

# Evaluation, in three provinces, of the introduction and impact of China's National Essential Medicines Scheme

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**Objective** To evaluate implementation of the National Essential Medicines Scheme (NEMS) in rural China.

**Methods** Two rural counties/districts in each of three provinces where NEMS had been implemented were surveyed. Information was collected from NEMS staff at the province, county/district, township and village levels; patients with chronic disease were also interviewed. Service provision, finances, prescriptions, inpatient records and the expenditures of patients with certain diagnoses were investigated in township hospitals and village clinics. The results were compared with the corresponding data recorded before NEMS was introduced.

**Findings** Following the introduction of NEMS, drug procurement in each study location was systematized. Total drug costs declined. This, and improved prescribing, reduced the costs of outpatient and inpatient care and led, apparently, to increased uptake of health services. However, the prices of some drugs had increased and the availability of others had declined. The compensation of health-care providers for NEMS-related reductions in their incomes had been largely ineffective. As a result of the introduction of NEMS, health facilities relied more on public financing. Many health-care providers complained about higher workloads and lower incomes.

**Conclusion** Although it was well conceived, the introduction of NEMS into China's decentralized, fee-for-service system of health care has not been straightforward. It has highlighted the problems associated with attempts to modernize health care and health financing for patients' benefit. Sustainable mechanisms to compensate health-care providers for lost income are needed to ensure that NEMS is a success.

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## Introduction

China's 12th Five-Year Plan, covering the years 2011–2015, focuses particularly on equitable and sustainable development, in an acknowledgement that economic growth has not benefited all population groups equally. One area of major inequity in China is access to affordable and appropriate health care. The cost of health care in China and public concern over it have both risen dramatically over the past two decades,<sup>1</sup> particularly as a result of the over-prescription of drugs and additional user fees in the health sector.<sup>2</sup> Since drug sales are the largest income source for China's health facilities, health-care providers have a pecuniary incentive to prescribe more and more expensive drugs.<sup>3,4</sup> In 2008, 42.7% of China's total health expenditure was on drugs;<sup>5</sup> by comparison, the corresponding average value in nations belonging to the Organisation for Economic Co-operation and Development was only 17%.<sup>6</sup> Excessive drug administration is common in rural China<sup>3,4,7–9</sup> and there is evidence that China's rural health insurance scheme encourages over-prescription.<sup>3,10</sup> The fact that hospitals and doctors derive substantial profits from drug sales<sup>4,11</sup> makes health care unaffordable for many.<sup>12,13</sup> Poor regulation of drugs also raises safety concerns.<sup>4,14</sup>

Previous efforts to improve the pharmaceutical sector in China have not been very successful. The impact of laws, decrees and 24 separate price reductions introduced between 1996 and 2007 was lessened by systemic issues (e.g. hospital financing/income generation and market influences) and patient preferences.<sup>3,4</sup> Price controls were undermined by manufacturers, wholesalers and retailers, and by hospitals and doctors that limited the prescription of the price-controlled

drugs.<sup>4,5,15</sup> In an attempt to rectify inequity in health care, China commenced extensive health-sector reform in 2009.<sup>16</sup> This included the establishment of a National Essential Medicines Scheme (NEMS) to improve population access to, and reduce the cost of, essential medicines,<sup>17</sup> particularly at the "grassroots" (i.e. township and village) level.

The NEMS covers drug production, pricing, distribution, procurement, prescribing and payment,<sup>5</sup> and it includes a new National Essential Drugs List for primary health-care institutions. The list comprises 205 "western" drugs and 102 traditional Chinese medicines. The government also capped the bidding price for 296 of the drugs on the list<sup>18</sup> and instigated a "zero-mark-up" (i.e. no-profit) policy for medicines on the list when they were prescribed at the grassroots level. Previously, a mark-up of at least 15%<sup>4</sup> had been allowed on all drugs; mark-ups remain allowed at the county and higher levels. The zero-mark-up policy was phased in over a 2-year period (2009–2010) and by late January 2012 99.8% of township hospitals and 58.1% of village clinics had implemented the policy.<sup>19</sup> In addition, by 2010 90.2% of (urban) districts and 94.7% of (rural) counties had made medicines on the National Essential Drugs List reimbursable by health insurance schemes.<sup>20</sup> This important element of the NEMS transfers final payment for drugs on the National Essential Drugs List, when used at the grassroots level, from patients to insurers, who are mostly government-funded. In this way, equity is enhanced. Finally, to regulate the marketing and distribution of essential drugs, the NEMS requires province-wise, collective, public (online) bidding and procurement for medicines on the list.

Four elements – the National Essential Drugs List, the grassroots zero-mark-up policy, reimbursements for drugs

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(Submitted: 28 June 2012 – Revised version received: 13 November 2012 – Accepted: 16 November 2012 – Published online: 11 January 2013)

on the list and public procurement – constitute the core of China's recent pharmaceutical reform. However, the official documents for this reform provide only guiding principles that encourage the local adaptation and piloting of the NEMS,<sup>21,22</sup> including the use of the National Essential Drugs List (now widely augmented<sup>14,23</sup>) and strategies to compensate health-care providers for income lost as a result of the zero-mark-up policy.

In a pre-reform pilot study of the NEMS that was conducted in three urban areas, the zero-mark-up policy was handled in various ways by the local health-care providers but decreases in the total retail price of the drugs used and in mean cost per prescription and per clinical visit were observed.<sup>5</sup> The monitoring and evaluation of China's most recent health-sector reform are critical to the reform's success and are being encouraged by the government.<sup>16</sup> Although the NEMS has now been almost universally introduced, the effects of its introduction in rural China have not been widely investigated. In a recent evaluation,<sup>22</sup> China's NEMS was viewed as a dynamic process with multiple and unpredictable stakeholders interacting in a complex conceptual framework. In the present study, which was based on selected health facilities at the grassroots level, various methods were used to explore the implementation and financial and operational impact of the NEMS and to record the views of the health-care providers and patients affected by it.

## Methods

There were six main study areas: two rural counties in Ningxia province (which covers 66 400 km<sup>2</sup> in north-western China), two rural districts in Chongqing province (which covers 82 401 km<sup>2</sup> in the central-western part of the country) and another two rural districts in Tianjin province (which covers 11 917 km<sup>2</sup> in the eastern part of the country). In 2010, Ningxia, Chongqing and Tianjin had populations of approximately 6.2 million, 28 million and 13 million, respectively, and mean annual incomes equivalent to 690, 779 and 1488 United States dollars (US\$) per capita. (For this report, all incomes and expenditures have been converted to US\$ using the mean exchange rate, for the year 2010, of 6.77 renminbi to one US\$.) The survey sites were selected randomly from lists

of those rural counties/districts in each province where mean annual incomes were US\$ 334–US\$ 1474. The study was conducted between June and September of 2010.

The use of several research methods enabled collection of both quantitative data, such as the impact of the NEMS on costs, fees and prescribing patterns, as well as qualitative information, such as the views and opinions of patients, health-care providers and local health authorities.<sup>24</sup> Although the main aim was to evaluate how the NEMS had affected various quantitative measures of health care, an important secondary goal was to explore how different locations were implementing a scheme for which only general principles had been outlined.<sup>22</sup> The collection of both quantitative and qualitative data has recently been recommended for health policy and systems research.<sup>25,26</sup> The analytical approach to be followed was established in advance (Appendix A, available at: <http://www.12320.gov.cn/12320dt/show.jsp?id=5141>).

After a thorough literature review and a seminar attended by rural health specialists from government and academia, we prepared a questionnaire and guidelines for in-depth interviews and focus group discussions (Appendix A). These research instruments were designed to assess, both quantitatively and qualitatively, the implementation of the NEMS and its impact on health facilities, health personnel (i.e. managers of county/district health bureaux, directors of township hospitals and doctors in township hospitals and village clinics), and rural residents (represented by a convenience sample of patients with chronic disease who lived near the surveyed facilities). Each instrument was improved after pre-testing in rural districts near Beijing.

The questionnaire was sent to the six county/district health bureaux in the study areas and then distributed by bureau staff to four township hospitals in each county/district and, in Ningxia only, to four village clinics in each participating township. The hospitals and clinics receiving the questionnaires were selected at random. The questionnaire sought information on the workforce, workload, revenue, access to subsidies and expenditure of each surveyed facility. Members of the survey printed out completed questionnaires and collected them from the respondents. Every

e-mailed questionnaire was completed and returned.

Focus group discussions were facilitated by experienced interviewers (rural health specialists and Ministry of Health officials) and two trained investigators (CY and GS). These discussions focused on the implementation of the NEMS and its effects on operations, workloads, incomes and drug costs, expenses and financing. Three focus group discussions were held per township; each involved local residents and doctors from township hospitals and village clinics. Although village clinics in Chongqing and Tianjin were not sent questionnaires (because, at the time of the study, the NEMS had not been implemented at the village clinic level in these provinces), five or six randomly selected village doctors from each township surveyed in these areas participated in the focus group discussions and in-depth interviews. Additional focus group discussions were conducted with the health officials from county/district and provincial health bureaux responsible for drug administration, rural health, the rural cooperative medical (insurance) scheme and maternal and child health. We sorted the information from the discussions with patients, hospital and clinic staff and health officials by place of residence, type of facility and health system level (i.e. district, county or province). On average, eight staff members, officials or patients participated in each discussion, which lasted 60–90 minutes.

Each in-depth interview involved an interviewer (CY, YL or GS) who had been trained by specialists in interviewing techniques, and a single interviewee. The aim of each interview was to determine the interviewee's views on the financial aspects of the NEMS and on its impact, if any, on the interviewee's work, workplace and health services. We recruited interviewees from among those participants in the focus group discussions who were considered to have been most affected by the NEMS and/or to have the most experience within the health system, or among those who had raised specific issues during the discussions. We conducted in-depth interviews with one official from each county/district health bureau investigated, 69 doctors from township hospitals, 70 village doctors and 120 patients with chronic disease (Appendix A).

Data on the finances and service provision of the surveyed township hos-

pitals and village clinics were collected for two periods: the period (of 2 months in Ningxia and 3 months in Chongqing and Tianjin) since the zero-mark-up policy had been implemented (the “post-implementation period”), and the corresponding 2- or 3-month period of the preceding year (the “pre-implementation period”). We investigated total income, income from financial aid, drugs and medical services, expenditure on medical services and drugs, compensation mechanism (post-implementation), numbers of outpatients and inpatients, and the inpatient records and expenditures of patients with pneumonia or gastroenteritis. We compared doctors' caseloads (numbers of outpatients and inpatients) and income in the pre- and post-implementation periods and investigated doctors' post-implementation compensation for the zero-mark-up policy.

Before the survey, the research plan, questionnaire and guidelines for the discussions and interviews were approved by the Chinese Ministry of Health and by the provincial and county/district health bureaux that were to be investigated. The participants could not be identified from the data that were recorded and all participants gave their informed consent.

We recorded information from prescriptions in an Excel (Microsoft, Redmond, United States of America) database after evaluation by clinical specialists. We recorded other survey data in EpiData (EpiData Association, Odense M, Denmark) databases and used the SPSS15.0 software package (SPSS Inc., Chicago, USA) for statistical analysis. We calculated means and variance for the quantitative data. Statistical significance was assessed using  $\chi^2$  tests. We recorded all focus group discussions and interviews on audio tape and transcribed them for subsequent analysis. The resultant transcripts were independently analysed by an investigator (YL) and an experienced research assistant, who based their investigations on key phrases related to the research themes; a third person (LB) subsequently checked the two sets of conclusions for consistency.

## Results

### Implementation of the NEMS

In the post-implementation study periods, all of the surveyed areas were

implementing the NEMS. However, Chongqing and Tianjin had only implemented it in township hospitals, whereas Ningxia had implemented it in township hospitals and village clinics.

### Drug procurement and supply

Before the NEMS was implemented, most township hospitals and village clinics procured drugs directly from suppliers at variable prices. Following implementation of the NEMS, each province/municipality established unified bidding, purchasing and supply procedures for drugs sold in township hospitals (and, in Ningxia, in village clinics) (Table 1). Although prices varied, most fell below the nationally established “ceiling” prices for the drugs because suppliers were competing for government contracts. However, interviewees revealed that the ceiling prices for some drugs were higher than the corresponding prices that health-care providers had paid before local implementation of the NEMS. In one district, ceiling prices for nearly 70% of the drugs on the National Essential Drugs List were found to be higher (typically 16–25% higher but up to 300% higher) than the pre-implementation prices paid for the same drugs. Suppliers were still allowed to add unregulated transport charges to procurement costs and this could raise the prices paid for drugs by patients. In addition, county officials reported that some manufacturers had become reluctant to produce certain drugs because the corresponding ceiling prices had been set too low for a satisfactory profit. These post-implementation changes had had a negative impact on the reliability of the supply of several drugs on the National Essential Drugs List. For example, 30.4% of the patients who were interviewed said that, following implementation of the NEMS, essential drugs for diabetes and hypertension had become difficult to obtain at township hospitals; 11.5% of such patients reported similar problems with the purchase of other drugs. Although all the drugs involved were always available at county hospitals, they were relatively expensive when bought from such facilities because of the mark-ups that were permitted at this level of the health system. These problems were confirmed by doctors from township hospitals, who reported that they had been unable to provide some medicines following implementation of the NEMS.

According to the doctors, problems in drug supply had not only compromised service quality and clinic revenue but had also led to a misperception, among patients, that the doctors were unwilling to provide care that was not profitable.

### Use of the list, zero-mark-up policy and compensation

Doctors and patients at the surveyed health facilities felt that the National Essential Drugs List was too short. The local authorities in each surveyed locality had added drugs to the standard list (Table 1), but all drugs on the extended lists were governed by the zero-mark-up policy. Notional arrangements for the compensation of health-care providers varied widely among study sites. In general, however, providers relied on health insurance funds, public health allocations or health finance departments to replace any income lost as a result of the zero-mark-up policy (Table 1).

### Operational impact

#### Reduced charges for patients

The patients who were interviewed expressed their general satisfaction with the NEMS and believed that real benefits had accrued as a result of it. Expenses for outpatients (including emergency cases) and inpatients recorded in the three study provinces in the post-implementation period were 4.9–14.6% and 7.4–13.4% lower, respectively, than the corresponding values recorded in the pre-implementation period (Table 2). Reduction in drug expenses was a major contributor to these declines. For example, total expenses and drug expenses for inpatients with pneumonia or bronchitis were 12.6% and 17.5% lower, respectively, in the post-implementation period than in the pre-implementation period (Table 3). The corresponding values for inpatients admitted with gastroenteritis – 42.6% lower total costs and 48.4% lower drug costs – were even more encouraging.

#### Increased service uptake at township hospitals

The observed decreases in drug expenses may have contributed to post-implementation increases in the numbers of patients seen at township hospitals. Outpatient (including emergency) visits to the township hospitals in Ningxia, Chongqing and Tianjin were 5.7%, 24.0% and 6.2% higher, respectively, in the post-implementation period than in

Table 1. Implementation of the National Essential Medicines Scheme in three study provinces, China, 2010

Aspect of implementation	Procedures followed in:		
	Chongqing	Tianjin	Ningxia
Drug procurement	<ul style="list-style-type: none"> <li>– Centralized purchase.</li> <li>– Online public bidding. Unified distribution and selling prices.</li> <li>– Drug sales are included in reimbursement system in some areas.</li> </ul>	<ul style="list-style-type: none"> <li>– As in Chongqing, plus additional measures to ensure supplies and prices of drugs with both oral and injectable formulations.</li> </ul>	<ul style="list-style-type: none"> <li>– Public bidding for drug supply and distribution.</li> <li>– Contracts awarded to five manufacturers to supply the entire province, with each county covered by two manufacturers, to assure reliable supplies.</li> </ul>
Adaptation of the NEDL <sup>a</sup>	<ul style="list-style-type: none"> <li>– NEDL not adapted yet.</li> <li>– Up to 30% of the drugs sold by township hospitals may be non-essential, but these must also be sold with zero mark-up.</li> </ul>	<ul style="list-style-type: none"> <li>– NEDL extended to include 325 western drugs and 212 traditional Chinese medicines, all of which must be sold with zero-mark-up.</li> </ul>	<ul style="list-style-type: none"> <li>– NEDL adapted by addition of 64 drugs and removal of schistosomiasis drugs, leaving 369 drugs on the medicines list, all of which must be sold with zero-mark-up.</li> </ul>
Compensation of health-care providers for ZMP	<ul style="list-style-type: none"> <li>– County health-finance bureaux prepay compensation (15% of the previous year's drug sales).</li> </ul>	<ul style="list-style-type: none"> <li>– Prepayment (15% of the previous year's drug revenue) from medical-insurance scheme. If drug revenue exceeds the previous year's total, further compensation (2% of the current year's drug revenue) is supplied by local finance bureau.</li> </ul>	<ul style="list-style-type: none"> <li>– Insurance funds pay township hospitals and village clinics 5% of the value of all essential drugs prescribed. Most (53%) of the US\$ 2.21 allocated to each registered resident in basic public-health funding is used to pay the salaries of village doctors.</li> </ul>

NEDL, National Essential Drugs List; US\$, United States dollar; ZMP, zero-mark-up policy.

<sup>a</sup> Health authorities in Chongqing complained that only 190 of 307 drugs on an earlier essential drugs list were useful.

the pre-implementation period. Inpatient admissions to the same hospitals were 41% higher (Ningxia), 24% higher (Chongqing) and 11.8% lower (Tianjin) during the post-implementation period (Table 4).

In Ningxia, where both township hospitals and village clinics had implemented the zero-mark-up policy at the time of the present study, the number of patient visits to the village clinics investigated in the post-implementation period of study (when there was a zero-mark-up policy) was 40.8% higher than the number recorded in the pre-implementation period (when a 5% mark-up was allowed) (Table 4). In contrast, in Tianjin and Chongqing, where the zero-mark-up policy had only been implemented in township hospitals

at the time of the present study, there was a corresponding 64% decline in patient attendance at the village clinics that were surveyed. In the focus group discussions and interviews conducted in Tianjin and Chongqing, many patients said that, following implementation of the NEMS, they had attended township hospitals rather than the nearer village clinics because drug costs were lower at the township hospitals.

#### Prescribing behaviour and drug charges

Prescribing practices among the surveyed doctors appeared to have improved following local introduction of the NEMS. For example, exclusion of hormones (such as steroids) and certain antibiotics from the National Essential Drugs List had apparently reduced the

(often unwarranted) prescription of such drugs. The training on rational drug use that occurred during the introduction of the National Essential Drugs List may also have improved prescribing practices. At the township hospitals that were surveyed, the mean number of drugs prescribed per patients dropped from 3.8 in the pre-implementation period of the study to 3.6 in the post-implementation period, while the corresponding mean charge for drugs dropped from US\$ 9.45 to US\$ 8.12. However, 49.2% of the patients seen at township hospitals in the post-implementation period of study had received parenteral treatment, compared with just 39.7% in the pre-implementation period. Most (68%) of the doctors interviewed after implementation felt that

Table 2. Medical expenses before and after local implementation of the National Essential Medicines Scheme, China, 2009–2010

Location	Outpatient costs (US\$ per visit)		Percentage reduction	Inpatient costs (US\$ per hospitalization)		Percentage reduction
	Before	After		Before	After	
Yongning, Ningxia <sup>a</sup>	3.13	2.02	35.38	106.48	102.26	3.97
Pingluo, Ningxia <sup>a</sup>	4.74	4.70	0.93	101.55	90.25	11.13
Banan, Chongqing	15.38	14.06	8.55	294.20	277.50	5.67
Yubei, Chongqing	15.26	15.07	1.26	318.74	253.37	20.51
Wuqing, Tianjin	15.33	14.59	4.82	335.13	261.37	22.01
Beichen, Tianjin	18.05	15.83	12.27	325.83	324.70	0.35

US\$, United States dollar.

<sup>a</sup> Only one township hospital provided inpatient services in this location.

Table 3. Medical expenses for adult inpatients with pneumonia or bronchitis before and after local implementation of the National Essential Medicines Scheme, China, 2009–2010

Variable	Ningxia		Chongqing		Tianjin		Percentage change all three provinces <sup>a</sup>
	Before (n = 23)	After (n = 26)	Before (n = 19)	After (n = 24)	Before (n = 22)	After (n = 24)	
Mean days of hospitalization	9.1	7.6	4.1	5.5	3.3	3.3	-1.7
Charges (US\$ per admission)							
Hospitalization (total)	91.64	73.63	291.24	280.00	170.00	119.31	-29.8*
Hospitalization (per day)	10.03	9.72	73.26	55.51	57.77	31.34	-45.7*
Drugs (total)	43.06	41.57	214.80	173.15	56.65	32.92	-41.9*
Drugs (per day)	4.72	5.48	53.81	33.97	15.49	8.51	-45.1*
Percentage change	-16.5		+34.1		-3.9		0

US\$, United States dollar.

<sup>a</sup> Chongqing, Ningxia and Tianjin; \*P < 0.05.

their prescribing followed the recommended protocols of the NEMS.

Prescribing practices also changed in Ningxia village clinics following the local introduction of the NEMS. In these clinics, post-implementation declines were recorded in the mean number of drugs prescribed per patient (which fell from 2.7 to 2.2), the proportion of patients being prescribed antibiotics (which fell from 54.1% to 37.6%) and the proportion of patients being given drugs by injection (which fell from 18.8% to 14.0%).

### Financial impact

#### Reduced income for doctors

In general, the surveyed doctors who were implementing the zero-mark-up policy were not only earning less than they had before implementation of the NEMS but were also dealing with greater numbers of patients; their salaries and compensatory income had not increased sufficiently to protect their total incomes. In one township hospital in Ningxia, for example, the mean doctor's income had dropped by 17%, while in a township hospital in Tianjin it had dropped by 15% (Table 5). The income of the village doctors surveyed in Ningxia had also fallen, by a mean of 22%. Only in Chongqing, which had established a mechanism to compensate staff for anticipated losses before implementing the zero-mark-up policy, had the mean income of a doctor in a township hospital increased following implementation of the NEMS. However, the long-term sustainability of Chongqing's compensation strategy is a cause for concern because the monthly financial support given to some township hospitals in the province during the post-implementation period of study (e.g. US\$ 7386 and US\$ 14 870 for each hospital supported via the Banan and Yubei health bureaux, respectively) barely covered salaries.

Interviews revealed that the fall in doctors' total incomes had had a negative impact on the doctors' levels of enthusiasm and satisfaction. Many doctors reported that they had tried to supplement their post-implementation incomes by increasing their fee-for-service activities, such as the administration of injectable antibiotics at the township level and the prescribing of raw herbs and unprocessed traditional medicines.

#### Township hospitals and village clinics

Table 5 details the changing composition of township hospital income. In each county/district, drug revenue as a proportion of total income declined following implementation of the NEMS, and the percentage of total income supplied by the government increased, by 2–28%, in most of the surveyed counties and districts. Ten of the 12 directors of township hospitals who were interviewed were uncertain as to how they could compensate for revenue lost as a result of implementing zero mark-up. Although each location surveyed had drafted compensation policies, other components of national reforms in the health service were also reliant on local resources, which stretched local finances. At the time of the present study, neither Ningxia nor Tianjin had implemented their strategies for drug-revenue compensation and this had, apparently, adversely affected the routine operation of the township hospitals in both provinces.

Doctors in five of the 13 village clinics surveyed in one Ningxia county had stopped providing essential medicines (at zero mark-up) because of the lack of profit. One of these doctors complained that his ability to provide basic clinical services and meet patients' needs had been very badly affected by local implementation of the NEMS. The livelihoods of many village doctors in Ningxia are now largely reliant on government subsidies for public health work. At the time of the present study, village clinics in Chongqing and Tianjin had also been adversely affected by the NEMS, even though it had not been implemented in the clinics, because so many patients were travelling to township hospitals so that they could reduce their drug costs. The 64% mean decline in consultations observed at village clinics in Chongqing and Tianjin following implementation of the NEMS at township hospitals in the provinces had reduced the mean annual income of such clinics from US\$ 2716 in 2009 to US\$ 2216 in 2010, raising doubts about the clinics' viability.<sup>27</sup> The clinical income lost in such clinics was having to be replaced by income from public health activities and other services.

### Discussion

We assessed the introduction of China's NEMS in three provinces midway

Table 4. Numbers of patients before and after implementation of the zero-mark-up policy, China, 2009–2010

Type and location of facility	No. of outpatients <sup>a</sup>			No. of inpatients <sup>a</sup>		
	Before	After	Percentage change	Before	After	Percentage change
<b>Township hospital</b>						
Yongning, Ningxia <sup>b</sup>	12 439	12 728	+2.3	43	65	+51.2
Pingluo, Ningxia <sup>b</sup>	8 247	9 137	+10.8	16	18	+12.5
Banan, Chongqing	16 407	19 495	+18.8	1 657	2 104	+27.0
Yubei, Chongqing	15 604	20 145	+29.1	969	1 152	18.9
Wuqing, Tianjin	19 482	19 159	-1.7	811	729	-10.1
Beichen, Tianjin	17 793	20 422	+14.8	555	476	-14.2
<b>Village clinic in Ningxia</b>						
Shengli township, Yongning	110	202	+83.6			
Wanghong township, Yongning	252	296	+17.5			
Tongfu township, Pingluo	62	96	+54.8			
Yaofu township, Pingluo	32	48	+50.0			
Mean values	114.0	160.5	+40.8			

<sup>a</sup> The numbers shown are those recorded in 2010, in the first 2 months (Ningxia) or 3 months (Chongqing and Tianjin) after the policy was implemented, and in the corresponding periods of 2009.

<sup>b</sup> Only one township hospital provided inpatient services in this location.

through China's health-sector reform for 2009–2012 and found a mixture of benefits as well as challenges to the scheme's sustainability. Its benefits included reductions in the cost of care and better prescribing practices. Patients expressed satisfaction with the NEMS. However, the reliability of drug supplies was a problem and drug prices had not fallen uniformly despite centralized procurement. The incomes of doctors and health-care facilities had often fallen and the workloads at township hospitals had generally increased without compensatory increases in revenue. This had lowered the morale of many health-care providers. These problems present operational and financial challenges to the NEM's viability and could lead to health-

care services being restricted to a few "grassroots" facilities with the ability to implement and sustain the zero-mark-up policy and to county-level facilities, where mark-up is still permitted.

In general, the main objectives of the NEMS – to improve equitable access to essential medicines and reduce the out-of-pocket expenditures of patients in poorer communities of China – were being achieved in the provinces investigated. Reduced expenditure on outpatient and inpatient care, partly through the use of the rural cooperative medical (insurance) scheme to reimburse patients for drug costs and other charges, almost certainly contributed to the increase in service uptake observed in most study areas. The post-imple-

mentation reduction seen in inpatient numbers in Tianjin was probably the result of financial limits on the numbers of patients that some facilities were willing to admit. In Ningxia, where both township hospitals and village clinics had implemented the zero-mark-up policy at the time of the present study, the number of patient visits to the village clinics that were surveyed had risen by a mean of 41%, probably augmented by other initiatives in the province. In contrast, in Chongqing and Tianjin, the number of patient visits to village clinics had fallen massively following introduction of zero mark-up at township hospitals. These changes, and the observation that the post-implementation increase in the number of patients admitted to

Table 5. Sources of income for township hospitals, and doctors' incomes in such hospitals, before and after implementation of the zero-mark-up policy, China, 2009–2010

Location	Proportion of hospital income (%) <sup>a</sup>						Mean doctors' income (US\$)		Percentage change
	Before			After			Before	After	
	Public finance	Medical treatment	Drug sales	Public finance	Medical treatment	Drug sales			
Yongning, Ningxia	46.6	16.4	36.9	55.5	13.7	30.9	326.4	291.6	-11.0
Pingluo, Ningxia	37.4	21.5	39.4	39.2	18.5	35.9	322.0	266.9	-17.0
Banan, Chongqing	26.4	47.1	17.6	28.0	49.3	11.9	451.1	456.7	+1.0
Yubei, Chongqing	9.3	53.6	32.0	22.1	47.7	28.6	632.8	720.5	+14.0
Wuqing, Tianjin	6.3	41.7	50.9	34.3	35.1	29.0	368.1	352.2	-4.0
Beichen, Tianjin	10.1	46.1	43.3	7.2	52.3	39.8	542.1	462.3	-15.0

US\$, United States dollar.

<sup>a</sup> Minor sources of income have been omitted.

township hospitals was proportionally greater than the corresponding increase in outpatient numbers, would also have been influenced by the rural cooperative medical (insurance) scheme, which provided limited or no compensation for outpatient charges in 2010.<sup>28</sup> Other research has revealed the impact of changes to China's health financing on patient numbers<sup>29</sup> and a mixture of increased public funding and increased membership of health-insurance schemes will almost certainly be required to sustain health services in the country.<sup>28</sup> The observed problems with the supply of certain drugs may influence the distribution of service contacts among village-, township- and county-level providers, as patients seek care where their needs can be most reliably and affordably met. Such a trend, which could undermine China's attempts to provide equitable community access to services, must be carefully monitored and regularly evaluated.

The observation that the NEMS may be reducing the number of drugs prescribed is encouraging. In township hospitals, the mean numbers of drugs of all types and of antibiotics prescribed fell after the NEMS was implemented. Surprisingly, the use of injections became more common but this was probably because doctors, who can charge for giving injections, were trying to boost their incomes. Reduced prescription of both steroids and antibiotics but increased use of injectable drugs were also observed in a pre-NEMS pilot study in Ningxia,<sup>27</sup> and in a separate government evaluation.<sup>28</sup> The fall in injection rate recorded in the village clinics in Ningxia may reflect a preference, among patients with conditions that require treatment with injectable drugs, for the generally higher standard of care and cheaper essential drugs available at township hospitals. Although the observed changes in prescribing practices were encouraging, the survey substantiated earlier indications that doctors are seeking and using other forms of revenue to compensate for income lost because of the zero-mark-up policy.<sup>29</sup> To avoid the unnecessary use of drugs, local authorities may have to limit the sale of drugs that are not on the National Essential Drugs List, although resistance to this practice should naturally wane as patients realize that the rural cooperative medical (insurance) scheme will not reimburse them for the purchase of unlisted drugs.

The NEMS aims to regulate the supply and cost of essential drugs at township and village levels. However, its price controls and recommended procurement procedures have adversely affected the supply of some drugs that are on the National Essential Drugs List. The production of some essential drugs by some manufacturers may cease because the NEMS has severely curtailed the profit to be made by the manufacturers, who claim that the relevant "ceiling" prices have been set too low. Many health-care providers complained that the prices they were paying for some drugs after implementation of the NEMS were higher than those they had paid immediately before the NEMS was introduced in their facility. In China, as elsewhere, the pharmaceutical industry's need for profit competes with the government's objective of ensuring the affordability of essential medicines.<sup>3</sup> There have been previous reports of drug price-fixing and drug shortages in the country<sup>28</sup> and such problems will need careful monitoring.

Province-level health authorities are not totally satisfied with the standard National Essential Drugs List, and local adaptation of the list with the addition of other drugs is the norm.<sup>23</sup> A senior official in China, while noting that numerous health authorities have deemed the standard National Essential Drugs List to be inadequate, has rightly questioned the concept of such a list if drugs can be added to it without limit.<sup>30</sup> Given China's decentralized health system, it may be difficult to ensure that affordability and medically appropriate treatment are maintained following the local adaptation of the National Essential Drugs List. It is important that local adaptations to the list are undertaken in collaboration with the administrators of the rural cooperative medical (insurance) scheme at each level of the health system, to ensure that any changes are affordable to the insurer.

Although the low incomes of health-care providers in rural China are recognized as a major problem,<sup>27</sup> any measures to markedly raise them appear to be difficult to sustain. Following the local introduction of the NEMS, doctors' incomes in the provinces investigated in the present study had either fallen (Ningxia and Tianjin) or been maintained only by following a strategy that appears unsustainable (Chongqing). In many of the surveyed areas, a compen-

sation policy had been formulated but not implemented. Budgetary shortfalls threaten the size, activity and very existence of many township hospitals. As observed by others, "unless separation of (provider) revenue and expenditure accounts is implemented and local governments fully support implementation, zero mark-up is not likely to be sustainable" in China.<sup>5</sup> Major reform of China's decentralized health system relies fundamentally on the willingness and capacity of the relevant authorities at relatively low levels of government to formulate policy details, implementation mechanisms and financing arrangements.<sup>31,32</sup> The responsibilities of low-level health-care providers and the importance of their support will only increase as village doctors are encouraged to play an ever-increasing role in China's health system.<sup>33</sup> Our research confirms the conclusion drawn by a Ministry of Finance researcher<sup>34</sup> and the Xinhua News Agency<sup>35</sup> that the long-term success of the NEMS will depend largely on local subsidies. Just as health care in China became unaffordable for many patients, recent health-sector reform may become unaffordable for the national government.<sup>36</sup>

In addition to doctors seeking alternative income sources,<sup>29</sup> in some counties health-insurance funds and basic public-health funds are being used to compensate doctors for the income they have lost as a result of zero mark-up. In both Tianjin and Chongqing there are problems with how such compensation is calculated: Tianjin uses the previous year's drug income to formulate the compensation amount, allowing for an increase if drugs sales rise, whereas Chongqing prepays 15% of the previous year's drug sales to subsidize its health facilities (Table 1). Compensation based on previous practice still encourages doctors to over-prescribe and, when faced with several options, to prescribe the most expensive drug. This perpetuates the problem of drugs being chosen to benefit the incomes of doctors as much as the health of patients. In summary, our research in rural areas echoes the World Bank's conclusion from pilot studies on zero-mark-up policies in urban areas: that "...a close eye must be kept on the sustainability of the zero-mark-up policy, primarily because a mechanism has not yet been worked out on how to compensate hospitals for their lost revenues".<sup>5</sup>

## Limitations

The present study has several limitations in addition to those common to all qualitative research. First, only three of China's provinces were studied and interventions similar to some of those recommended in the NEMS had previously been performed in Ningxia and Tianjin. In Ningxia, for example, unified public bidding, distribution and pricing for drugs, and a pilot 5% limit on the mark-up permitted for drugs, had been introduced in 2006. According to the staff of the Ningxia provincial health bureau, these strategies resulted in drug prices in Ningxia being a mean of 49.5% lower than the national maxima and overall drug costs in township hospitals falling by 48.6% (unpublished data). Tianjin was also piloting earlier iterations of the recent health-sector reform before the NEMS was introduced in the province. Prior experience of similar strategies may have already prepared the health-care providers of Ningxia and Tianjin for the changes required for the implementation of the NEMS. Therefore, the conclusions drawn from the data collected in these areas, for the present study, may not be applicable to locations in China that have no prior experience in the control of drug prices and procurement.

A second limitation of our study is that we collected post-implementation soon after the introduction of the NEMS. At that stage, local government may simply not have had enough time to meet the challenges posed by the NEMS: neither Ningxia nor Tianjin had implemented their policies for drug-revenue compensation; only Ningxia had introduced the zero-mark-up policy at the village level, and Chongqing had not adapted the National Essential Drugs List. Given China's rapid economic development, it may be that all the issues identified in this study will be solved as the financial capacity of local government improves. However, measures to keep the costs of health care low for consumers from the poorer sectors of the population will still be important. Unfortunately, many health-care providers appear to be seeking ways to maintain or increase their incomes at the patients' expense.

The present findings cannot be regarded as representative of all of

China. Rural districts in Tianjin and Chongqing are generally wealthier than rural counties elsewhere in the country and Ningxia, although poorer than most provinces in China, has been very progressive in introducing equity-enhancing pilot schemes for health financing and service reforms.

As the introduction of the NEMS is occurring in the context of comprehensive health-sector reform in China and was, in 2009, a high-priority element of that reform, it was not possible to include matched control sites in late 2010. Roll-out of the NEMS in each of the three surveyed provinces was rapid. With other interventions being simultaneously introduced as part of the wider reform, the changes recorded in the present study in health-care costs, patient uptake of services and the relative importance of various sources to health-facility income cannot be entirely attributed to the NEMS. In particular, improvements in rural health insurance have increased service uptake.<sup>13</sup> General improvements in household income, basic education, public transport and road access may also have contributed to the increases seen in patient numbers. However, all of the observed changes in drug availability and expenditure and prescribing practices are probably attributable to the NEMS.

Despite the limitations of the present study, the main changes observed following implementation of the NEMS were predictable, impressive and worrisome in some respects. Our findings match those of other evaluations of the NEMS (W Yip, personal communication, 2012). When their ramifications are so important, there is little reason to ignore them simply because the study population is considered to be non-representative.

The results presented here indicate that the NEMS is having its intended impact on drug prices overall. The NEMS also appears to be associated with increased uptake of health services and, probably, more rational drug prescribing. It seems to be regarded positively by patients, despite the new shortages of some drugs. In addition to the suggestions made above, we recommend that the National Essential Drugs List be expanded by the national government and that its local adaptation in China, as in Australia,<sup>37</sup> be limited and conducted

with consideration of affordability for the medical insurers. Drug-procurement tenders should include the cost of delivery to the health facilities at the grassroots levels, and measures to ensure that health-care providers always have supplies of drugs on the National Essential Drugs List, such as penalties for manufacturers who exhaust their stocks of such drugs, should be introduced. The side-benefits of such measures may be a much-needed consolidation, and better regulation, of China's pharmaceutical industry. Additional treatment algorithms should be made available to guide clinical care and prescribing practices, especially for under-qualified rural practitioners.

Unfortunately, the implementation of the NEMS has left many health-care providers unhappy with lower incomes despite higher workloads. More guidance is needed, from the national level, on options for provider compensation and on whether the basic public-health funds provided as part of recent health-sector reform may be used to supplement the salaries of village doctors. The sustainability of the NEMS and, in particular, the zero-mark-up policy, like that of most of China's recent reforms,<sup>31</sup> will largely depend on financial inputs from local governments. However, local governments should perhaps not be given too much responsibility for the detailed design and funding of the NEMS, as this could also threaten the NEMS' viability.<sup>22</sup> Until the link between drug sales and the incomes of health-care providers and facilities is broken, the full realization of the intended benefits of the NEMS will remain a great challenge. ■

## Acknowledgements

We are grateful to the staff of the three provincial health bureaux and the providers and patients involved in the survey for their kind assistance and willingness to participate. We also thank the experts who provided support and valuable suggestions during the investigation and drafting of this report.

**Funding:** The research reported was funded by the UNICEF China Country Office.

**Competing interests:** None declared.

## ملخص

## تقييم إدخال المخطط الوطني للأدوية الأساسية في الصين وأثره في ثلاث مقاطعات

والداخليين وأدى، على نحو واضح، إلى زيادة الإقبال على الخدمات الصحية. ومع ذلك، زادت أسعار بعض الأدوية وانخفضت إتاحة أدوية أخرى. وكان تعويض مقدمي خدمات الرعاية الصحية عن الانخفاضات ذات الصلة بالمخطط الوطني للأدوية الأساسية غير فعال على نحو واسع. ونتيجة لإدخال المخطط الوطني للأدوية الأساسية، اعتمدت المرافق الصحية على التمويل العمومي بشكل أكبر. واشتكى العديد من مقدمي الرعاية الصحية بشأن ازدياد أعباء العمل وانخفاض الدخل. الاستنتاج على الرغم من تصور المخطط الوطني للأدوية الأساسية بشكل جيد، إلا أن إدخاله في نظام الرعاية الصحية غير المركزي الذي يتحمل فيه الأفراد دفع رسوم الخدمات لم يكن دقيقاً. فقد أكد على المشكلات المرتبطة بمحاولات تحديث الرعاية الصحية وتمويل الصحة المصلحة المرضى. ولا بد من وجود آليات مستدامة لتعويض مقدمي الرعاية الصحية عن الدخل المفقود لضمان نجاح المخطط الوطني للأدوية الأساسية.

الغرض تقييم تنفيذ المخطط الوطني للأدوية الأساسية (NEMS) في المناطق الريفية في الصين. الطريقة تم إجراء مسح لمقاطعتين/منطقتين ريفيتين في كل واحدة من المقاطعات الثلاث التي تم تنفيذ المخطط الوطني للأدوية الأساسية فيها. وتم جمع المعلومات من موظفي المخطط الوطني للأدوية الأساسية على مستويات الإقليم والمقاطعة والمنطقة والبلدة والقرية؛ وتم كذلك إجراء مقابلات مع المرضى المصابين بأمراض مزمنة. وتم تحري تقديم الخدمات والتمويلات والوصفات وسجلات المرضى الداخليين ونفقات المرضى في المستشفيات بالبلدة والعيادات القروية. وتم مقارنة النتائج بالبيانات المقابلة التي تم تسجيلها قبل استخدام المخطط الوطني للأدوية الأساسية. النتائج بعد إدخال المخطط الوطني للأدوية الأساسية، تم تصنيف شراء الأدوية في كل موقع من مواقع الدراسة على نحو منهجي. وانخفضت تكاليف الدواء الإجمالية، وهو ما أدى بالإضافة إلى تحسين الوصفات إلى تقليل تكاليف رعاية المرضى الخارجيين

## 摘要

## 在三个省份中对中国国家基本药物计划实施和影响的评估

**目的** 评估国家基本药物计划 (NEMS) 在中国农村的落实情况。

**方法** 在三个省份中，对每个省份实施NEMS的两个农村县/区进行了调查。由NEMS在省、县/区、乡、村的各级员工收集信息；对慢性疾病患者进行了采访。在乡镇卫生院和村卫生所对服务供应、财务、处方、住院记录、某些诊断的患者支出进行了调查。将结果与实施NEMS之前记录的相应数据进行比较。

**结果** 实施NEMS之后，在每个研究地点的药品采购系统化。总药物成本下降。再加上处方改进，减少了门诊和住

院服务的成本，并因此明显增加群众就医。然而，一些药品的价格有所增加，另一些药品的来源减少。卫生保健提供者基本上没有得到NEMS方面的有效减收补偿。由于实施NEMS，卫生设施对公共资金依赖程度增加。许多卫生保健提供者抱怨工作负担增加，收入降低。

**结论** 虽然经过很好的部署，但在中国分散、有偿服务的医疗保健体系中实施NEMS并不是一蹴而就。它凸显了力图为病人利益而进行的医疗保健和卫生筹资现代化的相关问题。要确保NEMS成功，必须有弥补卫生保健提供者收入损失的可持续机制。

## Résumé

## Évaluation de l'introduction et de l'impact du programme national chinois des médicaments essentiels dans trois provinces

**Objectif** Évaluer la mise en œuvre du programme national des médicaments essentiels (PNME) en Chine rurale.

**Méthodes** Une enquête a été menée dans deux comtés/districts ruraux de trois provinces où le PNME a été mis en œuvre. Des informations ont été recueillies auprès du personnel du PNME, au niveau de la province, du comté/district, de la municipalité et du village. Les patients atteints de maladies chroniques ont également été interrogés. La prestation de services, les aspects financiers, les ordonnances, les dossiers des patients hospitalisés et les dépenses des patients avec certains diagnostics ont été étudiés dans les hôpitaux municipaux et les cliniques de village. Les résultats ont été comparés avec les données correspondantes, enregistrées avant le lancement du PNME.

**Résultats** Suite à la mise en œuvre du PNME, l'approvisionnement en médicaments dans chaque site faisant l'objet de l'étude a été systématisé. Les coûts totaux des médicaments ont diminué. Cela, ainsi qu'une amélioration de la prescription, a réduit les coûts des

soins ambulatoires et hospitaliers et a conduit, apparemment, à une augmentation de l'utilisation des services de santé. Toutefois, les prix de certains médicaments ont augmenté et la disponibilité d'autres a diminué. L'indemnisation des prestataires de soins de santé pour compenser les réductions de revenus liées au PNME a été largement inefficace. Du fait du lancement du PNME, les établissements de santé dépendent davantage du financement public. De nombreux prestataires de soins se plaignent de charges de travail plus importantes et de revenus plus faibles.

**Conclusion** Bien qu'elle ait été correctement conçue, la mise en œuvre du PNME dans le système chinois de soins de santé, décentralisé et rémunéré à l'acte, n'a pas été simple. Il a mis en exergue les problèmes liés aux tentatives visant à moderniser les soins de santé et le financement de la santé au bénéfice des patients. Des mécanismes durables pour compenser la perte de revenu des fournisseurs de soins sont nécessaires pour assurer le succès du PNME.

**Резюме****Оценка введения и влияния Схемы предоставления жизненно-важных лекарственных средств, проведенная в трех провинциях Китая**

**Цель** Произвести оценку внедрения Схемы предоставления жизненно-важных лекарственных средств (NEMS) в сельских районах Китая.

**Методы** Были проведены исследования в двух округах/районах каждой из трех провинций, где была внедрена Схема предоставления жизненно-важных лекарственных средств (NEMS). Сбор информации проводился у сотрудников NEMS на уровне провинции, округа/района, города и поселка. Был также проведен опрос больных хроническими заболеваниями. В поселковых больницах и сельских клиниках проводилось исследование предоставления медицинских услуг, финансового обеспечения, назначения лекарственных средств, карт стационарных больных и затрат на пациентов с определенными диагнозами. Результаты сопоставлялись с соответствующими данными, полученными до введения NEMS.

**Результаты** Вслед за введением NEMS, была проведена систематизация закупок лекарственных средств в каждом месте исследования. Уменьшились совокупные расходы на закупку лекарственных средств. Это, а также более обоснованное назначение лекарственных средств, способствовало сокращению

расходов на амбулаторное и стационарное лечение и, очевидно, привело к повышению потребления услуг здравоохранения. Тем не менее, цены на некоторые лекарственные препараты выросли, а наличие других сократилось. Компенсации поставщикам медицинских услуг, выплачиваемые за снижение их доходов в результате введения NEMS, оказались, в основном, неэффективными. В результате введения NEMS медицинские учреждения стали больше полагаться на государственное финансирование. Многие поставщики медицинских услуг выражали недовольство по поводу большой загруженности и низких доходов.

**Вывод** Несмотря на хорошую идею, внедрение NEMS в децентрализованную систему платного медицинского обслуживания Китая оказалось неэффективным. Оно выявило проблемы, связанные с попытками модернизации системы здравоохранения и финансирования здравоохранения в интересах пациентов. Необходимы устойчивые механизмы компенсации утраченных доходов поставщикам медицинских услуг для обеспечения успеха NEMS.

**Resumen****Evaluación de la introducción e impacto del Plan nacional de medicamentos esenciales de China en tres provincias**

**Objetivo** Evaluar la puesta en práctica del Plan nacional de medicamentos esenciales (NEMS) en las zonas rurales de China.

**Métodos** Se examinaron dos condados o distritos rurales en cada una de las tres provincias en las que se había implementado el NEMS. Se recogió información del personal del NEMS a nivel provincial, de condado/distrito, municipal y de aldea; también se entrevistó a pacientes con enfermedades crónicas. En los hospitales municipales y clínicas rurales se investigó la prestación de servicios, la situación económica, las recetas, los registros de pacientes hospitalizados y los gastos de los pacientes con ciertas enfermedades. Los resultados se compararon con los datos correspondientes registrados antes de la introducción del NEMS.

**Resultados** Tras la introducción del NEMS se sistematizó la adquisición de medicamentos en cada lugar objeto de estudio y el precio de los medicamentos disminuyó. Esto, junto con una mejora en la prescripción de recetas, redujo los costes de la atención tanto a los pacientes ambulatorios como a los hospitalizados. Asimismo, condujo, al parecer,

a una respuesta superior ante los servicios sanitarios. No obstante, el precio de algunos medicamentos aumentó y la disponibilidad de otros disminuyó. La remuneración a los proveedores de atención sanitaria por las reducciones salariales relacionadas con el NEMS ha sido en su mayor parte ineficaz. Como resultado de la introducción del NEMS, los centros de salud dependían más de la financiación pública y muchos proveedores de atención sanitaria se quejaban del aumento de la carga de trabajo y la reducción de los salarios.

**Conclusión** Aunque bien concebida, la introducción del NEMS en el sistema de atención sanitaria descentralizado y de pago por servicios de China no ha sido sencilla. Han destacado los problemas relacionados con los intentos de modernizar la atención sanitaria y la financiación de la salud en beneficio de los pacientes. A fin de asegurar el éxito del NEMS, se necesitan mecanismos sostenibles para compensar a los proveedores de atención sanitaria por la pérdida de ingresos.

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