

Health human resource development in rural China

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China has made significant progress in increasing the quantity of health workers in rural areas. Attention is shifting to improving the quality of health workers. This article documents several features of health workers in rural China. Many have not received formal training to a level implied by their rank and title, and there is no clear relationship between the skills of health workers and the functions they perform. Many better-qualified personnel have left lower level health facilities for more attractive employment in higher level and urban facilities. A system of professional licensing is currently being considered that will link educational requirements to employment and promotion. This article outlines some of the issues that should be taken into consideration in formulating this system. In particular, licensing may have unequal impacts on rich and poorer areas. This article argues that other regulatory measures will be necessary if licensing is to be an effective mechanism for controlling the quality of health workers, and contribute to the provision of affordable health services in both rich and poor areas.

1 Introduction

China is in the process of transforming its health sector from a situation of severe shortages of people with medical skills in the early 1950s, to a situation in which the benefits of health care technology are made widely available. The establishment of a health sector capable of providing the entire population with the benefits of modern health care technology is a long-term process of investment in human capital and establishment of management and regulatory systems.

China's major priority in human resource development has been to increase the quantity of health personnel. One sign of its success is that most people see a health worker when they fall ill (Tang et al. 1994; Henderson et al. 1994). Recently, the country has been experiencing an economic boom, particularly in eastern parts. Health services have expanded rapidly in the cities and in the better off rural areas. This has led to an increasing concern regarding the quality of health workers in the better off areas, where services are becoming increasingly sophisticated, and in the poor rural areas, which have lost their most experienced personnel to facilities in the areas experiencing economic growth.

This article documents the increase in the number of health workers and describes the mix of health workers employed in rural health facilities. It also highlights some problems faced by policy-makers as they shift their priority from increasing the number of health workers to improving the performance of the existing personnel. In so doing, they have to address issues such as the appropriate relationship between training and the function of health workers, the development of promotion systems that reflect the need for effective health service management and supervision, and the role of professional licensing and regulation.

2 Quantitative analysis of health human resources

2.1 The major categories of health worker in China

Table 1 summarizes the levels of training of three major categories of Chinese health worker: qualified doctors (high school graduates with at least three years training in a medical college or university);

Table 1. Levels of medical training institutes and qualifications

Level	Training institute	Duration of training	Title obtained	Enrolment prerequisite
1. National, province and municipality	Medical university or college	≥ 5 years post-graduate training	Qualified doctor	Senior high school graduate (12 years general education)
2. Province, city and prefecture	Post-secondary medical college	3 years	Qualified doctor	Senior high school graduate (12 years general education)
3. Prefecture or city	Secondary medical school	2–3 years	Assistant doctor	Junior high school graduate (9 years general education)
4. County	County health school	<2 years	Village doctor	High school or less

Source: compiled by authors.

assistant doctors (junior high school graduates with 2–3 years training at a secondary medical school); and village doctors (peasants who have had short periods of training at a county health school). These categories apply to practitioners of both Western and traditional Chinese medicine.

Different categories of health worker work in different kinds of facilities. Assistant doctors are mostly employed by township health centres and county general hospitals. University-trained doctors tend to work in county and higher level hospitals. Some teaching hospitals and specialized hospitals employ only medical university graduates and postgraduates. Village doctors are not employed by publicly-owned health facilities. They work at village level in collectively-owned facilities or as private practitioners. Although village health workers make important contributions to health care delivery, the remainder of this paper focuses on the health workers employed by county hospitals and township health centres.

There are no clear-cut differences in the functions of these different categories of health worker. For example, qualified doctors, assistant doctors, and village doctors are all permitted to prescribe any drug, except narcotics or major tranquillisers. Assistant doctors mostly work under the guidance of a qualified doctor in county hospitals and higher level facilities, but are often unsupervised in township hospitals. Moreover, the basic salaries of qualified doctors are not much larger than those of assistant doctors. The major determinants of pay are the number of years of

service, promotion to senior management posts, and bonuses whose size is linked to the ability of the employing facility to generate revenue. The blurring of the distinctions between categories is made greater by the fact that many people employed as qualified doctors or assistant doctors do not have the requisite qualifications (see section 3).

2.2 The increase in the numbers of health workers

In 1952 China had very few Western-trained doctors relative to its population (Table 2). It had 0.09 doctors and 0.12 assistant doctors per thousand population. The shortages were particularly great in rural areas, where there were only 0.04 doctors and 0.09 assistant doctors per thousand population. China also had large numbers of Chinese traditional doctors who included personnel 'ranging from poorly educated pill peddlers to well-trained and experienced practitioners' (Sidel and Sidel 1982). At that time China's population had very poor health, with an average life expectancy at birth of 39 years (Yen and Chen 1991). This was due in part to an inadequate health sector that provided very few effective services to the majority of the population.

China has subsequently trained and deployed large numbers of health workers in both Western and traditional Chinese medicine. In 1988 there were 0.81 Western doctors and 0.32 assistant doctors per thousand population. This represents a six-fold increase in the numbers of these categories of health worker since 1952. The numbers of traditional Chinese Medicine doctors fell, but their levels of training increased. Inequalities between urban and rural areas

Table 2. Health workers per thousand population between 1952 and 1994

	1952			1988			1994
	Rural	Urban	Total	Rural	Urban	Total	Total
Western doctors	0.04	0.45	0.09	0.40	1.99	0.81	0.97
Western assistant doctors	0.09	0.27	0.12	0.23	0.57	0.32	0.30
Western doctors and assistant doctors	0.13	0.72	0.21	0.63	2.56	1.13	1.27
Traditional Chinese Medicine doctors*	0.55	0.41	0.53	0.26	0.52	0.33	0.30

* Traditional Chinese Medicine doctors include senior, assistant and other TCM doctors.

Sources: Population: State Statistical Bureau (1994, 1995); Health personnel: Ministry of Public Health (1989), State Statistical Bureau (1995).

Table 3. Socioeconomic and HHR indicators in a sample of rural counties (1992)

	Rural average	Wealthy	Well-off	Sustainable	Poor
No. of counties surveyed	65	16	20	21	8
Av. population per county	495 754	438 670	628 116	442 793	229 298
Av. per capita income (Yuan)	747	1018	755	633	501
Health personnel per 1000 pop.	2.1	2.9	2.0	2.1	1.5
Doctors and assistant doctors per 1000 pop.	0.9	1.2	0.9	0.9	0.5

Source: Ministry of Public Health (1994).

persisted, but even the rural areas had 0.40 Western doctors and 0.23 assistant doctors per thousand population.

The supply of Western-trained health workers per thousand population in rural China is greater than the average number of doctors in both urban and rural areas in many other low and middle income countries (World Bank 1993). For example, India has 0.41, Malaysia has 0.37, the Philippines has 0.12, and Thailand has 0.20 doctors per thousand population. While the different definitions of a doctor highlight the difficulties of making international comparisons, these indicators suggest that there is no shortage of health workers in rural China.

A survey carried out in 1993 shows that wealthy counties have almost twice the number of doctors and assistant doctors per thousand than the poor ones (Table 3). However, even China's poor counties have

a relatively good supply of health workers compared with other low and middle income countries.

2.3 Workloads of rural health workers

Workers in publicly-owned health facilities were previously guaranteed jobs for life, although at low levels of pay. They could not change their job without permission, nor could managers dismiss them. Local personnel bureaux continue to assign people to health facilities, whether or not they are needed.

The increase in personnel has been more rapid than the rise in use of outpatient and inpatient services. For example, between 1984 and 1992 the number of outpatient and inpatient visits to township health centres decreased by almost 17%, while the number of doctors and assistant doctors in township health centres increased by around 15% during the same period (Ministry of Public Health 1990, 1993). This indicates a fall in the productivity of health workers.

Table 4. Percentage of doctors and assistant doctors with various training backgrounds at county hospitals and township health centres

	Titled doctors Rural average (%)	Poor (%)	Assistant doctors Rural average (%)	Poor (%)
<i>County Hospitals</i>				
medical university or college	16.5	17.6	-	-
post-secondary medical college	19.2	19.1	2.3	1.5
secondary medical school	48.9	54.8	57.2	73.0
senior high school	7.0	1.6	23.1	13.6
junior high school	8.4	6.9	17.4	11.9
<i>Township Health Centres</i>				
medical university or college	3.9	0.0	-	-
post-secondary medical college	15.5	18.5	1.0	0
secondary medical school	40.3	48.2	57.0	71.1
senior high school	14.3	14.8	19.0	11.1
junior high school	26.0	18.5	25.0	17.8

Source: Ministry of Public Health (1994).

This is due to a combination of the rise in supply of health workers with only basic training, and the fall in demand for services resulting from the loss by rural health facilities of their most experienced personnel (section 3).

One measure of the low productivity of rural health workers is the finding of a recent national survey (Ministry of Public Health 1994) that the average number of clinic visits per doctor and assistant doctor per day was 12 in county hospitals and 12.5 in township health centres.* It is possible to find examples of spectacularly unproductive personnel. Two examples observed by one of the authors during a recent visit to Henan Province were one person whose only task was to give 15 injections a day; and another who saw only six gynaecology patients a day. This situation is found in most health centres, where there are very few inpatients, little surgery is done and the patients they have tend not to be very sick.

The increase in numbers of personnel with intermediate level qualifications needs to be limited in order to increase the productivity of staff of hospitals and health centres. This is particularly important since pay levels have risen substantially. A shift in priorities from quantity to the quality of health care services is occurring in China, as elsewhere (Tipping and

Segall 1995; Hornby 1992), and the quality of human resources has become a key concern. The Minister of Health has recognized the importance of this issue (Chen 1993).

3 Quality of health human resources in rural areas

3.1 Levels of training of doctors and assistant doctors

Table 4 presents data from a national survey on the pre-service medical training of health workers employed as doctors and assistant doctors. It shows that a large proportion of them do not have the requisite training for the title they hold. Only one-third of people employed as doctors by county hospitals have had university or medical college training, half have had secondary medical school education, and one-sixth have had no pre-service medical training at all. In other words, two-thirds of the people working as doctors in county hospitals have not had the necessary training.

There are very few university-trained doctors in township health centres and less than one-fifth of doctors in these facilities have had the requisite training. Two-fifths of doctors and assistant doctors in

Table 5. Loss rates among better qualified health workers in poor counties

Location	No. of Counties	Year	Type of personnel	Loss rate (%)
Sichuan ^a	11	1980-90	qualified doctors	84.7
Hubei ^a	1	1970-90	qualified doctors	90.0
Xizang ^a	10	1981-85	qualified doctors chief doctors	77.8 91.3
National Survey ^b	20	1986-87	qualified doctors at township level	90.0
Guangxi ^a	1	1980-93	qualified doctors and assistant doctors	80.3
Shanxi ^a	10	1978-91	qualified doctors and assistant doctors	82.4
Guizhou ^c	1	1970-90	qualified doctors	91.0
Guangxi ^c	1	1980-94	qualified doctors at township level	100.0

Notes: Qualified doctors are doctors with medical university or post-secondary medical college education.

Sources: ^a Nong (1995), Jiang (1994), Shan (1994), Yu (1992).

^b Ministry of Public Health (1991).

^c IDS-SMU case studies.

township health centres have had no pre-employment medical training.

3.2 Loss of skilled personnel by facilities in poor rural areas

Prior to the 1980s health workers were assigned to facilities and could not leave them without permission. This kept trained staff in rural facilities. The situation has changed and health workers are now allowed to take up other jobs if they wish. There are strong incentives for qualified health workers to leave poor rural areas. The larger facilities can generate enough revenue to pay substantial bonuses. In addition, as in many other countries, trained personnel prefer to live in urban centres which have better amenities. There has been a substantial movement of experienced and better trained staff to positions in county or urban hospitals.

Table 5 summarizes the findings of several studies of the loss of skilled personnel from poor counties during the 1980s. They all report losses of more than 80% of the qualified doctors. One of the responses of health facilities to the loss of their better qualified staff has been to promote middle-level and non-professionally trained personnel to senior positions. This is one reason for the large numbers of personnel in positions for which they have not been trained.

Previously, students in post-secondary medical colleges were drawn from rural areas and were assigned posts in rural areas after graduation. Most colleges no longer maintain their rural orientation. New university graduates, who are often of urban origin, are unwilling to work in rural areas. This has contributed to the scarcity of well-trained health workers in poor rural counties.

3.3 Human resource policy and the labour market

Section 3 has identified three features of China's corps of technical health personnel: a large proportion of them have less professional medical training than implied by their rank and title; many health workers are allowed to engage in specialist technical work despite having no formal medical training; and senior ranked and better qualified personnel are distributed unevenly between county and township facilities, and between richer and poor rural areas.

The weak link between training backgrounds and titled positions has arisen because of a promotion system that gives a lot of weight to experience. The adoption of this system was a response to the shortage of trained personnel and to broader political factors. The policies of the Cultural Revolution (1966-1976) were particularly significant in this regard. This political movement, typified by Mao's call to 'put politics in command', can be understood as a reaction against the development of a bureaucratic and intellectual

elite, whose interests were perceived to have become divorced from those of the people they were meant to serve (Lee 1991; Tsou 1986). During the Cultural Revolution, professionalization was de-emphasized in the health system. Between 1966 and 1969 medical universities and colleges were closed, and through the mid-1970s training institutes provided courses of practical orientation of no more than three years' duration (Lampton 1977). Within health facilities, status and role differences among personnel with different levels of expertise were reduced in an attempt to remove the power of physicians. Hospitals were governed by revolutionary committees, whose members were often either non-professionals or lower-level technicians, but who nevertheless became responsible for medical decision-making (Sidel and Sidel 1973). Ranking by titles was opposed and promotion of any kind stopped for ten years.

After the Cultural Revolution, this approach was gradually reversed. Curriculum lengths were increased in an attempt to improve the quality of health workers, and expertise was re-emphasized. In 1978, the promotion system was revived, but because large numbers of personnel had not been promoted for many years the criteria for promotion were relaxed. The promotion of assistant doctors in the late 1970s and early 1980s contributed to the substantial increase in numbers of personnel employed in senior positions noted in other studies (Song et al. 1991). An assistant doctor could be made a 'qualified doctor' after having served for a number of years. Some people promoted to this position had had no pre-service medical training, although some had received in-service training through correspondence or a TV programme training course.

With the development of a labour market for health personnel during the 1980s, many skilled personnel have left rural areas while new university graduates are unwilling to serve in rural areas. To compensate for the resulting shortage of skilled personnel, rural health facilities often promoted personnel with secondary medical school education or experienced personnel with no pre-service training. This personnel management strategy has neither stemmed the outflow of better qualified health workers, nor raised the quality of health care services provided.

4 Summary and discussion

There have been substantial improvements in the availability of health workers in rural China over the

last 40 years. However, past approaches to human resources development and more recent economic and health sector reforms have left a number of problems, especially in poor areas. Section 3 revealed the extent of two major problems relating to the quality of doctors. First, many of them have not received formal training to a level implied by their rank and title. The national health services survey (Ministry of Public Health 1994) suggests that among currently employed personnel, 70 000 hospital doctors and 220 000 township health centre doctors require in-service training to address this discrepancy. Second, many better-qualified personnel have left township health centres and poorer areas for more attractive positions in county and higher level hospitals. The change in staffing mix is one factor behind the decline in the scope of services provided and in utilization rates at the township level in poor areas (Tang 1997).

Assessing and assuring the quality of health services requires the establishment of standards against which to evaluate the current situation (Roemer and Montoya-Aguilar 1988). This article has shown that there is no clear relationship between the skills of health workers in China and the functions they perform. First, the roles of the different kinds of health worker are not clearly differentiated. Second, the titles of health workers do not reflect their level of training – and by inference, their knowledge and skills. This makes it difficult for managers of health facilities to recruit appropriate employees and for users of health services to assess the quality of health workers.

The Chinese government is considering the passage of a Physician's Law that will define the minimum educational requirements for employment and promotion to various titled positions. For example, the title 'qualified doctor' is likely to be reserved for those who have completed formal medical training for three or more years at a medical university or post-secondary medical college. Personnel with less than this minimum requirement would be certified as 'assistant doctors'. Large numbers of village health workers have already been licensed as 'village doctors'. The passage of this law would be an important step towards the creation of a regulatory framework for health workers. It is important that the potential impact of this framework on health services in poor areas is understood. Section 4.1 outlines some of the issues that should be taken into consideration in the formulation of this law. Section 4.2 discusses some

problems that the professionalization of the work force may pose for health services in poor rural areas.

4.1 Ensuring the quality of health personnel: the re-emergence of professions

Systems of professional licensing provide a simple mechanism for identifying qualified health workers. The aim is to protect the population against incompetent and unethical practitioners. The construction of a licensing system should start with the definition of tasks that different categories of health worker are expected to perform. It is then possible to identify the knowledge and skills required to carry out these tasks. It is only possible to identify essential skills, without which it would be impossible to practice competently. The assumption is that health workers will be able to find the information they need to deal with specific problems as they arise and, if not, that they will refer complicated cases to higher level facilities where the skills are available. In some countries, a secondary set of qualifications is recognized which certifies people as specialists in particular areas of work.

Once the basic knowledge and skills of the different categories of health workers have been defined they can be used as benchmarks against which to measure the existing stock of health workers. Those without the necessary qualifications could be offered the chance to take up-grading courses and sit a licensing exam. This would provide a mechanism for upgrading the quality of health workers over time. Those who do not pass licensing exams would no longer be entitled to perform the tasks for which they were not trained.

One of the criticisms of professional licensing systems is that they do not provide assurance that practitioners *maintain* adequate levels of knowledge and skills. The precedent set by the need to upgrade the existing health workers could provide a means for addressing this problem. Health workers could be asked to attend refresher courses and pass regular examinations to retain their professional license. It would also be possible to provide a mechanism through which assistant doctors could earn certification as doctors if they met certain educational requirements and passed the requisite exam.

Most licensing laws reserve certain functions for certified personnel. For example, doctors may be the only people allowed to prescribe certain drugs or

undertake dangerous surgical procedures. In some countries the regulations apply only to the private sector; the law may limit the right to charge for certain practices to licensed doctors, but it may have little to say about who provides the same services in the public sector. This is quite common in the ex-British colonies of Africa and Asia, where the system of regulation of the private sector resembles the structures in advanced market economies, but where doctors provide only a minority of services through the public sector. In many of the advanced market economies the delineation of roles between different categories of health worker is more rigid. For example, in a number of countries only licensed doctors can prescribe drugs.

Most countries with a system of professional certification have mechanisms for regulating the performance of the licensed professionals. This is often the role of state and/or professional regulatory bodies. In order for this system to work, mechanisms must exist for depriving people who demonstrate incompetence or who act against the interests of patients of their license to practice. This ensures that the possession of a license provides assurance of the quality of services the possessor provides.

One reason for the increasing interest in China in the potential role of professional regulation as a means of controlling quality is that the previous mechanisms for influencing the behaviour of health service providers have become weaker. Health facilities now derive most of their revenue from charges to patients, and local governments have relatively little influence over their behaviour. Furthermore, neither local government health bureaux nor health facilities have the resources to allocate much effort to regulatory tasks (Bloom et al. 1995). As a result of their enhanced autonomy, health facilities are strongly influenced by the interests of their employees. This is one factor behind the very high rate of promotion of unqualified people into professional posts. The growth of a fully private sector (Liu et al. 1994) is another reason why some form of professional regulation is required. Licensing and certification measures introduced for village health workers in the 1980s have not effectively regulated the technical standards of village health workers in some poor areas (Deng et al. 1997). In order for a professional licensing law to protect users of health services against unwarranted use of untrained personnel, resources and mechanisms for enforcement would have to be established.

4.2 Protecting quality in a health system with structural inequalities

The introduction of professional licensing of health workers as a means of quality control will pose problems for the poor rural areas. If health workers are given nationally (or internationally) recognized certifications, they could become more mobile. This could lead to a further drain of the best qualified personnel from poor rural areas. It also could raise the cost of retaining health workers who could easily move elsewhere.

The introduction of professional licensing protects practitioners against unlicensed competitors. This can have several adverse consequences for health services in poor areas. First, a law drafted to meet the needs of more developed areas, where there are enough licensed doctors to justify strong measures to prevent so-called 'quacks' from practising, may not be appropriate for poorer areas, where it may be desirable to encourage people with relatively basic training to provide services under some form of regulation. Licensing laws need to take into account the different needs of different areas. Second, the protection that a licensing law gives against uncertified competitors may enable health workers to improve their income and increase the cost of care.

Organized professions can use their regulatory powers to further their own interest by limiting the ability of potential competitors to practise. This is very much the case in many ex-British colonies where strong medical professions have denied non-medical persons the right to practise privately and, in some cases, have prevented the provision of upgrading courses for non-medical practitioners. One way to diminish this risk is to ensure that all stakeholders are represented on the boards of regulatory bodies.

4.3 Conclusions

The challenge facing policy-makers in China is to find strategies that encourage a general upgrading of the quality of health services. These strategies are required for two quite different objectives: to meet the demands for major improvements in the quality of services in the rapidly growing parts of the country, and to prevent a deterioration in the quality of services in the poorer parts of the country. In the latter areas, there is a need for a major reassessment of the skills and knowledge that health workers require in order to deliver a package of essential services. Training programmes will need to be designed to provide existing practitioners with these skills.

It may not be desirable, or financially feasible, to try to fill all the present posts for doctors in rural facilities with fully licensed professionals. Suitably retrained assistant doctors could become increasingly important as providers of health care in these areas. Systems of professional certification and job progression need to be established to encourage these people to stay and develop their careers. This might imply different routes to accreditation than regulation through medical licensing, but regulation of these health workers would still be essential to ensure that the services provided are consistent with their levels of technical expertise. The goal would be to ensure that these services not only reflect local health needs but are also affordable and acceptable to the populations served.

Endnote

* This includes outpatient and inpatient visits, where it is assumed that one occupied bed day is equivalent to 2.5 outpatient visits.

References

- Bloom G, Lucas H, Cao S, Gao J, Yao J, Gu X. 1995. Financing Health Services in Poor Rural Areas. *IDS Research Report 30*. Brighton: Institute of Development Studies.
- Chen MZ. 1993. Speech to opening session of the Second National Workshop on Health Human Resources in China.
- Deng W, Wilkes A, Bloom G. 1997. Village health services. *IDS Bulletin 28*: 32-37.
- Henderson G, Akin J, Li ZM, Jin SG, Ma HJ, Ge KY. 1994. Equity and the utilization of health services: report of an eight-province survey in China. *Soc. Sci. Med.* 39(5): 687-99.
- Hornby P. 1992. New Approaches to the Planning of Human Resources for Health. Paper presented to WHO consultation, Bangkok.
- Jiang GH. 1994. Strategies to stabilize rural health personnel in China. *Chinese Rural Health Services Administration* 4(9): 32-3.
- Lampton D. 1977. *The Politics of Medicine in China: the Policy Process 1949-1977*. Folkestone, UK: Dawson.
- Lee HY. 1991. *From Revolutionary Cadres to Party Technocrats in Socialist China*. Oxford: University of California Press.
- Liu G, Liu XZ, Meng QY. 1994. Privatization of the medical market in socialist China: a historical approach. *Health Policy* 27: 157-74.
- Ministry of Public Health. 1989. *Health Statistics Information in China 1949-1988*. Beijing: Ministry of Public Health.
- Ministry of Public Health. 1990. *Chinese Health Yearbook 1990*. Beijing: Ministry of Public Health. (In Chinese).
- Ministry of Public Health. 1991. *National Health Services Survey*. Beijing: Ministry of Public Health.
- Ministry of Public Health. 1993. *Yearbook of Public Health in China 1993*. (English edition). Beijing: Ministry of Public Health.
- Ministry of Public Health. 1994. *Research on National Health Services Survey: An Analysis Report of the National Health Services Survey in 1993*. Beijing: Ministry of Public Health. (In Chinese).

- Nong LB. 1995. Attrition of HHR in poor rural areas. *Chinese Primary Health Care* 9(1): 26–7.
- Roemer M, Montoya-Aguilar C. 1988. *Quality assessment and assurance in primary health care. WHO Offset Publication 105*. Geneva: World Health Organization.
- Shan CZ. 1994. Reasons and strategies for loss rate of health personnel. *Chinese Rural Health Services Administration* 14(6): 33–4.
- Sidel R, Sidel VW. 1982. *The Health of China: Current Conflicts in Medical and Human Services for One Billion People*. London: Zed Books. p. 27.
- Sidel VW, Sidel R. 1973. *Serve the People: Observations on Medicine in the People's Republic of China*. New York: Josiah Macy, Jr. Foundation.
- Song FJ, Rathwell T, Clayden D. 1991. Doctors in China from 1949 to 1988. *Health Policy and Planning* 6(1): 64–70.
- State Statistical Bureau. 1994. *China Statistical Yearbook 1994*. Beijing.
- State Statistical Bureau. 1995. *A Statistical Survey of China 1995*. Beijing.
- Tang SL. 1997. The changing role of township health centres. *IDS Bulletin* 28: 39–47.
- Tang SL, Bloom G, Feng XS, Lucas H, Gu XY, Segall MM. 1994. Financing rural health services in China: Adapting to Economic Reform. *IDS Research Report 26*. Brighton: Institute of Development Studies.
- Tipping G, Segall M. 1995. Health Care Seeking Behaviour in Developing Countries: An Annotated Bibliography and Literature Review. *IDS Development Bibliography 12*. Brighton: Institute of Development Studies.
- Tsou T. 1986. *The Cultural Revolution and Post-Mao Reforms: a Historical Perspective*. Chicago: University of Chicago Press.
- World Bank. 1993. *World Development Report: Investing in Health*. Oxford: Oxford University Press.
- Yen R, Chen SL. 1991. *Chinese Population Studies* 2: 1–10.
- Yu ZS. 1992. Loss rate of health human resources and strategies. *Chinese Primary Health Care* 6(9): 21–3.

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