

# Health Service Delivery in China: A Critical Review

by

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## Summary

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## I. INTRODUCTION

China has made unprecedented progress in lifting millions out of poverty, increasing living standards, and addressing pressing health problems. Nonetheless, significant challenges remain, particularly in adapting the health system to fit with China's market-based economy and reformed social protection system. This critical review focuses on one key facet of China's health sector: health care service delivery.

The current system does not satisfy patients, providers or the government. According to a common Chinese saying, *kan bing gui, kan bing nan* (getting medical care is expensive and difficult). Why is this, and what might be done to remedy the problems? What might be appropriate roles for the government and the market for health care delivery in 21<sup>st</sup> century China?

This review seeks to contribute to the evidence base for policy by summarizing and critically assessing the literature on several specific aspects of the delivery system. The first section briefly describes the institutional background. The second section summarizes the literature review's key findings on the quality, efficiency and equity of China's health service delivery. The third section focuses on several key determinants of provider performance — from payment incentives to regulation and ownership — that shape the incentives of a delivery system (system incentives). For each, an overview of theory and international evidence is followed by a summary of the Chinese experience. Section IV discusses determinants and implications of cost-escalation in the health sector. The final section concludes with a discussion of research methodology, knowledge gaps, and policy implications.

## II. INSTITUTIONAL BACKGROUND<sup>1</sup>

From 1949 until 2001, the total number of health care organizations in China increased continuously.<sup>2</sup> Excluding health resources in villages, there were 3.42 health workers, 1.15 doctors, and 1.76 hospital beds per thousand people. Through the 1990s, there were more health workers per capita than in India or Thailand.

Private sector delivery has grown significantly. As shown in Table 1, for county-level providers and above, the vast majority of Chinese patients receive treatment (both outpatient and inpatient) in public facilities, but the private sector has grown more rapidly than the public since the mid-1990s. The private sector share is higher below the county level, since many village clinics have been sold to individuals (privatized).<sup>3</sup> Over 90% of for-profit institutions are small

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<sup>1</sup> All data in this section are from Ministry of Health yearbooks and/or the National Health Surveys (1993, 1998, 2003), unless otherwise noted.

<sup>2</sup> By the end of 2003, there were 806,243 health institutions in China, including 514,920 village clinics, 17,764 general hospitals, 44,279 township health centers, 3,584 centers for disease control (CDCs), 3,033 maternal and child care institutions, and 1,749 disease-specific treatment institutions. There were 0.87 million village health workers and 4.3 million health workers in township and above health institutions.

<sup>3</sup> According to the *PRC National-Standard for Health Institutions* (MOH, 2002), health institutions can be classified by ownership into: State-owned, Collective-owned, Joint-stock Cooperation, Coalition, Limited Liability, Private, Invested by HK, Macao & Taiwan (HKMT) and Chinese-foreign Joint Venture hospitals. At the end of 2002, medical institutions could be divided

scale private clinics. The majority of beds and personnel are in non-profit (mainly public) institutions (see Figure 1).

From 1980, a rapid increase in health workers graduating from formal medical universities provided a foundation for improved health care quality.<sup>4</sup> However, the training and skill level of health workers is still low, especially in rural areas. In 2003, 21.8% of health workers had no more than a high school education. Only 1.6% of all health workers, and 18% of workers in hospitals at the county level or above, were university graduates. The majority of village health workers have no formal medical education.

According to early results from the Third National Health Survey, comparing 1993 with 2003, utilization rates decreased in both urban and rural areas among those who were sick in the previous two weeks. Over the same period, facility-level data show that outpatient visits decreased (by 35% for township health centers, and from 1,494 million visits in 1990 to 1,213 million in 2003 at county and above hospitals). Although inpatient admissions at county and above hospitals slightly increased (31.8 million in 1990 and 41.6 million in 2003), admissions to township health centers decreased (from 19.6 million in 1990 to 16.3 million in 2003).

Simultaneous expanded supply and decreased utilization has resulted in decreased productivity, at least along measured dimensions.<sup>5</sup> Medical costs have escalated rapidly for both outpatient and inpatient care. Between 1990 and 2002 in general hospitals, for example, nominal outpatient spending per patient increased 8.14 times (from 10.9 yuan to 99.6 yuan), and nominal inpatient spending per admission increased 6.6 times (from 473.3 yuan to 3597.7 yuan). This equates to high real medical cost escalation, since per capita income increased 4.1 times in urban areas and 2.6 times in rural areas over the same period.

The global trend is for increased public financing as per capita income grows. In contrast, Chinese patients' share of out-of-pocket spending is increasing.<sup>6</sup> The rapid cost increase, combined with decreased organized financing, has reduced the affordability of care. According to National Health Surveys, between 1998 and 2003 the proportion of people ill in the last two weeks who did not seek care for financial reasons increased in both urban and rural areas (Rao 2004).

The share of drug costs in total medical costs has decreased slightly, but remains excessively high. In 2003, drug expenditure accounted for 54.7% and 44.7% of outpatient and inpatient expenditure, respectively.

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into state-owned -32%, collective-owned - 18%, private (mostly private outpatient departments and clinics) - 46%, and other types - 4% (HSIC, 2004b). There were 17,844 hospitals, of which there were state-owned - 81.95%, collective-owned - 7.83%, private - 6.13%, joint-stock - 1.59%, and others - less than 1%. Of all health centers, state-owned and collective-owned accounted for 57.57% and 41.22%, respectively, with private and other health centers accounting for less than 2%. All MCH Centers, and nearly all (99.49%) specialized disease control institutions, are state- or collective-owned. Medical institutions affiliated with enterprises (SOEs) accounted for 12.65% of total medical institutions in 2002.

<sup>4</sup> Between 1976 and 1980, about 20,000 graduates from formal medical universities came into the medical market annually. This number increased to 50,000 between 1991 and 1995. In 2003, about 110,000 students graduated from medical universities.

<sup>5</sup> In township health centers, occupancy rates decreased from 43.4% in 1990 to 36.2% in 2003. Occupancy rates for county and above hospitals decreased from 85.7% in 1990 to 70.6% in 2003. For inpatient care, the length of stay (LOS) decreased 1 day for township health centers and 3.5 days for county and above hospitals, from 1990 to 2003.

<sup>6</sup> See the critical reviews on public finance and insurance for more information on these trends.

Significant policy and institutional changes underpin these delivery system developments. Health care in rural areas was originally given priority, especially after the famous “June-26<sup>th</sup> Speech” by Chairman Mao in 1965. For example, the proportion of beds in rural hospitals increased from 40% to 60% in the following ten years. However, since economic reform, the focus of health care work returned to urban areas (Wang 2003). Devolution of health administration to various levels of government through the 1980s has been associated with increased inequality between rural and urban areas, with resources increasing in urban centers and declining in rural communities.

Government has also reduced its financial support for health institutions as a share of total costs, now only funding personnel wages and new capital investments. In addition, the government has given health institutions a larger degree of financial autonomy. Since government-set fees for most services are below cost (Liu, Liu et al. 2000), hospitals have a strong financial incentive to over-supply the few profitable services, such as medicines and high technology medical services. As discussed in more detail below, price regulation is a critical component of system incentives, and strongly affects provider performance. Initiatives have also been observed in service delivery. These range from personnel system restructuring (competing for appointments, pay-for-performance incentives in contracts) to outsourcing support services and hospital marketing.

### **III. OVERVIEW OF EMPIRICAL LITERATURE ON PROVIDER PERFORMANCE**

#### **Quality and safety**

The quality of health care can be measured along multiple dimensions. We focus on two: technical quality and service quality. The former measures the quality of professional services in terms of safety, efficacy, efficiency, and adherence to best practice. The latter assesses the quality of services in terms of patient satisfaction and the attitudes of health providers toward patients.

Most studies of quality in China focus on a specific area or a relatively small sample of delivery institutions. Unfortunately, no studies assessed the overall quality of health care for the whole country. Because of variations in sampling and study methods, individual studies are not directly comparable.

The largest sample in the literature consisted of 199 hospitals in Shaanxi Province, using data from 2001. The results showed that the recovery rate for inpatients was 62.27%, and the mortality rate was 0.98% (Yu and Wang 2003). Another study using data from 12 county-level and above hospitals assessed the quality of care for four diseases, finding that: the consistency of diagnoses when admitted and discharged was 98.70%; the recovery rate varied from 30% to 100%; and the hospital infection rate was 1% (Wang and Qu 2001). Evidence also indicates that quality is better in higher-level hospitals than in lower-level hospitals.<sup>7</sup>

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<sup>7</sup> For example, studies have found that diagnostic accuracy was better in tertiary hospitals than in secondary hospitals (Wang and Qu 2001). In the study in Zibo and Nantong (Zhuang and Tang 2001), the quality indices were 1.079 in municipal hospitals and 1.060 in county hospitals in Zibo; 1.074 in municipal hospitals and 1.056 in county hospitals in Nantong.

Health care quality appears to have improved in urban areas over the past decade. A study in Zibo of Shandong Province (22 hospitals) and in Nantong of Jiangsu Province (19 hospitals) measured the quality of health care using a general index, showing that the quality index increased from 1.048 in 1990 to 1.070 in 1997 and to 1.072 in 1999 in Zibo. Similar changes in quality were also found in Nantong (Zhuang and Tang 2001). From a study in the No.3 Zhongshan University hospital, quality of health care decreased from 1990 to 1994, but increased between 1995 and 1998 (Weng and Yin 2003). Other studies showed similar results (Huang 2003; Zheng and Chen 2003).

Studies, while limited in number and sophistication, suggest that users' perceived quality of health care and patient satisfaction have increased in China recently. In general, patients report satisfaction with the technical quality provided by higher-level hospitals, but complain about long waiting times. Conversely, patients are satisfied with the shorter waiting time in small health facilities, but complain about the technical quality of care in those hospitals.

Chen *et al.* investigated 662 outpatients in three Shanghai hospitals in 1994 (Chen and Chen 1996). Results indicated that 89.8% of patients were satisfied with their care overall. For common outpatient services, the waiting times were 2 minutes for registration and 10 minutes for seeing a doctor, and the average patient met with the doctor for 10 minutes.<sup>8</sup> Of Cai's interview sample of 642 urban residents (Cai, Chen et al. 2002), about 69.2% expressed satisfaction with health care services, and 65.1% were satisfied with the attitudes of the health providers. However, 53.5% complained that their doctors were not clear about their disease status, and 3.9% said that they or their relatives had open conflict with the health providers (*yiliao jiu fen*). The main factors influencing patients' satisfaction were patient educational attainment and provider attitudes.

Many studies focus on the quality of health workers as measured by training and experience. Unsurprisingly, studies confirm that higher-level hospitals have better trained and more experienced medical staff. For example, a study of three general hospitals in Jinan with 428 doctors found that 49.74% had received undergraduate, and 46.06% graduate education, respectively, and 46.9% of the doctors were senior professionals (Yu, Sun et al. 2004). In contrast, a study of 58 community health centers in Jiangsu Province in 2002 found that only 11.90% of health workers had received a university education, and senior health professionals were rare (Wang, Chu et al. 2002; Lan, Zuang et al. 2003).

The overall quality of health workers in rural areas was low. In Jiangxi Province, 666 township health centers were investigated in 2000. Most of the health workers thought that their medical knowledge and skills were not adequate to provide high quality services, and felt that the best way to strengthen their capability was to attend training programs (Wang, Jiang et al. 2002; Kang, Wang et al. 2003). A large-scale study of 46 counties and 781 village doctors in 9 western provinces was conducted in 2001 (Wang, Xu et al. 2003). It found that 70.4% of village doctors had no more than a high school education. Those doctors received an average of only 20 months of medical training. In addition, 24.8% of the village doctors ran their practice without any certification. Similar results emerged from a study of village doctors in Yicheng and Fenyang of Shanxi Province in 2002 (Zheng, Wang et al. 2003).

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<sup>8</sup> For specialists, the waiting times were 8 minutes for registration and 20 minutes to see the doctor, and the average time spent consulting with the doctor was 10 minutes. Factors influencing patients' satisfaction rate were age of the patient, medical spending, attitudes of the doctors, and the professional level and environment of the hospitals.

One study considered the overall educational structure of health workers (Zhang and Qiao 2002). In township health centers, 41.43% of health workers had graduated from high school, while 30% had only a primary school education. There were few senior professionals at low-level health facilities. The majority of the health workers in provincial and municipal hospitals had received a university or professional education.

Another aspect of quality that has received attention in the empirical literature is drug utilization. The studies usually use experts to assess how much of pharmaceutical use is “irrational”, in other words prescriptions that are incorrect or excessive given the patient’s recorded medical condition. Irrational use of drugs was common. For example, an analysis of 360,219 prescriptions from 40 hospitals in 18 prefectures found that 19.6%-26% of drug prescriptions were not rational (Zhong 2001). A 1998 study in Hunan with a sample of 8497 drug prescriptions found that 13.57% were irrational (Wu and Li 2000).

There was even more irrational use of drugs in rural areas. In 1998 and 1999, a study conducted in 4 township health centers and 8 village clinics in Wuxi County of Chongqing and Min County of Gansu determined that only 1.79% of the drug prescriptions were rational. For village clinics alone, only 0.06% of drug prescriptions were deemed reasonable (Zhang, Feng et al. 2003).

A study in Henan found that antibiotics comprised 70% of drug prescriptions at village clinics and township health centers (Zhang, Zhang et al. 2001). Zhang R. (2004) presents substantial and often alarming evidence of the problem of antibiotic and other drug misuse in China. This includes the prevalence of self-medication and the widespread indiscriminate use of antibiotics for children, and the associated social costs of decreased effectiveness of antibiotics and direct patient harm.

To summarize, technical quality and safety appear to be improving in urban areas, but there is little evidence of improvement in rural areas. Patients are dissatisfied with cost as well as with the service quality and responsiveness of providers. The quality of health workers, as measured by their educational attainment and professional experience, has been improving, but these gains are concentrated in urban areas and large hospitals. Rural areas have difficulty retaining qualified health professionals. Drug expenditure is high, with widespread use of village/township drug posts and self-medication, and strong evidence of irrational drug use in both urban and rural areas.

## **Efficiency**

As mentioned above, supply has expanded while utilization has decreased, leading to a decrease in measured dimensions of productivity. Apparently any increase in demand from improvements in quality have been offset by other factors, such as rapid cost escalation and decreased insurance cover.<sup>9</sup> Since the late 1980s, as shown in Figure 2, hospital occupancy rates have generally declined (from already low levels in township hospitals). The number of outpatients served by each health professional has also declined.

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<sup>9</sup> There is less support for an alternative explanation that health improvements had led to declining utilization. For example, comparing the 1993 and 2003 national health surveys, there was a slight increase in the number of residents who had been ill in the previous two weeks (Rao 2004).

In 2003, the bed occupancy rates were 58.7% for general hospitals and 36.2% for township health centers, these being declines of 20 and 10 percent compared to 1990 (Center for Statistic Information 2003). The national health survey showed that outpatient services provided by primary health facilities decreased by 41.6% in urban cities and 25.7% in rural areas between 1986 and 1997 (Gong 1999).

Hao developed a model exploring the relationship between the inefficiency of use of health resources and the shortage of health resources. It indicated that increased government budgets for the health sector would improve the efficiency of health care provision (Hao 1995). Zhou's economic model indicated that extensive use of high technology negatively influenced the efficiency of health resource use (Zhou 1997). Zhuang's study used unit cost, productivity, and Data Envelope Analysis (DEA) to measure the efficiency changes in the use of health resources in two cities (Zhuang and Tang 2001). A study in 28 WB Health VIII project counties showed that occupancy rates for hospital beds ranged from 41.9% to 63.3% for county hospitals and from 11.0% to 44.8% for township hospital (Duan 2000).

Revenue generated from high technology diagnostic services, such as CT and MRI scans, is an important source of finance for many providers. The Ministries of Health and Finance and the Center for Health Care Costing estimated the cost of use of high technologies and analyzed their utilization in 33 hospitals from 1994 to 1997. The results showed that investment in high technologies had been wasteful (Ci 1997). Bian estimated the costs and revenues of PET use, concluding that utilization was low and oversupply had been exacerbated by the high regulated price for this service (Bian 2002).

## Equity

Using data ranging from national aggregate statistics to individual clinical measures (such as children's height for age), many researchers have found evidence of growing inequities in health and health care in China (Liu, Hsiao et al. 1999; Gao, Tang et al. 2001; Gao, Qian et al. 2002; Zhan, Sun et al. 2002). For example, Shen *et al.* (1996) found that between 1975 and 1992, "despite an overall improvement in child growth during the economic reforms in China, the improvement has not been equitable, as judged by increased differences in height between rural and urban children and increased disparities within rural areas." According to the third national health survey in 2003, patient-initiated hospital discharge for reasons of financial difficulty was a higher percentage of self-initiated discharges in rural areas (67.3%) than in urban areas (53%) (Rao 2004).

There are vast differences in social indicators within, as well as between, rural and urban areas that contribute to differences in health status and health service utilization. Many micro studies find lower health status and utilization among the poor.<sup>10</sup> Other factors, such as distribution of kinds of employment and insurance coverage, affect equity in health and health care.<sup>11</sup> Zhu, Meng, Jing and Li (Li, Ren et al. 2001; Zhu, Tian et al. 2001; Jing, Liu et al. 2003;

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<sup>10</sup> Zhu *et al.* (2001) surveyed 18,877 households in Henan in 1998, finding that the health status of low-income households was worse than that of high-income households. Meng *et al.* (2003) investigated 19,240 households in 8 counties in the Dongting area of Hunan Province in 1998, finding that households suffering from flood disaster were poorer and had more health problems than households that did not.

<sup>11</sup> Gong and Chen (2001), examining the impact of health insurance status on utilization of health care in Zibo and Nantong, found that the residents without health insurance coverage used less health care when they had the same health problems as those

Meng, Yang et al. 2003) analyzed equity of health care finance and reached similar conclusions: compared to high income households, poorer households spent a higher proportion of household income on health care services. Several studies show lower utilization by the migrant population.<sup>12</sup> A few studies assess the equity of resource distribution in China, with mixed results.<sup>13</sup>

Thus, much empirical evidence paints a picture of large and in many cases growing disparities. Yet some evidence using micro panel data from the China Health and Nutrition Survey suggests little growth in disparities, and broad availability of health services (Henderson, Akin et al. 1994; Henderson, Akin et al. 1998).

#### IV. DETERMINANTS OF PROVIDER PERFORMANCE

System incentives shape provider performance. The incentives of a delivery system arise from the interaction of several factors, including payment incentives, macro and micro organization, regulation, and ownership. We briefly discuss each determinant, first presenting a conceptual overview and international evidence and then turning to the Chinese experience.

##### Provider payment

Robust international evidence suggests that health care providers respond to the incentives explicit or implicit in the system of payment. One very common payment method is *fee-for-service* (FFS), wherein the provider is paid a pre-determined fee for each service rendered. The fees may correspond to competitive market prices, or, more commonly, are administered prices negotiated or unilaterally set by a government agency, such as the State Price Commission in China.

Since under full cost reimbursement, or FFS payment, the provider bears none of the costs of care, these payment alternatives involve no *supply-side cost sharing*. FFS payment is

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with insurance. Zhang and Mao (2003) explored the relationship between employment status and health care utilization and found that unemployed people had higher “need” for health care and lower utilization of health care services. Wang *et al.* (2001) analyzed the health status and health care utilization of children. In different income groups, female children had the poorest health status and received the least health care. For those who suffered severe health problems, 28.6% did not use health care.

<sup>12</sup> Yang (2002) reports that only 5% of the migrant people in Shenzhen in 2002 have had health insurance, compared to 65% and 11% of employees in the government and enterprise sectors, respectively. Han *et al.* (2001) reported that only 40.3% of migrant women received pre-marital medical examinations, 48.2% received pre-natal care, and 13.1% received post-natal examinations. All these were much lower than the utilization rates of pregnant women who were permanent residents in the study site of Wuhan. Yu *et al.* (Yu and Gu 1997) investigated 2,722 households in three poor provinces (Guangxi, Guizhou and Shaanxi) in 1997. They concluded that there was a positive relationship between income and health care utilization. In Zhu and Tian (2001) both provision of and access to health care were poorer for low-income family members. Jing and Liu *et al.* (2003) conducted a study in Urumqi city showing that, although both income and health status gaps between residents were small, poorer families used significantly fewer health care services. Other studies present similar findings (Yin, Hu et al. 1999; Ou 2001).

<sup>13</sup> For example, Xue *et al.* (2003) examined the distribution of maternal health manpower in rural areas, and found that there was no significant difference across areas in the number of maternal and child health workers per thousand population. Yet Ding and Hu (Ding and Hu 1994), using data from all provinces, found that hospital beds were relatively more fairly distributed than doctors and nurses. Studies in Guangdong, Shenzhen City, Fujian, Shanxi, and Guizhou concluded that health resources were unevenly distributed across urban and rural areas (Leng, Fang et al. 2002; Wang, Sun et al. 2002; Song and Luo 2003; Peng, Yang et al. 2004). Lei (1999) measured inequality of distribution of high technologies using a Lorenz curve measure. Li *et al.* (Li, Xu et al. 2003), using data from Dongying city in 2002, estimated a Gini coefficient of 0.6 for the distribution of high technologies. This indicates a highly unequal distribution.

therefore frequently associated with high levels of use, and may encourage over-use, especially of the most profitable services. The term *supplier-induced demand* refers to the controversial phenomenon of a health care supplier (physician or other provider) manipulating patients into receiving more services than they would want, so that suppliers can increase their income (Cutler and Zeckhauser 2000). Several countries have combined FFS with other measures. In Japan, for example, the government has successfully adjusted the fee schedule to keep overall expenditures relatively low. A more common approach involves formally imposing an overall cap or global budget on provider reimbursement (e.g., Germany).

A more effective method of controlling the quantity of services may be to introduce some explicit amount of supply-side cost sharing (e.g., *case-based or prospective payment, or capitation*). A capitated provider will be financially rewarded for skimping on quality, restricting beneficial services, and discriminating among patients by engaging in risk selection. The more at risk the provider is, the greater the incentive to control costs by improving efficiency or selecting profitable risks. Therefore, there is a fundamental trade-off associated with supply-side cost sharing: low supply-side cost sharing gives no incentive for improving efficiency, but high supply-side cost sharing creates an incentive for risk selection (Newhouse 1996).

Risk adjustment techniques could make risk selection unprofitable, thus allowing choice while both protecting solidarity (equal access) and preserving incentives for efficiency and quality improvement. Unfortunately, current risk adjustment techniques are not sophisticated enough for this, and are not as widely used as one might expect.<sup>14</sup>

Economic theory and international evidence suggest that mixed or blended payment can be effective in promoting quality improvement and cost control without unwanted side-effects such as high levels of risk selection (e.g., Ellis and McGuire 1990; Ma 1994; Newhouse 1996; Ma and McGuire 1997; Eggleston 2000; Newhouse 2002). Mixing FFS with case payment or (risk-adjusted) capitation can help to avoid the extreme incentives of “pure” FFS or capitation payment.

International comparisons of health care spending underscore the importance of incentives in explaining the level and growth of expenditures, and the related financial sustainability of a health care system.<sup>15</sup> In OECD countries, as theory would predict, in ambulatory (outpatient) care, “capitation systems tend to lead to lower expenditure on average than fee-for-service systems by about 17 to 21 percent” (Gerdtham and Jonsson 2000).

Further evidence comes from analysis of the impact of the US Medicare system since 1984 of paying hospitals according to Diagnostic Related Groups (DRGs). This case-based Prospective Payment System (PPS) is one of the most widely cited and emulated payment systems. PPS actually represents a mixed payment system, since it includes many features, such as outlier payments for unusual cases and DRGs defined by procedure, that differ from a purely

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<sup>14</sup> The most accurate forms of risk adjustment are based on a patient’s diagnosis or whole set of diagnoses. State-of-the-art diagnosis-based risk adjustment techniques such as hierarchical coexisting conditions (based on diagnostic cost groups, DRGs) and ambulatory care groups (ACGs) represent significant improvements over adjustment based on age and gender. However, they can predict only a fraction of the 20-25 percent of variance in individual health spending that an ideal risk adjuster would predict (Newhouse, Buntin et al. 1997).

<sup>15</sup> This section draws heavily from Kornai and Eggleston (2001).

prospective payment system.<sup>16</sup> Research has shown that most of the intended beneficial effects of PPS on costs and intensity of care have been realized, while the feared side effects have been minimal (Cutler and Zeckhauser 2000).<sup>17</sup> Thus, PPS seems to have contributed to slowing the growth in inpatient costs without severely impacting on quality of care. This further confirms the importance of provider payment incentives for shaping performance of the delivery system.

Payment reform usually involves a process of institutional change and can raise controversial issues of political economy. It may be more acceptable to move incrementally. Case payment in Taiwan and Korea, for example, began with just a few conditions and has subsequently expanded to more conditions and more institutions. In Korea, for nine selected services which together account for 25% of inpatient cases, there were generous margins, averaging 23.8%, above the FFS reimbursements. These helped to gain provider acceptance of the perceived infringement on professional autonomy (Kwon 2002). Other countries have had similar experiences. For example, Starr (1982) discusses the history of similar objections to prepayment among American physicians. Later, when the US reformed provider payment to DRGs, the initial rates were quite generous, so that the profit margins for hospitals were not immediately reduced.

Chinese experience also demonstrates that provider payment is a key determinant of health service quality, efficiency and equity.<sup>18</sup> The funding policy for hospitals is closely linked with provider behavior. There is a strong association between a decline in the proportion of revenue from the government budget, an increase in reliance on user charges, and over-treatment with services that have a positive profit margin (such as high technology diagnostics and drug prescriptions). For example, a study in 9 provinces found that prescriptions in village clinics were intended to generate revenue, and were not well aligned with patient clinical need (Zheng, Wang et al. 2003).

Several studies attempt to isolate and quantify the impact of payment incentives on Chinese provider behavior. The literature finds responses to be generally consistent with theory and evidence in other developed and developing countries. User charges for the provision of professional services and drugs could have reduced the government's fiscal burden, but also resulted in distortion of provider behavior and actually increased the financial burden to society as a whole (Guo, Guo et al. 2003). Wang *et al.* explored the relationship between hospital financial reform and the social efficiency of health resource use (Wang, Zhang et al. 2002). They concluded that the current financing policy led to provision of unnecessary health care and drug prescriptions, while hospitals' incomes increased rapidly.

Unfortunately the evidence is not as strong as it could be, because many studies lack methodological rigor. For example, since provider payment interacts with insurance and patient demand, it can be difficult to pinpoint how much inappropriate use is caused by moral hazard or barriers to access, and how much might be supplier-induced demand because of FFS or stinting on the uninsured. Future research should try to separate out these effects.

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<sup>16</sup> For example, a hospital receives a larger payment for a patient with coronary artery disease who undergoes a bypass operation than for a similar patient who does not.

<sup>17</sup> Admissions declined somewhat, while inputs to care and length of stay fell significantly. The quality of care for the average patient showed little change. Several researchers have uncovered evidence of dumping of high-cost patients from PPS to non-PPS (usually specialized) hospitals.

<sup>18</sup> Bloom and Gu (1997) emphasize the importance of provider behavior in shaping the performance of China's health sector.

It is also common to compare average expenditures or expenditure growth rates before and after a payment system change, without a “control” group or other method for isolating the payment system effect from other factors. Evidence about cost shifting, quality of care, and risk selection is usually only anecdotal. Multivariate regression analysis of provider- and/or patient-level data is rare (Eggleston and Hsieh forthcoming).

For example, Yang *et al.* (Yang, Xuan et al. 1999) analyze the results of capitating hospitals for the outpatient expenditures of government insurance program beneficiaries in the Putuo district of Shanghai. Per capita outpatient expenditure was 12.3% higher in the year of implementation than in the previous year, compared to an average annual 23.4% rate of increase in the previous three years under FFS reimbursement. While this reduction is consistent with the incentives of supply-side cost sharing, the wide variation in growth rates under FFS casts some doubt on this result. In fact, two years before capitation, there was a growth rate of 13%. The authors suggest that capitated rates should be adjusted for the age structure of the patient population. While there is no evidence available, the strong incentives in the 1998 flat-rate capitation program could be expected to result in reduced care for chronically ill, elderly patients. A longer follow-up period, comparing a range of outcomes with a plausible control group (such as a neighbouring district in Shanghai that did not revise payment) could furnish much greater insight into the impact of such payment reforms.

In discussing the “Liang Jiang” model of reforms, Yip and Hsiao (Yip and Hsiao 1997) cite anecdotal evidence consistent with theoretical predictions. Payment reforms with higher supply-side cost sharing appear to exacerbate risk selection (hospitals referring expensive patients to alternative providers), cost shifting, quality stunting and inequitable access.

In 1994, Shanghai authorities implemented global budgets for hospitals, together with other insurance reforms. Health care expenditure growth fell from 34% prior to 1993 to around 12-13%, without evidence of reduced access to, or quality of care (Guo and Ge 1998). This suggests that carefully designed payment reforms, featuring supply-side cost sharing, can improve performance.

Hainan Province offers an interesting case study with its implementation of prospective payment for six key hospitals in January 1997. This was done to control costs and reduce the administrative burden and political friction of retrospective claims auditing. Figure 3 (from Yip and Eggleston 2004) illustrates the impact of payment reform on costs. The average expenditure per admission fell steeply immediately after payment was changed from FFS to prospective payment for the reform hospitals. In contrast, expenditures per admission continued to increase in the comparison group (hospitals that were paid under FFS throughout), and remained significantly above costs in the reform hospitals until later changes took effect.

Empirical analysis of individual-level data is even more instructive. Yip and Eggleston (2001) use claims data for hospital expenditures and a difference-in-difference analysis to isolate the impact of the payment system reform compared to hospitals that were paid on a FFS basis throughout the study period (June 1995-June 1997). Hospital prepayment is associated with a slower rate of growth of overall expenditures, program spending, and patient co-payments per inpatient admission, compared to FFS. Reduced expenditures per admission in the prepaid hospitals (by 26-35%, and over 50% compared to trends in FFS hospitals) indicate the power of supply-side cost sharing for controlling costs. Nevertheless, the authors note that caution is

warranted, since the expenditure decrease could stem from some combination of reduced quality of care, risk selection, and cost shifting to the uninsured.

In a companion paper, Yip and Eggleston (2004) report that Hainan's prepayment reform was also associated, in particular, with a slower increase in spending on high profit-margin services (expensive drugs and high technology services) compared to FFS. The association of supply-side cost sharing with reduced growth in spending on the most expensive drugs seems particularly encouraging. The authors conclude that provider payment reform can be an effective policy instrument for correcting market failures and adverse side effects of government health sector interventions (such as distorted prices to assure access to basic services).

Dong, Bogg, *et al.* (1999) studied county(1999), township and village health care facilities in four counties in rural China. They found that financing and payment significantly affected outpatient antibiotic prescribing. This is an important result, given the evidence of overwhelming misuse of antibiotics in China, which contributes to the global problem of drug resistance.<sup>19</sup>

## **Regulation and oversight**

Given uncertainty and information asymmetry in health care, regulation of this sector has been pervasive in many countries around the world. The kinds of regulations vary, but generally cover entry (through professional licensing and institutional accreditation) and sometimes prices and volumes, such as fee schedules, rate-of-return regulation, or community benefit requirements for non-profits (Gaynor and Vogt 2000).

## **Price Regulation**

Regulated fee-for-service prices constitute one of the most important components of system incentives, shaping provider performance in China. As noted above under provider payment, countries around the world use administered prices for many health services. Setting appropriate prices is a challenging task.

Liu, Liu and Chen (2000) provide an overview of the Chinese experience with hospital price regulation. They compare fees to average costs derived from a study of recurrent and capital costs for 130 service items in 17 hospitals in Shandong province. The ratio of fee to average cost is well below 1 for simple and non-invasive services. For example, their results include registration (0.16), checking blood sugar levels (0.2) and the base charge for a hospital day (0.25). This also holds for more clinically complicated but long-standing services such as appendectomies (0.48) and normal delivery (0.3). In contrast, regulated fees for some new high-technology diagnostics are set well above average cost. In the Shandong sample, the ratio of fee to average cost was 180 to 110 RMB for CT scans and 50 to 35 RMB for remote control x-ray scans (*ibid*, p.158). A 1994 study of the average cost of full-body CT scans in Shanghai and

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<sup>19</sup> See Zhang (2004). Many other studies found similar results, albeit with often limited comparison-group data. For example, a study in Nanjing indicated that some doctors, driven by profits, over-prescribed, particularly for expensive drugs (Ye, Chen *et al.* 2003).

Tianjian found that the ratio of allowed fee to average cost varied from a low of 181/156 (for self-pay patients) to 362/113 for insured patients (Chen 1994).

These administered prices, combined with the current funding policy for hospitals, give hospitals and doctors strong financial incentives to provide inappropriate services. Distorted medical fees can result in distorted service provision and inefficient medical resource use, without appreciably reducing the economic burden on patients. Improvements to health care pricing policy, such as by reducing prices for high technology services and drugs and increasing prices of professional services, could result in better system incentives.

### **Chinese Regulatory Institutions**

In China, as in many countries, regulations in the health sector are administered by many departments. Each department has its own interests, goals and priorities. For example, the MOLSS regards the balance of social insurance funds as the top priority; the MOF focuses on financial expenditure; the MOH has to guarantee the availability and accessibility of health care services. There may be conflicts between these priorities, which makes the reform of the health sector difficult.

The MOH has multiple roles. It is a regulator, the owner of many health providers, and, in some cases, the purchaser (e.g. in some rural community financing arrangements). This presents obvious challenges. In most countries, purchasers and providers are distinct, and regulatory authority is usually separate from the owner-manager function. For example, UK providers and NHS purchasers have become increasingly autonomous, and the purchaser-provider split has survived several waves of reform.

### **Workforce planning**

There is still controversy about extent to which regulation and planning of the physician and nurse workforces is possible and desirable (See Grumbach (2004) and Reinhardt (2004) for a recent exchange in the US context). Docteu and Oxley (2003, p.26) provide an overview of recent workforce policy in OECD countries.

As noted earlier, rapid expansion of China's health care workforce, without a proportional increase in health demand, was associated with a decline in provider productivity. Rapid increases in health manpower and salaries also contributed to cost escalation. This could lead to a vicious cycle: expanded workforce, higher medical costs, lower utilization, and lower productivity. Suitable incentives could be used to promote a desirable distribution of providers, especially given the constraints some areas of China face in attracting and retaining qualified medical professionals. A credible system of ongoing supervision of provider competence is necessary regardless of whether delivery is through government provision or market forces.<sup>20</sup>

The health sector workforce needs more than "just" clinical skills. Management and quality control skills are also important, as has been recognized in China with the mushrooming of training centers for hospital management.

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<sup>20</sup> See Gong *et al.* (1997).

## Regional planning

Regional planning is intuitively and institutionally appealing as a way to guide health sector development, particularly in countries with a tradition of economic planning outside the health sector. However, as with workforce planning, international experience is mixed. For example, certificate-of-need regulation of hospital investments in the US appears to have played a much smaller role than the spread of managed care in controlling costs.<sup>21</sup>

In China, regional health planning (RHP) has also had mixed results. Since 1997, following the *Decision of the Central Committee of the CPC and the State Council on Health Reform and Development*, all levels of government started to built up principles and policies of RHP. The State Council approved the *Guidance to Implementing RHP* made by MOF, MOH, and NDRC in 1999. However, implementation has encountered problems. For example, local governments lack the authority to direct hospitals held by other departments and higher-level governments, and also, financial leverage is diminishing since government subsidies to providers are decreasing as a share of revenue.

## Regulating the pharmaceutical sector

In most OECD countries, pharmaceuticals are one of the most highly regulated segments of the health sector. For example, in addition to the widespread use of drug price regulation, countries such as France and the UK audit and benchmark physician prescribing behaviour (Docteur and Oxley 2003, p.45).

Many developing countries have struggled with the traditional system of providers profiting from selling drugs, and the associated over prescribing (Chou, Yip et al. 2003; Eggleston and Yip 2004). The Korean and Taiwanese experience illustrates the political economy of reform. Korea legislated separation of prescription and dispensing functions in July 2000. Unsurprisingly, the measure proved extremely controversial: “despite a lengthy planning process and negotiations, in an attempt to derail the reform process, the physician group called for an unprecedented four general strikes, forcing closure of most clinics and hospital outpatient departments” (Yang and Bae 2001). The government raised physician fees by 45% after the physician strikes, and agreed to defer implementation of some other reforms, including those of provider payment (Kwon 2002).

Taiwan has reduced the high profit margins for drug dispensing by reducing reimbursements and using reference pricing (Lu and Hsiao 2003, p.84). Chou *et al.* (2003) used a difference-in-difference analysis to examine the separation of prescribing and dispensing. They found, “the probability of prescription and drug expenditure per visit were, respectively, 17–34% and 12–36% less among visits to clinics without on-site pharmacists, compared with the control sites. However, no difference in total health expenditure was found between these two types of visits. Hence, the separation policy could be effective in reducing *drug* expenditure and affecting prescription behavior, but is less certain as a policy for reducing *total* health expenditure.” (p.316)

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<sup>21</sup>Salkever (2000) provides a review of regulation of prices and investment in hospitals in the US.

In this case, the separation policy was not strict: hospitals were unaffected (because they have on-site pharmacies) and physicians could hire on-site pharmacists and also dispense drugs to patients meeting specific eligibility criteria. Moreover, fees were raised to encourage pharmacies to take up the new roles, and to mollify physicians upset by the loss in drug revenue. The “good news” is that drug expenditures did decline significantly with the most affected providers; but the “bad news” is that total spending did not decline, because the decrease in drug spending did not offset the increase in fees for drug dispensing and consultation. The lack of impact on total expenditure arose from policy design, not providers’ behavioral response. Empirical pre-post analysis with a control group found, “no evidence of physicians engaging in behaviors such as increasing the provision of lab-tests and diagnostic procedures to compensate for the reduced drug revenue” (Chou, Yip et al. 2003, p. 327). The evidence on impact covers only a short period (three months before and after the change). Unfortunately data were not available to assess whether the separation policy was associated with more appropriate prescriptions, such as a reduction in over-use of antibiotics.

Many studies focus on the need for improved drug policy and the effect of drug policy changes in China (e.g., Dong, Bogg et al. 1999; Hu 2001). For example, one study found that mass public bidding for pharmaceuticals<sup>22</sup> was associated with a 31% decline in average prices in Weifang, compared to a 17.6% decrease under negotiated prices (Guan 2003). However, the potential impact of mass bidding is limited by the small fraction of total drug use procured in this way.

Yang Bucui *et al.* (Yang, Zhang et al. 2003) collected financial data from 7 city hospitals in Shenzhen between 1997 and 2002 to investigate the outcome of the policy separating drug revenue and expense since 2000. They found a slowing of the rapid increase in income from pharmaceuticals, but it remains unclear whether this policy is the key factor, since changes in hospital leadership and promulgation of new pharmaceutical prices may also have contributed to the decline in drug revenue.

More evidence on the potential effectiveness of pharmaceutical regulation (and payment incentives) comes from the Shanghai experience with a drug list policy and a hospital revenue capping policy, both introduced in the mid-1990s. Hu, Chen, *et al.* (2001) combined quarterly drug expenditure data from a few years before and after the policy changes, with more detailed drug expenditure data from seven selected hospitals and twelve focus group discussions. Analysis revealed that the policies curtailed drug expenditure growth and improved, “the rational use of drugs without loss of equity” (ibid).

## **Other Regulatory Issues**

There is a long-standing and sophisticated literature exploring the appropriate role of regulation and its incentive effects on an economy (e.g., Posner 1974; Laffont and Tirole 1993).

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<sup>22</sup> To address issues of cost escalation and drug misuse, the 2000 price reform contains policies to implement mass public bidding for medicine (Ministry of Health 2000) and the separation of revenue and expense of medicine in hospitals. General speaking, under the mass public bidding of medicine, the Bureau of Health of a city takes responsibility for organizing the bidding in order to cut down the price of pharmaceutical production. All the non-profit hospitals in the city have to attend the bidding and buy the medicine on the list at the bidding price.

Regulation is not always the appropriate response to market failure.<sup>23</sup> “Regulatory barriers” can become entrenched and counterproductive. In fact, according to one recent study in the US, the cost of state and federal health care regulations (preliminary estimate of \$340 billion) outweighs their social benefits (estimated at \$212 billion) (see Conover 2004). China’s health sector has already been called a “regulatory maze” (Qi 2000). Nevertheless, regulation is crucial for establishing effective “rules of the game”, whether through “command and control,” or, increasingly, “steer and channel.”

Regulation of advertising can play an important role in protecting population health and reducing information asymmetries.<sup>24</sup> There is also an important place for regulation of behaviour in the market, such as price collusion, “fee splitting”, kickbacks (often an issue for pharmaceuticals), protecting patients’ privacy, and self-referral to institutions in which the provider has an ownership share. “Dual practice” of providers in both the public and private sectors is allowed in many countries around the world, but does need regulation to avoid the extreme situation of the public subsidizing illicit private care and other corrupt behaviour. In health systems that allow a prominent role for markets in shaping the delivery system, antitrust policy is a crucial tool for establishing a “fair playing field”.<sup>25</sup>

A system of provider liability and malpractice penalties can play an important role in protecting patients and keeping providers accountable. Injury prevention/deterrence is the prime motive for health service providers being legally liable.<sup>26</sup> Unfortunately, there is virtually no evidence from China documenting a link between provider performance and legal liability.

## **Organization and management**

There is a vast literature on how organizational structure and management practices shape organizational performance.<sup>27</sup> The organization and management of health service delivery is one special case, and each country’s choices, whether by active policy or by historical default, shape system incentives and performance.

One example of an important organizational choice is whether the system is structured to require patients to visit a primary care provider and obtain a referral prior to accessing specialist services. Gerdtham and Jonsson (2000) find that international studies of health expenditures support the theoretical prediction that use of primary care gatekeepers can moderate total health

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<sup>23</sup> Glaeser and Shleifer (2003) argue that the appropriate balance of regulation and private litigation, as institutions to enforce law and order, depends on the country’s initial conditions, particularly the vulnerability of institutions to subversion through corruption.

<sup>24</sup> Some forms of advertising, such as for tobacco, may legitimately be banned altogether (see the WHO Framework Convention on Tobacco Control (2004)). Other kinds of advertising, such as for pharmaceuticals (see below) may need regulation to prevent unsubstantiated claims (which merit study in China).

<sup>25</sup> For an excellent overview of antitrust and competition in health care markets (with a focus on the US), see Gaynor and Vogt (2000).

<sup>26</sup> For example, “incidence of negligent injury has been estimated at roughly one per hundred hospital admissions in the US and about one in seven physicians is sued a year” (Danzon 2000, p.1341). The cost of physicians acting to prevent litigation, called “defensive medicine”, is largely unknown (see Kessler and McClellan (1996) for a US study). Recent dramatic increases in malpractice insurance has underscored the problems of the existing US system and spurred debate about reforms. Many institutional arrangements are possible. The UK has a form of enterprise liability. In Sweden, patient compensation insurance established in 1975 de-links patient compensation from provider liability and deterrence. The New Zealand system is also of interest. Low overhead costs in such systems are not entirely because of the no-fault system (Danzon 2000).

<sup>27</sup> Milgrom and Roberts (1992) provide a classic economics treatment of these issues and an excellent overview.

spending. “The estimated coefficient suggests that countries with gatekeepers have expenditure which is about 18 percent lower than those without gatekeepers” (p.46).

Given evidence of large disparities in utilization rates across levels of providers in China, policymakers may wish to consider the feasibility of re-instituting a referral system. Under the planned economy, the three-tiered health system functioned effectively because it matched the old health insurance system. Unfortunately this method of rationalizing patient flow and resource use has been weakened by developments both outside and within the health sector. These include the sale of rural clinics to individuals and the weakening of the referral system in both rural and urban areas. Mechanisms for controlling access to the three tiers of care broke down. As more health care costs were paid directly by patients, they gained more rights to make decisions and self-refer to tertiary care. Without any significant price differences, the rational choice for patients is to visit high-level hospitals directly. As a result, high-level and famous hospitals are overloaded, while lower-level hospitals, such as township health centers, lack patients and stand idle. Introducing a referral or gatekeeping system and/or enlarging the price differential between different levels of hospitals could help to remedy these problems.

Overlapping functions and fragmented delivery merit consideration. For example, family planning institutions, township health centers, and maternal and child health facilities in China have overlapping functions. MOH, military, SOE and other enterprise hospitals all provide similar services in an uncoordinated manner. These issues suggest benefits from horizontal and vertical integration.

Delivery systems can be organized through vertical, hierarchical bureaucracies, long-term contracts, or short-term market interactions (World Health Organization 2000, ch. 3, p.15), each of which have advantages and disadvantages. For example, hierarchies excel at coordinated effort, but can be rigid, inefficient, captured by certain interests, and unresponsive. Many countries have experimented with increased decentralization and autonomy for organizations such as hospitals.

One area of focus for future research could be the appropriate level of decentralization for various types of service. Several studies have found that decentralization in China has had a negative impact on delivery, especially equity of services between richer and poorer regions (Tang and Bloom 2000; Meng, Li et al. 2004).

Quality and efficiency are also affected by the internal structure and management of delivery organizations. Many hospitals lacked effective quality control system. The functions of quality control are often distributed among different divisions within the hospitals, such as the Communist party committee, medical office, nursing department, and outpatient department. This leads to coordination difficulties (Li, Han et al. 2002).

Financial management systems and personnel policies affect incentives and provider performance. The study in Zibo and Nantong (Meng, Rehnberg et al. 2004) found that the main factors influencing unit cost, LOS, and DEA scores were the bonus system, competition for hospital positions, selection of staff, and the accountability system. The study found that a combination of measures, rather than reliance on any single administrative measure, was most effective. This is consistent with the theme of this review, namely that system incentives, rather than any one specific feature, shape performance.

## Competition

The many types of “market failure” in the health sector include uncertainty, asymmetry of information, health care provider market power, moral hazard, and difficulty of measuring quality and outcomes. The presence of these suggests that competition between health care providers may not maximize social welfare.

The impact of provider competition may differ according to whom the providers are competing to attract: individual patients; or organized purchasers. Patient choice of provider may result in supply that is more responsive to individual patient needs and preferences. However, health care is not like many other goods or services. The patient often lacks the time, information, and/or acumen to choose optimally between competing suppliers with various prices and qualities of service. In particular, the patient frequently cannot determine the quality of hospitals or physicians, or the treatment options for his or her medical condition. Providers derive power over patients from this information asymmetry and from the fact that medical care is a non-tradable service (see discussion in McGuire 2000; Eggleston and Yip 2004). Dranove and Satterthwaite (2000) summarize much of the research on the impact of competition for individual patients under FFS payment before the 1980s in the US. At that time, quality investments to attract patients took the form of a socially wasteful “medical arms race.” Evidence from several developing countries confirms that competition for individual patients (or insurance enrollees) is far from a “magic pill” for the health sector (Hsiao 1995).

Organized purchasers (such as government programs, sickness funds, social insurers, employers) have economies of scale and scope in gathering and analyzing information to make prudent purchasing decisions. They can also prevent providers from cream skimming the most profitable patients in the beneficiary group. Competition for purchaser contracts thus has advantages over competition for individual patients, albeit with its own complications (e.g., the fate of non-selected provider groups, pressures to include “all willing providers”, and promoting effective competition in rural areas where “natural monopolies” may be efficient).

There is some evidence that regulated competition, particularly with active organized purchasers, can improve provider performance. For example, Kessler and McClellan (2000) studied the welfare effects of hospital competition using US Medicare data on beneficiaries' treatment and outcomes for heart attacks between 1985 and 1994, when managed care, prospective payment and “payer-driven competition” became prominent. They found that, in the 1990s, hospital competition unambiguously improved welfare, since competition led to both lower treatment costs and improved patient outcomes. Regulations affecting providers included requirements to treat patients needing urgent care regardless of ability to pay, anti-trust policies preventing collusion, and many other policies designed to assure a level “playing field” for patients and providers (regardless of ownership or profit status).

Competition can be within the public sector (such as the UK experiment with “quasi-markets”), between public and private providers, and within the private sector. Competition in labor and other input markets can also be important for improving system incentives. Such markets are generally less prone to market failure, since human resource and other input markets often feature organized purchasers and suppliers with similar information and market power. For example, in many countries there is a competitive labor market for hospital managers, who attract similar compensation packages from both for-profit and non-profit hospitals. Competition

in the markets for physicians, nurses and other providers, and medical equipment and materials, can help to allocate resources in a way that rewards, and thus stimulates, improved performance.

Empirical studies of hospital competition have three well-known limitations: lack of evidence on total spending and health outcomes; biases introduced by commonly used measures of market competitiveness; and failure to control for a comprehensive set of hospital and area-specific variables, such as bed capacity and the influence (in the US) of managed care (Kessler and McClellan 2000). The literature is also heavily focused on the US experience (and, within the US, often using California data). As Sloan (2000) notes, “empirical evidence on the performance of hospitals in countries other than in the US is badly needed” (p.1169). In addition, only a few other countries, such as the UK, Sweden, the Czech Republic and New Zealand, have, “experimented with greater competition among hospitals as a means of inducing improvement in efficiency, quality and responsiveness....[these initiatives] have not achieved the expected results and have run into considerable patient and provider opposition. However, as these experiments were discontinued after a relatively short period, more time may have been needed for positive results to appear” (Docteur and Oxley 2003, p.36).

The administration of a competitive system can often be costly. More research is needed to quantify these costs. It may then be possible to clarify the relationship between the social benefit (or cost) of competition, and the contracting capacity of health sector institutions. The limited evidence available to date suggests that, for economies as a whole (i.e., not confined to the health sector), competition raises the level of administrative costs at a given point in time, but also lead to much higher rates of innovation and productivity growth over time (Kornai 1992).

The transformation from a planned economy to a market-based economy requires a modification of the government’s role in the economy. This adjustment of government and market functions takes some time. In China, public service units (PSUs) in the health sector have become “semi-public service and semi-marketized”. This is thought to have led to many distortions in behavior. For example, with the resources and market power gained through government funds and preferential policies, many PSUs have acquired a unique “cost advantage”. Also, with the administrative and supervisory power granted by the government, they are able to set up high barriers to entry and limit competition.

Unfortunately, there are very few studies that attempt to isolate the impact of competition on Chinese service provider performance. Some media and other reports suggest that prices for specific services are lower in competitive markets (e.g., Wuhan’s cardiac surgery market). However, no peer-reviewed studies quantify this impact, taking account of the many other features of system incentives that might be confounding factors. Moreover, there is little or no evidence of the impact of competition on other aspects of performance, such as quality or equity (risk selection).<sup>28</sup>

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<sup>28</sup> Eggleston and Yip (2004) theoretically model and simulate increased market competitiveness between the public and emerging private sectors in China, finding the expected effects. More market power tends to exacerbate service distortions (such as skimping on unprofitable services), although competition for patients does not uniformly increase quality, and can exacerbate induced demand for profitable services or a “medical arms race” among hospitals.

## Ownership

There is mixed evidence on provider ownership and performance. Privatization is no panacea for poor provider performance. System incentives affect providers of all ownership forms, with government hospitals often serving as a “safety net”. For example, Duggan (2000) examined Californian hospitals’ responses to a plausibly exogenous change in hospital financing through the Disproportionate Share Program (DSP) payments for indigent patient care. He found that local governments decreased their subsidies to public hospitals, matching almost exactly dollar-for-dollar the increased revenues the hospitals received from the state. Therefore, government hospitals saw no increase in total revenues, despite the fact that they continued to treat the least profitable patients. In contrast, both for-profit and not-for-profit private hospitals cream-skimmed the more profitable indigent patients previously served by public hospitals, and enjoyed substantial revenue windfalls from DSP payments.<sup>29</sup> Duggan concludes that the evidence contradicts the theory that non-profit providers are more altruistic than are for-profit providers. Sloan (2000) summarizes additional empirical evidence, concluding that the behavior of for-profit and not-for-profit providers is, “far more alike than different” (p.1168).

Other researchers have suggested that for-profit and not-for-profit provider behavior differs to a discernible extent.<sup>30</sup> Devereaux, Choi *et al.*(2002) undertook a meta-analysis of studies comparing the mortality rates of private, for-profit hospitals and those of private, not-for-profit hospitals. Based on evidence from fifteen observational studies, involving more than 26,000 hospitals and 38 million patients, private, for-profit hospitals were associated with an increased risk of death. Some evidence suggests that competitive pressures lead to convergence of provider behavior among ownership forms.<sup>31</sup> Nevertheless, these pressures may not erase all differences in behavior among providers of differing ownership status.<sup>32</sup>

The theoretical literature on ownership and competition in the health sector of developing countries is quite limited.<sup>33</sup> Theory suggests that, when contracts can specify clearly the quantity and quality of services desired, contracting out to private providers can often improve efficiency (e.g., Hart, Shleifer *et al.* 1997). Consistent with this theory, there has been mixed experience with outsourcing to private providers, with the most promising cases including, “outsourcing the maintenance of medical equipment in Thailand, management services in South Africa, and routine custodial, dietary, and laundry services in Bombay”, as well as some success with public health interventions, such as malaria control programs, nutrition programs in Senegal, and

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<sup>29</sup> They used these windfalls primarily to increase holdings of financial assets, which increased their net worth almost dollar-for-dollar with increases in revenues.

<sup>30</sup> For example, studying adoption of technologies by U.S. dialysis units, Hirth, Chenew and Orzol (2000) found, “the trade-offs made by for-profit and non-profit facilities when faced with fixed prices appeared quite different. For-profits tended to deliver lower technical quality of care but more amenities, while non-profits favored technical quality of care over amenities” (p.282). A study of psychiatric hospital behavior finds that the market share of for-profits has an independent negative effect on access, holding constant the intensity of competition (Schlesinger, Dorwart *et al.* 1997).

<sup>31</sup> For example, compared to other non-profits, US non-profit hospitals in areas with many for-profit competitors are significantly more responsive to financial incentives (Duggan 2002). Frank and Salkever (2000) study US not-for-profit hospitals’ efforts to diversify into profit-generating areas; they find considerable diversification and, “beyond adding to the general financial health of hospitals, returns from profit-making activities do not seem to be targeted specifically to increased supply of social goods” (p.210). Studying psychiatric hospitals, Schlesinger, Dorwart, Hoover and Epstein (1997) find that US not-for-profits provide greater access than for-profit providers (in terms of uncompensated care) under conditions of limited competition, but that behavior tends to converge as competitive pressures increase.

<sup>32</sup> McClellan and Staiger (2000) find that mortality (quality) differences between ownership forms in the US increased between 1985 and 1994.

<sup>33</sup> See Eggleston and Yip (2004) for one such model and simulation of China’s reforms.

reproductive health programs in Bangladesh (World Health Organization 2000, ch. 3, p.25). These services are relatively straightforward for contractual specification. If paid to cover the costs of provision, private providers will often be eager to bid for contracts and perform commendably in fulfilling them. Contracting for appropriate clinical care is more challenging. For an excellent overview of many of these public-private contracting issues in developing countries, see Harding and Preker (2003).

The limited evidence available comparing public and private providers in China is largely consistent with global findings that system incentives shape provider behavior as much as, if not more than, ownership. For example, Meng, Liu and Shi (Meng, Liu et al. 2000) collected data from a random sample of village clinics in Shandong Province in 1997. Using observable measures of quality including training of health care workers, medical equipment available, working conditions and supervisors' evaluations, they found virtually no difference across kinds of ownership structure (public, private, and mixed). All kinds of clinics were willing to provide preventive services if compensated for the costs, and the clinics exhibited similar levels of over-prescription of drugs, consistent with the payment incentives.

Private providers are often quick to respond to incentives and can play a useful complementary role to public providers. In a study by Wang and Zhang (Wang and Zhang 2002), 6 private hospitals, 2 in Wenzhou of Zhejiang Province and 4 in Quanzhou of Fujian Province, were examined in terms of their source of finance, managerial mechanism, service specialties, and personnel policy. They concluded that, compared with public hospitals, private hospitals have more clearly defined property rights and a more efficient managerial system (fewer administrators, autonomy in hiring and firing hospital staff, simpler administrative systems, and lower administrative costs). The private providers tended to focus on development of professional specialties that were supplementary to those offered by public hospitals and were responsive to patients' health needs.

Researchers from the School of Public Health at Beijing University analyzed perceptions about private practice with the data from three provinces in 2001 (Study Team of Beijing University 2002). In general, patients were more satisfied with private than with public practice. Advantages of private practice included better accessibility, less waiting time, lower charges, and health workers having better attitudes and more respect for patients.

Lim *et al.* (2003) emphasized the need for careful sector-wide regulation and quality assurance. Surveys of households, providers and government officials in Guangdong, Shanxi and Sichuan clearly indicated that stakeholders believed that the growing private sector provided a valuable service that complemented government provision of health care. However, concerns about poor quality of care still needed to be addressed.

Chinese policymakers seem to be increasingly viewing government hospitals as a form of state-owned enterprise. Consequently, there is experimentation with managerial autonomy, incentives, and property rights reforms as have been applied to other SOEs (Li and Song 2002). Some of the same trends in ownership reform elsewhere in the economy, such as harder budget constraints and competitive pressures (Cao, Qian et al. 1999), also drive property rights diversification in the health sector (Eggleston, Wang et al. 2004).

Li and Song (2002) studied the transformation of public, primary hospitals into shareholding-cooperatives. They also found that all kinds of providers are willing to provide preventive services if paid adequately to do so (indeed, providers see them almost as “good advertising” for their services to the community). There was no evidence that quality problems are specific to a particular ownership form.

## V. DETERMINANTS AND IMPLICATIONS OF COST-ESCALATION

Changing patterns of mortality and morbidity are one contributor to cost escalation in China.<sup>34</sup> Compared to communicable diseases, on average diagnosis and treatment of non-communicable diseases consume more health resources. Changes in demographic structure, particularly aging, also contribute to cost pressures.<sup>35</sup>

In addition to these factors, however, system-wide incentives in China’s health system contribute to a high growth rate of health spending. Fee-for-service payment, especially when combined with a distorted fee schedule, is widely acknowledged to spur cost escalation (see discussion above under payment incentives and price regulation). Design and implementation of Government Health Insurance and Labor Health Insurance plans encouraged unnecessary provision of medical services and drug prescriptions. Shi reported significantly higher medical expenses for the insured than for uninsured with the same health problems and treatment outcomes (Shi and Chen 1998). Li indicated that the main cause of differences in medical expenses between the insured and uninsured was the cost of drugs (Li and Li 2002). It remains unclear how much of this difference is due to patient price-elasticity of demand versus supplier-induced demand for those able to pay. Insurance reforms, with active purchasers implementing a package of reforms, have had some success in restraining cost growth without adverse effects on measured dimensions of quality (Meng, Rehnberg et al. 2004)

Drugs accounted for an unusually high percentage of total medical expenditures in China, compared to other countries. Studies on drug expenditure reached the same conclusions, finding that about 50% of medical expenditure was for drugs (Fang and Chen 1996; Chen, Cheng et al. 1999; Zheng and Chen 2003). Drugs comprised an even higher share of expenditure in primary health care institutions. Reasons include the incentive effects of drug pricing and regulation (see earlier discussion), as well as the payment systems adopted by health insurance schemes, and policies motivating providers to enhance revenue by prescribing more, and more expensive drugs.

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<sup>34</sup> According to the Center for Health Information and Statistics of MOH, causes of death have changed substantially over the past five decades. The top three causes of death in 1957 were respiratory diseases, infectious diseases, and digestive diseases. After the 1980s, the causes of death changed to malignant tumors, cerebrovascular disease, and heart conditions. Hu *et al.* (1994) analyzed medical expenditures for the 15 diseases with highest medical spending, finding that 11 of the 15 diseases were grouped into the top 3 causes of death. Expenditure per case for those diseases was 3974.14 yuan, 3.3 times higher than the average. The LOS for those diseases was 35.9 days, 1.8 times higher than the average.

<sup>35</sup> By the end of 2003, 7.5 percent of China’s population was over 65 years old, and the proportion of aged is projected to increase significantly. Chen, Cheng *et al.* (1999) reported that the medical expense for those aged above 60 years old was more than twice that of those younger than 40. A study by Cai, Wan *et al.* (1999) in Yunnan confirmed this spending pattern on diseases for the different age groups.

Total hospital expense is closely linked to LOS.<sup>36</sup> Xu analyzed the factors influencing total expenditures for those whose hospital expenses exceeded 10,000 yuan and found that LOS for those patients ranged from 10 to 108 days (Xu and Xi 2001). Average LOS is higher in China than in many countries at a similar development level, suggesting that this long LOS is not only attributable to patients' clinical needs. As noted earlier, a high percentage of patients in both rural and urban areas discharged themselves from hospitals (thus truncating LOS), many for financial reasons (Rao 2004). This trend is disturbing if patients are foregoing "needed" care, but early discharges could also reduce care of marginal value, thus cutting costs without damaging quality. Unfortunately there is little evidence to distinguish between these situations.

Around the world, rapid innovation of medical technology has driven cost increases (e.g., Cutler 2004). Introduction and use of high technologies are stimulated, perhaps excessively, by the distorted price system in China. CT and MRI are common, even in township health centers, contributing to excess supply and low efficiency.<sup>37</sup> Liu and Hsiao (1995) emphasized the importance of adoption of new technology, use of more expensive drugs and increased quality of services as contributing to cost escalation. They noted that demand-side measures (such as increasing patient co-payments) are limited in their ability to contain cost growth.

While worldwide trends are toward substitution of outpatient for inpatient care, the macro organization of delivery in China and patient self-referral incentives contribute to cost escalation through increased utilization of tertiary health care. Jia investigated 63 hospitals in Guangdong to examine the changes in volume of health services between the different levels of hospitals (Jia and Lai 2001). Between 1995 and 1998, both outpatient services and inpatient care increased in tertiary hospitals and decreased in primary hospitals. Medical expenses in tertiary hospitals were double those in other types of hospitals. Other factors spurring expenditure increases include rising prices for other health care inputs, including wages for hospital staff (Han 2001; Lu 2002).

It is difficult to determine what proportion of spending growth is "reasonable", given increasing incomes and improved quality of care, at least for some patients. However, the double-digit rates of growth are extremely high, even in the context of China's unprecedented, rapid rate of income growth. Cai and co-authors analyzed demand and medical costs using data from Sichuan Province from 1990 to 1997, concluding that the increase in medical costs had been too fast compared with GDP growth, and with affordability for health care users (Cai, Wan et al. 1999).

The rapid increase of medical costs in China has had two main impacts on utilization of health care. First, as discussed in the first section, overall utilization in China has recently declined, with rapid cost increases apparently a primary contributor. The second impact is on patient choice of health provider. Ying reported that low-income patients tended to use less expensive, low-level health providers, even when their medical condition called for treatment in tertiary hospitals (Ying and Hu 2003). The uninsured were most likely to choose self-treatment and/or self-medication. In contrast, as has also been observed in the US, uninsured and poor Chinese have been found to use more inpatient care and less outpatient care compared with

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<sup>36</sup> In a study with a regression model for identifying factors influencing hospital expenditures on 10 diseases (Yang and Wang 2000), LOS was the principal cause of medical expenditures. Meng and Tang (Meng and Tang 2001) analyzed contributing factors to hospital expenditures and found that LOS was one of the important determinants for hospital charges.

<sup>37</sup> A study in Xi'an found that CT and MRI were used for only 39.2% and 46.8% of their full-utilization times (Du and Yan 1996). A study in Shandong indicated that CT was used for 59.4 days on average, a utilization rate of 41.21% (Li and Fang 1997). Utilization of high technologies was much lower in lower-level hospitals (Fang and Chen 1998; Fang and Chen 2000).

richer people. This is because they delayed care until their medical condition was quite severe (Luo and Shao 2002). Some low-income inpatients stopped treatment and asked to be discharged when they could no longer pay (Zheng and Han 2002).

## VI. CONCLUSIONS

### Research Methodology and Knowledge Gaps

A large and growing body of literature focuses on analyzing the quality, efficiency, and equity of Chinese health service delivery. The methodology for measuring each of these aspects has improved significantly over time, and researchers have studied an ever-increasing array of providers and determinants of performance. Nevertheless, data and methodological limitations remain. The literature falls short of providing a strong evidence base for policy for several reasons:

Most studies focus on a small sample of providers, organizations or regions. It is unclear whether the findings are more generally applicable. There are two areas where future work would be most valuable: analysis of a *nationally representative* sample of patients and providers (such as linking national health survey household data to facility-level data); and *detailed micro analysis of specific regional experiments, controlling as much as possible for confounding characteristics*.

- In the reviewed literature, the methodologies used are too basic to accurately measure the efficiency of health care provision. DEA, frontier analysis and other methods could be more widely applied. There was little information about technical and allocative efficiency of health resources.
- Most studies focus on one aspect of provider performance only. (For example, studies of quality or efficiency alone rarely address, or control for, the other. Studies identifying high quality providers often fail to account for resource use; studies identifying efficient providers usually fail to use sophisticated quality measures.) However, policies should address all aspects of performance. *Studies should combine the methodologies for measuring quality and efficiency so as to measure overall productivity, or social value (i.e., quality per unit cost, or value of quality net of resource use).*
- Generally, more attention should be given to the measurement and analysis of *social efficiency*. Most studies focus on the efficiency of an organization, whereas policymakers should attempt to improve overall social efficiency.
- Many studies use imperfect measures of patient case mix. Therefore conclusions about performance must be qualified; providers who treat more severe cases may appear to be less efficient, and/or giving lower quality treatment.
- Much of the literature describes provider performance. Few studies attempt to identify *how specific determinants affect provider performance*. Of those few, most focus on cost, with virtually no peer-reviewed, empirical studies assessing the impact on quality of specific determinants, such as payment reform or privatization. For example, several studies by Gordon Liu *et al.* analyzed the “liang jiang” experiments, using a detailed data set that collected baseline and follow-up data (see the “urban insurance” critical review for more detail). Unfortunately, policymakers do not know which components of the package of reforms had

which effects. This is because the reforms featured a package of simultaneous changes, and there was no comparable data collected for a comparison group (e.g., similar mid-size cities that did not undertake reform).

- As just noted, studying provider behavior without a *clearly defined comparison group* significantly limits the value of the analysis.
- Moreover, rigorous analysis of performance determinants requires *identifying exogenous source(s) of variation or policy change*. Describing current levels of quality or efficiency, for example, is not as helpful for policy as analyzing the effect of a specific policy change.
- China is rich in regional variation and policy experimentation. Unfortunately, few studies have used this variation to help to identify the effect on service delivery of potential policy variables (payment method, insurance system, or a new regulation, for example).

Future studies should try to use patient-level, as well as organization-level data, gathered from local social insurance bureaus, over periods of time that include exogenous changes in policy (expansion in insurance, change in provider payment, change in regulatory structure for public and private providers, etc.). Investment in *comprehensive panel data at the household and provider levels* would significantly raise the level and scope of analysis, allowing researchers to better address many policy-relevant questions. *Any major policy experiment ought to include funding for a systematic evaluation, including appropriate baseline and comparison-group data*. China has had great success with its overall economic reforms by using such a learning-from-experience approach.

In addition to the need for nationally representative cross-sectional and longitudinal information, it would be useful to look at “market-level” effects and the potential complementarities between public and private providers.<sup>38</sup>

*Analysis of the domestic and international evidence base should be linked to the political economy of reform*. Evidence about the effectiveness of reforms should be interpreted with care. Reform design and implementation frequently reflect the political economy of institutional change. Health sector reforms usually affect the income and well-being of many powerful supply-side interest groups (Roberts, Hsiao et al. 2004). Policy design does not take place in a vacuum; new reforms must often include concessions to “losers.” If a reform is shown to have little impact, was it due to flaws in the reform initiative itself, or a result of concessions made? For example, the impacts of payment reform on cost control in Korea, and of the separation of drug prescribing and dispensing in Taiwan, were reduced due to the increased payment rates introduced to obtain provider acceptance (Kwon 2002; Chou, Yip et al. 2003).

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<sup>38</sup> For example, at a descriptive level, one could consider comparing outcomes and the mix of providers across localities in China. Are access problems (percentage not hospitalized when recommended, etc), per capita costs (normalized by local average wage or some other local cost of living adjuster), utilization rates, and outcomes measures (immunization rates, infant and perinatal mortality rates, etc.) systematically different for communities with more private suppliers? This would be a first step to analyzing causality (e.g., do private suppliers selectively enter “markets” of a certain character, or is the market character itself the result of private entry). In addition, one could examine, with appropriate qualitative and quantitative methods, the institutional choice of profit status (e.g., determinants of whether government hospitals elected to remain public, become private non-profit, or even private for-profit) and its correlation with outcomes, as seen in studies of conversions in the US and elsewhere.

## Policy Implications and Relevant International Experience

Focusing on established market economies, Cutler (2002) describes three “waves” of international health policy reform. During the first, countries focused on establishing universal coverage and equal access, with generous coverage and low patient cost sharing. Financial pressures arose from health expenditure increases outpacing general economic growth. These spawned a second wave of reforms featuring cost controls, rationing and expenditure caps. In the continuing effort to balance solidarity and efficiency concerns, a more recent, third wave of reforms focuses instead on incentives and competition.

The evidence regarding these reforms, as well as that from China, suggests that *reforming system incentives can improve performance*. For example, Meng *et al.* (2004) found that the reform of urban health insurance in pilot cities had encouraging results, as shown in Figure 4. Cost increases for two studied conditions were smaller in the city that implemented a package of reforms (Nantong in 1997) than in a comparison city without reforms (Zibo). Providers in the two cities were comparable in terms of measured dimensions of quality. The package of reforms included a single insurance scheme within a municipal city, changes of payment system from fee-for-service to fixed (case) payment, and contracting between health providers and the insurer. Liu and Cai found similar results, concluding that urban health insurance reforms not only controlled medical costs but also improved fairness of finance (Liu, Cai *et al.* 2003).

This matches the experiences of many other countries: *active purchasing* by organized purchasers is one of the most effective ways to affect system incentives. In both the urban and rural areas, social insurers and other purchasers (such as the new CMS) can promote improvement in service delivery through: selective contracting (where providers compete for the insurer’s contract); mixed payment methods with quality bonuses (pay-for-performance);<sup>39</sup> drug use monitoring and formularies; and other policies (such as a referral system for accessing three tiers of care).

Reforms are needed especially in the case of fee-for-service payment systems with distorted price schedules. Tables 3 and 4 illustrate the growing prevalence of mixed forms of provider payment (i.e., risk sharing) in countries around the world, with risk adjustment of the fixed proportion of payment (such as capitation).

Active purchasing and other reforms should be “sector neutral”. That is, supervision and regulation should apply to both public and private providers, and purchasers should contract with the higher-performing providers on equal terms, regardless of ownership. Experience during reform in Eastern Europe (at first outside the health sector and later in the health sector) indicates that reforms without “sector neutrality” can lead to a vicious cycle of risk segmentation and quality differentiation by ownership type.<sup>40</sup>

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<sup>39</sup> For example, the ambitious new general practitioner contract in the U.K. includes 146 performance measures across seven areas of practice, affecting about 18% of practice earnings (Smith and York 2004). For a description of US initiatives in pay-for-performance, see Rosenthal *et al.* (2004) and Strunk and Hurley (2004).

<sup>40</sup> Kornai and Eggleston (2001) note, “the development of the private sector in the delivery and financing of health care [introduces] a danger of the health sector being split into two parts by an inconsistent, distorted process of reform. Private hospitals and individual private medical practices will serve the richer sections of society, who can afford to pay directly or to purchase private medical insurance. Many services that are in the basic package will also be paid for privately. Meanwhile the public hospitals and outpatient clinics, along with their associated primary care providers, will serve the less wealthy, paying for their care out of public funds. There are already some signs of such a split, which could cause serious damage. It could become a vicious circle....” (pp. 309-314).

In summary, Chinese experience matches theory and global evidence, namely that system-wide incentives shape provider performance. The interaction of incentives complicates assessments, and calls for a package of complementary reforms. Components of such a package should include: effective, sector-neutral and well-coordinated regulation; appropriate vertical and horizontal integration of healthcare institutions; active, sector-neutral purchasing; changing fee-for-service payment to mixed payment; improving provider internal management; and focusing government support on (a) public health and (b) guaranteeing access to basic services for the poor.

**Table 1. Utilization by Ownership, Providers at the County Level and Above**

	Outpatient visits (Million)		<i>Inpatient admissions (10,000)</i>	
	Public	Private	Public	Private
1996	858	----	2379	3
1997	776	1	2425	3
1998	795	1	2538	4
1999	819	2	2676	5
2000	876	3	2862	8
2001	874	4	3030	12
% increase, 1996 to 2001	2.1	300*	27.4	300

\*Percentage increase between 1997 and 2001.

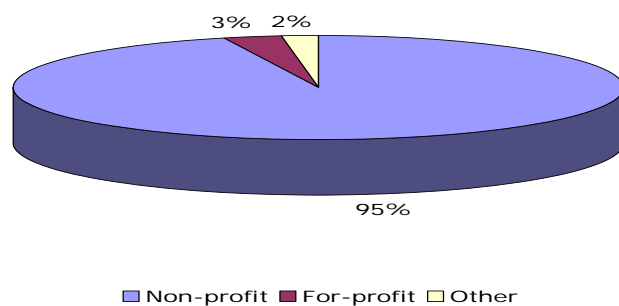
Source: Chinese Health Statistical Digest 2003, (Ministry of Health 2003)

**Table 2: Number of health professionals in medical institutions by ownership**

	Total	Hospital			MCH center	SDCI Institute	Township Health Center
		General	TCM	Specialized			
Total (unit)	2399023	1863710	309322	194284	106213	10642	914089
(%)							
State-Owned	94.23	95.08	94.39	86.45	99.63	95.4	65.79
Collective-owned	3.16	2.67	3.98	6.34	0.32	3.9	33.18
Joint-stock	0.52	0.4	0.64	1.33		0.45	0.43
Cooperation							
Coalition	0.18	0.18	0.01	0.36			0.1
Limited Liability	0.2	0.2	0.05	0.44			
Private	1.26	1.02	0.71	4.26		0.24	0.33
Invested by HK, Macao & Taiwan	0.03	0.03	0.01	0.01			
Chinese-foreign Joint Venture	0.05	0.05	0.02	0.17			

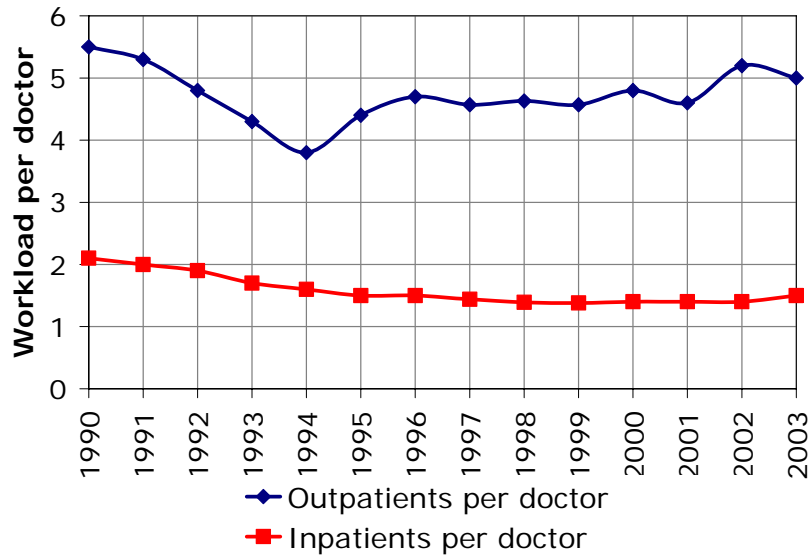
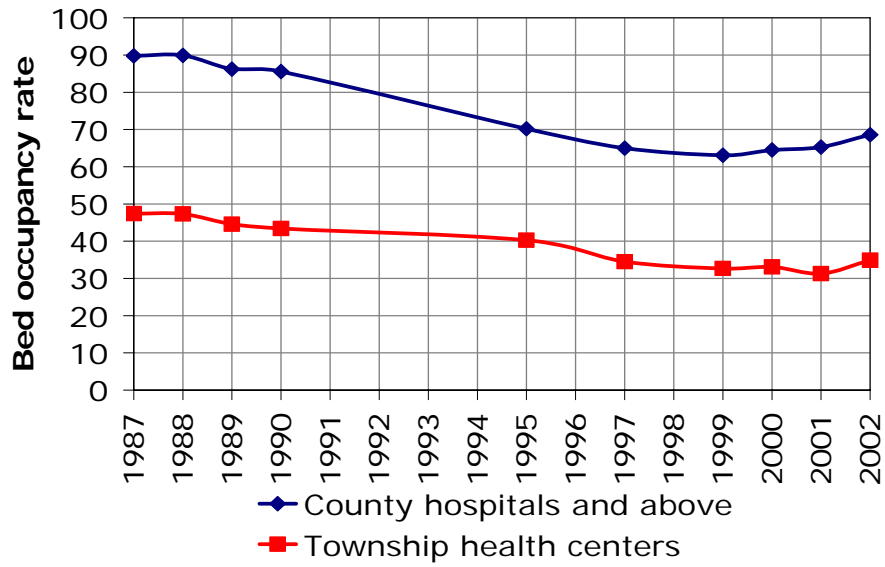
Source: The performance of Medical Institutions with Different Ownership (HSIC 2004).

**Figure 1: Number of beds in non-profit and for-profit medical institutions (2002)**



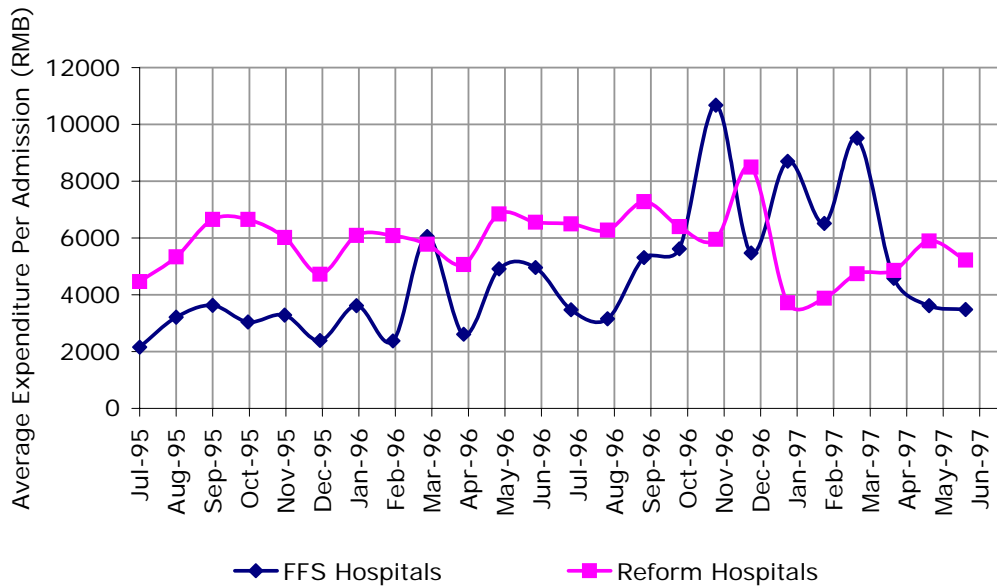
Source: Chinese Health Statistical Digest 2003 (Ministry of Health 2003).

**Figure 2: Evidence of Decreasing Productivity: Hospital Occupancy Rates and Patients per Doctor**



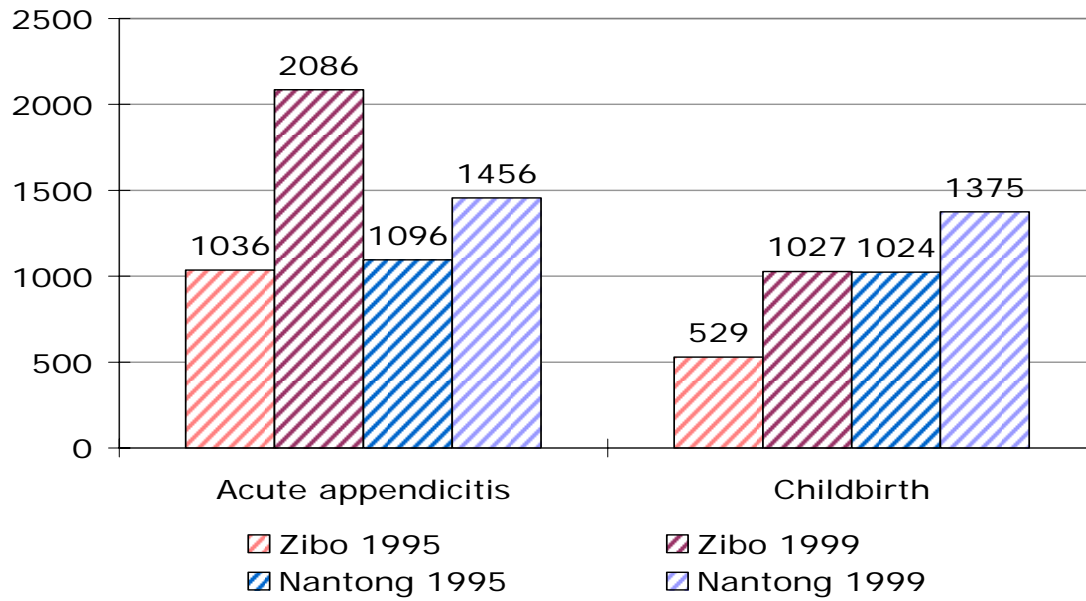
Source: Annual Report of Health Statistics 1996-2000; Chinese Health Statistical Digest 2004, MOH, PRC (Ministry of Health 2004).

**Figure 3: Average Expenditure per Admission in Hainan Reform and FFB Hospitals, by Month, July 1995 to June 1997**



Source: (Yip and Eggleston 2004).

**Figure 4. Cost Increases Smaller in City with Reforms (Nantong in 1997) than Comparison City without Reforms (Zibo)**



Source: (Meng, Rehnberg et al. 2004).

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