

Health Affairs

At the Intersection of Health, Health Care and Policy

Cite this article as:

Kimberly S. Babiarz, Grant Miller, Hongmei Yi, Linxiu Zhang and Scott Rozelle
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Centers But Not The Number Of Patients Served
Health Affairs, 31, no.5 (2012):1065-1074

doi: 10.1377/hlthaff.2010.1311

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China's New Cooperative Medical Scheme Improved Finances Of Township Health Centers But Not The Number Of Patients Served

DOI: 10.1377/hlthaff.2010.1311
HEALTH AFFAIRS 31,
NO. 5 (2012): 1065-1074
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ABSTRACT China's New Cooperative Medical Scheme, launched in 2003, was designed to protect rural households from the financial risk posed by health care costs and to increase the use of health care services. This article reports on findings from a longitudinal study of how the program affected the use of health care services, out-of-pocket spending on medical care, and the operations and financial viability of China's township health centers, which constitute a middle tier of care in between village clinics and county hospitals. We found that between 2005 and 2008 the program provided some risk protection and increased the intensity of inpatient care at township health centers. Importantly, the program appears to have improved the centers' financial status. At the same time, the program did not increase the overall number of patients served or the likelihood that a sick person would seek care at a township center. These findings serve as a benchmark of the program's early impact. The results also suggest that the composition of health care use in China has changed, with people increasingly seeking outpatient care at village clinics and inpatient care at township health centers.

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China's township health centers are primary health care organizations, traditionally owned by the state, that have provided public health and primary medical services to hundreds of millions of people in rural China for more than forty years. Unlike health centers in the United States, these centers typically provide basic inpatient care somewhat akin to small US community hospitals. The township centers are the middle tier of a three-tiered rural medical system in China. The bottom tier is village clinics, staffed by clinicians with little formal training. The top tier is county hospitals that provide relatively expensive, specialized care.

In between these two other tiers, township health centers play a pivotal role in delivering rural medical care and acting as a referral service to the county hospitals.¹ The centers also manage the provision of public health services and train

village clinicians practicing within their townships, effectively supervising local rural health systems.

Although the township health centers are important, they began to decline following China's decollectivization in the late 1970s. Shortly after launching market-oriented reforms, central authorities transferred fiscal responsibility for publicly financed rural health institutions—including the centers—to local governments² and began allocating the majority of central health funds to urban areas.³ Many localities were unable to adequately fund their health systems.⁴

The loss of fiscal support led township health centers to rely on service fees for revenue.⁵ For example, hospital managers were known to encourage the sales of high-profit drugs and the use of specialty services to increase revenues.⁶⁻¹⁰ Fiscal decentralization also led to the

collapse of publicly funded rural health insurance, leaving households to bear the burden of rising fees.

The result was an increase in household exposure to financial risk and a sharp decline in medical care use. Township health centers' patient visits and bed occupancy rates fell, and their quality of care deteriorated.^{3,4,11} By the early 2000s, 65 percent of people requiring hospitalization were either opting not to be admitted or checking themselves out of care before their doctors recommended discharge. The majority of respondents reported financial concerns as the reason for their actions.¹²⁻¹⁴

The New Cooperative Medical Scheme

The response to problems in the rural health sector was slow. However, in 2003 China's central government launched one of the largest public-sector health insurance programs in the world: the New Cooperative Medical Scheme.¹⁵ This is an indemnity health insurance program designed to protect rural households against financial risk and increase the use of underutilized health services, thereby bolstering the revenues of township health centers and other rural health facilities and reducing the facility-level overprovision of drugs and unnecessary services.

The program was initially funded by annual premiums of 10–20 yuan (approximately US \$1.20–\$2.40) per person and matching contributions from local and central governments. Government subsidies have recently increased, and they were slated to reach 200 yuan (approximately US\$31.50) per beneficiary by the end of 2011.¹⁶

Since the New Cooperative Medical Scheme was introduced, it has expanded rapidly in breadth and depth of coverage. By 2011 it was operating in more than 95 percent of China's rural counties and had more than 836 million enrollees.¹⁷

In general, the New Cooperative Medical Scheme reimburses patients for a specified portion of inpatient and, in some cases, outpatient expenses at designated health facilities after patients satisfy a per visit copayment. However, county governments have the authority to define local policy details, such as services covered, copayment amounts, reimbursement rates, and local policy innovations—hereafter collectively referred to as policy attributes. The result is that the program varies across counties and over time, according to local resources and priorities.¹⁸

Township health centers are central to the design of the New Cooperative Medical Scheme.

The program purposefully creates incentives for rural patients to use the centers rather than facilities in other tiers of the health system. Because the program emphasizes inpatient care, reimbursements are sometimes not allowed for expenditures in village clinics, which typically offer only outpatient care. To restrain costs by encouraging patients to use township health centers, copayment amounts are lower and patient reimbursement rates higher at township health centers than at the county hospitals, which are more expensive, and these differences have grown over time.¹⁹ Township health centers also play a critical role in implementing and managing local programs in the New Cooperative Medical Scheme.^{20,21}

Despite the central role played by township health centers in the New Cooperative Medical Scheme and China's evolving rural health care system, there are many unanswered questions about the impact of the program on the centers. Several studies of the program's early years reported mixed results.

One study found that although the program had raised township health center revenues as of 2005, it had also raised their expenditures.²² A more recent study also found that the centers' revenues grew faster in counties participating in the program, but this study was preliminary in nature and did not study the centers' expenditures.²¹ In contrast, another study found no substantive association between the New Cooperative Medical Scheme and increased revenues.²³

There is also conflicting evidence on household finances. One study of a variety of health insurance programs in China found that insurance was associated with a rise in health expenditures in the 1990s and early 2000s, but early studies of the New Cooperative Medical Scheme in particular found no substantive effect on out-of-pocket expenditures.²⁴⁻²⁶ Overall, early studies of the program suggest that increases in service use may offset the modest reduction in out-of-pocket expenditures.

These studies begin to build a picture of the impact of health care reform on township health centers and their patients, but most of the work is dated. Almost all studies in the literature are either preliminary or use data from the early years of the New Cooperative Medical Scheme. Many studies lack nationally representative data, and most consider only a narrow set of outcomes. Furthermore, no studies have disentangled the impact of individual policy attributes on facility-level outcomes, a task that is critical for improving the program's performance.

Given how quickly the number of people covered by the program has increased and the

variety of local program policy attributes that have been developed in different counties, new evidence is needed. Our study seeks to advance the literature by using recently gathered, nationally representative panel data to measure the impact of the New Cooperative Medical Scheme and its policy attributes on a variety of township health center and individual outcomes.

Study Data And Methods

SAMPLE AND DATA COLLECTION We used two waves of panel data that were collected in a collaboration between the Chinese Academy of Sciences and Stanford University in 2005 and 2008. The timing of the surveys allowed us to study China's rural health care system from the early stages of the New Cooperative Medical Scheme's implementation, beginning at the end of 2004, to nearly complete implementation, at the end of 2007.

Both survey rounds used a randomly selected, nationally representative sample of township health centers and people in twenty-five rural counties across five provinces, Jiangsu, Sichuan, Shaanxi, Jilin, and Hebei. The provinces were chosen to represent each of China's major agricultural and ecological zones. From each province, five sample counties were selected, one

county from each of five strata of per capita income.

We sampled two townships from each county and two villages from each township. Sample counties and random sampling details are shown in the online Technical Appendix.²⁷ We then used distinct modules—subsections of the survey—to collect data from the following four sources in sampled townships: individuals and households; township health centers; county administrative offices; and county statistical offices.

The first module collected data on individuals and households. Survey teams used village rosters to randomly select eight households in each village during the first wave of panel data, resulting in a sample of 3,257 individuals from 800 households (Exhibit 1). In the second wave, survey teams visited the same eight households plus an additional twelve randomly drawn households per village, yielding a sample of 8,339 individuals from 2,000 households.²⁸

From these individuals and households, we collected detailed information about medical care use and spending for each family member during the preceding year (Exhibit 1). Specific variables included whether a household was enrolled in the New Cooperative Medical Scheme; whether any family member had been sick during the previous year; and whether sick family

EXHIBIT 1

Descriptive Statistics For People, Township Health Centers, And County Hospitals In The Sample, 2004 And 2007

Statistic	2004	2007	p value
PEOPLE			
Number sampled	3,257	8,339	— ^a
Average per capita income (yuan)	3,098	3,677	— ^a
People with access to NCMS (%)	24.40	100.00	0.000
Average enrollment rate in NCMS (%)	78.70	89.30	0.000
People seeking medical care (% of sample)	90.57	94.95	0.000
Average annual health expenditure (yuan)	801	1,106	— ^a
TOWNSHIP HEALTH CENTERS			
Number	44	44	— ^a
Average patients per year	13,623	18,484	0.092
Average revenue per year (10k yuan)	101.11	140.47	0.118
Average revenue from services and drug sales (%)	82.75	79.50	0.405
Average expenses per year (10k yuan)	104.29	150.68	0.075
Average bed count	16.54	19.89	0.183
Average bed use rate (%)	37.03	54.63	0.005
Average inpatient length-of-stay (days)	4.14	5.52	0.000
Centers in the NCMS (%)	22.72	100.00	0.000
Average deductible for inpatient expense (yuan)	200.00	54.54	0.000
Reimbursement rate for 2,000 yuan inpatient expense (%)	31.02	53.63	0.000
COUNTY HOSPITALS			
Average deductible for inpatient expense (yuan)	280.00	168.63	0.024
Reimbursement rate for 2,000 yuan inpatient expense (%)	29.00	43.48	0.000

SOURCE Authors' data. **NOTES** NCMS is New Cooperative Medical Scheme. The yuan is China's national currency; the exchange rate in 2012 is approximately 6.30 yuan to \$1US. p values from two sided t test of means. Household income and health expenditure are adjusted for inflation. ^aNot applicable.

members had consulted a doctor. Respondents also reported their out-of-pocket spending for medical services and drugs—not any spending on transportation and meals related to obtaining medical care—and how much of it was reimbursed by the New Cooperative Medical Scheme.

For the second module, survey teams administered a detailed survey to the forty-four township health centers in all sampled townships. This module collected information about health center utilization, finances, and operations. Specific variables included annual number of patients, bed occupancy rates, average inpatient length-of-stay, gross revenue, revenue from inpatient and outpatient services, revenue from drug sales, revenue from government subsidies, and total expenses (Exhibit 1).

Township health centers were also asked about the work they performed to administer the New Cooperative Medical Scheme. In addition, information was gathered about specific staff duties performed, the number of days staff spent on these tasks, the expenses incurred (excluding staff salaries), and subsidy compensation received for this work.

For the third module, survey teams collected information about each township's local New Cooperative Medical Scheme policy attributes from county administrative offices. Specific policy attributes that were measured included copayments and reimbursement rates for township health centers and county hospitals (Exhibit 1).

Finally, for the fourth module, survey teams visited each township's local statistical office to collect data on township characteristics. Specific socioeconomic variables that we gathered included average per capita income, population, average distance between villages and the town, and average number of clinics in local villages (Exhibit 1).

STATISTICAL METHODS We studied how the expansion of the New Cooperative Medical Scheme and its individual policy attributes across rural China was associated with changes in outcomes among township health centers and among patients.

To analyze the program's effect on the performance and operation of the centers, we examined their gross annual revenue; annual expenses; operating deficit; shares of revenue from patient service fees, drug sales (inpatient, outpatient, and total), and government subsidies; annual patient visits; average hospital bed occupancy rate; and average inpatient length-of-stay. To analyze the program's impact on patients, we looked at whether or not sick people had sought care during the previous year and their annual out-of-pocket health spending.

Because the expansion of the New Cooperative

We found little evidence that the program has made sick people more likely to seek medical care.

Medical Scheme across rural counties was not random, characteristics that systematically varied between the counties that implemented the program in its early years and those that implemented it later could potentially confound our results. To mitigate this possibility, we used ordinary least squares to implement a difference-in-difference approach. This method accounts for unobserved county characteristics that are constant over time and potentially correlated with the program. Additional details of our methodology are provided in the online Technical Appendix.²⁷

We used our empirical strategy to estimate two types of statistical models, which we called the basic and full models. The basic model estimated how township health centers and patients' outcomes were associated with a single treatment measure. For township health centers, this measure was the presence of the New Cooperative Medical Scheme in that county and year; for patients, it was enrollment in the program. We also controlled for a wide range of potentially confounding variables in the basic model's estimates. These covariates are described in detail in the Technical Appendix.²⁷

Finally, to adjust for unobserved differences across localities that did not vary with time and to account for common changes over time, we included dummy variables for year in equations at both the center and patient level, and for county at the center level and village at the patient level.

The full model was the same as the basic model except that it included an additional set of explanatory variables: individual policy components of local New Cooperative Medical Scheme programs. In other words, it studied the unique contribution of county-level policy attributes to observed changes in outcomes by substituting program components for a single New Cooperative Medical Scheme indicator.

The individual policy attributes included the

share of the first 300 yuan spent that was covered by the program, taking complex copayments and reimbursement rates into account; the local reimbursement rate in the program for spending at township health centers ranging between the copayment and 2,000 yuan, and the reimbursement rate for spending at county hospitals in the same range.

Finally, we used quantile regression analysis to study how the association between enrollment in the New Cooperative Medical Scheme and out-of-pocket spending varied across the distribution of health spending. This approach allowed us to analyze the program's impact at each decile of out-of-pocket health spending.

Below, we summarize results from our analyses at the levels of township health center and individual patient, using figures for both the basic and full models. The figures report point estimates and confidence intervals for the association of the New Cooperative Medical Scheme and its policy attributes with key outcomes. Tables showing the complete results of regression analysis are provided in the Technical Appendix.²⁷

Estimates from specifications with natural log transformed dependent variables can be roughly interpreted as percent changes, or relative changes. Estimates from all other models, including linear probability models with dichotomous outcomes, can be interpreted as percentage point changes, or absolute changes.

Study Results

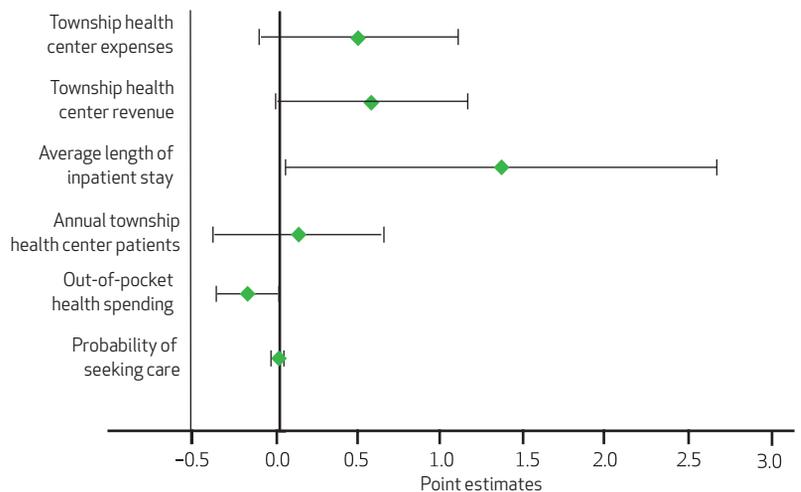
BASIC MODEL RESULTS We found that the New Cooperative Medical Scheme was associated with large increases in township health centers' annual revenues (58 percent; $p < 0.10$), but these were essentially offset by accompanying expense increases (50 percent; $p < 0.10$) (Exhibit 2). The net result was a decline in the centers' operating deficits, but this estimate was not statistically distinguishable from zero (data not shown). The program was not associated with meaningful changes in the shares of revenue from patient fees, drug sales, or government subsidies.

Annual numbers of patients and bed occupancy rates at the centers did not change under the program, but the average inpatient length-of-stay increased by 1.37 days ($p < 0.05$), as shown in Exhibit 2. Taken together, these results imply increases in intensity of inpatient service use but no change in total number of patients.

Exhibit 2 also shows congruent results for patient-level outcomes from the basic model. Specifically, the New Cooperative Medical Scheme was not associated with meaningful

EXHIBIT 2

Impact Of The New Cooperative Medical Scheme On Township Health Centers And Individual Patients, Basic Model

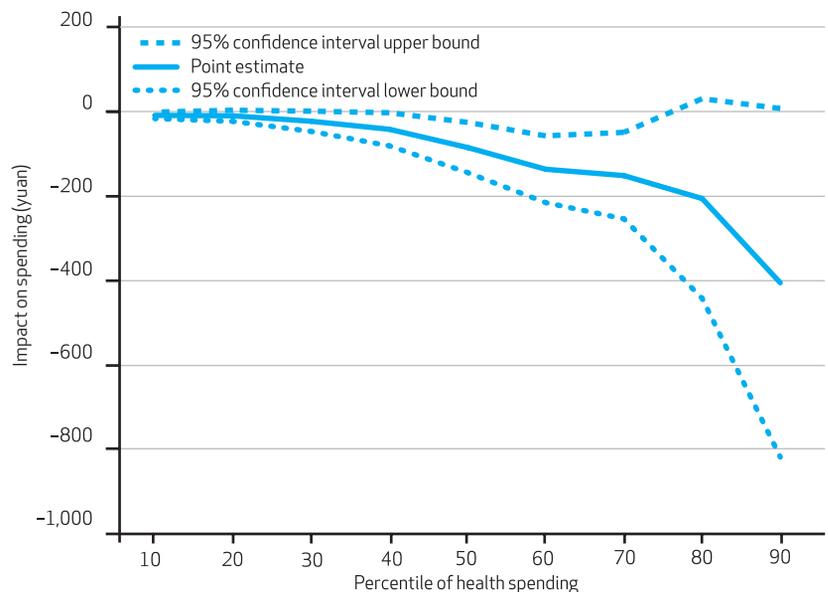


SOURCE Authors' analysis. **NOTE** Point estimates (diamonds) and 95 percent confidence intervals show average annual results from the basic model (described in the text).

changes in the probability of sick people having sought care during the previous year, which is consistent with the lack of change in the number

EXHIBIT 3

Impact Of The New Cooperative Medical Scheme On Patients' Out-Of-Pocket Spending, By Percentiles Of Health Spending



SOURCE Authors' analysis. **NOTES** Quantile regressions estimated at each decile of out-of-pocket spending. Regressions include village fixed effects and controls for patient's sex, age, age squared, residency status, and education; village per capita income; and characteristics of nearest township health center, including the total value of health center assets and numbers of staff, senior staff, and beds. 95 percent confidence intervals bootstrapped using 100 replications.

of patients at township health centers. However, patients' out-of-pocket annual spending declined by 17 percent ($p < 0.10$).

Exhibit 3 shows the impact of the New Cooperative Medical Scheme on patients' out-of-pocket spending across percentiles of health spending. Consistent with the program's aim of providing some protection against catastrophic expenses, estimates at the thirtieth percentile and above were statistically different from zero and became successively larger at higher percentiles, although many of the differences were not significant. In other words, the program decreased patients' out-of-pocket spending for higher-cost health services. For people at the ninetieth percentile of out-of-pocket spending—a level that would indicate catastrophic health spending—the program reduced out-of-pocket spending by more than 400 yuan (18 percent).

FULL MODEL RESULTS Exhibit 4 shows results

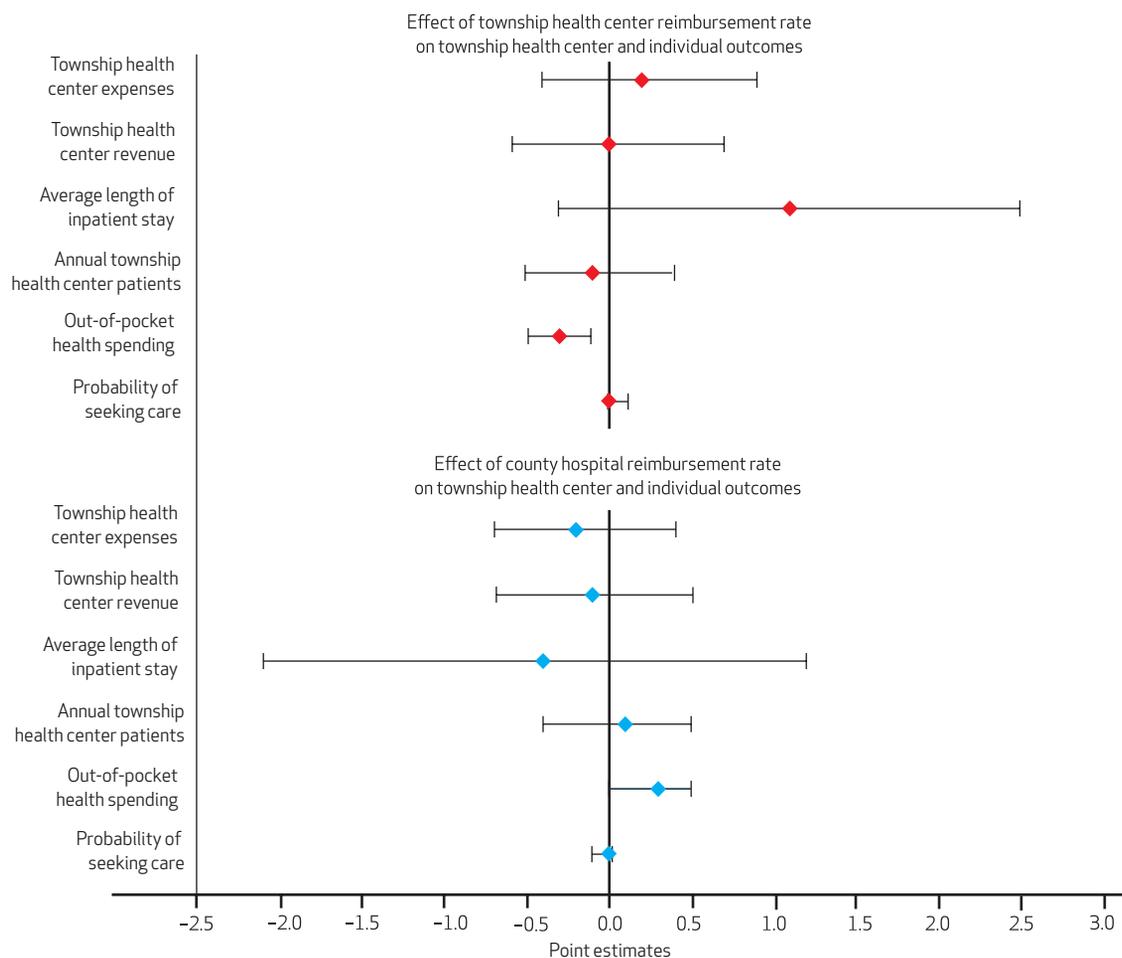
from the full model for the impact of local policy attributes of the New Cooperative Medical Scheme on township health centers and patients' outcomes. We did not find that higher township health center reimbursement rates were associated with significant increases in health center revenues or decreases in expenses. However, a marginal increase in the reimbursement rate was associated with a 25,000 yuan decline in operating deficits ($p < 0.05$; see the Technical Appendix).²⁷

Nor were the reimbursement rates meaningfully related to the number of patients or bed occupancy rates. However, consistent with our other findings on greater intensity of inpatient care, higher reimbursement rates were positively associated with inpatient length-of-stay (0.11 days; $p < 0.11$).²⁹

Exhibit 4 also shows that a marginal increase in the township health center reimbursement

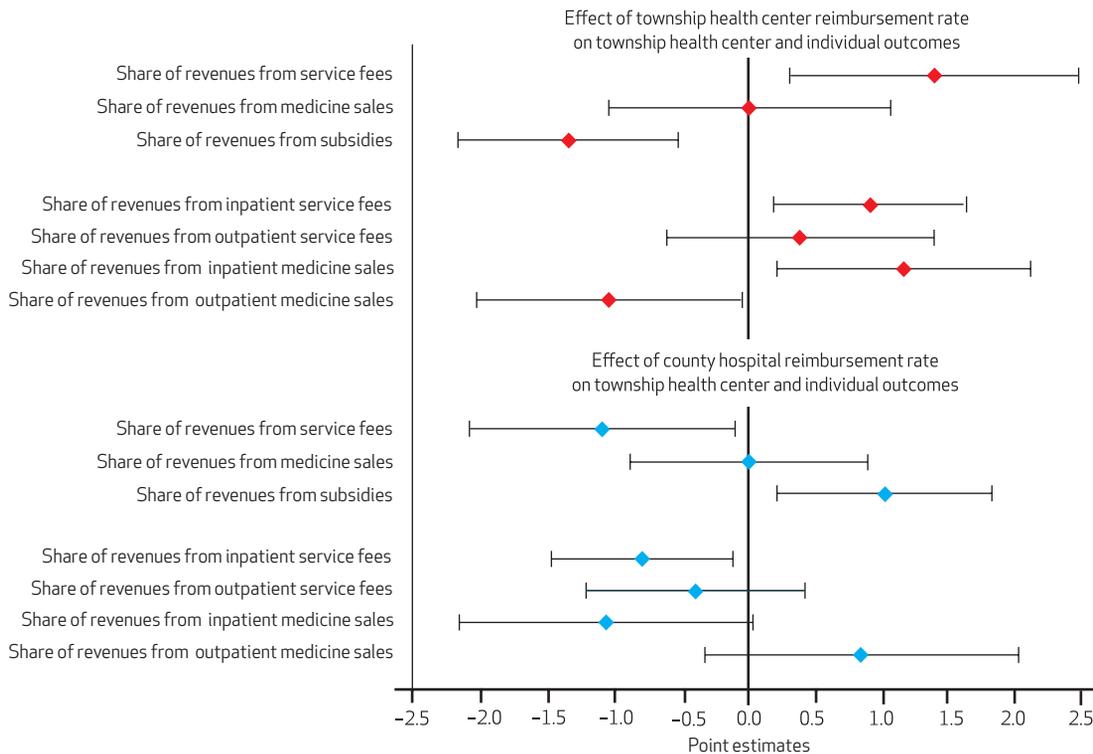
EXHIBIT 4

Impact Of The New Cooperative Medical Scheme On Township Health Centers And Individual Patients, Full Model



SOURCE Authors' analysis. **NOTE** Point estimates (diamonds) and 95 percent confidence intervals show average annual results from the full model (described in the text).

Impact Of The New Cooperative Medical Scheme's Reimbursement Rates On Township Health Center Revenue Sources



SOURCE Authors' analysis. **NOTE** Point estimates (diamonds) and 95 percent confidence intervals show the effect of the New Cooperative Medical Scheme's reimbursement rates at township health centers and county hospitals on centers' revenue sources.

rate was associated with a 3 percent reduction in out-of-pocket spending on medical care ($p < 0.05$). At the same time, a marginal increase in the county hospital reimbursement rate was associated with a 3 percent increase in out-of-pocket spending ($p < 0.05$). Presumably the increase is because relatively high county hospital reimbursement rates induce patients to use these hospitals over township health centers. As noted above, county hospitals provide more expensive, specialized services than township health centers do.

Exhibit 5 shows the impact of the New Cooperative Medical Scheme policy attributes on township health centers, specifically through the marginal effect of higher patient reimbursement rates on the centers' sources of revenue. Higher reimbursement rates were associated with larger shares of revenue from services and smaller shares from government subsidies. This association may reflect a renewed emphasis on service revenue rather than on supporting the centers through subsidies.

Specifically, a marginal increase in the township center reimbursement rate was associated with a 1.4-percentage-point increase in the share

of revenue from services (a 4 percent increase; $p < 0.001$) and a 1.34-percentage-point reduction in the share of revenue from subsidies (a 6 percent decrease; $p < 0.001$). Much of the increase appeared to be related to inpatient care. The share of revenue from total drug sales did not change, but there was a commensurate shift toward inpatient drug sales ($p < 0.05$), accompanied by an offsetting decrease in outpatient drug sales ($p < 0.05$).

Exhibit 5 also suggests that the county hospital reimbursement rate had an effect on township health centers. A marginal increase in the county hospital reimbursement rate was associated with a 1.09-percentage-point reduction in the share of township health center revenue from services (a 3 percent reduction; $p < 0.05$) and a 1-percentage-point increase (a 5 percent increase; $p < 0.05$) in the share of township health center revenue from government subsidies. This result is presumably because higher county hospital reimbursement rates draw patients to county hospitals and away from township health centers, particularly for inpatient care. A marginal increase in the county hospital reimbursement rate reduced township health centers' revenue

share from inpatient care by 0.79 percentage points ($p < 0.05$).

Discussion

The New Cooperative Medical Scheme appears to have partly ameliorated problems in China's rural health system, although health care costs continue to rise and health institutions' financial situation continues to worsen.³⁰ Our analysis suggests that the program successfully lowered out-of-pocket spending. In particular, it has provided protection against financial risk by reducing the spending by patients with catastrophic health episodes. This finding differs somewhat from those in previous studies, which found that the program and other health insurance plans implemented in China were initially ineffective in reducing health spending.^{22,24,26}

The New Cooperative Medical Scheme may also have increased revenue among rural health institutions. We found that the program reduced township health centers' operating deficits, strengthening facilities that provide both primary and curative care in rural China. In particular, the program may have increased revenues through greater inpatient service intensity, which might be appropriate given the possibility that inpatient care has been underused.

However, we found little evidence that the program has made sick people more likely to seek medical care, either at township health centers or elsewhere. These findings, in combination with previously published work showing that the program raised the use of outpatient services at village clinics,³¹ suggest that the program is changing health care utilization in rural China. People are increasingly seeking low-intensity

outpatient care at village clinics and inpatient care at township health centers.

Conclusion

Our finding that the New Cooperative Medical Scheme does not raise the likelihood that a sick person will seek care may partially reflect relatively low reimbursement rates observed in many counties. However, in recent years, overall patient reimbursement rates have increased. Many counties have also expanded their program coverage to include outpatient services and medical savings accounts that were not previously available.

Policy makers should look to future research to assess how the next generation of the New Cooperative Medical Scheme affects the utilization and composition of medical care services. In particular, although we have explored the effect of deductibles and reimbursement rates on key outcomes, more research is needed to understand the effect of recent changes such as increased outpatient coverage.

As the New Cooperative Medical Scheme continues to expand and evolve, further study is also needed to assess its changing impact on China's rural health system and health care providers. Importantly, we were unable to discern whether the increased emphasis on inpatient care represents an efficient use of health care resources.

Finally, without detailed data on health outcomes among patients, we were also unable to determine whether or not the program is raising the overall level of health in China's villages. Future research should focus more directly on health outcomes and the welfare implications of the program and its policy attributes. ■

The authors acknowledge funding from the following sources: Stanford University's Presidential Fund for Interdisciplinary International Studies; the Massachusetts Institute of Technology's Department of Political

Science; the Chinese Academy of Sciences (project KSCX2-YW-N-039) and through the Science 100 program; and Social Protection in Asia, a policy research and network-building program funded by the Ford Foundation and the

International Development Research Center and managed by the Institute for Human Development, in New Delhi, India, and the Institute for Development Studies, in Brighton, England.

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- 19 Data collected by the authors show that in 2004 the average county hospital in the New Cooperative Medical Scheme had a deductible of 280 yuan, while the average township health center had a deductible of 250 yuan. By 2007 the average deductible at county hospitals was 166 yuan compared to just 53 yuan at centers. Reimbursement rates follow the same pattern. In 2004 a patient with a health expenditure of 2,000 yuan or under would have had 29 percent of his or her costs over the deductible reimbursed at county hospitals, versus 31 percent at township health centers. By 2007 the reimbursement rates had increased to 43 percent and 53 percent, respectively.
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- 27 To access the Appendix, click on the Appendix link in the box to the right of the article online.
- 28 During the second wave of our survey, nearly 90 percent of the households were successfully resurveyed. Those households that could not be resurveyed were replaced, using 2004 village rosters and the same random sampling technique.
- 29 This estimate falls just short of conventional significance levels ($p = 0.11$).
- 30 Regression results (available in the Technical Appendix; see Note 27) show overall trends of increasing deficits and health care expenditures, trends that have been partially mitigated by the New Cooperative Medical Scheme.
- 31 Babiarz KS, Miller G, Yi H, Zhang L, Rozelle S. New evidence on the impact of China's New Rural Cooperative Medical Scheme and its implications for rural primary care: multivariate difference-in-difference analysis. *BMJ*. 2010;341:c5617.

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In this month's *Health Affairs*, Kimberly Babiarz and coauthors report on a long-term study of China's New Cooperative Medical Scheme, a program put in place in 2003 to extend health coverage to rural populations and increase their use of health services. Among the effects the authors cite are some protection of rural residents from catastrophic health expenses, along with changing use of township health centers. These constitute a middle tier of care between China's village clinics and county hospitals. The centers are now more heavily used for inpatient care and are in better financial shape as a result of the coverage scheme.

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