

Inequities in the allocation of medical resources in China's Township Health Centers

Medical
resources in
China's THCs

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Abstract

Purpose – The purpose of this paper is to produce a high-quality measure of the nature of healthcare resources available in China's Township Health Centers (THCs), paying particular attention to equity between high- and low-income areas.

Design/methodology/approach – This study makes use of data from a nearly nationally representative survey in rural China conducted by the Center for Chinese Agricultural Policy at the Chinese Academy of Sciences in 2011. The samples of towns were selected randomly from 25 counties located in five provinces from different regions of China. Data were collected through questionnaires and direct observation.

Findings – The THCs located in rich areas have higher levels of human resources than poor areas. THCs in rich areas also have more fixed assets than those in poor areas. In fact, even though the Chinese Ministry of Health mandates that all THCs have certain basic levels of medical equipment and facilities, many THCs in poor areas do not have them. The allocation of mandated equipment is unequal.

Practical implications – These findings suggest that China's government should pay more attention to THCs located in poor areas, especially in light of new initiatives to improve health care in poor rural areas.

Originality/value – This is the first nationally representative study to employ rigorous empirics to investigate the extent of inequality in allocation of resources within THCs across China.

Keywords China, Health, Inequality, Rural development, Medical resources, Township health centers

Paper type Research paper

1. Introduction

The deployment of healthcare resources, including human resources, facilities, and medical equipment (Liu, 2012), is a critical issue for health care system planning and health policy (Liu *et al.*, 1999; He *et al.*, 2013). The effectiveness and equitability of healthcare services hinges on the allocation of healthcare resources (Whitehead, 1991). Equitable deployment of healthcare resources is one step at trying to ensure that



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disadvantaged groups receive quality and accessible healthcare services (Liu *et al.*, 1999). If inequality in healthcare resources exists, these disparities may slow down economic and social development (World Health Organization, 2011). In China, where large income and educational inequality persists between urban and rural areas, inequities in healthcare resources may be particularly severe and significant for economic development trends (Li *et al.*, 2008).

In recent years, China has invested heavily in policies that seek to improve health service accessibility and equity (Zhang *et al.*, 2010; State Council, 2012). For example, at least three different policy initiatives since the early 2000s have explicitly aimed to emphasize “fairness” in and “equitable enjoyment” of the provision of basic public health services (Guan and Huang, 2010; Zhang *et al.*, 2010). As part of these efforts, from 2000 to 2008 the government’s annual investment in rural health care grew from 12.4 billion to 104.4 billion yuan (Xiang *et al.*, 2011). Additionally, the Ministry of Health announced in 2009 that the central government would increase investments by nearly 2.7 billion yuan to support the implementation of basic healthcare at the county, township, and village levels (State Council, 2012).

While these government policies have specifically sought to equalize the accessibility and distribution of basic health care services, recent research in China has shown that inequity is still a large problem. A significant body of research has shown that disparities in investment, equipment, and medical staff across regions are significant (Li *et al.*, 2003; Yi *et al.*, 2009; Xiang *et al.*, 2011; Lu, 2009; Guan and Huang, 2010). This lack of equity may be associated with the poor quality of health care observed among disadvantaged groups in China (Li *et al.*, 2003; Lu, 2009; Yang, 2010). While of great value to the literature, these studies did not identify precisely where in the rural health system are the largest gaps in health services present.

What the literature does highlight, however, is the key role of the township health centers (THCs) in China’s rural health care system (Hillier and Shen, 1996). There are nearly 40,000 THCs across the nation (almost one in every township in China) that deliver health services to more than 700 million rural residents. They often supervise village clinics and manage their staff and physicians (Eggleston *et al.*, 2008). Additionally, THCs also influence higher levels of the health system due to their role as gatekeepers, referring patients towards county and prefectural hospitals (Audiberet *et al.*, 2013). This huge role may be the reason why THCs are particularly high users of both trained labor and resources. Consequently, it becomes important to know whether such a large allotment of financial and human resources translates into equitable health services, or if it further increases inequality.

Despite the potentially adverse consequences of unequal access to quality THCs, there are few papers (and no rigorous empirical papers) that discuss inequalities at the township level. It is true that research teams have investigated the delivery of health care at the THC level. Unfortunately, most of the existing studies have been conducted within a single province, prefecture, or county (Mi *et al.*, 2007; Li, 2009a; Zhao *et al.*, 2011; Yang *et al.*, 2011).

Even with this limited literature base, there is an evidence of inequitable health resource allocation across the THC system. Studies have shown that poorer townships have limited funding resources (Yang *et al.*, 2011; Sun *et al.*, 2013). However, the samples used in these studies were small and regional, and therefore may not be representative of different parts of China. Beyond inequities in facilities and equipment, the literature also documents that some townships suffer from being operated by low-quality medical staff and the disparities in staff quality may be significant

(Li, 2009b; Sun *et al.*, 2013; Yang *et al.*, 2011). However, these studies also suffer from the problems inherent in the use of small, regional samples. In short, the existing literature does not investigate whether the levels of physical and human resources are poor in THCs across all of China's regions, irrespective of township wealth.

Given the central role of THCs in China's rural healthcare system (and thus the health of rural residents), acquiring a more thorough and rigorous understanding of this system is necessary to improve future rural healthcare outcomes. Therefore, the overall goal of our paper is to analyze the extent of inequality in medical resource allocation among China's THCs. To examine allocation inequality, we pursue three specific objectives. First, we compare the finances of THCs in different regions according to their annual per capita revenues and expenditures. Second, we compare key dimensions of human resources across rich and poor THCs. Third, we describe the allocation of facilities and medical equipment (as well as other assets) across THCs in China's richer and poorer areas.

The rest of the paper is organized as follows. In Section 2 we discuss our data and the nature of sample. In Section 3 we present our results and analyze the extent of inequality in medical resource allocation among China's THCs. The final section concludes.

2. Data and methods

2.1 Sampling and data collection

This study makes use of data from a nearly nationally representative survey in rural China conducted by the Center for Chinese Agricultural Policy at the Chinese Academy of Sciences in 2011. In this survey, 50 townships were randomly selected from 25 counties located in five provinces from different regions of China.

The sample townships were selected as follows. First, five provinces were each randomly selected to represent China's five major agro-ecological zones: Jiangsu represents the Eastern coastal areas (Jiangsu, Shandong, Shanghai, Zhejiang, Fujian, and Guangdong); Sichuan represents the Southwestern provinces (Sichuan, Guizhou, and Yunnan) plus Guangxi; Shaanxi represents the provinces on the Loess Plateau (Shaanxi and Shanxi), Inner Mongolia, and the rest of the provinces in the Northwest (Inner Mongolia, Gansu, Ningxia, Qinghai, and Xinjiang); Hebei represents the North and Central provinces (Hebei, Henan, Anhui, Hubei, Jiangxi, and Hunan); and Jilin represents the Northeastern provinces (Jilin, Liaoning, and Heilongjiang).

After the provinces were selected, the second step of the sample selection involved choosing the counties and townships. Five counties were selected from each province, one from each quintile from a list of counties arranged in descending order of per capita gross value of industrial output (GVIO). GVIO was used because Rozelle (1996) shows that unlike other income indices, it leaves little room for error which makes it suitable for our stratification purposes. Within each county, the survey team chose two townships, one from each half of a list of townships also arranged in descending order of per capita GVIO.

During the survey, the study teams collected data on the basic information on the township itself as well as its THC for 2011 (collected in 2012). Enumerators surveyed staff in the finance and accounting sections of the township government to collect basic social and economic indicators.

During the same visit, the investigators interviewed the director of each THC to collect detailed information about the basic situation of the township hospitals. Three parts of the questionnaires filled out in this section of the survey produced data

that form the core of this paper. First, enumerators collected information on the basic financial information of the THC. Information was collected on the total THC revenues and expenditures. THC officials also provided information on the amount of government subsidies and transfers they received.

Second, the interviews also produced data on THC human resources. The total number of staff members at each THC was recorded. In addition, enumerators collected rich information on each member of the THC staff, including each employee’s demographic information (gender, age, level of education, and formal level of credentialing).

Finally, an enumeration was carried out on the facilities and equipment of each sample THC. Information was elicited about the number of beds and the size of the area of the building structures. THC respondents also provided information concerning on-site medical equipment (e.g. blood test units, general X-ray units, ultrasound scanners, etc.).

The final sample includes 47 THCs. Although we visited 50 towns, the THCs in three towns had been administratively absorbed by the local county hospitals. As a result of the stratified sampling design discussed earlier, the remaining 47 towns are nationally representative in terms of both income and geography.

Using the information provided by the townships on income per capita, we divided the 47 THCs into three economic levels. In this paper we compare finances, human resources, and equipment and assets between the richest tercile (or the 16 THCs in the richest 16 towns) and the poorest tercile (or the 16 THCs in the poor 16 towns).

3. Results

3.1 Inequities of finances

According to our data, there are significant disparities that exist among THC in terms of financial health (Table I). THCs in richer townships have much better revenue-earning abilities than THCs in poor townships. Relying on annual per capita revenue figures, rich THCs earn per capita aggregate revenues that are much higher than THCs in poor townships (Table I, row 1).

If we disaggregate by revenue source, THCs from towns in the upper tercile receive more revenue from medical procedures and medicine sales (Table I, rows 2-3). Interestingly, THCs from rich townships, despite higher revenues (and potentially lower demand, as rural individuals have more healthcare choices in areas with better

Annual per capita revenue	THCs in poor townships (bottom tercile; RMB) (1)	THCs in rich townships (top tercile; RMB) (2)	Difference (1)-(2) (3)	t-test (p-value) H0: (1) = (2) (4)
Total	94.48 (61.82)	200.63 (183.10)	-106.15 (49.78)**	0.04
Medical procedures	14.05 (23.17)	67.26 (98.09)	-53.20 (26.90)*	0.06
Medicine	25.05 (18.83)	57.12 (65.37)	-32.07 (18.13)*	0.09
Other	0.67 (1.37)	5.11 (10.35)	-4.44 (2.79)	0.12
Central government transfers	55.55 (48.60)	64.31 (32.57)	-8.76 (14.93)	0.56
County transfers	1.06 (2.89)	6.84 (10.89)	-5.78 (3.01)*	0.06

Table I.
Township health center (THC) annual revenue per capita across revenue sources (RMB)

Notes: Means with standard deviations reported in brackets; standard errors in parentheses; poor areas: $n = 15$, rich areas: $n = 16$; annual per capita revenue means annual revenues divided by the population in the town. **,***Significant at 10, 5, and 1 percent, respectively
Source: Ma *et al.*’s (2012) survey

transportation), are receiving equal amounts of transfers from the central government as THCs from poor townships (Table I, row 5). Moreover, despite having higher revenue flows and equal amount of transfers from the central government, THCs from richer townships receive more transfers from local county governments (Table I, row 6). Clearly, from the revenue and subsidies point of view, THCs from richer townships fare much better than those from poor townships.

The disparities in revenue/subsidies per capita between THCs in rich and poor areas also lead to significant disparities in THC expenditures per capita (Table II). The aggregate expenditures of THCs in richer townships are much higher than those of THCs in poor townships (Table II, row 1). If we disaggregate expenditures, THCs from richer townships spend more on medical procedures (Table I, rows 2-5). However, individuals spend similar amounts on medicine and community health work in THCs of both rich and poor townships (Table I, rows 2-5).

3.2 Inequities of human resources

In order to compare the human resources between rich and poor THCs, we compare three dimensions of human resources: THC medical staff per capita, the average level of education of the health system personnel, and the credentials of the THC staffs in richer and poorer townships.

According to our data, THCs in rich areas have higher levels of human resources than those in poorer regions (Table III). In particular, THCs in rich areas have a higher

Annual expenditures per capita	THCs in poor townships (RMB) (1)	THCs in rich townships (RMB) (2)	Difference (1)-(2) (3)	<i>t</i> -test (<i>p</i> -value) H0: (1) = (2) (4)
Total	90.40 (60.27)	172.38 (104.63)	-81.98 (31.80)**	0.02
Medical procedures	20.80 (31.47)	79.97 (73.07)	-59.17 (21.96)**	0.01
Medicine purchase	22.25 (22.09)	42.39 (50.03)	-20.15 (15.09)	0.19
Community health work	17.71 (33.68)	21.73 (15.12)	-4.02 (9.32)	0.67
Other	0.44 (1.39)	5.43 (9.67)	-5.00 (2.61)*	0.07

Notes: Means with standard deviations reported in brackets; standard errors in parentheses; poor areas: $n = 15$, rich areas: $n = 16$; annual expenditures per capita means annual expenditures divided by the population in the town. *, **, ***Significant at 10, 5, and 1 percent, respectively

Source: Ma *et al.*'s (2012) survey

Table II.
Township health
center (THC) annual
expenditures per
capita across forms
of expenditure (RMB)

Staff per population	THCs in poor townships (1)	THCs in rich townships (2)	Difference (1)-(2) (3)	<i>t</i> -test (<i>p</i> -value) H0: (1) = (2) (4)
THC personnel per capita	1.04 (0.36)	1.39 (0.70)	-0.35 (-0.2)*	0.10
THC attending physicians per capita	0.06 (0.08)	0.25 (0.18)	-0.19 (-0.05)***	0.00

Notes: Means with standard deviations reported in brackets; standard errors in parentheses; poor areas: $n = 15$, rich areas: $n = 16$; staff per population means the total number of particular THC staff members per thousand population of the town. *, **, ***Significant at 10, 5, and 1 percent, respectively

Source: Ma *et al.*'s (2012) survey

Table III.
Ratio of township
health center (THC)
staff to township
population

ratio of personnel per capita (Table III, row 1). To understand the categorical makeup of this personnel, we conducted a supplementary questionnaire for 150 randomly selected health workers in the 47 townships. The results show that 80.4 percent of the personnel are attending physicians, 9.5 percent are nurses, 5.4 percent are pharmacists, 2 percent are laboratory technicians, and 2.7 percent are public health workers. Since attending physicians provide the most critical services when it comes to patient care, we examine the ratio of attending physicians to township population, and find that the ratio is over four times larger in richer townships compared to poorer townships (Table III, row 2). This finding suggests that populations in poorer townships have less access to attending physicians.

Differences in the level of THC human resources between rich and poor townships appear not only in terms of quantity, but also quality. On average, THC in rich townships hire medical staff members with higher levels of education than those in poor townships (Figure 1). According to our data, most THC doctors and other medical staff members for poor townships only received technical secondary school (32 percent) or junior college (50 percent) degrees from schools in poor areas. Among THC doctors and medical staff in poor areas, only 15 percent graduated from a four-year college or above. In contrast, 44 percent of staff in rich township THCs held diplomas from four-year colleges.

We also found that medical staff members from THCs in richer areas were more likely to have received formal medical credentials than medical staff members from THCs in poor areas (Figure 2). According to our data, most staff in poor areas (72 percent) either only have earned the most basic of credentials (44 percent – not in figure) or had no credentials at all (28 percent). This means that only 28 percent of the medical staff in THCs in poor areas had earned intermediate or advanced credentials. In THCs in richer areas, more than half (51 percent) of medical staff had earned intermediate or advanced medical credentials, which is almost double the number in THCs from poor areas.

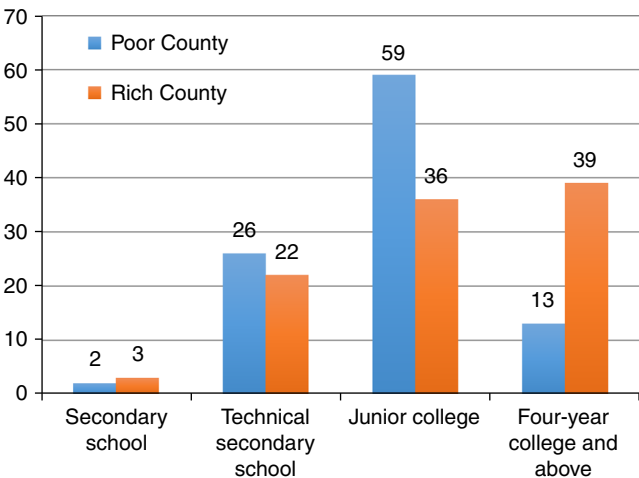
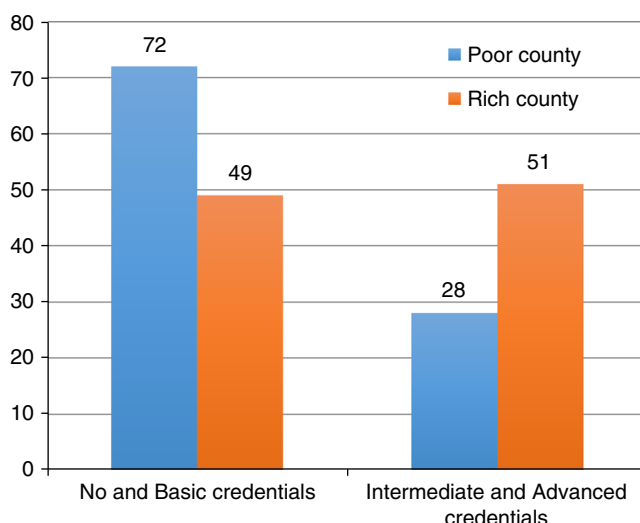


Figure 1.
Township health
center (THC) staff
education levels (%)

Note: *n* = 150
Source: Ma *et al.*'s (2012) survey



Note: $n = 150$

Source: Ma *et al.*'s (2012) survey

Figure 2.
Township health
center (THC) staff
credential levels (%)

3.3 Inequities of assets and equipment

In this section, we compare the financial assets and equipment available to THC's in rich and poor areas. To do so, we use value per capita (in RMB) to value the THC assets. As a basis of comparison, we use a list of equipment that all THC's are supposed to own and use according to official policy. This policy was issued as a part of the Ministry of Health's 2009 mandate, "Guidance for Five Primary Healthcare Institutions" (National Health and Family Planning Commission of the People's Republic of China, 2009). The list includes many pieces of equipment, including those for blood glucose testing, routine blood test units, routine urine test units, ultrasound scanners, general X-ray units, surgical equipment, pregnancy testing equipment, ventilators, and defibrillators.

According to our survey, THC's in richer areas have substantially higher THC asset values than those in poorer areas (Table IV). Specifically, THC's in richer areas have

Assets	THCs in poor townships (1)	THCs in rich townships (2)	Difference (1)-(2) (3)	<i>t</i> -test (<i>p</i> -value) $H_0: (1) = (2)$ (4)
Value of medical equipment per capita (RMB)	18.84 (26.03)	48.73 (58.32)	-29.89 (16.92)*	0.09
Value of building area per capita (RMB)	156.24 (226.49)	88.26 (104.98)	67.97 (63.09)	0.29
Beds per capita	1.88 (2.60)	4.87 (5.83)	-2.99 (1.69)*	0.09

Notes: Means with standard deviations reported in brackets; standard errors in parentheses; poor areas: $n = 15$, rich areas: $n = 16$; medical equipment and buildings are valued in RMB, which means per capita measures are the RMB value divided by the population of the town; beds per capita means beds per thousand population of the town. *, **, ***Significant at 10, 5, and 1 percent, respectively

Source: Ma *et al.*'s (2012) survey

Table IV.
Equipment and fixed
assets of township
health centers (THCs)

more medical equipment and beds for patients on a per capita basis. The only item that THCs in rich areas fall behind those from poor areas is buildings per capita (undoubtedly due to the fact that in poor areas building space and land is less scarce and costly). However, although the point estimate of the facilities areas in THCs in poor areas is higher than those in THCs in rich areas, the *p*-value suggests that the difference is not significant (0.29).

In terms of medical equipment, THCs in richer areas either have a statistically similar or larger amount of equipment than THCs in poor areas (Table V). According to our data, THCs in richer areas have statistically higher numbers of units of routine blood test equipment, pregnancy testing equipment (Table V, rows 2 and 4), and emergency care equipment (Table V, rows 8 and 9).

4. Conclusion

The overall goal of our paper was to analyze the extent of the inequality in medical resource allocation between China’s THCs. To meet this goal, we use descriptive and simple difference analysis to measure the differences in finances, human resources, and equipment and assets among THCs in the top and bottom terciles (in terms of average per capita income) of each township in our sample.

According to our data, the inequality of healthcare resources in China is high and pervasive. The finances of THCs in richer townships are better than those of THCs in poorer areas. The human resources are better both in terms of quantity and quality. Additionally, the facilities and medical equipment of THCs in richer areas are much better than those in THCs in poorer areas. In fact, THCs in poorer areas fall short of mandates of human and physical resources set by the Ministry of Health.

Hence, if human capital inequality truly impedes economic growth, then China’s economy is facing a serious challenge in terms of healthcare service provision. With such poor physical and human resources and inadequate finances, there is no doubt that growth will be affected. To combat this, China needs a new and more effective national program to build the capacity of the health systems in poor areas. This is no easy matter, since it must be developed on the foundation of a system that is weak in terms of both human and physical capital.

Table V.
Prevalence of
mandated medical
equipment in
township health
centers (THCs)

Equipment type	THCs in poor townships (1)	THCs in rich townships (2)	Difference (1)-(2) (3)	<i>t</i> -test (<i>p</i> -value) H0: (1) = (2) (4)
Routine urine test units	0.87 (0.35)	1.00 (0.00)	−0.13 (0.09)	0.14
Routine blood test units	0.80 (0.41)	1.00 (0.00)	−0.20 (0.10)*	0.06
Blood glucose testing equipment	0.87 (0.35)	1.00 (0.00)	−0.13 (0.09)	0.14
Pregnancy testing equipment	0.62 (0.51)	1.00 (0.00)	−0.38 (0.13)***	0.01
General X-ray units	0.87 (0.35)	0.93 (0.26)	−0.07 (0.11)	0.56
Ultrasound scanners	0.87 (0.35)	1.00 (0.00)	−0.13 (0.09)	0.17
Surgical equipment	1.00 (0.00)	1.00 (0.00)	0.00 (0.00)	–
Ventilators	0.20 (0.41)	0.56 (0.51)	−0.36 (0.17)**	0.04
Defibrillators	0.07 (0.26)	0.38 (0.50)	−0.31 (0.14)**	0.04

Notes: Means with standard deviations reported in brackets; standard errors in parentheses; poor areas: *n* = 15, rich areas: *n* = 16. *, **, ***Significant at 10, 5, and 1 percent, respectively
Source: Ma *et al.*’s (2012) survey

Recent work has documented the low quality of the rural health system in poor areas (Sylvia *et al.*, 2015). This paper shows that the quantity and quality of this system is poor throughout the rural economy. Hence, our work suggests that the national government must take steps to ensure that every locality works towards improving its health system to a point where it can be effective in building a more equitable and healthy society.

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Further reading

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