How far are we from universal access to TB service in China?

Barriers within health system in China which prevent TB patients from timely diagnosis under the background of health system transition

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How far are we from universal access to TB service in China: Barriers within health system in China which prevent TB patients from timely diagnosis of tuberculosis under the background of transition

A thesis submitted in partial fulfillment of the requirement for the degree of Master of Public Health
by
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Abstract

Objectives: Identify barriers within health system in rural China which prevent patients from access to timely diagnosis of tuberculosis, especially pulmonary tuberculosis, under the background of current health system reform.

Methods: Data used in this thesis comes through literature review of published TB research reports, papers, policies, journal articles in English and Chinese, and personal experience from 3 years working in the Global Fund TB program office, national center for TB control. Some data come from unpublished reports.

Conclusion and recommendation

In China village clinics, township hospitals, country hospitals and TB dispensaries are all the first line providers for TB patients. But for long time, TB dispensary is the only place for providing qualified and subsidized diagnosis service. The existing of unequal availability and affordability has become the barriers in terms of the utilization of service by patients. Policy for referring TB suspects from other health providers to NTP and bring diagnosis service to township hospital has been developed and implemented but lack of cost-effective analysis for those policies. New health insurance system has reduced the cost but impact on utilization is still not effective enough. Delay in diagnosis still exists.More systematic strategy is needed to improve the financial mechanism and involving more health providers towards universal access to timely diagnosis of TB.

List of abbreviations

CDC   Center for disease control

CMS   Cooperative medical scheme

CTD   County TB dispensary

DALYs   Disability-adjusted life-years

DOTS   Directly observed treatment, short course

DST   Drug sensitive test

EQA   External quality assessment

FFS   Fee-for-service

GDP   Gross domestic product

GF   the Global Fund to fight AIDS, Tuberculosis and Malaria

HBCs   High burden countries

HDI   Human development index

ISTC   International standard for TB control

PTB   Pulmonary tuberculosis

WHO   World health organization

MCH   Maternal and child health care service

MDG   Millennium development Goal

MDR-TB   Multidrug-resistant tuberculosis

MFA   Medical financial assistance

MOH   Ministry of health

NCDs   Non-communicable disease

NCMS   New cooperative medical scheme

NSB   National statistic bureau

NTP   National TB control program

PPM   Public-private or public-public mix

QA   Quality assurance

RTH   Rural township hospital

SARS   Severe acute respiratory syndrome

TB   Tuberculosis

TCM   Traditional Chinese medicine

UNFPA   the United Nations Population Fund

WB   the World Bank

Introduction

In 2003, I began to work in Tuberculosis (TB) control and prevention in Shandong, one of east-coast provinces in China. In stead of treating individual patients one by one as before when I worked as a physician, I started to think how to prevent a disease from happening in the general population. For TB, as for other infectious disease, the ways for prevention include detection and control of the reservoir of infection, blocking transmission route and protecting the susceptible population. As an airborne transmission disease for which no completely protective vaccine has been found, detecting and treating patients has become the most important way to prevent further transmission.

In 2004 I moved to work in National Center for TB control and prevention (NCTB). At that time I knew that, the stop-TB partnership has adopted TB control targets for 2005, set by the World Health Assembly, of detecting 70% of smear positive cases and successfully treating 85% of those detected. China, as one of the 22 high TB burden countries (HBCs), has achieved the target for successfully treating rate, but on the basis that the denominator only counted the patients registered in TB institutes, which only capture around 43% of estimated new smear positive patients in 2003 (WHO 2008). So the priority of TB control in China at the first half of 21 century is to increase case detection rate of new smear positive TB patients, on the basis of maintaining the high successfully treating rate. By the end of 2005, China has achieved the above targets and maintained new smear-positive case detection rate at around 80% for two years (See Annex 1).

But in WHO report 2008, "Global Tuberculosis Control, surveillance, planning and financing", WHO mentioned that "The Western Pacific Region is dominated by China, where case-finding expanded rapidly between 2002 and 2005. However, China has made no progress in case-finding since reporting that the 70% target had been met in 2005. The South-East Asia and Western Pacific regions are now slowing global progress in case detection." It looks strange that WHO showed

such a strong concern that China, one of only 77 countries who have achieved the smear positive case detection target by the end of 2006, about "no progress" and "slowing global progress", but if we consider the influence of large populations to disease burden, such as China and India together accounted for an estimated 35% of all new cases, and China is the third largest reservoir of undetected new smear positive cases in the world in 2006 (WHO 2008), we can understand that China can play a key role in decreasing the global burden of TB if it would be able to further improve case detection. Another concern is that although China has achieved the targeted case detection rate, cases might not be detected timely. The fact that China (unlike some of the other countries) has an estimated prevalence rate of more than twice the estimated yearly incidence rate might be a sign of late case detection (See Annex 2). So in this thesis I will discuss how China has achieved the international targets, what's the current barriers within health system prevent patients from accessing the timely diagnosis service and what can be done to further improve the early case detection by government, health providers and donors.

Chapter 1 gives some basic background information about geography, demography and economy development, major health problems, health system, TB epidemic and National TB Control and Prevention Program in China. Chapter 2 demonstrates the problems related to early case detection, why, when and how smear-positive case detection has become problematic in China. It also describes the overall and specific objectives of this thesis, and the methodology utilized. Chapter 3 elaborates the main findings obtained from literature review and personal experience from working at NCTB for 3 years, surrounding the study questions and objectives.. Chapter 4 provokes discussion concerning the important gaps between China policies & strategies and international request, and between strategies and practice for ensuring timely access to TB diagnosis service. Chapter 5 tries to provide the conclusion for the root reasons of problem and recommendations for best practice on improvement of health system to further increase access to TB service.

Chapter 1 Background information

1.1 China in general

China, with 1.3 billion populations living on 9.6 million Km^2 land in eastern Asia, is the most populated but the fourth largest country in the world (after Russia, Canada and United States). With less than 10% of the world's total cultivated land, China has provided food and clothing for one fifth of the world population. Bordered with Afghanistan, Bhutan, Burma, India, Kazakhstan, North Korea, Kyrgyzstan, Laos, Mongolia, Nepal, Pakistan, Russia, Tajikistan, and Vietnam, China has 14,500 Km coastlines along eastern and southern part of China (See Annex 3). From 1978, China has transferred from central-planned system to a market-oriented economy, and from then on its economy develops at average real growth of around 9% a year. Table 1 shows basic geographic, demographic information and Human Development Index (HDI) in China.

Table 1: Basic geography, demography information and HDI (ranks) about China

	Population (millions)	Surface area (sq.km, thousands)	Population growth rate (%)	HDI value	Adult literacy rate (% ages 15 and older)	Primary, secondary and tertiary gross enrolment ratio (%)	GDP per capita (PPP US$)
China	1,304.50	9,598.10	0.6	0.777(81)	90.9 (54)	69.1 (104)	6,757 (86)

Resource: Human development reports and the World Bank Group (Data for 2005)

1.2 Major health problem
1.2.1 Health status

In China, health status of people keeps increasing, and table 2 shows the current health status of Chinese population, but disparity between urban and rural areas is still significant. For example, in 2006, the infant mortality in urban areas was 8.0‰, while in rural areas it was 19.7‰; maternal mortality rate was 24.8/100,000 in urban areas and 45.5/100,000 in rural areas.

Table 2: Basic information about health status (ranks) of China

	Life expectancy at birth (years)*	Fertility rate (births per woman)	Maternal mortality rate (per 100,000)	Infant mortality rate (per 1,000 live births	Mortality rate, under-5 (per 1,000)*	Prevalence of HIV (% of population ages 15-49)
China	72.5 (68)	1.8	36.6	15.3	25	0.1

Resource: National statistic bureau of China (Data for 2007)
*Data for 2005

1.2.2 Non-communicable diseases (NCDs)

In China, according to Mathers (Wang et al 2005), non-communicable diseases account for an estimated 80% of total deaths and 70% of total disability-adjusted life-years (DALYs) lost (See figure 1), because of lifestyle westernization following improved living standards and increasing aging population. Data from National Bureau of Statistics of China also confirms that in 2006 the top 5 causes for death in urban area were cancer, cerebrovascular disease, heart disease, respiratory disease, and injury & toxicosis, for rural area the only difference is respiratory disease ranked the third instead of heart disease which ranked 4th (NSB 2007).
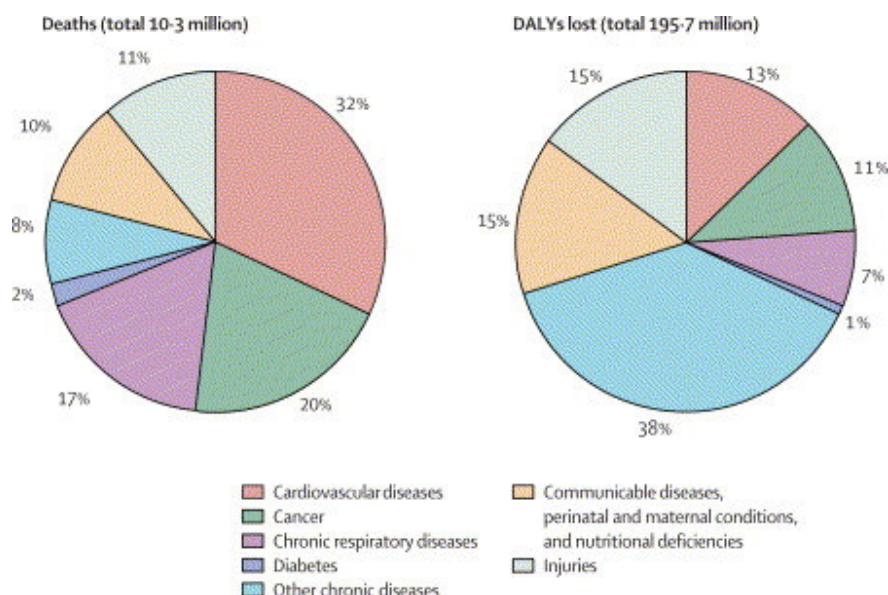
Figure 1: Estimated proportions of total deaths and DALYs lost for all ages in China, 2005

1.2.3 Communicable diseases

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According to the reporting system on infectious diseases, the top 5 infectious diseases in terms of notification rate in 2006 were virus hepatitis, pulmonary tuberculosis, bacterial and amebic dysentery, syphilis and gonorrhea. Meanwhile Rabies, plague, human avian influenza, AIDS and meningococcal meningitis are the 5 infectious diseases with highest case-fatality rate in China (NSB 2007). Prevalence of HIV (% of population ages 15-49) was 0.1 in 2006, and malaria mainly exists in several southern provinces of China.

1.3 Health system

Influenced by the former Soviet Union, health system in China consists of a series of vertical lines: one line is consisted of three-tier healthcare networks (county/district hospitals, township health centers, and village/community clinics) in urban and rural areas, with medical university & teaching hospitals (including traditional medicine) and specialist hospitals mainly in city and above level; one line is special for providing maternal and child health care services (MCH); the third line is formed by centers for disease control and prevention (CDC) at county and above level, which is for public health, evolving from Chinese Academy of Preventive Medicine (CAPM) at central level and epidemiological stations (EPS) at lower levels. All those services in those three lines, led by separate department within Ministry of Health (MOH) (Medical Administration, MCH, Disease control, etc.), are provided at provincial, prefecture, county/district, township and village/community levels (Lee 2003). In 2007, the density of physicians is 1.56 per 1,000 populations and density of nurses is 1.12 per 1,000 populations (NSB 2007)., just achieved the WHO minimum threshold of 2.3 doctors, nurses, and midwives per 1,000 population. Hospital beds in 2006 were 22 per 10,000 populations. After economic reform, more than half of health services' funding is from user fee (See table 3).

Table 3: Funding of health services (comparing 2000 to 2005)

	Total expenditure on health (THE) as percentage of GDP		Per capita THE at average exchange rate (US$)		General government expenditure on health (GGHE) as % of THE		Private expenditure on health as % of THE		Out-of-pocket expenditure as % of private expenditure on health	
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
China	4.6	4.7	44	81	38.3	38.8	61.7	61.2	95.6	85.3

Resource: WHO-National Health Accounts 2006.

1.4 National TB Control Program (NTP)

China is still one of 22 high TB burden countries. According to Global TB report 2008 by WHO, in 2006, the estimated prevalence of all form TB of China was 201/100,000 (ranked 18th), the estimated number of all form TB patients of China was 2,658,000 (ranked 2nd), and China has the highest estimated number of multi-drug resistant TB (MDR-TB). Pulmonary tuberculosis (PTB) was still the 9th cause of death for men in China's rural area in 2006(NSB 2007). Data from the National Random Survey for TB epidemiology in 2000 shows that the prevalence of active and smear positive PTB were 300/100,000 and 97/100,000 respectively (MOH 2002), the TB mortality was 9.8/100,000 (See table 4), and MDR-TB accounted for 10.7% of sputum culture positive TB.

The National Center for TB control was established in 1982, and the first 10 year NTP was designed at the beginning of 1980s. From the second NTP, China began to adopt DOTS strategy, an internationally recognized cost-effective mechanism for TB control; in order to get more financial support for expanding DOTS, the Chinese government applied for a World Bank (WB) project (1992-2000) covering 13 out of 31 provinces. The third NTP (2000-2010) focuses on DOTS expansion and quality enhancement; during this period, China applied for a second WB project for DOTS expansion (2002-2010) covering 16 provinces, and later on the Global Fund against HIV/AIDS, TB and Malaria to fill the financial gap for high-quality DOTS expansion and enhancement (Round 1 and 4) and dealing with the

three emerging challenges - MDR-TB, HIV/TB and TB among migrant workers (Round 5 and 7); from 2006, China formally involved strategies   for tackling MDR-TB, HIV/TB co-infection, TB control in migrant population and prisons in its implementation plan (2006-2010) for NTP; meanwhile, consistent with the Stop TB Strategy launched by WHO in 2006 (WHO, 2006), China also strengthened activities such as Public-public cooperation (PPM), community involvement in health promotion, case detection and treatment, and operational research on TB control.

According to data for China from WHO, the total real costs for TB control in 2006 was 149 US$ million, and the budget for 2008 is 225 US$ million, among which 67% will come from government, and funding gap accounts for nearly 28% (WHO 2008).

Table 4: The trend of TB prevalence and mortality from 1979-2000

Categories	Standardized prevalence (1/100,000)			Categories	Mortality (1/100,000)		
	1979	1990	2000		1983/84	1989	1999
Active PTB	796	523	300	TB of all form	35.0	20.4	9.8
Smear+ PTB	218	134	97	PTB	31.0	19.1	8.8

Resource: Report of National Random Survey for the epidemiology of TB in 2000

Funding for TB control from government or donors goes into the NTP, and the TB institutes (mostly one department of CDC) from county to national levels are the main implementers of the NTP, which is run as a vertical program (See Annex 4). TB institutes at central, provincial, prefecture are responsible for reporting and analyzing the information about TB patients, providing supervision and technical assistance to lower levels. County TB institutes-TB dispensaries (CTD), only one for each county, are the key facilities for registering, diagnosing, treating, managing and reporting TB patients, where TB patients/suspects will get free sputum smear and chest X-ray examinations, and also free anti-TB drugs for confirmed patients. Hospitals and clinics should refer out-patients/suspects to TB dispensaries for further diagnosis and treatment. TB patients, once diagnosed,

will take the drugs under directly observed treatment (DOT) by village doctors or family members. Treatment should also be supervised by health staff from township hospitals and county TB dispensaries (MOH 2007a). Free anti-TB drugs are procured by central or provincial governments and provided by TB dispensaries, following the guideline for anti-TB drug management. The bottom-up reporting system ensures that the data are collected and analyzed every quarter from county level to central level, including information of TB patients, drug management, training, supervision and health promotion activities, etc..

In response to the targets set by Stop TB partnership for 2005, which is at least 70% of people with infectious TB will be diagnosed and at least 85% of those diagnosed will be successfully treated, in 2004, China government committed to achieve those targets by the end of 2005. A series of measures were taken to strengthen Stop TB Strategy. By the end of 2005, China achieved 70% case detection rate of new smear positive TB patients and 85% successful treatment rate as committed.

Chapter 2 Statement of problem and methodology

2.1 Problem statement

In order to achieve Millennium Development Goal (MDG) 6 "Combat HIV/AIDS, malaria and other diseases", target 8 relevant to TB to "halt and reverse TB incidence by 2015", the Stop TB Partnership has set up two additional impact targets to "halve prevalence and death rates (reduced by half) by 2015 compared with their level in 1990", and then two outcome targets "detect at least 70% of new smear-positive cases and to successfully treat at least 85% of detected cases" by 2005, and to be sustained or exceeded by 2015.

For China, before 2005, successful treatment rate had remained above 85% since the first WB project for TB control starting from 1992, but the case detection rate stayed low for many years, around 30% from 1996-2002, and much lower than that before 1996. The reasons included that the detected cases were limited in those patients registered within TB dispensaries and there is only one TB dispensary for each county; the cases diagnosed outside of county TB dispensaries were not registered and therefore unable to show in the reporting system at that time, so were not in the denominator for successful treatment rate, and government subsidizes TB diagnosis and treatment only through TB dispensaries. TB dispensaries are the main qualified places for detecting and registering TB patients, providing and follow-up treatment and outcome. But studies show that most TB patients will not go to TB dispensaries directly after onset of symptoms and the more health facilities patients visited before going to TB dispensary, the longer delay they would experience for diagnosis (Wang & Jiang 2007).

Delays in diagnosis will consequently lead to delay in initiation of effective treatment of TB patients especially infectious patients, which will increase morbidity and mortality from tuberculosis, as well as the risk of transmission in

the community. According to WHO, "left untreated, each person with active TB disease will infect on average between 10 and 15 people every year. 5-10% of people who are infected with TB bacilli (but who are not infected with HIV) become sick or infectious at some time during their life. People with HIV and TB infection are much more likely to develop TB. Uncompleted or irregular treatment will not cure TB and even will lead to drug resistance TB. A particularly dangerous form of drug-resistant TB is multidrug-resistant TB (MDR-TB), which is defined as the disease caused by TB bacilli resistant to at least isoniazid and rifampicin, the two most powerful anti-TB drugs" (WHO n.d.). The treatment of MDR-TB will be more costly and difficult to manage.

How to increase the access to timely case detection has become the priority of China NTP in early 2000s. Ensuring the referral of suspects/patients from general health facilities to TB dispensaries was one solution. A serial referral policy and a lot of efforts have been performed on ensuring patients being referred from hospitals and clinics, and really arriving TB dispensaries. Those efforts include providing incentives to doctors in hospitals and clinics for referring TB patients, intensive supervision on patients' records in hospitals to find out if all suspects have been referred, tracing patients who did not arrive at TB dispensaries after being referred etc. (MOH 2007b). The effect is significant with case detection rate increased from 43% and 64% in 2003 and 2004 respectively to 80% in 2005, and successful treatment rate remaining above 90%.

The achievement is based on the estimated incidence rate, but if we consider that the estimated prevalence is a twice time as high as the estimated incidence in China, the DOTS program may be not effective enough to reduce the duration of illness, either because of the delay for diagnosis or due to incompliance to short-course treatment (Dye c. et al 1999). A study conducted across four provinces in 2004-2005, found that around 20-30% patients and suspects have a delay in seeking health care after 3 weeks of onset of symptom, and 30-60% of patients

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experienced a delay of more than 2 weeks in receiving a diagnosis after first seeking care (MOH 2005). Data from TB reporting system shows that by the end of 2006, only 71% patients/suspects reported by hospitals really arrived at TB dispensaries nationwide, which means there were still around 30% suspects/patients have arrived health facility but not received TB control health service or received substandard service (Internal material).

Why patients can not timely access the TB service has become the biggest concern. The Chinese NTP is now working to improve access to high-quality TB care for all people with TB, especially the poor and vulnerable. Because according to epidemiological surveys of tuberculosis in 2000, the prevalence of active and smear positive TB in rural area was higher than urban area (see table 5), the social and economic disparity between rural and urban population is large with the rural laging behind, and in china nearly 70% population is in rural area (MOH 2002), so rural areas is the focus of my thesis. Meanwhile following economic reform started from 1978, the health system of China also went through a series of change; in order to achieve the target of "health for all", more health system transitions will be happening in the following years, and those transitions will influence the access of TB service, so my thesis will consider the factors within health system under the background of health system reform. Access to TB care is started from access to diagnosis service, and cure rate has stayed relative high even after case detection increased, so my thesis will focus on what are the barriers of timely case detection within health system under the background of transition in rural China and how to lift them.

Table 5: TB prevalence in city, township and village (1/100,000)

Type of population	Active TB	Smear + TB
City	198	73
Township	319	109
Village	397	130

2.2 Objectives
2.1 Overall objective:

Identify barriers within health system in rural China which prevent patients from access to timely diagnosis of tuberculosis, especially pulmonary tuberculosis, under the background of current health system reform.

2.2 Specific objectives:

➢ Describe the first line providers for TB control service in rural China and identify current health system and policies used in China to ensure adequate access to TB control services.

➢ Analyze in how far the current system and policy are effective in ensuring adequate access to timely TB diagnosis and identify the most important gaps.

➢ Learn from and compare with international experience to further deduce if the health system and policies can be made more effective and efficient.

➢ Use the findings to make recommendations to health care providers, government and donors, on improvement of the health system to further increase access of TB control service in China.

2.3 Materials and methods to be used
2.3.1 Methods

Data used in this thesis comes through literature review of published TB research reports, papers, policies, journal articles in English and Chinese, and personal experience from 3 years working in the Global Fund TB program office, national center for TB control. Some data come from unpublished reports.

2.3.2 Conceptual framework

This thesis is built on conceptual framework extended from the Piot Model. The Piot Model demonstrates all steps that patients have to take when they are ill in order to be cured, including case detection and treatment, total 7 steps. Since this thesis focuses on case detection, so only uses part of this model, steps 1-4,

analyzing influencing factors for timely case detection related to health system response (See figure 3).
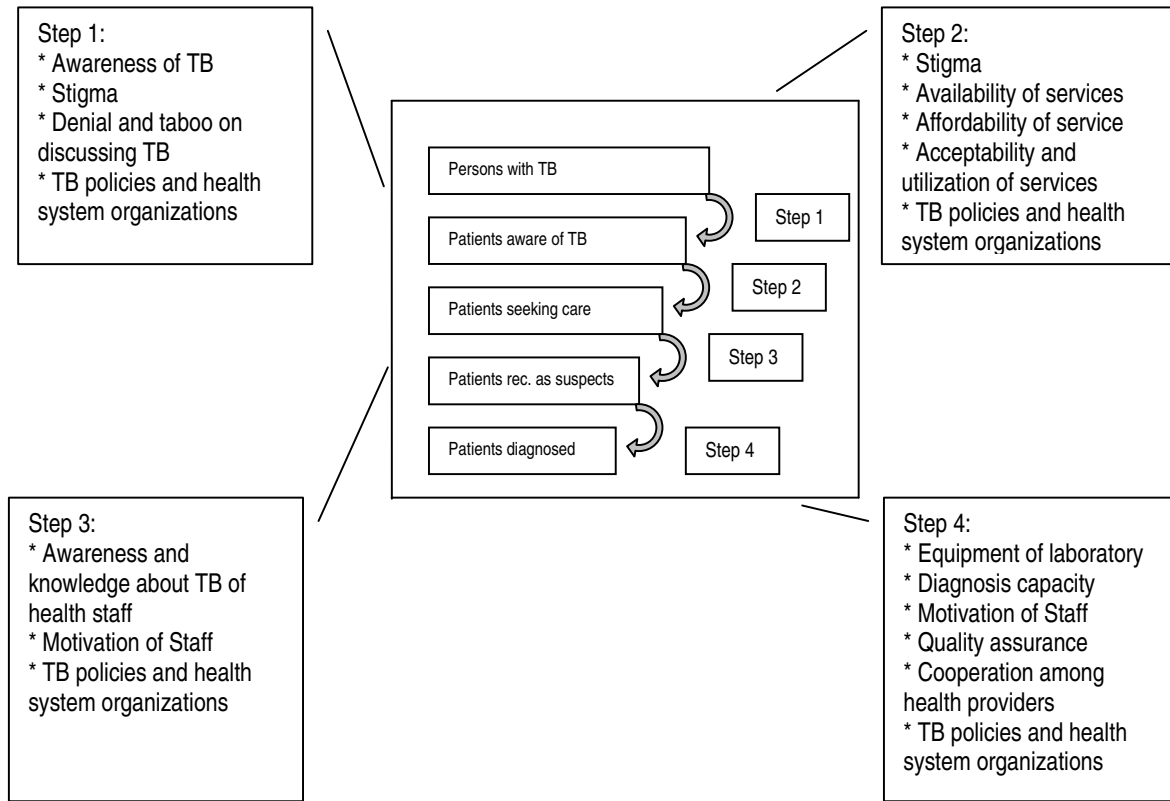
Figure 2: Factors influencing timely diagnosis of TB patients

2.3.3 Searching strategy and Key words

Searching tools such as pubmed and google, and website of WHO, WB, StopTB partnership, DCP2, China MOH, China CDC are used for searching relevant literatures. Key words includes first-line health provider, health service delivery, provider payments, referral system, tuberculosis, rural health care, health system reform, TB control, China, universal access, PPM, diagnosis delay, Piot model, TB diagnosis, primary health care.

Chapter 3 Study results

The demonstration of results will cover main factors described in concept framework but not necessarily following the same order, which include availability (geographical and technical), affordability, acceptability and finally utilization of TB detection services, collaboration among health providers for detecting TB cases, comparing what's in policies and strategies to ensure timely diagnosis, what happens in practice, and what can China learn from the international experience.

Because the symptom of TB is not specific, the health seeking pathway of TB patients before final diagnosis will be similar as for other patients. So this chapter will start from first line health providers for all disease, and then focus on providers for TB patients.

3.1 Availability of TB detection service

3.1.1 First line health providers in rural China

In rural China, a three-tier health and disease prevention networks have been established to provide health services (both curative and preventive) to the population short after the P.R. of China was established in 1949. The three-tier includes, from bottom to up, village level-village clinics (at least one for each village), town level-township hospitals (or health centers, at least one for each town) and county level-county general hospitals, CDC (include TB dispensaries) and MCH (at least one for each county).

The village clinics, usually covering the population of one village (average more than 1,000 populations /village), are supposed to work as gatekeepers of the rural health system, providing primary health care and prevention services, most of which don't have laboratory. Before the 1980s, around 60-70% of visits to

health facilities in counties happened at village clinics, but that has changed after economic reform, (more details will be in 3.2). The township hospitals (health centers), usually covering the population of one town (average 25,000 populations /town) (Ma 2007), work like a linkage between village clinics and county hospitals, conveying diagnosis, treatment for most disease, and also public health; county hospitals, covering the population of one county (from 5,000 to more than one million population/county), mainly focus on more complicated diseases and prevention services. County CDCs serve as a basis for implementing and supporting public health approach, not only for preventing infectious disease, but also NCDs including health promotion. TB dispensaries, mostly in county CDCs or as independent institutions, are the key facilities for diagnosing and registering, where TB patients/suspects will get free sputum smear and chest radiography examinations.

Because now in China, the referral mechanism is not working well (more details will be in 3.2), which means patients can visit any facilities in this system directly, so in this case these three-tier facilities are all first line health providers for rural area.

3.1.2 Geographical availability of first line health providers

From table 6 we can see that almost 98.8% of the towns have health centers and 74.3% of the villages have clinics nationwide. For those town with township health centers, the residence of 28.8% of villages have to go more than 5km to health centers, and the population of the 25.7% villages without clinics will have to use the clinics in neighbor villages, then it is imaginable for those populations that the distance from home to clinics will be far. What this table doesn't demonstrate is 100% of counties have county hospitals and CDC.

Table 6: general situation of health providers in rural China (by the end of 2006)

	Whole country	Eastern part	Middle part	Western part	North-eastern part
% of towns with township hospitals	98.8	99.2	99.2	98.8	96.4
Classified by distance from village to township hospitals					
0km (within villages)	7.2	7.0	6.7	7.8	7.4
1-3km	43.0	51.8	43.1	34.1	29.8
4-5km	21.0	21.3	22.9	18.5	22.4
6-10km	19.3	15.5	19.9	22.0	29.0
11-20km	7.5	3.9	6.2	12.8	9.7
20km and more	2.0	0.5	1.2	4.8	1.7
% of villages with clinics	74.3	74.1	79.6	68.1	81.7
% of village with qualification certificate doctors	76.1	75.9	80.8	68.9	91.5
% of village with qualification certificate midwives	16.3	9.3	19.3	20.9	23.9

Resource: Second nationwide agriculture census.

Anson et al. in his survey conducted in Hebei province of China proved that some villagers had to seek health services from other villages due to lack of the service in their place. His study also found that usually the villages without clinics were the one with the lowest household per-capita income, and located relatively far from the third layer of health system, like county hospitals and TB dispensary, at average distances of around 30 km. For the villages with clinics, the average distance from village to county hospitals and TB dispensary is around 10-20 km (Anson & Sun 2005). TB dispensaries locate at county level, and for each county there is only one. So in most cases, TB dispensaries are not the first facilities for TB patients seeking health service, as what will be further described in 3.3. Hebei is a middle size province with GDP per capita ranked 12 in 31 provinces of China in 2006. So in larger and poorer provinces, the problem about availability of health service could be even more serious.

3.1.3 Availability of qualified service

The guideline for TB control in China requires that all PTB suspects, who cough for more than 2 weeks or hemoptysis, should go through screening by sputum smear

and chest X-ray exam for TB diagnosis. So this section will describe the layout of equipment and skill of technicians in the three-tier health system.

Village clinics usually are supposed to provide basic health services including assisting with births, treating minor illnesses, and providing emergency first aid and immunizations, and organize public health campaign, but the latter has been weakened because village doctors are not compensated for health education, and they cannot afford to spend time away from their farms and their practice. Village clinics are staffed by village doctors, midwives, nurses' aides and assistant technicians, who, once are called "barefoot doctors" before 1980s, are trained basically through a few weeks to 6 months pre-service training after secondary or high school education, continuing education, and in-service training (Liu & Yi 2004) The most common equipment used in village clinics are stethoscope, thermometer, and blood-pressure meter. Most of village clinics don't have laboratory and technicians. One survey conducted in Hebei province showed that among the major two types of village clinics in rural area, home-based and collective clinics, only 5% of the home-based clinic in rural Hebei is equipped to perform a urine test, and only one-third of collective clinics are able to perform blood or urine tests. Sputum smear exam is basically unavailable in village clinics (Anson & Sun 2005).

More complicated cases and inpatient cares are provided in township hospitals (0.6 beds per 1000 population). Township hospitals personnel, as anticipated, usually with 2-3 years of medical school education after high school education, include assistant doctors, nurses and technicians. But in reality, the situation is even worse. For example, Yuzhong county of Gansu province has 4 central township hospitals and 15 general township hospitals. Among 411 health professionals in township hospitals, only 19.5% received college education, 48.4% schooling less than 12 years. 63.5% of those health workers don't have any professional qualification or technical titles (among the other 36.5%, senior

0.5%, middle 8%, and junior 28%). The equipment of township hospitals vary dramatically, with some of them only have stethoscope, thermometer, and blood-pressure meter, and others may have computed tomography (CT) and color ultrasonograph. Most township hospitals have been equipped with X-ray machine and microscopy for blood, urine and feces routine exam, but sputum smear exam is not performed routinely, not to mention examination for TB bacilli.

County hospitals (2-5 beds per 1,000 populations) provide more skillful specialist services and have more high-tech equipment. County hospitals are staffed with doctors trained in medical colleges normally last for 5 years, including an internship year, aided by assistant doctors, nurses and technicians. X-ray machine and microscope are the basic equipment every hospital should have. But not all hospitals can perform sputum smear exam for TB. Even those do perform, the result sometimes is questionable so not reliable because of lack of training and quality control (Zhou et al 2006). Health professionals in hospitals have the highest education level, followed by health professionals at CDCs.

County TB dispensaries, as specialized institution for TB control, have difficulties in maintaining their skilled personnel and attracting young medical graduates, because of the insufficient financial support from governments and the difficulty in revenue generation from preventive services (Liu & Yi 2004) (more detail in 3.2). By the end of 2005, more than one third of CTDs have less than 5 full time personnel, the amount required by NTP for implementing high quality services, and only one-tenth of personnel have received more than 5 years medical education and 30% of personnel working in TB institutes nationwide has middle and above qualification. (Zhou et al 2005) Every TB dispensary has laboratory and X-ray machine, one technician for sputum check and one for radiography. By the end of 2006, only 360 out of 3010 laboratories can conduct sputum culture and 90 can perform drug sensitive test (DST) in China, and 92% of laboratories performing smear microscopy (in TB institutes) have been covered by blinded

rechecking (EQA), according to WHO report 2008. Pre-service training and refresh training for laboratory technician and continues training for X-ray technician are required by NTP. Insufficient human resource capacity and inadequate financial support for quality assurance (QA) are still the main problems for further improving diagnosis quality (WHO 2008).

Some small scale surveys show that the awareness for TB epidemic of health providers out of TB dispensaries is not high enough which will influence quality for recognizing TB suspects.

3.2 Affordability of TB detection service

3.2.1 Influence from payment mechanism

Provider payment mechanism is crucial for determining performance of health care system in terms of cost containment, efficiency and quality of health care, which will further relate to the affordability and availability of health service. This part focuses on the influence to affordability. The providers of health service in China mainly receive payment from three resources including direct government subsidies (20%), individuals' out-of-pocket payment (60%), and reimbursement from health insurers to health providers (20%) (Karen et al 2006). In order to better understand the current payment mechanism of China, we have to retrospect what has happened to health financing system after economic reform.

Health system reform from 1980s to the first half of 1990s

Before economic reform, government subsidies and health insurers covered most expenditure. From 1978, China transferred from the central planned economy to market-based economy. Government began to put more emphasis on economic growth and leave health system following the same marketing rules. Following this policy change, financing mechanism for health service, including TB control service, also went through a series of changes. Firstly, financial support from government for health service has decreased, and providers are allowed to get payment from fee-for–service (FFS), in order to encourage the competition among health providers. Secondly, health insurance system (cooperative medical

scheme-CMS) in the rural areas has collapsed following the dissolving of commune system. Thirdly user-fee has become the main funding resource for health service.

With those changes, fee-for-service from patients has become the dominant payment model for health providers, the same for public health facilities. Public hospitals or public health agencies had to function like for-profit agencies to focus on revenue generation (Blumenthal & Hsiao 2005). The positive results include increased quality, efficiency and ability for providing health service, but unnecessarily over-prescribing medicine, overusing health service or overcharging patients for health care emerged, with health expense increased, and disease prevention, maternal and child health and health education neglected. (Wang et al 2007). All those have made the poor more vulnerable

Health providers have to compete for individual patients with each other, meanwhile patients can choose whichever level of provider they can afford. The former strict referral system has dismantled with the weakened linkage between the three levels of health care network, resulting in the higher-level hospitals (e.g. county) are overloaded with higher-income patients, while the lower-level hospitals (e.g. township) are underutilized and visited by mostly low-income patients (Karen et al 2006).

Most village clinics dismantled with the remaining became the private, only 15% are supported by collectives. Village doctors are supported primarily on a fee-for-service basis and by profits from the sales of medications. A large proportion of patients' expenditure was due to over-treatment. With decreased demand, increased cost and shrunk government subsidy, rural township hospitals (RTHs) are facing crisis. Only part of staff salary of township hospitals are supported by township government, all the rest are from user fee. In 1985, the total revenue of RTHs was far from covering their total cost and it was estimated that about

one-third of the RTHs could not make ends meet. County hospitals at the same time got relatively more financial support from government, including salaries for registered health workers and subside for registered beds, but they still need to earn the rest.

TB dispensaries, as facilities for disease prevention, are facing the same situation. Although they got subsidies from government or other projects for providing free diagnosis and anti-TB drugs and conducting other activities such as supervision and health promotion, as they can only get part of salaries for their staff from local government, especially in the poor areas, so besides subsidies from government for certain activities, some of them are also trying to make revenue from their services, such as inducing patients to have unnecessary test or examination or take extra medicine which are out of free policy.

New rural health system reform from second half of 1990s to now
From 2000s, China government began to transfer from economic-centered strategy to people-centered strategy. Strongly realized the former health system reform was far from perfect and trying to provide health for all, government starts a new series of health system reform, based on pilot starting from 1990s.

The systematic reform plan is still under development but some consensus have been perceived and got by both government and general population. The target is everybody has access to basic health services. The principles are prioritizing public health especially on prevention of disease, focusing on population in rural area, combining traditional Chinese medicine and western medicine. Government will play more important role in terms of policy-making and financial supporting, including rebuilding CDCs for prevention service, restoring three-tier health system for basic health service, and rehabilitating health insurance system for risk pooling. (MOH 2007c and websites) Specific activities closely related to rural health care include providing additional financial support from central and local

government for rebuilding three-tier health facilities and allocating necessary equipment, started from 2007 and funded by national loan project; giving financing and managing responsibility of township hospitals back to county government; establishing new CMS (NCMS) and medical financial assistance system (MFA) etc..

New CMS started from mid1990s but really began until 2003; in general it is a voluntary insurance funding consisted of contribution from villagers, local government and central government (80% from governments) and aims at providing basic drugs and primary health care to peasants. It covers both outpatients and inpatients cost with combining deductible, co-payment and ceiling to control insurance expenditures (Meng, 2007). News from MOH (2008) shows that by the end of March 2008, 93.6% of counties and 91% rural populations have participated in the new CMS. Funding per person in 12 out of 31 provinces (autonomy regions, municipals) has achieved 100 Yuan (around $14), close to the real cost per capita for poor rural populations (Kelaher & Dollery). MFA is a government-supported program aimed at helping the poor in rural and urban areas to access basic health care and preventing impoverishment due to illness. But now MFA is still in its early stage (started from 2003-2005), no national model is defined on how to implement it. Mostly it is used to support premium contribution for new CMS and reimbursement for catastrophic expenditures beyond the ceiling of CMS. Some counties have begun to use MFA to support patients' transportation cost for seeking health (from what I heard in supervision).

Many pilots of NCMS in China are trying to establish a mixed payment system, combining fee-for-service with prospective payment such as fixed charge, capitation etc. They are trying to contract village doctors or township hospitals for providing basic health service including disease prevention and health promotion.

This mixed payment system is becoming popular across the OECD (Eggleston et al 2006).

The effect of those systems is still controversial with some studies showing it has improved overall health care utilization and access while others showing not effective as expected, especially no impact on out-of-pocket spending or on utilization among the poor (Meng 2007, Wagstaff et al 2007).

3.2.2 Funding for TB control

From 2000s, especially after SARS crisis, the China government has endeavored to tackle public health problems. The funding for public health has been increased, along with the funding for four priority communicable diseases including tuberculosis. TB funding from central government increased by more than seven times from 2001-2005. The additional funding has been used to expand health-promotion activities, to provide financial incentives to village workers to find and follow-up the treatment of TB patients and, for the first time, to provide free treatment for people with smear negative PTB. Besides funding from central and local government, China also have WB/DFID, Global Fund and other programs support TB control service (Wang et al 2007). In 2005, the total funding for NTP was around 140 million US$, to support the activities including case detection, treatment, training, supervision, and health promotion, but still with 23% funding gap. The gap is mainly for supervision and laboratory supplies and equipment in 2007.

3.2.3 Cost by TB patients

Cost of health service is one cost influencing patients' decision on access health services. The other costs include potential cost caused by being unable to perform their work when seeking health, transportation cost, accommodation cost, and psychological cost by attitude of health staff etc. Especially for the poor patients

living far away from TB dispensaries, transportation and accommodation cost have become one of the main barriers for accessing health service.

According to guideline for TB control in China, TB suspects can get free charge for 3 times of sputum smear microscopy, 1 time of X-ray chest examination for diagnosis. But up to now those benefit is only available at TB dispensaries or some designated pilot hospitals. So for PTB patients, as stated before, they have to digest other cost from transportation, accommodation or additional medical services by themselves. A second analysis of Chinese National Household Health Survey for 2003 shows that for medical expense TB patients has to pay 45% of their annual household income for the low-income group and 16% for the high-income group (Zhang et al 2007).. Study by analyzing expenditures of TB patients found the exempted cost only accounted for around 20% of total actual cost, which included medical cost and non-medical cost (Liu et al 2007).

3.3 Acceptability and utilization of health service

Little information found about if the TB health service meets the cultural needs and standards of a community, but studies do find the perception of patients and communities about the availability and affordability of health service influence their health seeking behavior and utilization of health service.

3.3.1 Patients delay

According to the 1993 National Health Survey (NHS), utilization varies positively with household income per capita. Of total households, 58.8% in rural areas don't use health facilities due to economic difficulties; 13% due to poor quality (WB, 1997). 2003 Chinese National Household Health Servey found that 37% of TB suspects did not seek any professional care, with low-income groups less likely to seek care (Zhang et al 2007). A study conducted in four provinces of China (Henan, Liaoning, Fujian, Xinjiang) in 2004 also proved that the main reasons for health seeking delay of TB patients (see figure 3) are that symptom are perceived

not serious (average 48.6%), can't afford (33.6%), no time and long distance (10%), and the perceived cost for TB control service is even higher than the real cost, which also influence the possibility for seeking health. (Fei et al_2007)

□ Light symptom ▨ Can't afford □ No time □ Long distance ⊞ Others
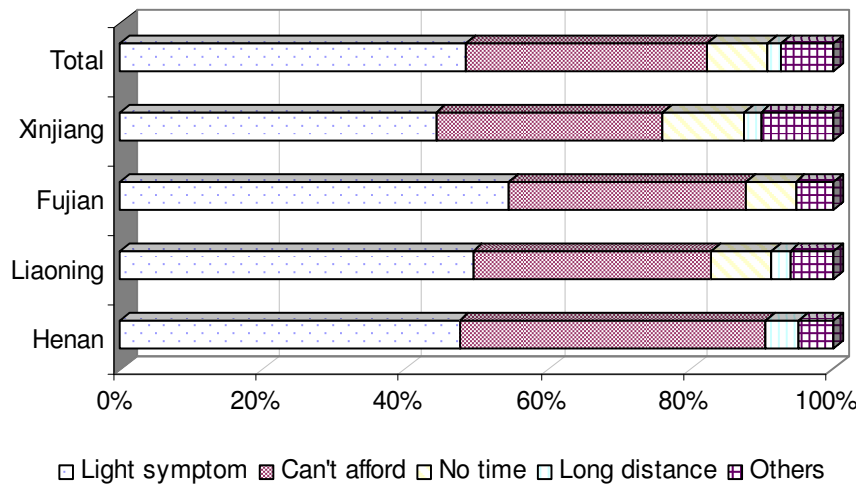
Figure 3: Reasons for health seeking delay of PTB patients

The total expenditure on health has increased from 3.8 of GDP in 1996 to 4.7% in 2005, but more and more expenditure came from private households' out-of-pocket payment. In 1996, 53.4% of total health expenditure was from private sector, among them 94.8% was out of pocket. In 2005, these numbers became 86.7 out of 60.9%, still higher than 10 years ago. At the same time, government expenditure on health has declined from 46.6% of total expenditure on health in 1996 to 39.1 % in 2005, once as low as 35.6% in 2001 (WHO 2006) As a result, patients chose not to go to see the doctors when they feel sick as perceived not necessary, so it is more possible that slight disease has been delayed and then become serious disease or infect more people, like TB. A lot of farmers had no risk pooling for health expense, so they have to pay health service out of pockets. People were more vulnerable to the potential financial catastrophic of disease and therefore more opt to be impoverished by illness. Table 7 from World Bank also shows decline of utilization (WB cited by Bloom and Fang 2003).

Table 7 Percentage increase in cost of service in county hospitals and township health centers, 1993–8

	County hospitals	Township health centres
Business Revenue	170%	121%
Total outpatient visits	-14%	-15%
Total inpatient admissions	-6%	-7%
Cost per outpatient visit	232%	141%
Cost per inpatient day	208%	157%
Consumer price index	60%	
Rural consumer price index	41%	

Source: World Bank (2002: Table 7.14)

3.3.2 Facility delay

Because of the unspecific symptom of PTB, usually patients will go to clinics or hospitals in stead of visiting TB dispensary directly. When concerning the first choice of health facilities, most rural patients prefer village clinics, because it is geographically more accessible, they are familiar to doctors and the cost is low; then if it is not effective, they will go to health facilities at higher levels, patients live in remote areas will chose to go to township hospitals first, others chose to go to county hospitals if the quality of RTHs is low and RTHs are relative far from where the patients live. The influence factors to facility choice, first is geographical accessibility, accounting for 45.4%- 73.9%, the second is quality of service, and the third is price. Figure 4 shows the choice for health facilities of TB patients, suspects and normal residence. Once they have arrived TB dispensaries, after average one day, they would get diagnosed, but before that, more than 39% patients have gone through more than 5 times visits to other health facilities. (WHO 2005)

Figure 4 the choice for first-visited health facilities of TB patients, suspects and normal residence.

☐ Village clinics/Private clinics ☐ Township hospitals ▨ County and above hospitals ☐ TB dispensaries ■ Others
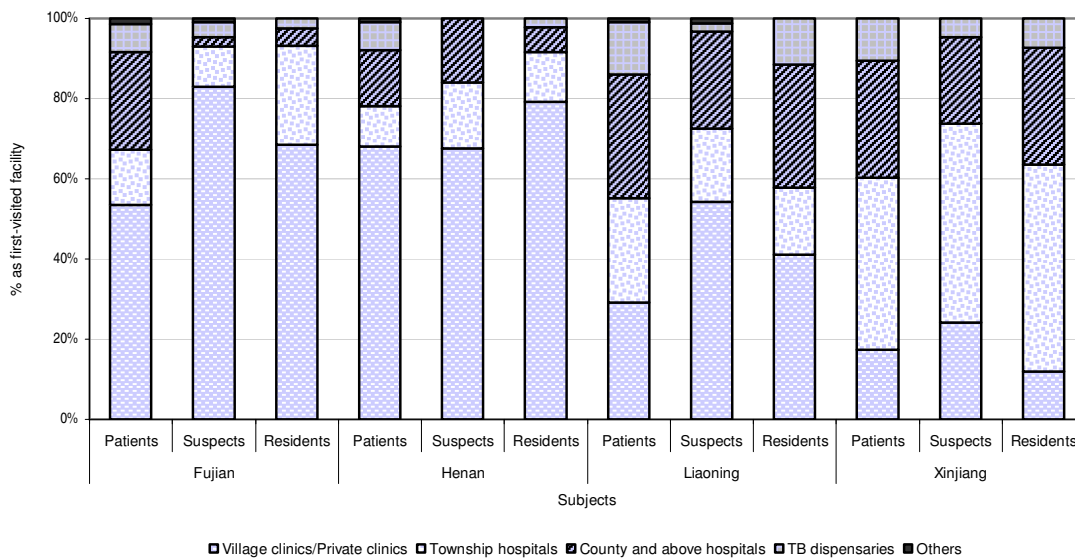
The study of Anson & Sun (2005) shows that among 156 respondents referred to a hospital but did not go, 29.5% is due to transportation difficulties, 28.8% refer to distrust and dissatisfied with hospital staff, 14.7% is because they could not pay. According to nationwide random survey for epidemiology of tuberculosis in 2000, most (88% of 374) of active PTB patients are diagnosed outside of TB dispensary (Figure 5).

Figure 5: Where are TB cases in China's health system
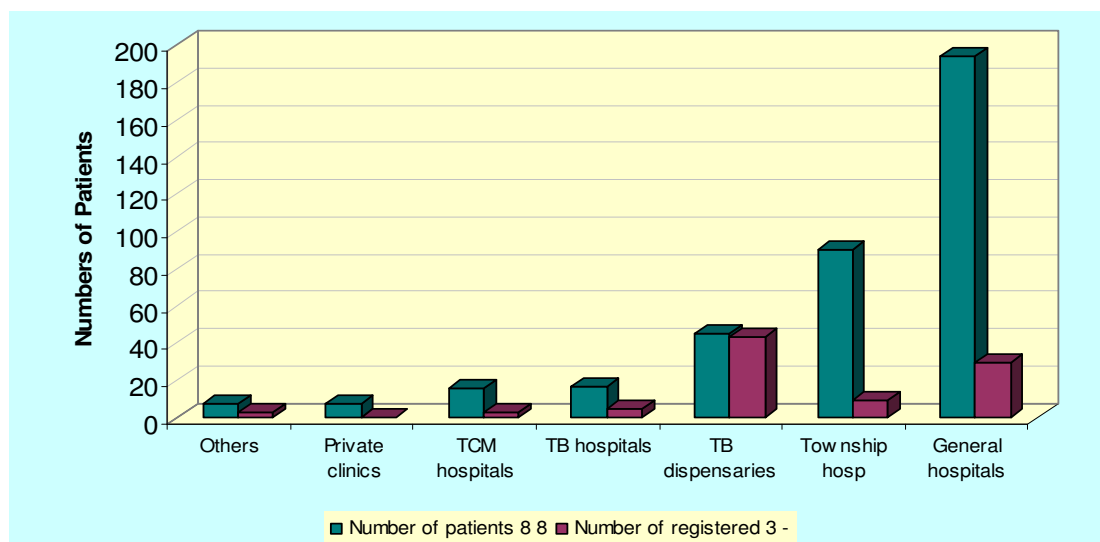
Resource: 2000 national TB prevalence survey (TCM= Traditional Chinese Medicine)

3.4 Health campaign and Social mobilization

As the factors influence access to health services are not just within health systems, elder age, genders, low income, low education of the patients, and stigma from family and community may all act as barriers for seeking health services. As the response from the health system, informing general population, especially the poor and vulnerable, the symptom of PTB, the benefit of timely diagnosis and treatment, the availability of subsidies from government is very important for increasing awareness of TB and service, tackling stigma and discrimination and improving the timely access of TB detection.

Many measures for health promotion and social mobilization have been conducted in China, like mass media activities for TB control, health campaign in schools, and face-to-face communication and suspects' detection and referral through members of women federation or family planning committee in villages, training health workers in TB dispensaries about communication skills, etc. Systematic evaluation is still need to prove the effect of those activities.

3.5 Policy and organization for TB diagnosis
3.5.1 Free diagnosis

The guideline for TB control requires that TB suspects, patients coughing for more than 2 weeks or hemoptysis, should be given sputum smear microscopy and X-ray chest exam to confirm diagnosis. Sputum smear microscopy is one of five components of DOTS strategy defined by WHO because of its low cost, simple to perform, low request for skill, and high specificity for diagnosing TB, while radiology such as X-ray chest exam has been proved relatively low specific therefore not recommended as the first measure for screening TB patients. Having sputum smear microscopy first, then giving those smear negative patients x-ray chest exam is recommended as the most cost-effective way for diagnosing TB patients (Frieden 2004). But from above information we know that village clinics, township hospitals and county hospitals may all be first line health providers for TB patients, but not all of them have the capacity to diagnose them.

Village clinics don't have equipment and skill, township hospitals may have equipment and geographically more accessible to patients, but the quality of service is relative low and most of them don't have enough skills for diagnosing TB patients. County hospitals perform better than township hospitals, but still lack of laboratory skills and quality control. TB dispensaries are capable therefore required to provide microscopy and X-ray checks to suspects free of charge, because government and other donors subsidize that expense in order to reduce the financial burden of TB patients and increase the access of patients to service. This free service is available nationwide only after 2003, before that mainly limited in WB project areas.

3.5.2 Involving more health providers

Referring system

County and township hospitals lack skill for sputum exam but are able to conduct X-ray check, they prefer to diagnose TB only based on X-ray check result, instead of firstly by sputum exam as recommended by WHO. The treatment outcome of those facilities is also far away from optimal. Survey done in 2000 shows, most of active PTB patients is diagnosed outside of TB dispensary (Figure 5). For those patients, nearly 79% failed to complete standardized treatment, compared with 39% for those diagnosed in TB dispensary. At that time, DOTS coverage in China was around 68% (Annex 5), so the low treatment success rate of patients registered at TB dispensary may due to the low DOT implementation. Dye et al. in 2003 analyzed the annual reports of DOTS coverage and case notifications, especially of the 22 high-burden countries (HBCs) that account for about 80% of new TB cases arising globally each year, and got the conclusion "unless the DOTS strategy can reach beyond traditional public health reporting systems, or unless these systems can be improved, case detection will not rise much above 40% in the 22 HBCs, or in the world as a whole, even when the geographical coverage of DOTS is nominally 100%." (Dye et al 2003). It is proved to be true

in China because the reporting system within TB dispensary, representing public health reporting systems at that time, as showed by figure 5, only captured small part of TB patients.

Under this background, at the beginning of 2000, the Ministry of Health (MOH) set up a regulation requiring all hospitals to report and refer TB patients/suspects to TB dispensaries for further diagnosing registering and following-up. But it proved difficult to implement, because hospitals are reluctant to refer patients and at that time TB dispensaries, as the supervisory agency, lack an efficient information system to monitor whether hospitals were in fact reporting and referring all their TB cases and suspected cases.

Sputum check spots at township hospitals

In order to make diagnosis service more accessible to rural population, in 2004, MOH began to establish sputum check spots at one third of township hospitals step by step, based on the experience learned from India (Khatri & Frieden 2002), and the recommendation from WHO of one unit for 50,000 to 150,000 inhabitants. For example in Hainan province, by the end of 2006, 89 spots had been established among planned 100 spots, among them 87 has conducted sputum smear microscopy; Among 5546 visiting patients, 5042 got sputum smear check with 102 found smear-positive, contributing a 2% increasing in case detection in the same year for Hainan; blind-rechecking showed the quality achieved the request for quality control. Systemic evaluation nationwide has not been done, so the general quality of those laboratories and impact on timely diagnosis are not clear, but some concerns have been raised about quality of some laboratories as well as lack of motivators to laboratory technicians, because in some spots, microscopy has been disseminated and staff trained, but amount of samples really checked are low (From what I heard during supervision).

Strengthened public health system after SARS

SARS epidemic made China government realized the weakness of the public health system, and several measures have been taken after that. The measures related to TB control include increased political commitment and funding for public health, established world's largest internet-based communicable disease reporting system in 2004 (Ma et al 2006), and revised law on Controlling Infectious Disease. In this revised law, reporting all cases of 37 communicable diseases including PTB become a legal request (Order of the state council 2004), etc.

Further cooperation between TB dispensaries and other health providers
Several documents have also been issued by MOH for strengthening collaboration between TB dispensaries and other health providers as follows,

- In 2004, demand all health facilities with diagnosis capacity should diagnose TB patients and report them to local CDC, those without diagnosis capacity should refer suspects to designated facilities. In-patients can only been admitted in designated facilities, out-patients need to be treated according to guideline and be referred to TB dispensary for register and treat management. TB dispensaries need to trace the patients who are referred but not arrived, and screen TB patients among close contacts of PTB patients.

- In 2005, further standardize TB control in TB special hospital, requiring all TB patients diagnosed in special hospitals be registered and reported, and patients discharged or without hospitalization should be referred to TB dispensaries for continuing treatment.

- In 2005, based on effect and experience of World Bank and Global Fund program, government began to provide funding for incentives to health providers outside of CDC for reporting and referring active PTB cases .

- Soon after that, another document was issued for further regulating the procedures of case detection, referral and tracing of patients referred. This document requests that every suspects should get not only X-ray chest examination but also sputum smear exam, facilities unable to perform above

diagnosis exam should refer patients to TB dispensary, TB dispensaries should export patients information reported by hospitals from "communicable disease reporting system", discuss with hospitals to confirm if patients reported have been referred and how many patients have not arrived TB dispensary, and for the first time the detailed requirement for tracing suspects/patients not arrived is defined in this document, which includes following up through phone call, informing village doctors to find out patients, and using mobile van to tracing patients.

Those methods effectively increased the access of TB patients to diagnosis service with case detection rate soaring from 43% in 2003 to 80% in 2005, because now covering or not reporting TB patients' information is illegal, and from the information reported by hospitals through internet, TB dispensaries can even trace those patients who are not referred by hospitals.

But problems such as failure to reporting and referring by other health providers still remain, due to three main reasons. Firstly current payment mechanism still acts as disincentives for referring patients, secondly health providers outside of TB dispensaries have low awareness about TB, the importance of timely diagnosis and availability of free service, and thirdly those health providers distrust the quality of TB dispensaries (especial doctors in county hospitals). Referring arriving rate also need to be improved, as nearly 30% of patients reported by hospitals did not arrive TB dispensaries in 2006, due to financial difficulty, low awareness, long distance and distrust (MOH 2005). So training for village and township hospital doctors in recognizing TB suspects still need to be strengthened and evaluated, and the knowledge about TB should be included in pre-service training curricula; training to the doctors in general hospitals has just begun and need to be supervised. As part of GF program, pilot work about involving general hospitals in TB diagnosis and treatment following the same policy as TB dispensaries started from 2007, and it is still too early to see the impact.

3.5.3 Concerning the vulnerable group

Further policies for detecting TB patients in special group (migrant workers, HIV/AIDS, prisoners) are under planning, pilots supported by government and Global Fund program are conducting in some provinces.

3.6 Experience from other countries: Vietnam, Philippine, Indonesia

Annex 5 shows that by the end of 2006 at least 4 high burden countries have achieved 70% of case detection rate and 85% successfully treatment rate. Besides China, the other 3 countries are Vietnam, Philippine and Indonesia. So what experience dose China can learn from them for increasing case detection?

Among those countries, the progress in Philippine and Indonesia made mainly because of collaboration with private health-care providers and non-NTP public providers, in conjunction with community-based TB care, partly because in those countries, private health service is emerging and accounts for important proportion of health providing, for example according to 1997 National Prevalence Survey in Philippine, 30-50% of TB patients first seek care in the private sector, partly because growing evidence has shown that in order to capture more TB, more health providers, especially those outside of NTP should be involved in TB control service, which includes public-private mix and public-public mix (PPM) models. In Philippine, formal PPM projects was implemented in coordination with Philippine Coalition against Tuberculosis (PhilCAT) and with support from Global Fund. DOTS' training for staff of non-NTP health facilities participating in PPM activities was conducted, and certification of NTP and non-NTP facilities providing TB diagnosis and treatment by regional certifier team in all regions will be implemented. In Indonesia, International standard for tuberculosis control (ISTC) is adapted for professional organizations as training materials for hospitals and private practitioners. Collaboration with professional organizations was established to standardize TB diagnosis and treatment. There has been progress in piloting PPMD in some countries, including the Philippines. However,

monitoring is not yet routinely done and the impact of PPMD on case finding and quality of case management has not been systematically evaluated.

Vietnam, as the first country achieved the case detection and treatment target, has achieved the target almost 10 year ago, with the strategy of integration of TB control service into the general health system at primary health care level (district and commune level). The TB control network in Vietnam is organized along a four-tiered pyramid: national, province, district and commune/village. The district tuberculosis unit (DTU) is responsible for confirmation of the diagnosis by microscopic sputum examination at the district general laboratory, start of treatment and supervision. One commune health worker in commune health post (CHP) which covers average 7,500 populations is responsible for communicable disease prevention including TB, so identify and refer TB suspects to DTU and supervise the treatment of TB patients (Huong N.T., et al). With the emerging of private practitioners, now Vietnam also begin to scale up PPM, develop/strengthen a policy to expand collaboration between NTP and prison/rehabilitation camps and expand "Strengthening primary health-care network and TB control" project to remote and mountainous areas.

Strengthening health system and involving all health providers in TB control are two components of Stop TB Strategy. PPM often works as a starting point for increased access to TB services, in other words, involving private and non-NTP public providers has increased access to TB services with earlier diagnosis.

Chapter 4 Discussion

The definition of universal access from WHO and UNFPA (2008) for reproductive health and HIV/AIDS is, the equal ability or probability of all persons to receive appropriate health intervention in a timely manner according to their need. So the universal access to TB detection services could be "the equal ability of all persons to receive appropriate diagnosis in a timely manner according to their need".

This ability is influenced by multi-factors, which can be divided into demander side and provider side. Here our discussion, like the whole thesis, focuses on provider side, the response of health system, to clarify how to enhance the provision of services in order to increase timely use by those who need them in rural China. The assessment of access includes measuring physical and technical access, financial resources, perception and acceptability of patients, as well as policy and organization – which influence utilization, and through assessment to analyze how far the current system and policy are from effectively ensuring access to timely TB diagnosis.

4.1 Unequal availability –bring patients up or bring service down
According to current policy, TB diagnosis is mainly conducted and confirmed by TB dispensary, but the health seeking pathway of the patients involving all kinds of health providers due to unspecific symptom of tuberculosis, which mainly include village clinics, township hospitals, county hospitals and county TB dispensaries.

In China at least every town has a township hospital, every county has one county hospital (mostly more than one) and one TB dispensary. In terms of administration unit, one TB center for each county, China has achieved universal access. But due to the large territory, geographic diversity is one character of China, with one county may has only 5,000 populations while another has more

than one million, and one village is within 10km from county center while another more than 30km away. In this case, only one TB dispensary at each county, which is the center for diagnosis and initiate of treatment, is far less than enough, especially for counties with more than 150,000 populations. Geographic accessibility has become the main factor for choosing health facilities once patients decided to seek care, following by cost and quality. So bringing down the service as close as possible to patients has become one option for achieving universal access, if the lower levels are qualified to shoulder this responsibility.

The quality of village clinics is quite low due to of low qualification of staff and no equipment for TB diagnosis. Township hospitals are better equipped, but the quality of human resource is still problematic. County hospitals are perceived to have higher qualification and adequately equipped, but having the same access problem as TB dispensary, or even when patients are able to access, the high cost for service provided there has constrained patients from further diagnosis, and the skills for diagnosis by laboratory still need to be improved. So if we want to bring service down, then training of the staff, maintaining of the skills, allocating and maintenance of equipment, supervision and quality control are all the components we need to fulfill and consider before start, with financial influence always in mind. This has been proved to be possible as India has successfully implemented this method and Chinese NTP has also begun to bring diagnosis service to township hospitals, but in China systematic assessment for impact and quality of this method are still lacked. In contrary to bringing service down, bringing patients to service or ensuring timely referral has become another option for achieving universal access, with precondition that simple training for recognizing suspects is available, no conflict of interest exist among health providers at different levels in terms of income, and potential cost has been reduced to bearable level. Training has been started but quality is various, and the current financial mechanism has performed as a disincentive to referring patients.

4.2 Affordability- influenced by financial mechanism

After 1980s, government mainly provides salary and subsides for registered beds to health providers excluding private ones, in poor areas only part of the salary available from government. User-fee has become the dominant resource of payment for health providers, accounting 60% of total payment. Unnecessarily over-prescribing medicine, overusing health service or overcharging patients for health care emerged within health facilities including TB dispensary in poor areas, which has damaged the reputation of county TB dispensary for providing free diagnosis and lead to distrust by patients. Most patients will not seek health care when they have needs mostly because of high cost, including medical and non-medical cost, with perceived cost even higher than actual cost. The new CMS, also known as community-based health insurance, will provide reimbursement for patients' cost for health service. Because it is still a new initiative, little research has been done about how far this scheme has reduced the burden of TB patients and increases the utilization of TB service, but studies do show that the impact to utilization of the whole medical service is not as effective as expected. But this situation may change with more household participating and more successful experiences learned and expanded (Sleigh 2007). MFA has been used in some places for covering transportation cost for poor patients, but not practice on all poor patients, non-medical cost is still a big burden to patients and influence their use of service.

Fee-for-service mechanism allows patients to choose whatever health providers as long as they can pay, and also causes health providers to compete individual patients with each others for revenue generation. Referring patients means losing revenue, so current payment system has become a disincentive factor for timely referring of patients, then for universal access to timely diagnosis. The new CMS is trying to rebuild the referring system, and at the same time, NTP has begun to provide incentives to doctors outside of TB dispensary for referring active TB patients. The cost-effectiveness of this initiative has not been evaluated, with

some places show increased patients referred by hospitals while doctors still show reluctance to refer patients.

4.3 Policy evolution- government playing the key role

Strong government commitment and financial support is always the key for success. From 1992, government began to adopt DOTS strategy and gave financial support to NTP, then applied for loan from WB and grant from the GF, to provide free TB diagnosis for TB patients and suspects. Training and supervision within NTP have been the routine activities for ensuring quality. The aim of free diagnosis is to decrease the inequity related to affordability, with obvious effect that in project areas prevalence declined more than non-project areas at early stage. But this subsidized service is only available in TB dispensary for a long time, leaving patients who mostly visit other health facilities instead of CTDs uncovered. This effort has been diminished by unequal potential cost caused by unequal availability and affordability. Because of inaccessibility and unawareness about the availability of free service, patients will more often go to village clinics and hospitals instead of TB dispensaries. In rural China, village clinics are the priority for first-visit choice because of its low cost and geographic convenience, followed by township and county hospitals, but the quality for diagnosing TB patients in those facilities is still far away from optimal, compared with TB dispensary.

In order to bringing patients up, government developed the policy for ensuring referring the TB suspects from non-NTP health providers to county TB dispensary from the end of 1990s. The successful example for this measure is Vietnam, by this policy, Vietnam become the first country who has achieved the international target for TB control. Trainings are provided for recognizing TB suspects; Incentives are given to doctors of village clinics, township and county hospitals to subsidy their losses; modified law obligated health facilities to report any TB patient or suspect they found, with further policy required TB dispensary to tracing patients not arriving. Referring, reporting and tracing, those three steps

have captured lots patients, with case detection rate achieved 80% by the end of 2005. But still 30% of patients reported by other health facilities did not arriving TB dispensary, with cost, awareness and long distance may be part of the reasons. At the same time, high prevalence compared with incidence, along with studies concerning delay of diagnosis, indicate the current health system is still not effective enough for universal access to timely diagnosis. Health promotion and social mobilization has always been put on agenda in order to increase awareness of general population for TB control knowledge, and the availability of free service.

In terms of bringing service down, considering available of technical skill and equipment, it is far from feasibility for village level to share this task because of lack of skills and equipment, also low workload for maintain this skill, although it is firstly visited by most patients. Township hospital is more suitable since it has better human resource with equipment already available in most place, the average population covered by town is around 25,000 and 71% of populations in China is within 5km from township hospitals. So from 2004, sputum smear microscopy centers were established in part of township hospitals. New health system reform is trying to restoring the referring system with township hospitals as the linkage between county hospitals as well as TB dispensary and village clinics. Working condition and equipment are improved but more time and policy support are needed for the improvement of quality of human resource. Under this situation, training of laboratory staff and supervision are important for quality assurance. The necessity of subsidies to township hospitals still needs further reasoning. But systematic assessment is not available about the effect in increasing access.

Considering general hospitals also have the capacity for diagnosing, and actually are diagnosing most patients, so involving general hospitals has been the next step for increase access. Experience from other countries and study has proved

that they would like to participate in disease control and prevention if properly subsidized. Pilot work has just begun in terms of public general hospitals providing diagnosis and treatment following the same policy as NTP. Training and supervision is still vital for quality assurance.

New health system reform aims at everybody having access to basic health services. More emphasis of government will be put on disease prevention or public health with the cost of curative service shared by government, social society and individual themselves. Tuberculosis is a public health problem but also involves curative service. Government and other donors have provided main proportion of TB control funding, but compared with need, especially the future need in involving more health providers, the funding is still not enough. Current new insurance system is on its early stage. Some pilot works about contracting out service through CMS have shown effect on cost containment, but its effect on improving quality and utilization of health service is still not clear. It has not been strong enough to function like a third purchasing party and an overseeing power for rational using and providing of health service. But from the experiences of other countries we know purchasing service and therefore monitoring the effective and efficient of service delivery should be the direction for insurance mechanism.

4.4 Limitation of methodology

Because the methodology used in this thesis is literature review, so it lacks raw data for further analyzing disparity between rural and urban areas for case detection, and quality of laboratory in TB dispensaries. Analysis from the perspective of doctors in other health facilities is not enough due to lack of research data. It also lack of recent data and some data may be incomplete, which may result in information not advancing with the time.

Chapter 5 Conclusions and recommendations

5.1 Conclusion

The universal access of timely diagnosis for TB means patients have no constraint in getting diagnosis no matter where they live, who they are, when and why they get sick and how much they can pay. TB diagnosis service should be bringing closer to patients' homes, or patients should be timely referred to diagnosis facilities, including remote and migrant populations.

In China, because of the unspecific symptom of TB and relaxed referring system, TB patients can seek care from health providers at every level. Village clinics, township hospitals, country hospitals and TB dispensaries are all the first line providers for TB patients. But for long time, TB dispensary is the only place for providing qualified and subsidized diagnosis service.

The existing of unequal availability and affordability has become the barriers in terms of the acceptability and further the utilization of service by patients. High cost or perceived high cost, long distance and low awareness are the main constraints of patients for seeking care, despite that in China the diagnosis of TB is free or is subsidized by government and other donors, and lot of training and health campaign for increasing awareness. Current payment mechanism for health providers is mainly fee-for-service, which has made the exemption of fee-for-diagnosis only accounting for a small part of actual cost by patients.

Policy for referring TB suspects from other health providers to NTP and bring diagnosis service to township hospital has been developed and implemented, and show effect on increasing case detection, but lack of cost-effective analysis for those policies. New health insurance system has reduced the cost but impact on utilization is still not effective enough, but with more household participated and more experience learned, it is promising that this scheme will not only reduce the patients burden but also increase the timely access of service. Delay in diagnosis

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still exist which will diminish the effort for control the epidemic. The experiences from other countries demonstrate the important of cooperation between health providers, but the policy from the government always play the most important role.

With the new health system reform, government endeavored to play more important role in achieving "health for all" by increasing political commitment and financial support for public health. With all health providers involved and service funded by both government and insurance system and with medical assistance system subsidizing the real poor, universal access to early TB diagnosis could be achieved.

5.2 Recommendation
5.2.1 For government

- Continue to strengthen the implementation of StopTB Strategy and the Global Plan to StopTB 2006-2015. DOTS strategy is important component of StopTB strategy and the Global Plan, in those strategies, they give detailed guidelines for how to achieve the universal access to timely diagnosis and treatment, including DOTS expansion, dealing with other challenges, engaging all health providers, empowering community, health system strengthening and promoting research.

- Coordinate with relative sectors, such as financial sector, social insurance sector etc., to make new CMS and MFA more supportive to TB control service, for example giving more reimbursement for expenditure happened in TB dispensaries, and provide insistence to prro patients for transportation and accommodation. At the same time make sure that TB dispensary shifts away from user fees toward full public funding for salaries and operating costs of TB dispensaries through increased financial support form government.

- Increasing supervision for policy implementation in terms of patients reporting, referring and diagnosis confirmation. TB dispensaries are now playing the role of supervision, with inadequate human resource and not authorized as a supervision facility, it is a difficult task. The necessity of further Legislating TB control needs to be reasoning with law enforcement to participate in the supervision.

- Improve the capacity of general providers for recognizing TB suspects and referring patients, through increasing the awareness of those providers about the benefit of timely diagnosis by training. Integrate the laboratory technician in township and county hospitals into training and retraining system and the EQA system of NTP.

- Conduct Cost-effective analysis of subsidies and incentive policy, including the necessity of subsidizing township hospitals for sputum microscopy and establishing diagnosis center in township hospital.

- Further focus on disparity between rural and urban areas, indicated in data reporting and analysis. Health promotion should be more focused on the poor and the vulnerable with timely effect evaluation.

- Put social assessment as part of regular data collection or supervision to understand the keep-changing reasons for delay and barriers in accessing timely diagnosis with policy evolving.

5.2.2 For health providers

- Be more responsiveness to implementing policy and patients need. Provide patient-friendly service, ensure no stigma for TB patients from health providers.

- Be sensitive to the evolving of policy and impact of those policies to access to timely diagnosis. Promote practical researches to evaluate those impacts, and then provide effective suggestion to further improving the policy.

- Strengthen the competence of health workers at the village and township levels for detecting TB suspects and the quality assurance for TB diagnosis.

- Provide information, education and communication on TB that reaches poor people of different ages in remote rural areas. Tackle stigma and discrimination through effective health promotion activities. Informing village clinics about the available of diagnosis center and encourage them to refer patients there.

5.2.3 For donors
- Support cost-effective analysis of incentive and subsidizing policy, and research for health insurance financing mechanism

- Support human resource development and health system strengthening

- Support communication with other countries for experience about PPM and health insurance mechanism

So we anticipate in the near future, with more systematic strategy developed in terms of financial mechanism and human resource development, universal access to timely diagnosis will be achieved in China.

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Appendices

Annex 1 Case detection rate for new smear-positive cases (%), 1995–2006

		DOTS programmes											
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	India	0.3	0.9	1.0	1.6	6.8	12	23	30	43	55	59	64
2	**China**	**15**	**29**	**32**	**32**	**30**	**31**	**31**	**30**	**43**	**64**	**80**	**79**
3	Indonesia	1.3	4.4	7.4	12	19	20	21	30	37	52	65	73
4	South Africa	–	–	6	22	61	58	56	66	71	70	67	71
5	Nigeria	11	11	10	11	12	12	12	11	15	17	18	20
6	Bangladesh	6.4	14	18	23	23	24	26	30	35	40	54	65
7	Ethiopia	15.0	19.8	21.8	23	24	30	30	30	31	31	29	27
8	Pakistan	1	2	–	4	2	3	5	13	17	25	37	50
9	Philippines	0.4	0.5	3.2	10	20	48	56	61	67	72	74	77
10	DR Congo	41	47	44	54	51	48	50	49	55	62	63	61
11	Russian Federation	–	0	1	1	2	5	6	7	9	15	33	44
12	Viet Nam	30	59	78	82	83	82	83	87	85	89	84	85
13	Kenya	57	58	54	59	58	51	59	61	64	66	68	70
14	UR Tanzania	57	56	53	54	52	49	48	45	46	47	47	46
15	Uganda	–	–	56	56	56	48	44	44	44	45	44	44
16	Brazil	–	–	–	3	3	6	6	8	14	37	43	55
17	Mozambique	57	51.7	50.0	49	48	45	43	43	43	44	46	47
18	Thailand	–	0	5	22	40	47	74	67	73	73	76	73
19	Myanmar	–	26	27	29	33	49	58	68	76	86	100	109
20	Zimbabwe	–	–	–	50	47	45	45	46	41	44	41	42
21	Cambodia	40	34	45	48	54	50	48	57	62	62	68	62
22	Afghanistan	–	–	3.1	9.3	8.6	15	24	33	34	44	52	66
High-burden countries		**8.3**	**14**	**16**	**20**	**23**	**26**	**30**	**34**	**43**	**53**	**59**	**63**
	AFR	23	25	29	34	35	35	36	42	44	46	45	46
	AMR	25	25	27	31	34	41	40	43	47	56	60	69
	EMR	11	9.6	11	18	20	24	26	31	33	38	45	52
	EUR	2.6	3.5	4.6	11	11	12	14	22	23	26	36	52
	SEAR	1.5	4.0	5.5	8.0	14	18	27	34	44	55	62	67
	WPR	16	28	32	33	32	37	39	39	50	65	77	77
Global		**11**	**16**	**18**	**22**	**24**	**28**	**32**	**37**	**44**	**52**	**58**	**61**

– Indicates not available.

Resource: WHO report 2008 (P25)

Annex 2 Estimated epidemiological burden of TB, 2006

Estimated epidemiological burden of TB, 2006

	POPULATION 1000s	INCIDENCE[a] ALL FORMS		SMEAR-POSITIVE		PREVALENCE ALL FORMS		MORTALITY ALL FORMS		HIV PREV. INCIDENT TB CASES
		NUMBER 1000s	PER 100 000 POP PER YEAR	NUMBER 1000s	PER 100 000 POP PER YEAR	NUMBER 1000s	PER 100 000 POP	NUMBER 1000s	PER 100 000 POP PER YEAR	%
1 India	1 151 751	1 933	168	867	75	3 445	299	325	28	1.2
2 China	1 320 864	1 311	99	590	45	2 658	201	201	15	0.3
3 Indonesia	228 864	534	234	240	105	578	253	88	38	0.6
4 South Africa	48 282	454	940	184	382	482	998	105	218	44
5 Nigeria	144 720	450	311	198	137	890	615	117	81	9.6
6 Bangladesh	155 991	351	225	158	101	610	391	70	45	0.0
7 Ethiopia	81 021	306	378	136	168	520	641	68	83	6.3
8 Pakistan	160 943	292	181	131	82	423	263	55	34	0.3
9 Philippines	86 264	248	287	111	129	373	432	39	45	0.1
10 DR Congo	60 644	237	392	105	173	391	645	51	84	9.2
11 Russian Federation	143 221	153	107	68	48	179	125	24	17	3.8
12 Viet Nam	86 206	149	173	66	77	194	225	20	23	5.0
13 Kenya	36 553	141	384	56	153	122	334	26	72	52
14 UR Tanzania	39 459	123	312	53	135	181	459	26	66	18
15 Uganda	29 899	106	355	46	154	168	561	25	84	16
16 Brazil	189 323	94	50	59	31	104	55	7.6	4.0	12
17 Mozambique	20 971	93	443	39	186	131	624	24	117	30
18 Thailand	63 444	90	142	40	62	125	197	13	20	11
19 Myanmar	48 379	83	171	37	76	82	169	6.1	13	2.6
20 Zimbabwe	13 228	74	557	30	227	79	597	17	131	43
21 Cambodia	14 197	71	500	31	220	94	665	13	92	9.6
22 Afghanistan	26 088	42	161	19	73	60	231	8.3	32	0.0
High-burden countries	**4 150 313**	**7 334**	**177**	**3 265**	**79**	**11 889**	**286**	**1 330**	**32**	**11**
AFR	773 792	2 808	363	1 203	155	4 234	547	639	83	22
AMR	899 388	331	37	165	18	398	44	41	4.5	6.4
EMR	544 173	570	105	256	47	826	152	108	20	1.1
EUR	887 455	433	49	194	22	478	54	62	7.0	3.0
SEAR	1 721 049	3 100	180	1 391	81	4 975	289	515	30	1.3
WPR	1 764 231	1 915	109	860	49	3 513	199	291	17	1.2
Global	**6 590 088**	**9 157**	**139**	**4 068**	**62**	**14 424**	**219**	**1 656**	**25**	**7.7**

[a] All estimates include TB in people with HIV. Estimates of incidence, prevalence and mortality in people with HIV are given by country and region in Annex 3, Table A3.1.
[b] Prevalence of HIV in incident TB cases of all ages.

Resource: WHO report 2008 (P19)

Annex 3 Map of the People's Republic of China

Resource: CIA

Annex 4 Structure of health care system for TB patients

State Council: Ministry of Health	Key Medical University & Teaching Hospitals: Referring TB suspects, hospitalizing and treating TB patients with complication	National Center for TB Control (NCTB), China CDC: Reporting information to MOH, supervision and technical assistance to hospitals and lower level TB dispensaries
Provincial Government: Department of Health	Provincial general & Specialist Hospitals, institute of Chinese medicine: Referring TB suspects, hospitalizing and treating TB patients with complication	Provincial institute of TB control (1 for each province): Reporting, supervision and technical assistance to hospitals and lower level TB dispensaries
City Government: Bureau of Health	Prefecture general & Specialist Hospitals, institute of Chinese medicine: Referring TB suspects, hospitalizing and treating TB patients with complication	Prefecture TB dispensary (1 for each city): Reporting, supervision and technical assistance to hospitals and county TB dispensaries
County Government: Bureau of Health	General & Specialist Hospitals, hospital of Chinese medicine: Referring TB suspects, hospitalizing and treating TB patients with complication	County/district TB dispensary (1 for each county/district): Diagnosis, register, reporting, treating, management of TB patients, supervision and technical assistance to hospitals and village clinics
Township Government	Township hospitals: Referring TB suspects, treating management of TB patients	
Villagers' Committee	Village clinics: Referring TB suspects, conducting DOT to TB patients	

Annex 5 DOTS progress in high-burden countries, 2003-2006

2003-2004
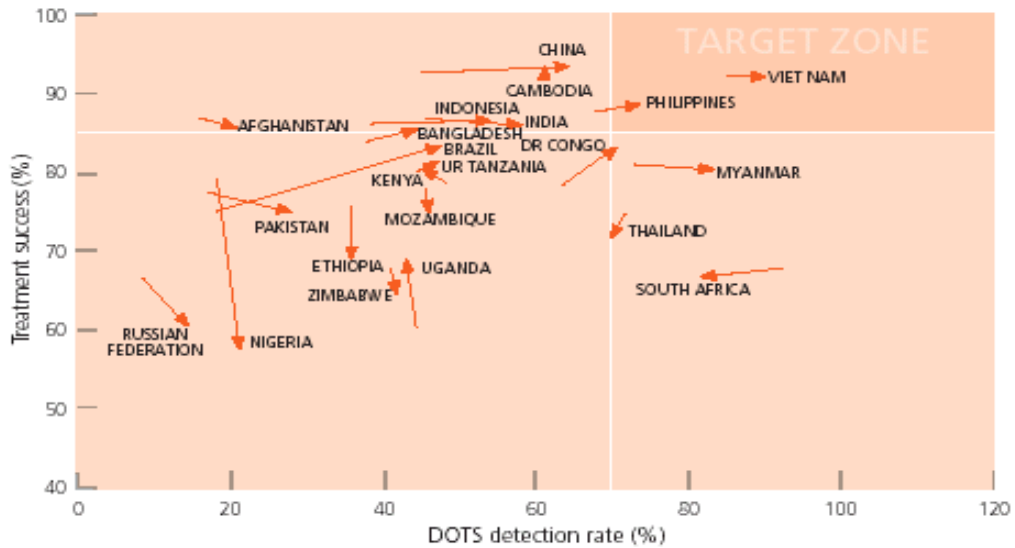
2005-2006

Resource: WHO TB Report 2006, 2008.

Annex 6 Progress in DOTS implementation, 1995-2006

Progress in DOTS Implementation, 1995–2006

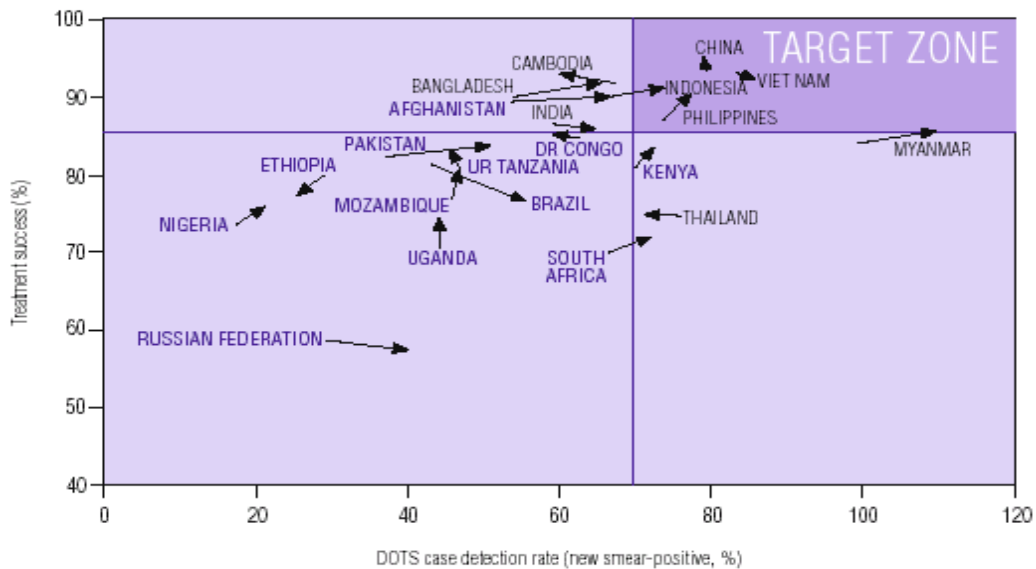|	PERCENT OF POPULATION COVERED BY DOTS											
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1 India	1.5	2	2.3	9	13.5	30	45	51.6	67.2	84.0	91.0	100
2 China	49	60	64	64	64	68	68	78	91	96	100	100
3 Indonesia	6	13.7	28.3	80	90	98	98	98	98	98	98	98
4 South Africa	–	0	13	22	66	77	77	98	99.5	93	94	100
5 Nigeria	47	30	40	45	45	47	55	55	60	65	65	75
6 Bangladesh	40.5	65	80	90	90	92	95	95	99	99	99	100
7 Ethiopia	39	39	48	64.4	63	85	70	95	95	70	90	100
8 Pakistan	2	8	–	8	8	9	24	44	66	79	100	100
9 Philippines	4.3	2	15	16.9	43	89.6	95	98	100	100	100	100
10 DR Congo	47	51.4	60	60	62	70	70	70	75	75	100	100
11 Russian Federation	–	2.3	2.3	5	5	12	16	25	25	45	83	84
12 Viet Nam	50	95	93	96	98.5	99.8	99.8	99.9	100	100	99.9	100
13 Kenya	15	100	100	100	100	100	100	100	100	100	100	100
14 UR Tanzania	98	100	100	100	100	100	100	100	100	100	100	100
15 Uganda	–	0	100	100	100	100	100	100	100	100	100	100
16 Brazil	–	0	0	3	7	7	32	25	33.6	52	68	86
17 Mozambique	97	100	84	95	–	100	100	100	100	100	100	100
18 Thailand	–	1.1	4	32	59	70	82	100	100	100	100	100
19 Myanmar	–	59	60	60.3	64	77	84	88.3	95	95	95	95
20 Zimbabwe	–	0	0	100	11.6	100	100	100	100	100	100	100
21 Cambodia	60	80	88	100	100	99	100	100	100	100	100	100
22 Afghanistan	–	–	12	11	13.5	15	12	38	53	68	81	97
High-burden countries	**24**	**32**	**36**	**43**	**45**	**55**	**61**	**68**	**79**	**87**	**94**	**98**
AFR	43	46	56	61	56	71	70	81	85	83	88	91
AMR	12	48	50	55	65	68	73	73	78	83	88	93
EMR	16	12	18	33	51	65	71	77	87	90	97	98
EUR	5.4	8.2	17	22	23	26	32	40	42	47	60	67
SEAR	6.7	12	16	29	36	49	60	66	77	89	93	100
WPR	43	55	57	58	57	67	68	77	90	94	98	100
Global	**22**	**32**	**37**	**43**	**47**	**57**	**62**	**69**	**78**	**83**	**89**	**93**

Zero indicates that a report was received, but the country had not implemented DOTS. – Indicates that no report was received.