the 1970s, government had taken full responsibility for financing public hospitals to provide health services. However, in last three decades, subsidies from government have been dramatically reducing to less than one third of public hospitals' revenue. Public hospitals have to heavily rely on user charges for cost recovery (Ramesh, 2008). Fee-for-service is the most common provider payment mechanism in China, which encourages health workers to provide unnecessary health services (Yip and Hsiao, 2008; Ramesh, 2008). This supplier-induced demand, among other factors, has greatly contributed to the escalation of health expenditure (Hu et al, 2008).

From international experiences, cost containment measures on the supply side such as use of generic drugs, and ceilings on cost of hospitalization are essential and effective in controlling and reducing excessive healthcare costs (Mays et al, 2004; Musau, 1999). However, current NCMS policy has concentrated more on controlling health cost from the demand side (through deductibles, co-payments and ceilings), but less on the supply side. The pilot of case-based payment in Qianjiang is an exception. NCMS in Qianjiang employed case-based payment for 31 diseases and ceiling payment for 547 diseases for hospitalization, which aimed to motivate healthcare providers to control healthcare cost. Drug purchase by concentrated bidding also aimed to reduce the prices of basic drugs, and thus constrain the high costs of health services due to irrational drug prices. The study results suggest that these supply side cost control measures were effective, since the hospitalization expenditure and consequently the economic burden in Qianjiang County was significantly less than the other two counties.

3. Medical Financial Assistance

Our results indicated that inpatients in Datong obtained more reimbursement than other two counties from MFA. This further relieved patients' financial burden after NCMS reimburse-

ment. This is possibly because more patients in Datong were in absolute poverty who were eligible for both types of financial protection (NCMS and MFA). This study found that the combination of supplementary financial assistance contributed towards alleviating the frequency and extent of CHE among the absolutely poor in Datong. Such supplementary assistance remains necessary to protect the absolutely poor from further impoverishment due to healthcare costs.

Conclusion and recommendations

CHE is a major cause of impoverishment in rural China. The NCMS aims to protect its members against CHE, but this objective is only partly achieved due to high medical costs and low effective reimbursement levels. NCMS has promoted equity in health financing as poor inpatients can acquire more protection than non-poor from NCMS. However, both the headcount and overshoot of CHE remain relatively high for the poor and non-poor.

To further enhance the financial protection and reduce CHE, cost containment measures need to be strengthened. These should include, but not be limited to supply side measures. A key step is to gradually change the current fee-for-service payment system. In addition, NCMS benefit package and policy design need to be reconsidered with a focus on increasing the effective reimbursement rate. Other medial financial assistance programmes may also need to be extended, especially for poor and vulnerable group, to supplement the NCMS and help further relieve economic burden of disease in rural China.

Acknowledgement

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Tables

Table 1 Socio-economic status in three counties in China, 2005

	Yuexi	Qianjiang	Datong
Number of townships implementing NCMS	24(100%)	30(100%)	22(100%)
Enrollees (thousand persons)	320.1	240.9	298.4
Coverage rate (%)	90.1	56.1	94.8
GDP (million Chinese yuan)	1857	3654	5433
Annual net income per capita (million CNY)	1839	2129	2165

Data source: NCMS management data

Table 2 NCMS policies in three counties in China, 2005

County	Hospital level	Deductible (CNY)	Reimbursement rate	Ceiling (CNY)
Yuexi	Township	200	50%	3000
	County level	300	40%	10000
	Above county level	500	40%	30000
Qianjiang	Township	0	50%	800
	County level	0	40%	8000
	Above county level	0	30%	8000
Datong	Township	100	40%	15000
	County level	300	35%	15000
	Above county level	500	30%	15000

Data source: NCMS policy document

Table 3 Socio-economic features of sampled population, China, 2005

	Yuexi		Qianjiang		Datong		Three counties	
	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor
Sample size	143	148	89	201	126	174	358	523
Average age	40.6	40.8	54.4	40.9	45.4	36.9	45.7	39.6
Percentage of male inpatients (%)	60.1	48.3	69.3	42.1	59.2	50.0	62.1	46.5
Proportion of absolutely poor inpatients (%)	19.6	-	68.5	-	100.0	-	59.8	-
Average annual household income* (CNY)	10015.8	15965.3	5926.4	16775.9	5298.6	10759.3	7052.2	14556.6
Average annual household expenditure (CNY)	17263.9	20900.7	6512.7	16110.2	9639.3	10598.3	11905.4	15641.3
Percentage of households who have debt due to illness (%)	67.0	48.3	75.9	39.5	79.1	73.4	76.4	59.9

Data source: questionnaire survey

* The aaverage annual household income in poor households includes all kinds of living subsidies

Table 4 Annual expenditure and reimbursement for hospitalization in three counties, China (2005, unit: CNY)

		Yuexi		Qianjiang		Datong		Three counties	
		Poor	Non-poor	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor
Direct medical expenses A		6114.2	4119.9	1559.0	1400.9	5719.9	3497.4	4829.7	2871.1
Transportation and caring fee for hospitalization B		1039.5	1198.4	190.4	301.3	941.7	575.4	785.6	643.1
Self-purchased drug expenses C		207.6	159.3	50.3	26.3	10.7	65.3	99.2	76.9
Total expenses for hospitalization D		7533.0	5574.10	1799.7	1731.8	6737.2	4080.0	5757.1	3601.4
Proportion of direct non-medical expenditure to total hospitalization (B+C)/D		22.3%	24.1%	14.9%	18.4%	18.1%	17.5%	18.8%	19.6%
Proportion of total hospitalization expenditure to annual household expenditure		44.1%	27.7%	25.3%	14.6%	57.8%	37.5%	44.1%	26.1%
Reimbursement from NCMS E		1168.8	800.7	379.0	429.1	1211.6	718.4	978.2	625.0
Effective reimbursement rate	of direct medical expenses E/A	20.3%	19.4%	57.2%	44.3%	25.5%	24.4%	31.8%	31.0%
	of total hospitalization expenses E/D	15.6%	14.6%	48.1%	35.8%	20.3%	20.2%	26.1%	24.9%
Subsidies related to healthcare from other sources		122.0	0	72.1	0	1441.2	0	573.9	0

Data source: questionnaire survey

Table 5 Head count* of catastrophic health expenditure in three counties, China, 2005

		Yuexi	Qianjiang	Datong	Average
Poor	Before reimbursement (P_1)	89.2%	62.5%	99.2%	85.8%
	After reimbursement from NCMS (P_2)	85.6%	33.3%	95.0%	75.1%
	After reimbursement from NCMS and other sources (P_3)	85.6%	31.0%	90.8%	72.9%
Non-poor	Before reimbursement (N_1)	78.4%	39.1%	83.8%	65.3%
	After reimbursement from NCMS (N_2)	73.9%	27.9%	80.2%	58.3%
Differences	P_1-P_2	3.6%	29.2%	4.2%	10.8%
	P_2-P_3	0.0%	2.3%	4.2%	2.2%
	N_1-N_2	4.5%	11.2%	3.6%	7.0%

* Head Count refers to the frequency that CHE accounted for more than 10% of their annual household expenditures.

Table 6 Overshoot* of catastrophic health expenditure in three counties, China, 2005

		Yuexi	Qianjiang	Datong	Average
Poor	Before reimbursement (A)	34.8%	17.0%	47.8%	34.8%
	After reimbursement from NCMS (B)	26.7%	8.0%	36.8%	25.4%
	After reimbursement from NCMS and other sources (C)	25.8%	7.3%	24.0%	20.2%
Non-poor	Before reimbursement (A')	18.4%	8.3%	28.0%	17.9%
	After reimbursement from NCMS (B')	14.8%	5.4%	20.9%	13.4%
Differences	A-B	8.2%	8.9%	11.1%	9.4%
	B-C	0.8%	0.7%	12.8%	5.2%
	A'-B'	3.7%	2.9%	7.1%	4.5%

* Overshoot refers to the average extent to which the CHE is above the 10% threshold.