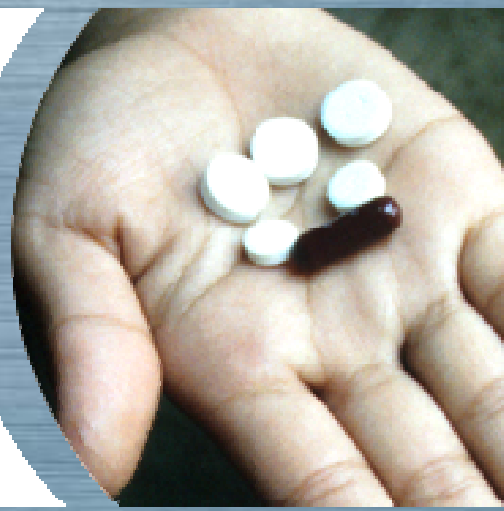
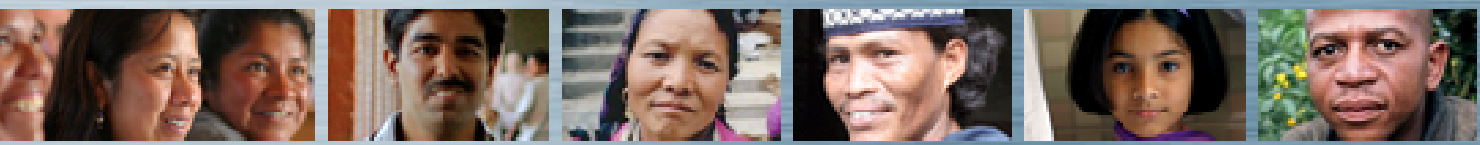
TB ALLIANCE
GLOBAL ALLIANCE FOR TB DRUG DEVELOPMENT

Analysis of the Global TB Drug Market and Country-Specific Case Studies of TB Drug Distribution Channels



China Case Study



Prepared with IMS Consulting

November 2006

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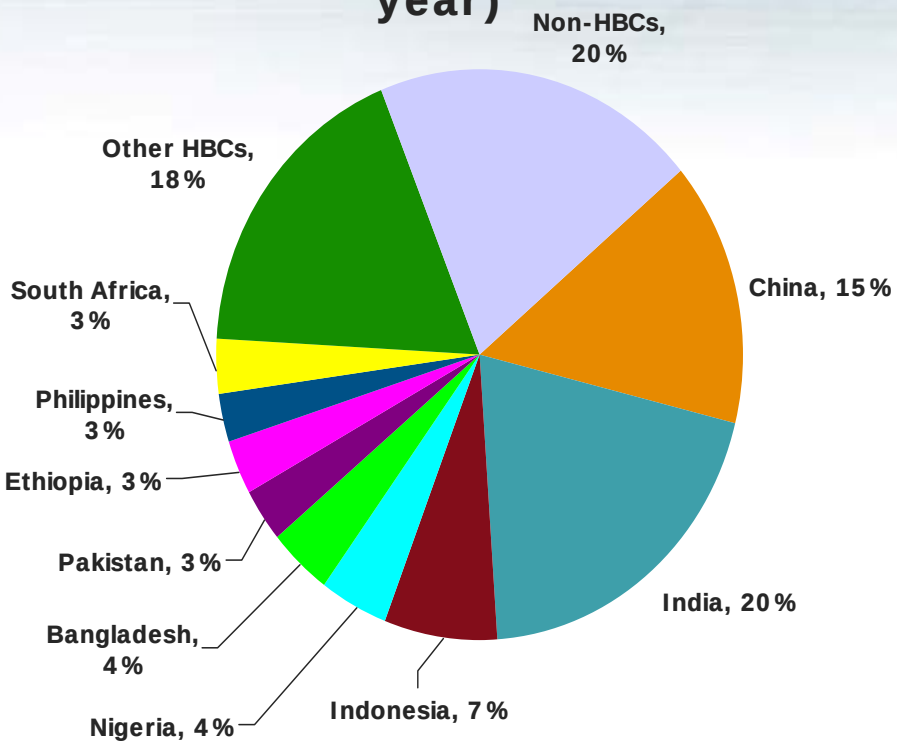
China ranks number 2 of the HBCs and accounts for approximately 15% of the global TB burden

Share of worldwide incidence of TB (total= 8.8 M new cases per year)



<u>According to the WHO and the NCTB (2004 Estimates):</u>

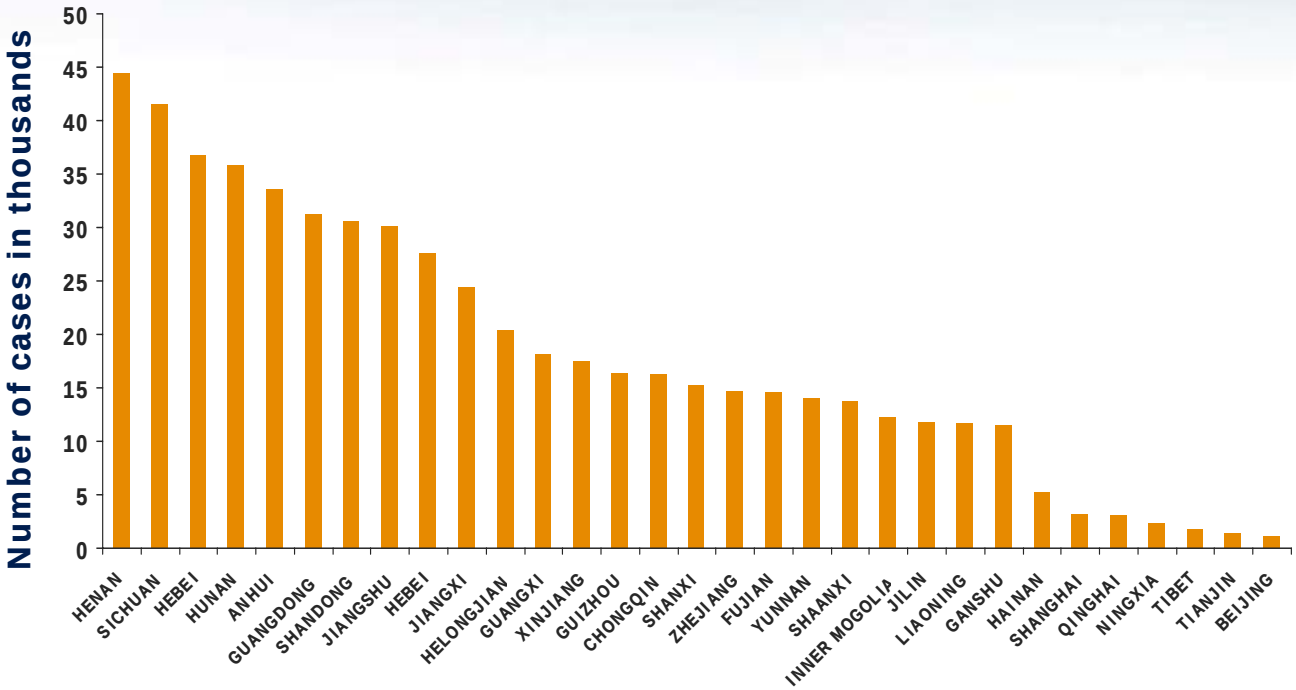
- **Incidence: 101 cases per 100,000**
  - **-1% change from 2003**
  - **SS+ are 46 per 100,00 persons**
- **Prevalence: 221 cases per 100,000**
- **Mortality: 17 per 100,000**
- **.9% of cases are HIV +**
- **New MDR-TB cases: 5.3%**

Source: WHO Geneva; WHO Report 2005: Global Tuberculosis Control; Surveillance, Planning, and Financing. MDR figures are cited in the WHO Surveilllance Report as estimates from: Zignol M et al. Global incidence of multidrug-resistant tuberculosis

A total of ~564,000 smear + cases were reported by the provinces to the CDC-NCTB in 2005

Reported Cases in each province in 2005

(New and re-treatment Smear +)

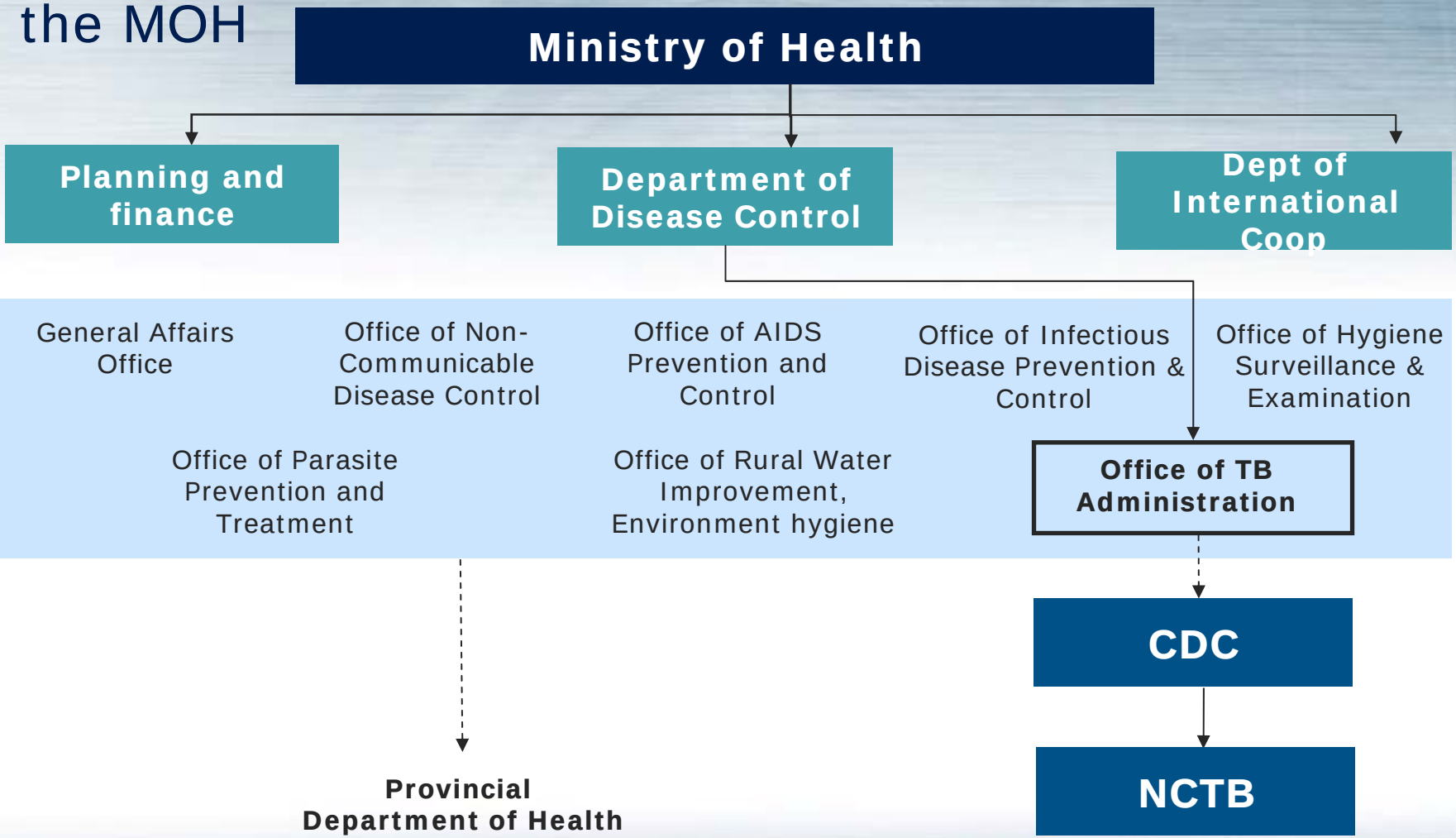


- TB burden more highly concentrated in less economically developed, rural provinces
- For example, in 2000, prevalence noted is nearly twice as high in the Central and Western provinces compared to wealthier Eastern coastal provinces
- Urban areas (e.g., Shanghai) remain a concern due to “floating” population of rural migrants into urban areas

Source: China CDC – NCTB Estimates 2006;

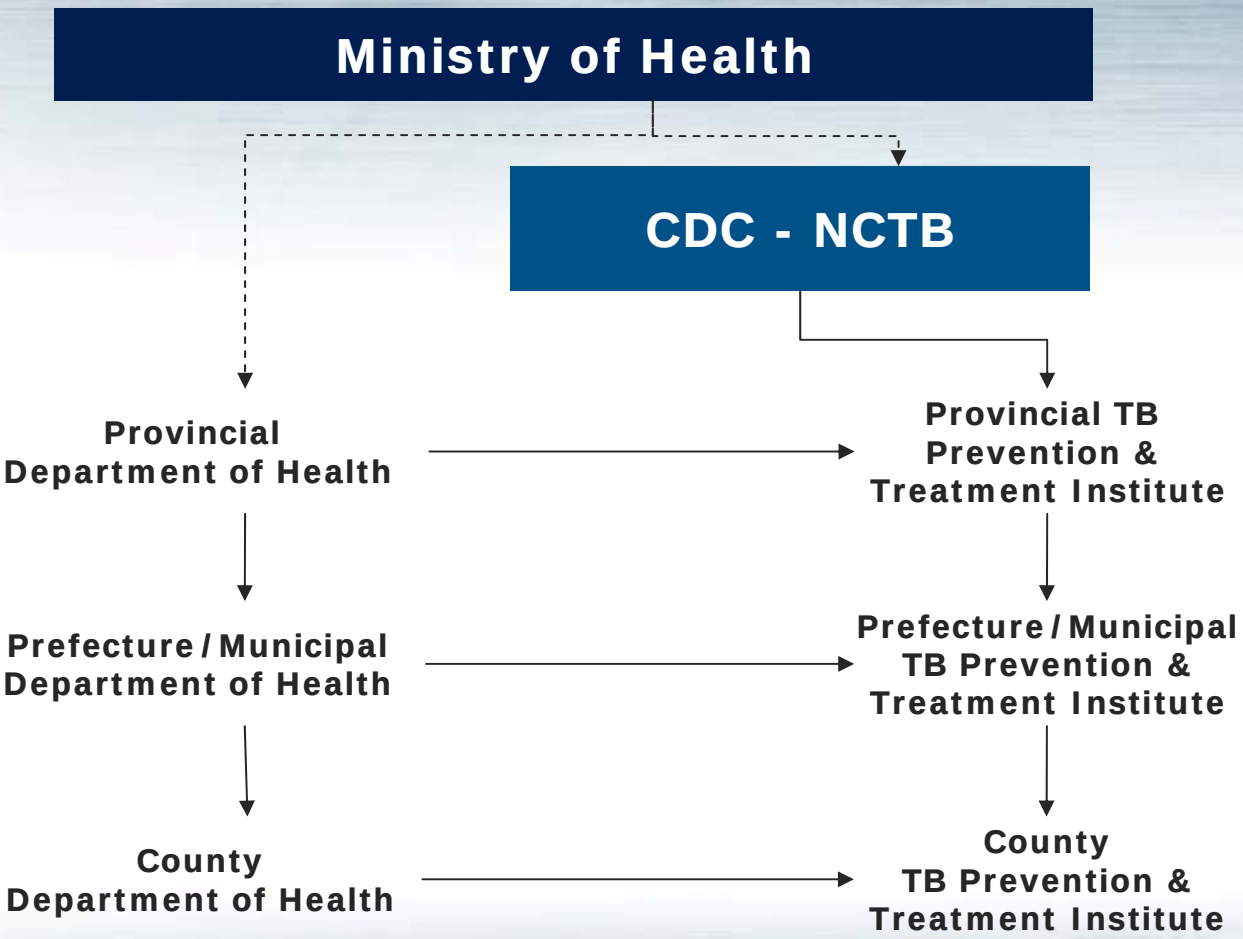
Biao, Xu, Access to tuberculosis care in rural China

TB is recognized as a priority and policy is set centrally through the Office of TB administration at the MOH



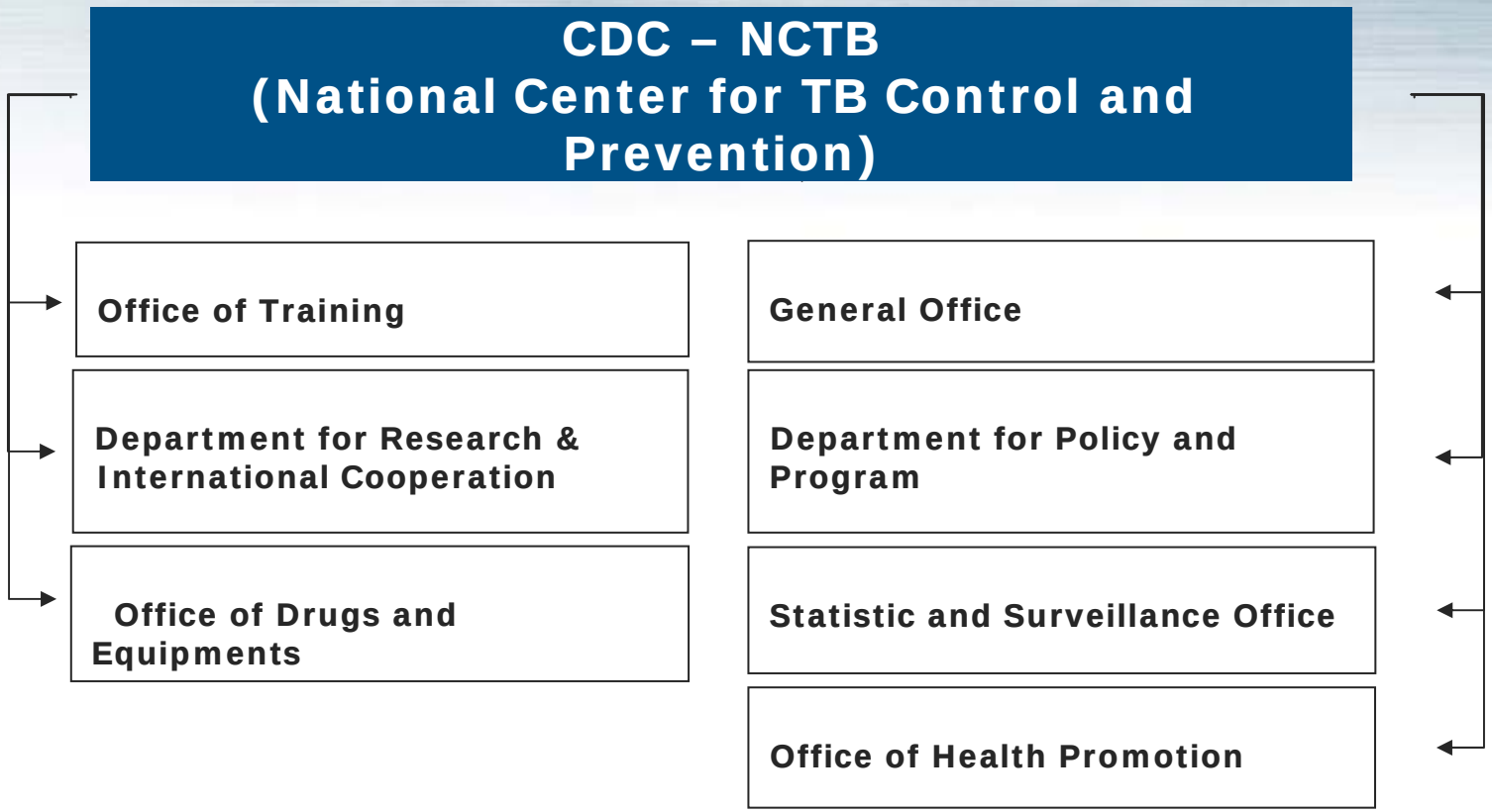
Source: CDC-NCTB 2006

The CDC oversees and works closely with the National Center for Tuberculosis Control and Prevention (NCTB) to implement the priorities set forth by the MOH



Source: CDC-NCTB 2006

The NCTB is responsible for execution and technical support of the national TB program



Source: Tuberculosis Control In China, NCTB, CDC, 2003

According the MOH, DOTS expansion and strengthening the TB program has been a major focus in recent years

DOTS progress to date:

- **Introduced on a wide-scale in 1992 when it was expanded to 13 of 31 mainland provinces using funds from a World Bank loan**
- **According to the WHO, coverage reached 100% in 2005**

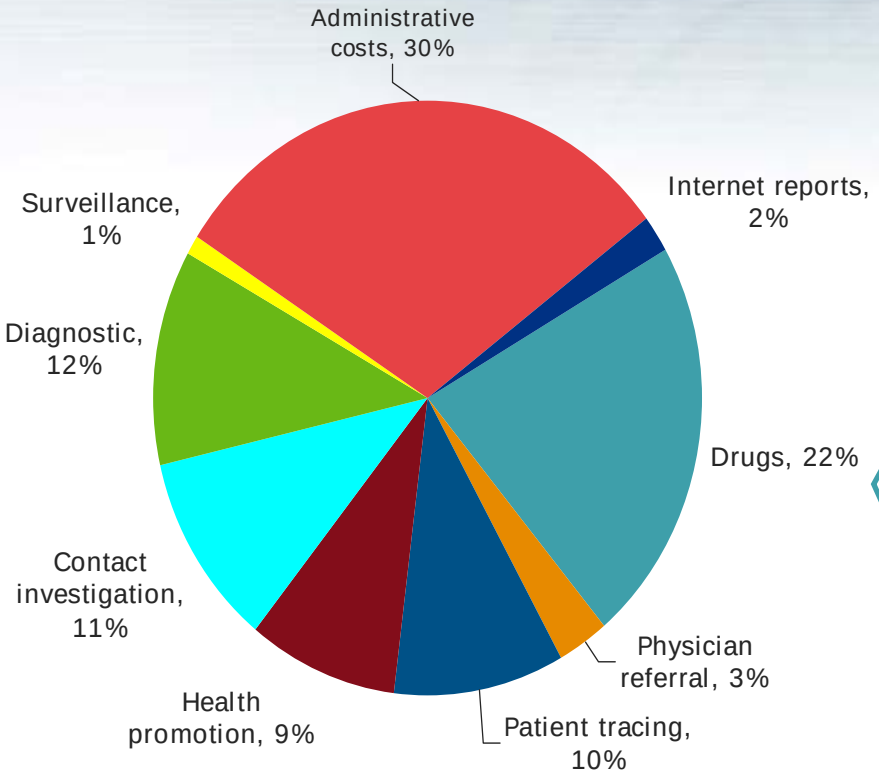
2005 achievements:

- **Increased government funding for TB control**
- **Intensified management in 12 of 31 provinces**
- **Sputum examination sites established in 1/3 of township hospitals**
- **Waived treatment fees for some smear negative patients**

Source: WHO Global Tuberculosis Control Report
Country China Country Profiles, 2005

Starting in 2004, the central government expanded its financing for TB from $5 M to $37.6 M per year

NCTB Central Budget (2005)



Funds cover a number of initiatives including:

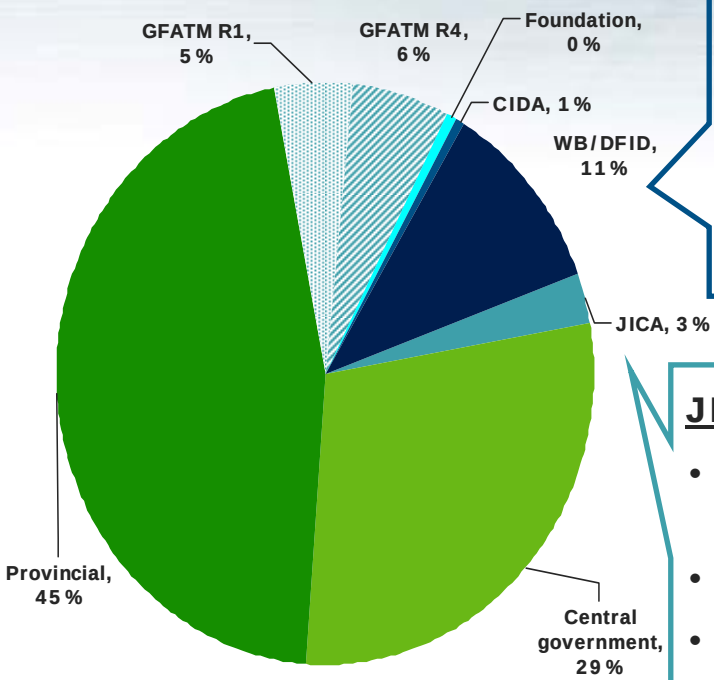
- Health promotion: .97 million notebooks distributed to doctors; 1.7 million posters distributed throughout communities
- Surveillance: Internet based surveillance system launched in all TB units by end of 2004
- Training: 26,009 staff members trained in 2004; Preliminary training module developed based on WHO and NTP modules
- Drugs: Smear + patients previously covered; Coverage for smear – patients initiated in 2005

1 RMB = .124758 USD

Source: China NCTB Estimates for 2005; Tuberculosis Control In China, NCTB, CDC, 2004

Central government funding is supplemented by provincial and external funding sources (JICA, WB)

2005 sources of funding TB (internal and external)



WB/DFID Loan:

- $13.9 M allocated through 2009 for drug and equipment procurement
- Also includes training of provincial authorities; development of project management, procurement management and financial management modules and a pilot project for social assessment

JICA:

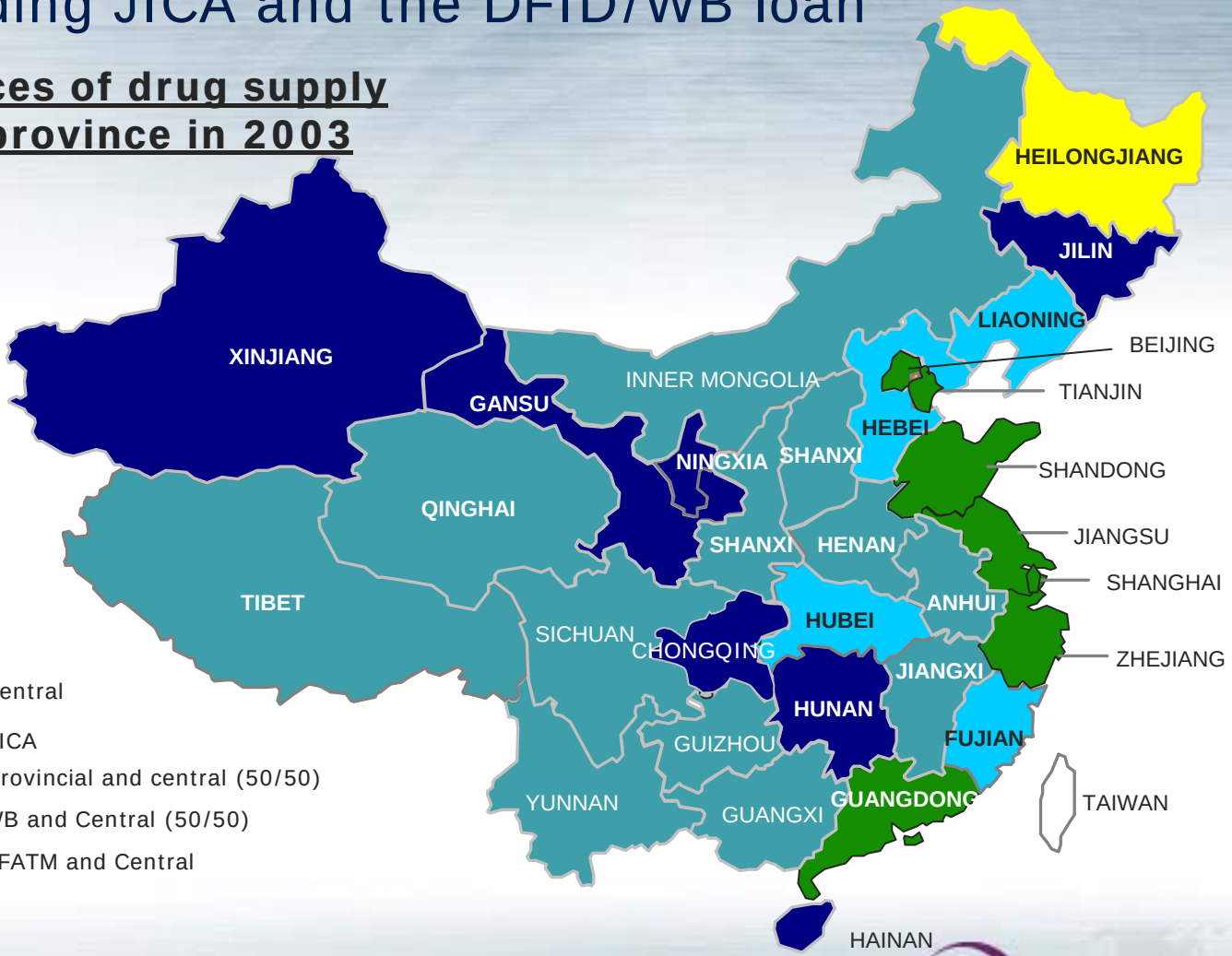
- JICA started in 2002 in 11 provinces and expanded to 1 autonomous region (Tibet)
- In 2004, 99,716 blister packs of drugs were provided
- $3.4 M provided primarily for drug procurement in 2005
- Project ended in 2005 at which time the central government has taken over procurement for the project provinces

1 RMB = .124758 USD

Source: China R5 Global Fund Proposal, 2005; DFID's Country Assistance Plan in China 2006 - 2011

Though the central government provides much funding there are other sources for TB drug procurement, including JICA and the DFID/WB loan

Sources of drug supply by province in 2003



Source: Tuberculosis Control In China, NCTB, CDC, 2003

The GFATM Round 1 grant introduced FDCs through a pilot program in Heilongjiang province

FDC:

- Rd1 Phase 2 grant that should now be in Year 4 of implementation.
- Pharmaceutical budget for the whole Phase 2 is ~$1.3million ($430,000 in Y4)
- Grant provides anti-TB drugs for all the new smear + TB patients
- Estimated that the grant is providing drugs to treat around 35,000 TB cases and that is set to target 47,000 TB cases at the end of Phase 2. Cure rate of new smear positive TB patients is reported to be 91%;
- Chinese Centre for Disease Control and Prevention is responsible for procurement through its procurement department and its bidding agency
- CDC procuring from local manufacturers

Source: GFATM

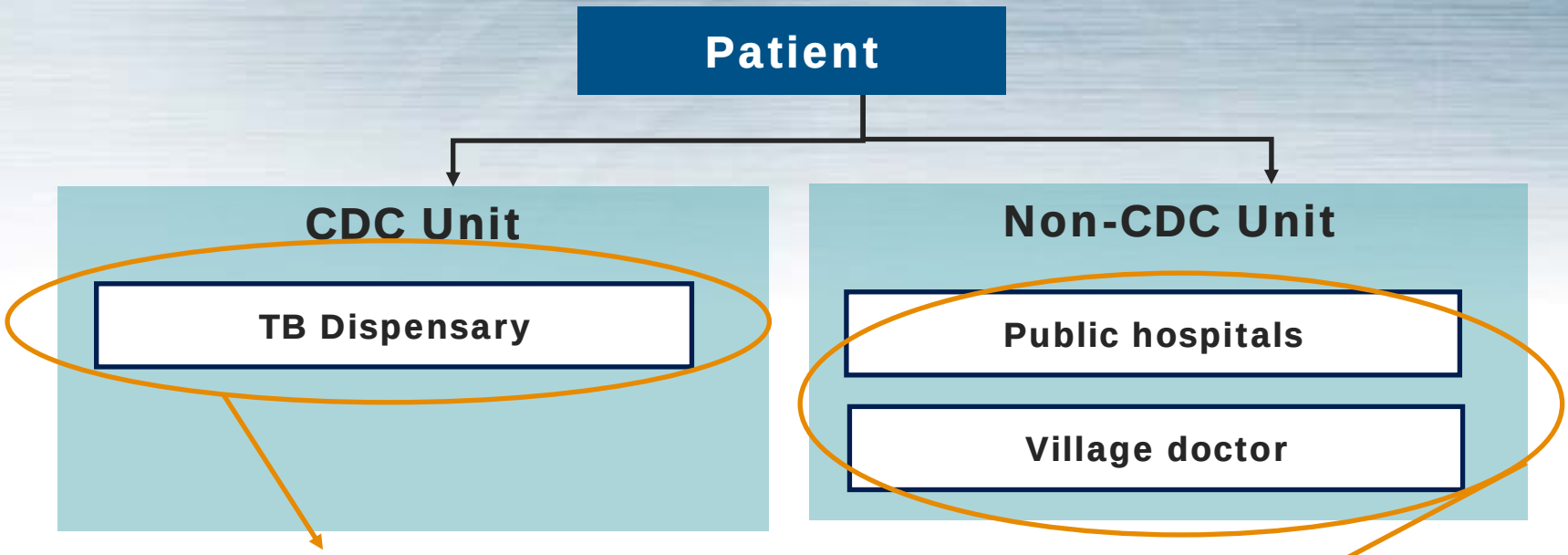
The GFATM Round 5 will fund pilot programs for the most vulnerable populations with programs for MDR-TB, migrant workers, and TB/HIV as the primary focus

MDR-TB Programs:

- Project to provide 4,000 MDR-TB patients with treatment between 2007-2011 through GLC/ GFATM support
- 2 pilot programs started in Shenzhen, Guandong Province and Wuhan, Hubei Province
- Plans to include 31 DOTS Plus Sites in program over next 5 years

Source: GFATM

In most instances, patients go directly to the hospital system and are referred to a TB dispensary



- Most go to a prefecture or county level CDC unit/ TB dispensary
- Depending on the size, this may be a CDC unit for multiple diseases (e.g. Guandong Panyu County Chronic Diseases Center) or just for TB referred to as a TB Prevention Institute)

- In some instances, the government may also establish a public hospital may treat and distribute free TB medicines
- In rural areas, village physicians may also administer free medicines which they pick up from the county level TB unit
- This is under the authority/ guidance of the CDC

Once referred to a TB dispensary, patients have access to free diagnosis and treatment

All provinces that implement their TB program through central government funding, JICA, WB/DFID donations provide the following for free (other provinces use this list as reference for implementation):

Diagnosis

- X-ray photo for suspicious TB patients
- Smear test for patients with abnormal X-ray photo
- Smear tests for patients during free treatment

Treatment

- Category I: New Smear + Pulmonary TB and serious smear - patients
- Category II: Smear + re-treatment
- Category III: Smear – Pulmonary TB (less serious)

Source: IMS Interviews

Patients approach a hospital or TB dispensary; once diagnosed, they are categorized, and treated according to the MOH's guidelines

Consultation

- Patient approaches a practitioner or public health facility for consultation
- In more rare cases, patient may approach a TB dispensary directly; though in most instances, patients are referred to the TB dispensary after initial consultation

Diagnosis

- May be diagnosed at a hospital or TB dispensary
  - Hospital: x-ray, CT and in rare cases sputum testing
  - TB dispensary: x-ray and sputum testing
- X-ray conducted first at county/township hospital or TB institute
- If abnormal x-ray, then smear test conducted (primarily at the TB prevention institute); some county hospitals have capability to conduct smear tests and may diagnose patients in their facilities

Treatment

- Patients confirmed as having TB are then categorized into one of three categories, according to the sputum test results and their symptoms
- Patient reported into an internet reporting system at the hospital (before referred to dispensary) and at the dispensary
- Hospitals are then supposed to refer patients to TB dispensary for treatment
- If a patient prefers or has failed repeat treatment, may be referred to specialized TB hospital for treatment

Source: IMS Interviews

The established treatment regimens for Category I/II/III are provided for free at the local TB dispensary

NCTB TB Drug Treatment Regimen

Category	Definition	Intensified phase	Continuation
Category I	New smear-positive; seriously ill smear negative; seriously ill extra-pulmonary	INH .3 X 2 (600 mg) RFP .3 X2 (600 mg) PZA 0.5 X 4 (2,000 mg) **EMB .25 X 5 (1250 mg)**	INH .3 X 2 (600 mg) RFP .3 X2 (600 mg)
Category II	Previously treated smear-positive (relapse, failure, treatment after default)	INH .3 X 2 RFP .3 X2 PZA 0.5 X 4 EMB .25 X 5 S 750mg	INH .3 X 2 (600 mg) RFP .3 X2 (600 mg) **EMB .25 X 5 (1250 mg)**
Category III	New smear-negative; and extra-pulmonary, not seriously ill	INH .3 X 2 (600 mg) RFP .3 X2 (600 mg) PZA 0.5 X 4 (2,000 mg)	INH .3 X 2 (600 mg) RFP .3 X2 (600 mg)

Details on the 1st line Regimen:

6 month treatment regimen – 4 months intensified phase and 2 months continuation phase. All treatments are every other day; doses not based upon per kg weight.

No fixed doses used with the exception of Heilongjiang, which just started using in 2005 through a global fund grant.

Source: China CDC-NCTB 2006

Patients who do not opt for TB dispensaries can pay out-of-pocket for diagnosis at general or specialized centers

Role in diagnosis of TB

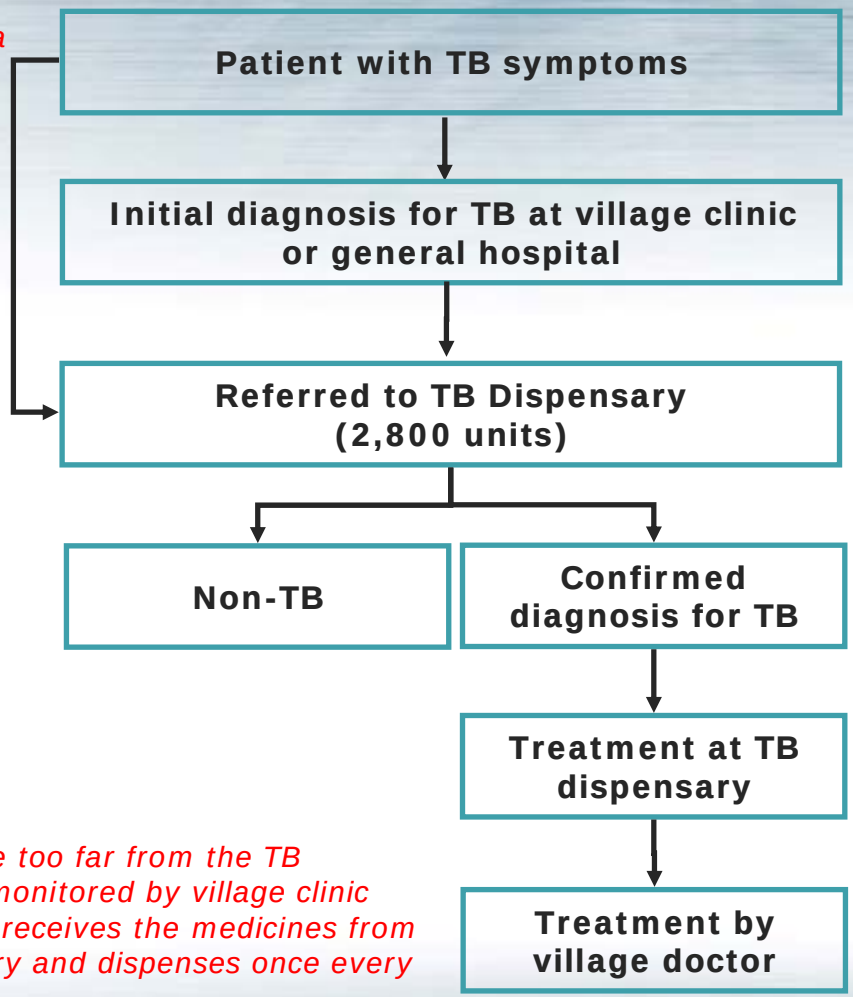
	Diagnoses or refers?	X-rays	Smear tests	Cost to patient
Village clinic	Refer	No	No	Consultation fee: 1.25 USD X-ray: 10 USD Smear: 1.25 USD
County / township hospital	Refer	Maybe	Maybe	
TB specialized hospital	Diagnosis	Yes	Yes	
TB institute	**Diagnosis**	**Yes**	**Yes**	**Consultation fee: free** **X-ray: free** **Smear: free**

1 RMB = .124758 USD
1.25 USD = 10 RMB
100 USD= 80 RMB

Source: IMS Interviews

Most patients suspected of having TB are referred to a CDC unit for further diagnosis and treatment

CONCEPTUAL FLOW



Can self-refer to a local TB center

Typically present at county or township hospitals. In rural areas, may present to village healthcare worker.

Some county hospitals that have capabilities to conduct x-rays and sputum microscopy in their facilities conduct initial diagnoses in their facility.

Most patients are referred to TB dispensary for diagnosis and are treated and monitored at the township or village level TB dispensary.

Majority of patients remain treated at the TB dispensary, typically receiving a month's supply at a time.

Patients who live too far from the TB dispensary are monitored by village clinic physicians, who receives the medicines from the TB dispensary and dispenses once every 1-2 weeks.

Source: Cambridge interviews 2006; Biao, Xu, "Access to tuberculosis care in rural China"

Incentives are being put in place to ensure patients are referred and monitored through the NCTB

- In the past, many patients were not referred on to the TB dispensary as several hurdles existed (*e.g.*, physician disincentives, patient costs, lack of awareness) or were referred after a significant amount of time has passed
- A key aspect of recent efforts has been to ensure collaboration between CDC and hospitals and referral through various initiatives (e.g. physician referral fees)

1 **Initial Referral:**

10 RMB or $1.25 given to village, township and county facility staff for discovering a patient and referring to a TB dispensary

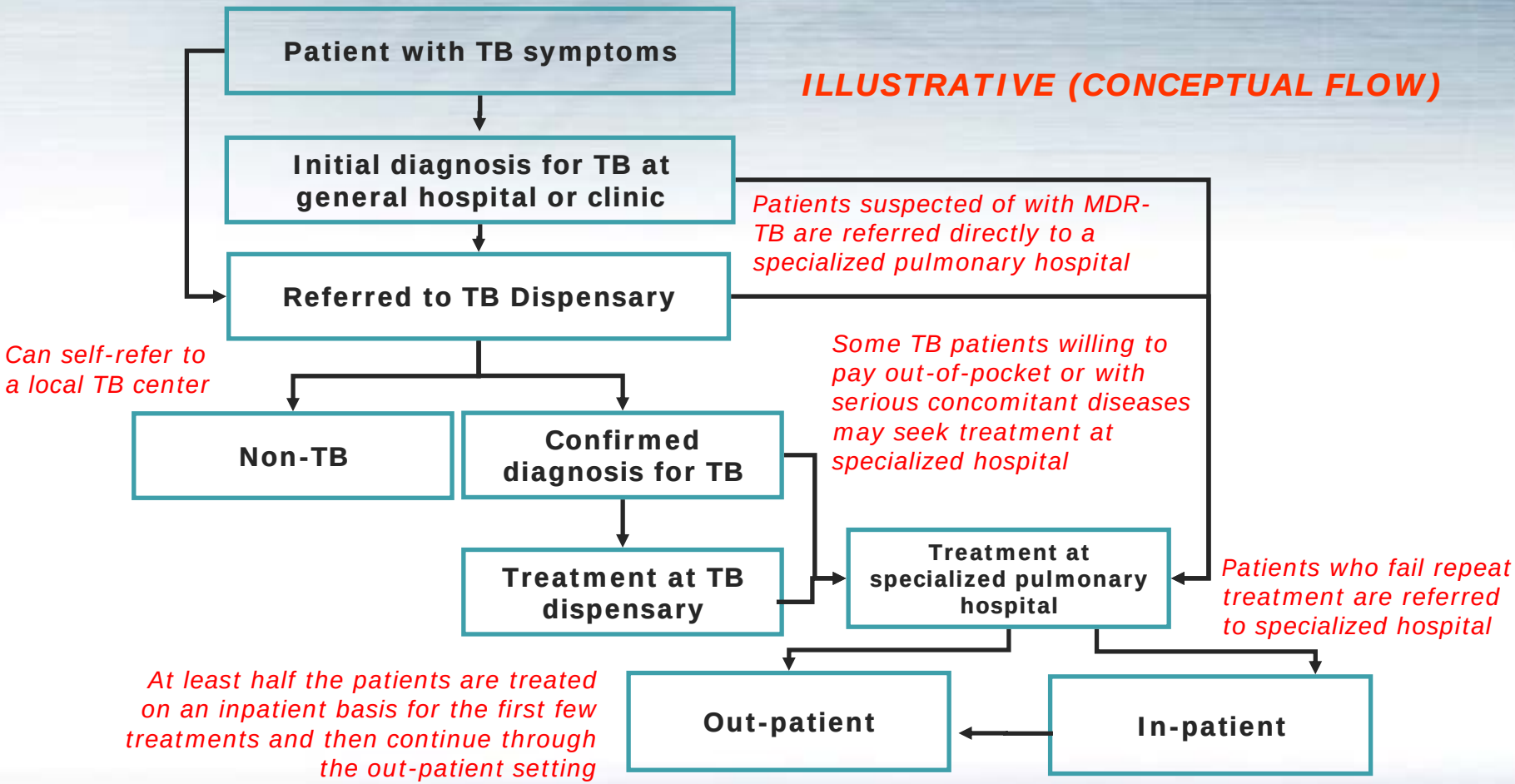
2 **Monitoring:**

- New smear +: 100RM
- Re-treatment smear +: 120RMB
- Smear -: 60RMB

1 RMB = .124758 USD
1.25 USD = 10 RMB

Source: IMS interviews

Some MDR-TB patients or those who failed re-treatment are referred to specialized TB hospitals at their own cost



Source: Cambridge interviews with specialized hospitals in Guandong, Beijing and Shanghai, Cambridge interviews with provincial and country CDC in Guandong, Shanghai and Hainan; 2006

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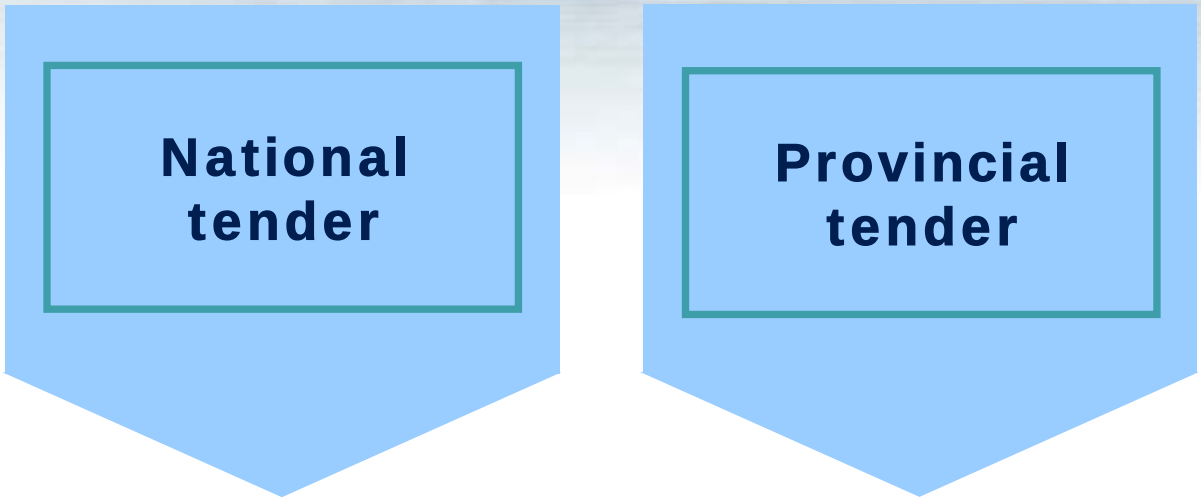
In China, TB drug procurement channels depends on the route of funding and setting of administration

Procurement mechanism

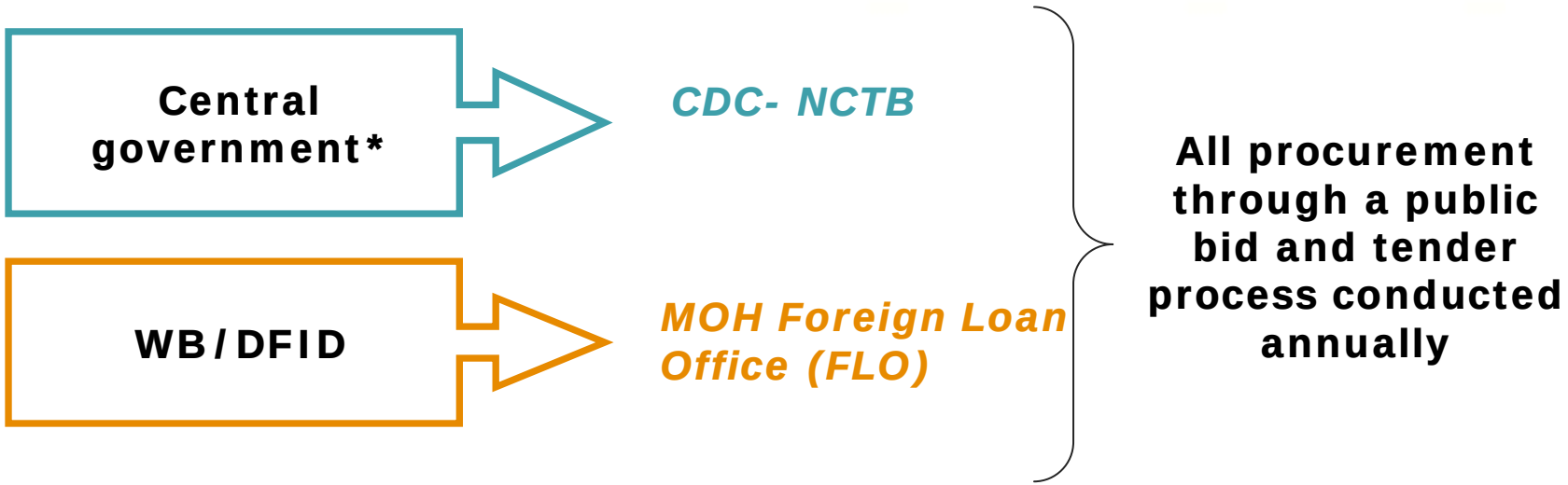


- ***TB prevention institute or CDC unit (for centrally provided drugs)***

- ***TB prevention institute or CDC unit (for drugs provided by provincial government)***
- ***Specialized pulmonary hospitals***

Source: IMS Interviews

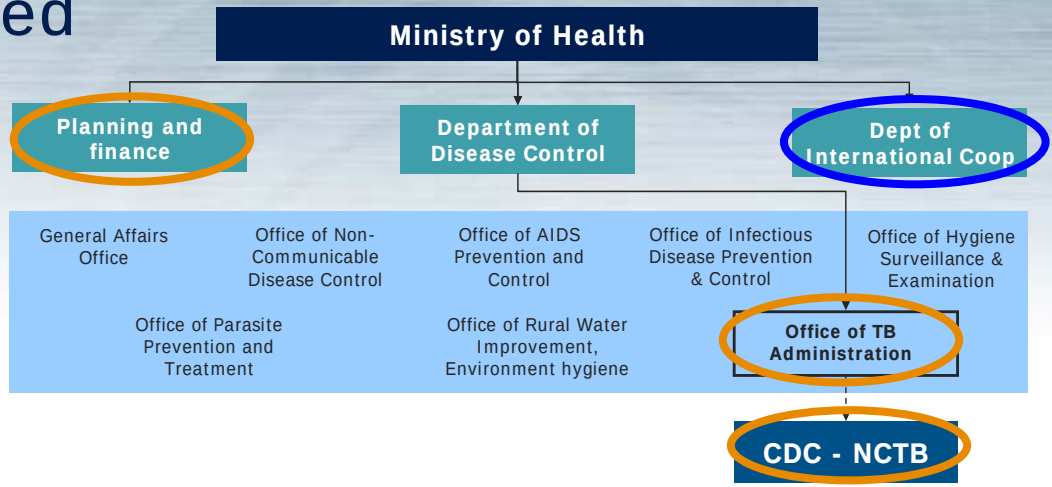
The majority of TB medicines provided to patients for free are procured at a central level through funds provided by the government or international donors



*Includes funds provided to central government funds from JICA or other international donors

Source: IMS Interviews with CDC-NCTB 2006

The CDC- NCTB is a key stakeholder in the procurement process though other departments are also involved



- Funds may come into the NCTB's budget through central government allocation or through grants from international donors
- For **funds provided by central government**, three different departments come together to make all decisions on procurement for TB drug funds:
  - Planning and finance is the "gatekeeper for financial resources"
  - Office of TB Administration is the official "MOH representative" for TB
  - CDC-NCTB is the "implementer"
- For funds **provided by foreign sources** (e.g. JICA), the Department of International Cooperation also involved

Source: IMS Interviews with CDC 2006

For funds provided through the WB/ DFID loans, a separate entity is responsible for procurement decisions

Route of Funding	Procurement Agent
WB/DFID	*MOH Foreign Loan Office (FLO)*

- Separate procurement process for WB loans
- Bank loan is managed by FLO, and any procurements using the loan have to follow the bank's procurement requirement and procedure
- Only 4 provinces (Hubei, Hebei, Liaoning, and Fujian) and have used the loan to purchase drugs in the past until 2006
- Funds borrowed and repaid by provincial governments; local government required to provide counterpart funds for the project
- Though not yet finalized, it is most likely that the central government will cover all the drug purchase starting from 2007 even for those 4 provinces

Source: World Bank, 2006

For all channels, suppliers are selected through an annual bid and tender process issued by the CDC or MOH FLO

"Organizing company" who arranges the tender is selected…

- Procurement gatekeeper (CDC for central funds or FLO for WB/DFID funds) selects a company to administer the bid and tender
  - Eligible companies based on a pre-qualified list
  - For the CDC, China Technology Import and Export General Company is the current contractor

…National competitive bid floated to public…

- Manufacturer must be SFDA approved (no additional pre-qualification criteria)
- Eligible manufacturers may submit bids

…Limited number of suppliers win the bid for the next year

- A minimum of 3 suppliers per unit is ideal
- However, in the past few years, there have only been one or two suppliers per unit
- Winning bid is highly based on price
- Tender issued for 1 year

Though the procurement party responsible differs (the MOH Foreign Loan Office for WB/DFID funds and the CDC-NCTB for central funds), the process is similar

Source: IMS Interviews with CDC-NCTB 2006

In 2005, the following domestic suppliers were awarded the tenders for 1st line TB supply

Company	Units	
Shenyang Hongqi Luoshan Sanjiu	HRZE	Pre-packaged blister pack containing daily dose for regimen
	HRZ	
	HR	
Guoyao Guorui	Streptomycin	Vial
	Water for injection 5 ccs	5 cc vials
Anhui Tiankang	Syringe 5 cc	n/a

Source: MSH; IMS interviews

The NCTB determines how much supply it will need on an annual basis based on provincial estimates of burden

Flow of Reporting

CDC-NCTB
Dept of surveillance and statistics

Based on all provincial reports, NCTB aggregates forecasted demand*

Provincial TB Prevention Institute

Reports new cases on a monthly basis;

General report of drug supply and distribution on a quarterly basis*

Prefecture TB Prevention Institute

Report supply drugs on monthly basis

County TB Prevention Institute

Report supply of drugs on monthly basis

NCTB uses reports to generate a demand forecast

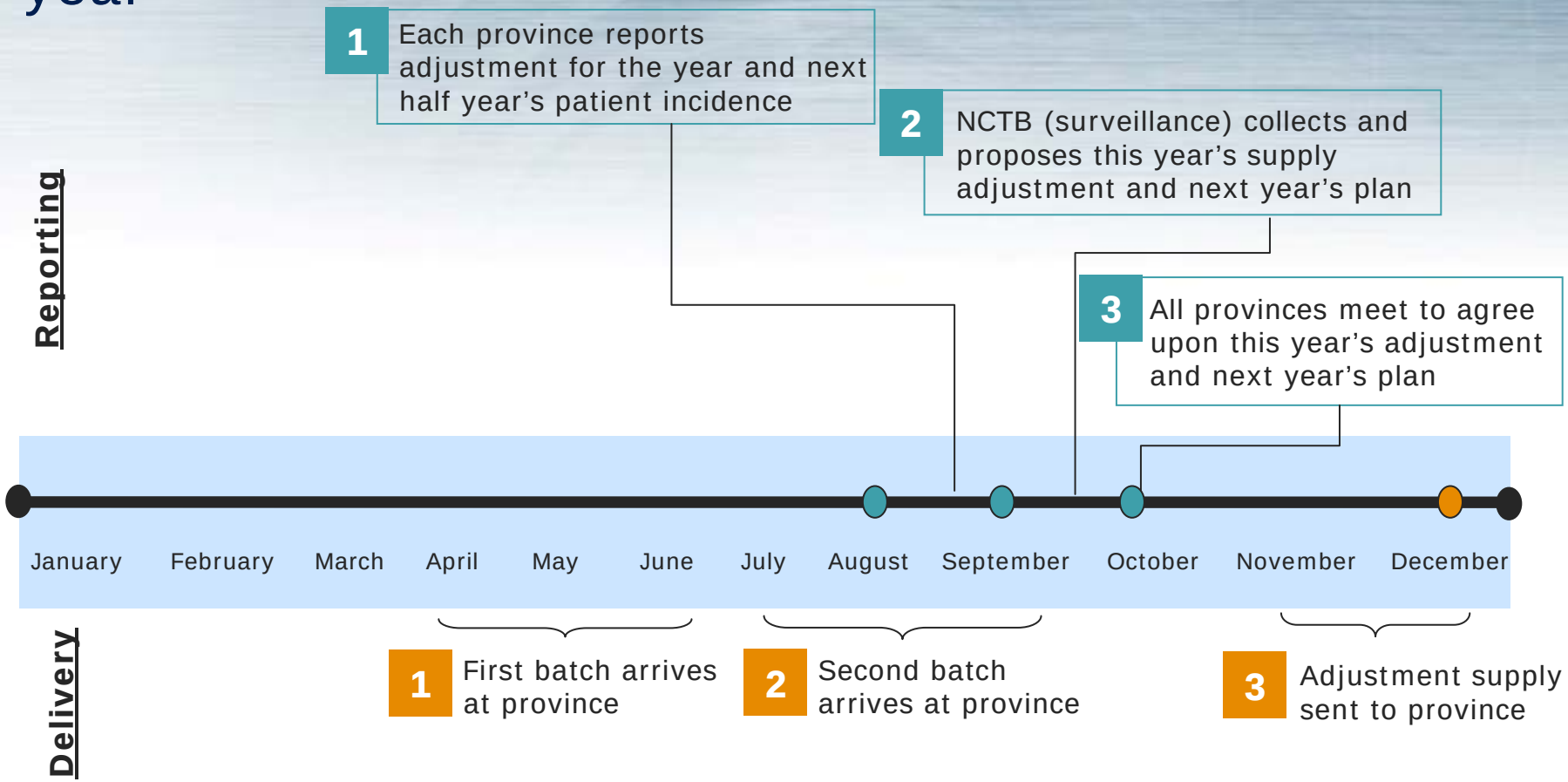
Forecast is used to:

- ***Write up the public tender***
- ***Place orders with suppliers***
- ***Determine supply allocations to each province***

**Department of surveillance and statistics conducts statistical modeling to confirm a county is requesting an appropriate level, and may adjust accordingly*

Source: IMS interviews with CDC- NCTB 200

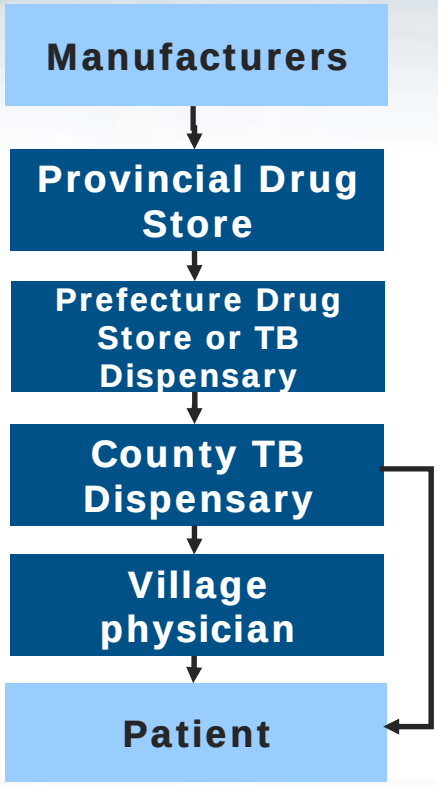
CDC procured drugs are delivered directly to each province at pre-determined points 2 to 3 times a year



Source: Cambridge interviews with CDC- NCTB 2006

TB medicines flow directly from the manufacturer to the provincial level TB prevention institute or warehouse

Example: Overview of Distribution Flow through in the CDC-NCTB (Including Drugs Procured Through Central/JICA, WB loan and Provincial Funds)



1st transfer:
Distributed directly from manufacturer to provincial level CDC unit or TB drug warehouse

3rd transfer:
Distributed to county level CDC unit or TB drug warehouse on an ad-hoc basis

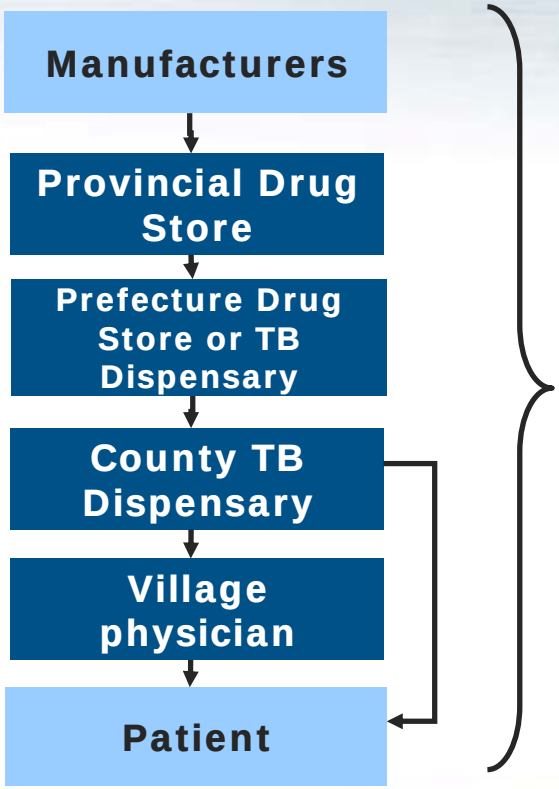
2nd transfer:
Distributed to prefecture level CDC unit or TB drug warehouse at least 4 times a year

4th transfer:
To village physician to dispense to patient or direct to patient on a once monthly basis.
Patients generally present used blister packs as proof of use.

Source: IMS interviews with CDC- NCTB 2006;

Once supply reaches provinces, there may be variances in supply and distribution as standard procedures are not set

Example: Public Sector through NCTB-CDC (Central/JICA and WB)



- Drug management functions are undertaken at 4 levels of the supply system: central, provincial, prefecture and county
- As systems and processes differ in each province, there is no stand operating procedure for drug distribution:
  - How drugs are distributed
  - Level of buffer stock kept
  - Frequency of distribution
- The MOH is currently implementing a pilot study on Standard Operating Procedures

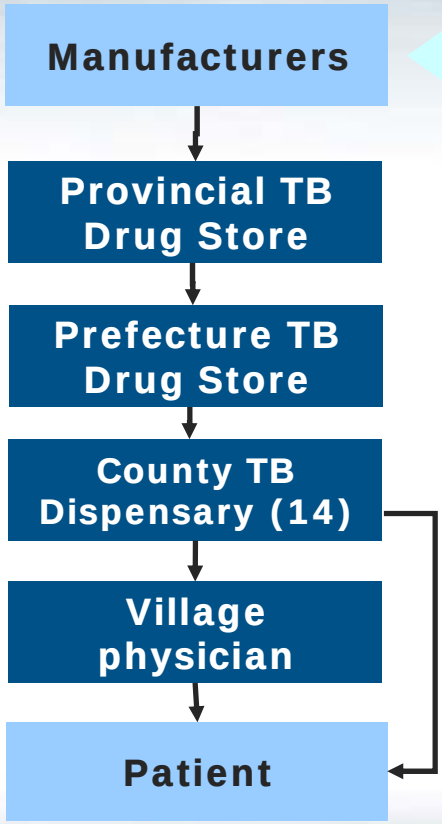
Source: IMS interviews with CDC- NCTB and MSH

Provinces receiving drugs procured centrally both through the government and WB/DFID essentially have two separate supply processes though the flow is similar

Drug Flow: FUJIAN PROVINCE

WB
Delivery once a year
25% buffer stock with suppliers
Lead time of 90 days

Central government / JICA
Issued three times a year to one of 31 provincial drug stores: April – June, July-September, December.
Lead time of > 90 days.
25% buffer with suppliers.



1st transfer:
Distributed directly from manufacturer to provincial level CDC unit or TB drug warehouse

3rd transfer:
Distributed to county level CDC unit or TB drug warehouse about **4 times a year**. **Push system** employed when new stocks arrive; permits a **pull system** for dispensaries with high case detection rate when extra drugs are needed. Closest dispensary is 4 Kms and furthest is 100 kms. 3-4 months stock kept.

2nd transfer:
Distributed to prefecture level CDC unit or TB drug warehouse **twice** a year. Employs a "**push system**" for distributing drugs to prefecture level when fresh stocks arrive; keep sufficient stocks as buffer

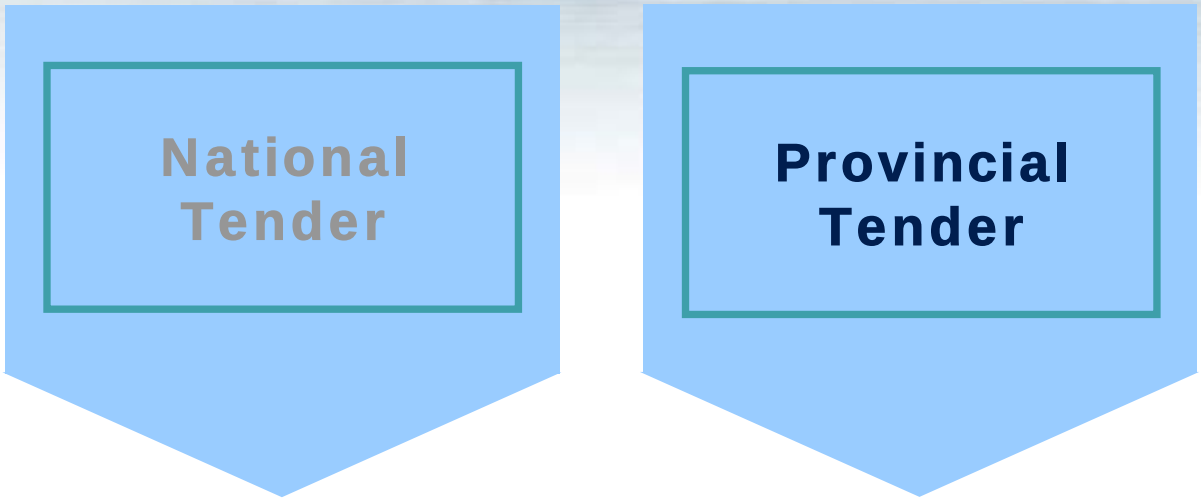
4th transfer:
To village physician to dispense to patient or direct to patient on a once monthly basis (on presentation of empty blister packs.

Source: IMS interviews with CDC- NCTB 2006;

Rational Pharmaceutical Management Plus Pre-assessment Visit to Fujian Province, China: Trip Report, November-December 2004

Provinces are responsible for the procurement process for 1st and 2nd line TB medicines for two situations

Procurement channel



- ***For all provinces, the provincial administers an annual bid to determine eligible manufacturers for public hospitals in its region including for 1st and 2nd line TB medicines (for specialized pulmonary hospitals)***
- ***For those (eastern coastal) provinces that are responsible for procuring TB medicines, bids are run by the provincial DOH for the TB program***

Source: IMS interviews

Each province administers an annual bid to determine eligible suppliers of products used within public hospitals

The DOH issues a bid…

- Each year the provincial department of health issues a bid for all drugs (not just TB) through the internet
- Manufacturers and distributors submit requests

…and an eligible list of supplier is determined

- DOH uses different expert teams to evaluate bids
- Therefore, specialized hospitals very involved in the process as they are on the TB expert team
- Expert teams determine winners of bid
- Criteria based upon quality and price

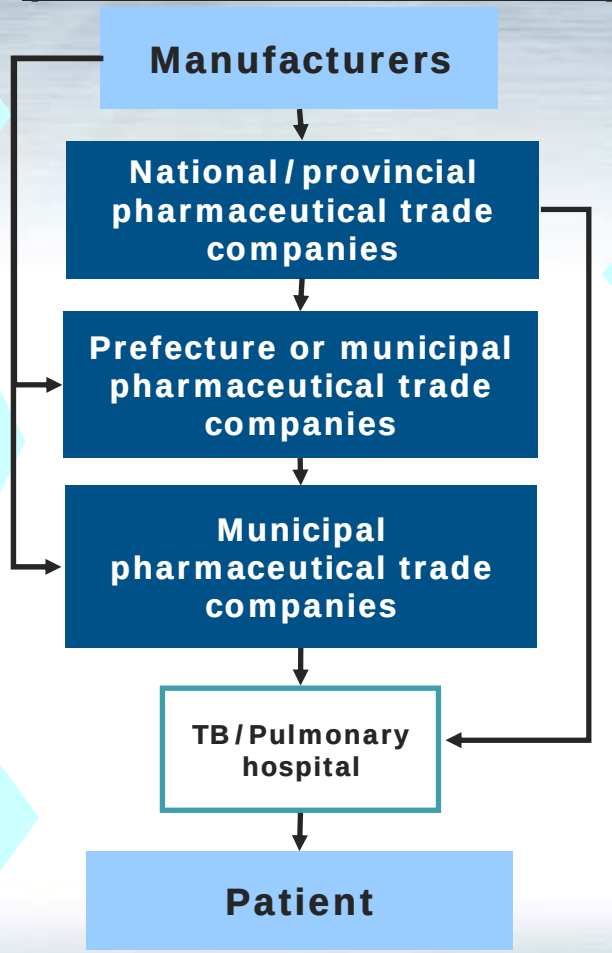
…Once awarded, hospitals buy direct from supplier

- Once the winners are determined, the hospital pharmacy orders directly from the distributor or supplier on an ad-hoc basis

Source: IMS interviews

TB medicines, like other drugs procured by hospitals, may flow through multiple distributors to the hospital

Drug Flow: Hospital Setting (traditional distribution process)



1st transfer:
Supply delivered from manufacturer to distributor's warehouse.

2nd transfer:
National or provincial distributor may deliver directly to more localized distributors who distribute to smaller hospitals. For TB, an estimated 10% of drugs go through these channels.

3rd transfer:
Hospitals receive drugs on a regular basis (i.e., once a week); pharmacy and/or providers then sell drugs to patients

2nd transfer:
National or provincial distributor delivers directly to hospital. This is more common for TB, given that most patients are treated in large specialized hospitals.

Source: IMS interviews with hospital and suppliers/ distributors

Several provinces provide resources for part of their TB program and thus are responsible for procuring drugs that are funded through local resources

- Shanghai
- Beijing
- Tianjin
- Jiangsu
- Wuhan (Hubei Province)
- Guandong
- Shandong

- Several Eastern coastal provinces are responsible for providing funds to procure half of drug needs for TB in their region
- For these provinces, the CDC-NCTB provides some guidelines or standards under the National TB program
  - Level of supply to be procured
  - Similar packaging as national
- However, the provincial level has discretion in implementation
  - Determining suppliers
  - Providing extra coverage to patients
  - Transferring drugs and of payment

Source: IMS interviews with CDC-NCTB

The provincial bid and tender process itself is similar to the central process

	Central	Province
Who issues the tender?	• CDC- NCTB/ Office of TB Admin • Organizing company who administers bid selected by central	• **Provincial DOH** • Organizing company who administers bid selected by province
International or national tender?	• National	• National
Pre-qualification required?	• SFDA approved	• SFDA approved
How often is tender floated?	• Annually • Contract is good for one year	• Annually • Contract is good for one year
How is tender awarded?	• At least 3 suppliers to open the bid • Once pre-qualified, 1-3 suppliers are chosen mostly on the basis of price	• At least 3 suppliers to open the bid • **Multiple suppliers likely (3-4)**
How is payment issued to supplier?	• Depends on source of funding • If from NCTB, supplier submits receipt to planning and finance department for reimbursement	• **Province pays supplier directly**

Source: Interviews with NCTB-CDC and Provincial CDC

There are variances in how the TB program is administered and how drugs are distributed

In Shanghai:

- Rural immigrants receive labeled "free drugs“ procured from national government
- Rest of patients get drugs go to 1 of 36 TB appointed hospitals or clinics
- Drugs are purchased by these clinics and hospitals through traditional commercial channels
- Patient are reimbursed for the items or first lines of drugs specified by the TB programs

In Guandong:

- Similar to central government
- Medications are labeled “free drugs” and are available only at the TB prevention institute

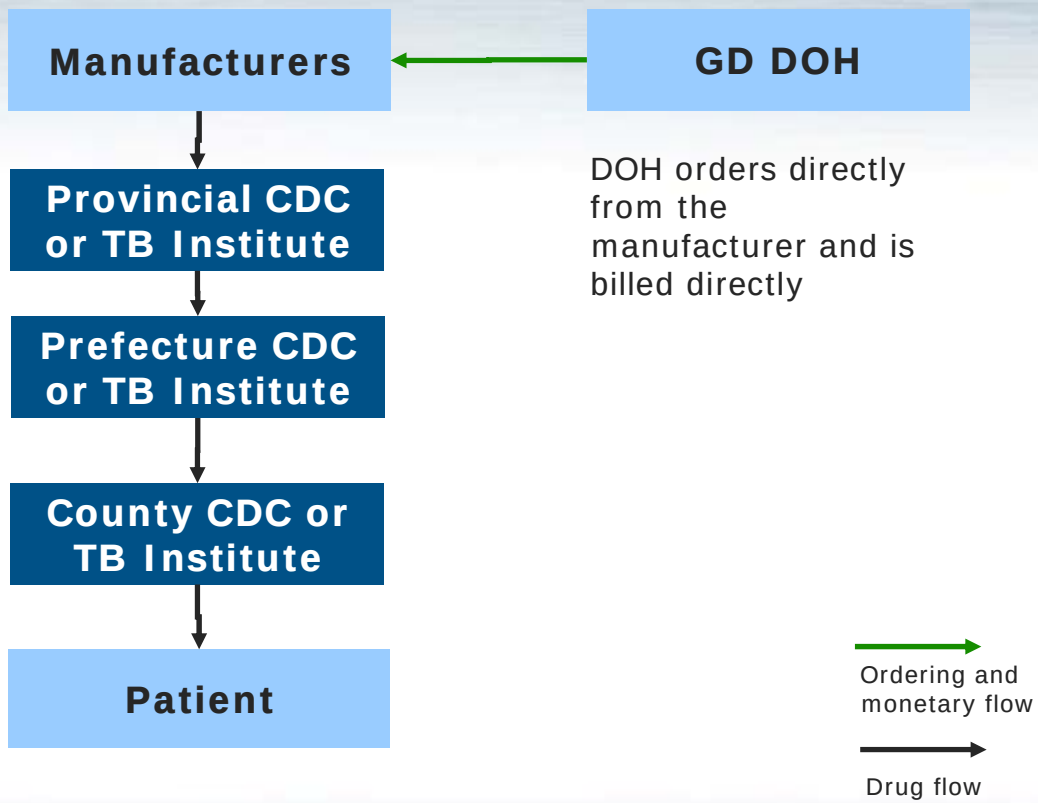
Source: Interviews with Shanghai and Guandong CDC

In Guandong province, TB medicines are procured through provincial funds but are distributed through the same channels as centrally procured medicines

Example: Guangzhou, Guangdong Province

In Guangdong:

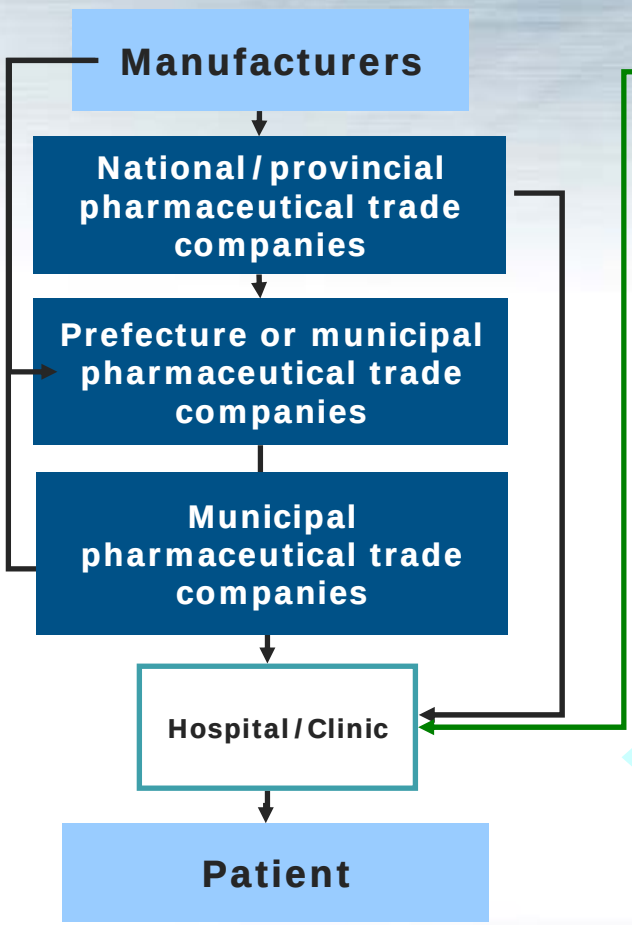
- TB medicines are procured by the provincial DOH through an annual bidding process
- Medicines are delivered from manufacturer through traditional channels
- At the prefecture level in Guangzhou, delivered from provincial TB Institute to the Guangzhou TB Prevention Institute (which is under Guangzhou Thoracic Hospital)
- Subsequently delivered to county level unit (e.g. Panyu County Chronic Diseases Hospital)



Source: IMS interviews with CDC- NCTB 2006; Guandong CDC; Guangzhou Thoracic Hospital; Panyu County Chronic Disease Hospital

In Shanghai, TB medicines are distributed through commercial channels

Example: Shanghai



SH DOH

Administers bid to determine eligible suppliers

Hospitals order 1st line TB medicines directly from manufacturer through traditional distributor channels.

There are 36 appointed TB hospitals and clinics. Patients visiting one of these approved settings will be reimbursed for diagnosis and treatment with 1st line medicines, as specified by the TB program.

Ordering and monetary flow

Drug flow

Source: IMS interviews with CDC- NCTB 2006; Shanghai CDC Hospital

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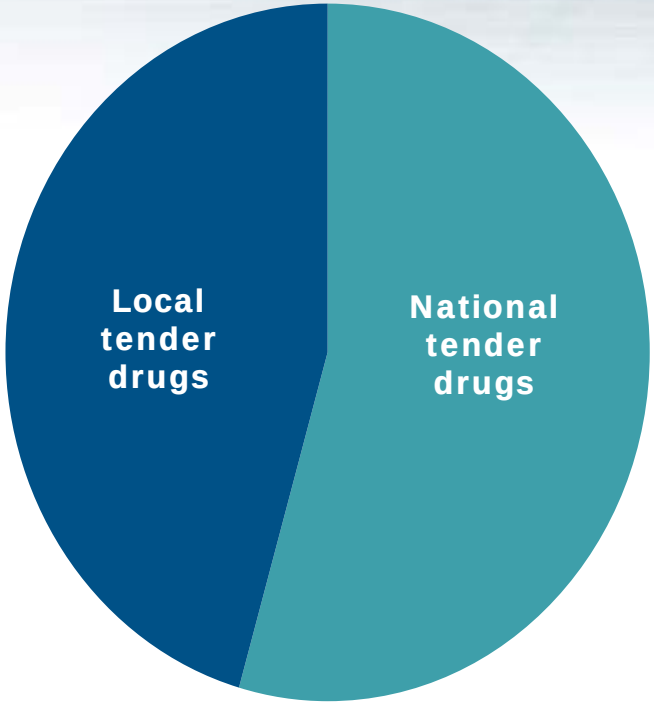
The 1st line TB market in China is currently valued at $20 million USD

Total TB Market Value in 2005 (Approx 20 M USD)



A publicly-driven 1st line market:

- Majority of 1st line TB drugs flows through the public sector
- Nationally procured drugs include:
  - All drugs financed by central government and procured through CDC
  - Drugs financed by external funds/ loans and procured through CDC/FLO
- Locally procured includes drugs procured by provinces or individual hospitals

Note: Segmentation is by product—does not account for use of 1st line products in 2nd line treatment and vice versa

Source: Supplier figures, IMS database, IMS analysis

1st line market is predominantly publicly financed whereas the 2nd line market is private

Total TB Market

1st line market

- **1st line market dominated by the public sector**
- **Significant volume and value procured by national government and provided for free to patients at TB institutes/ TB dispensaries; supplemented by provinces**
- **Some patients may opt to pay out-of-pocket or through private insurance at a specialized hospital– but this is expected to be small**

2nd line market

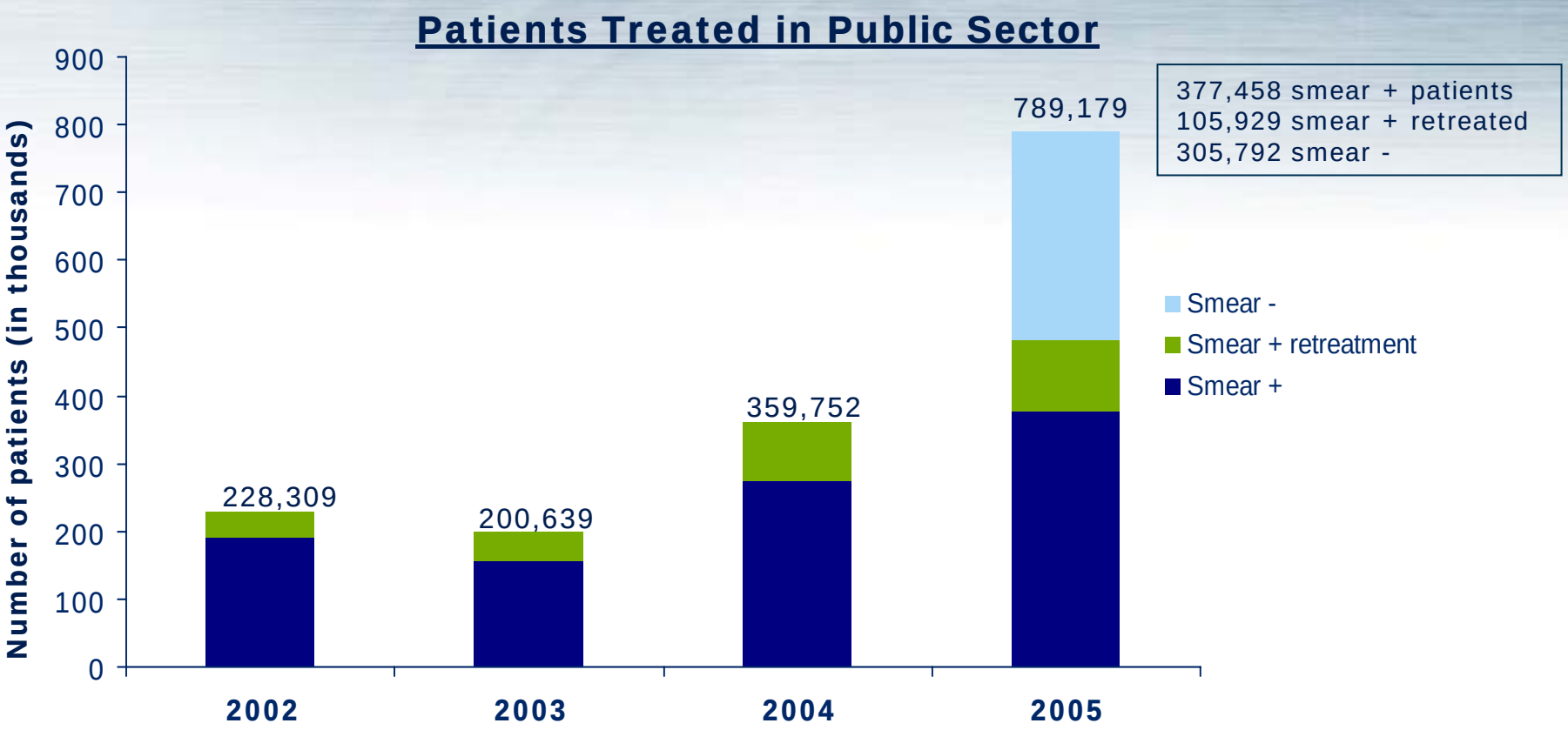
- **The National TB program does not cover 2nd line market**
- **Patients treated at specialized pulmonary hospitals and pay out-of-pocket or through insurance**
- **2nd line estimates are <u>very rough</u> as sales data is not captured based on indication***

**Percentage use for TB was applied to each product's sales based upon qualitative inputs*

Note: Segmentation is by product—does not account for use of 1st line products in 2nd line treatment and vice versa

Source: Supplier figures, IMS database, IMS analysis

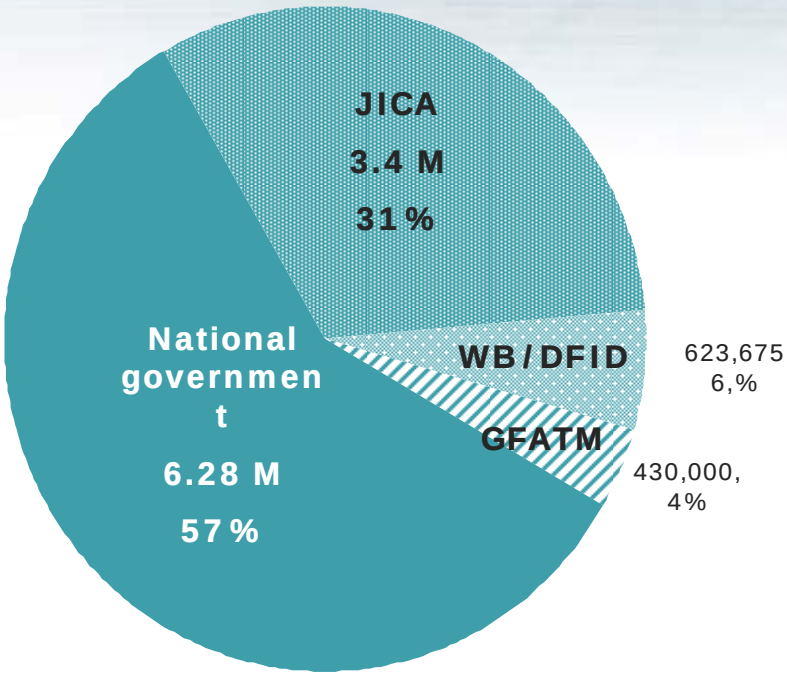
The NCTB reported that 789,179 patients were treated in the public sector for TB in 2005



Source: Data provide by the NCTB in 2006

Aggregation of various funding sources indicates the total 1st line public sector TB market procured through national tenders were a minimum of 10.75 M USD in 2005

Total TB Market Value by Sector in 2005 (Approximately 10.75 M USD)



Nationally procured public market includes[1]:

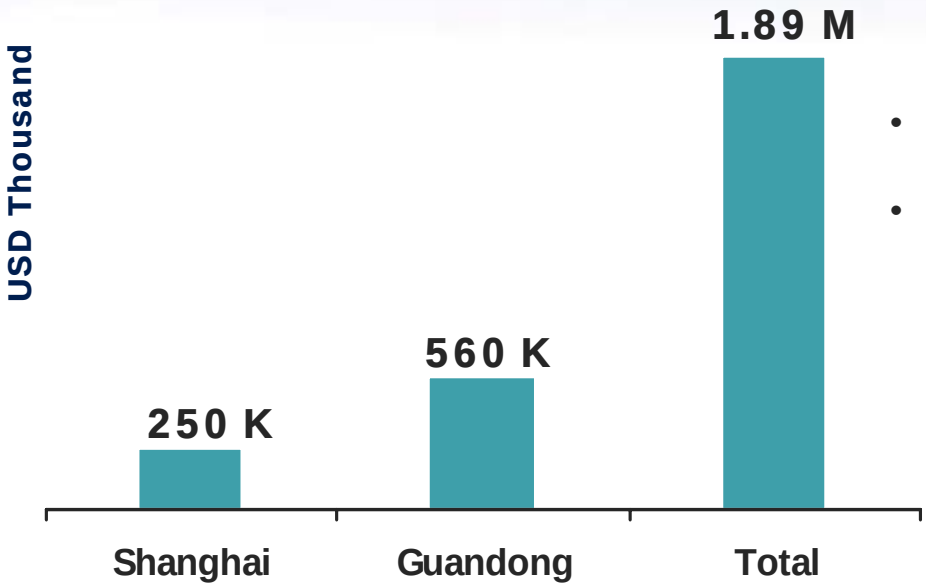
- **NCTB** funds from central government – 6.28 M USD
- Funds from **external agencies**:
  - JICA – 3.4 M USD
  - WB/DFID – 623 K USD
  - GFATM – 430 K USD
- Does not include any provincial funds allocated to drug procurement[2]

1: Definition: Nationally procured drugs are all purchased through a national tender process which is issued by the CDC or FLO (for WB loan). Drugs are financed through central government funds or external loans. Drugs are provided for free to patients.
2:Certain provinces are expected to procure their own TB medicines and provide for free to patients- this is not included in the above estimate.

Source: NCTB Data

Provincial funds for procurement of drugs in the public sector are not included in the 10.75 M USD estimate; doing so could raise public sector figure to 11.6-12.6 M USD

1st Line TB NCTB Budget for Drug Procurement (2005)



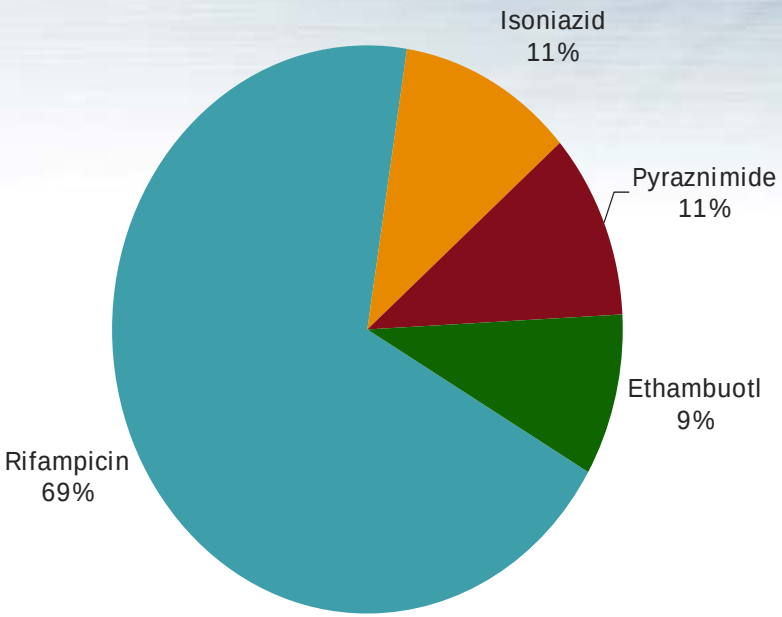
- Half of funding provided by national government and the other half by provincial
  - Guangdong provincial government spent about **560 K** USD for drugs
  - The Government of Shanghai contributed around **250 K** USD to purchase TB drugs
- A total of 80,000 patients estimated to be treated by the provinces
- Extrapolation of patients in the 8 provinces that fund their own drug procurement yields a total market of 1.9 M USD
  - This is based on treated patient numbers of ~31,202 in Guandong and 3,146 in Shanghai
  - Represents 30% of treated patients among 8 provinces (~112 K patients) that were reported by the central government

Note: Some of this (e.g. Shanghai) is captured through the IMS data and depicted in the "local tender drugs" as drugs are distributed through traditional distribution channels and patients purchase at the hospital pharmacy and are reimbursed. Each province differs so further research would be required to estimate the value by each province, and thus is not captured in the 1st line figure.

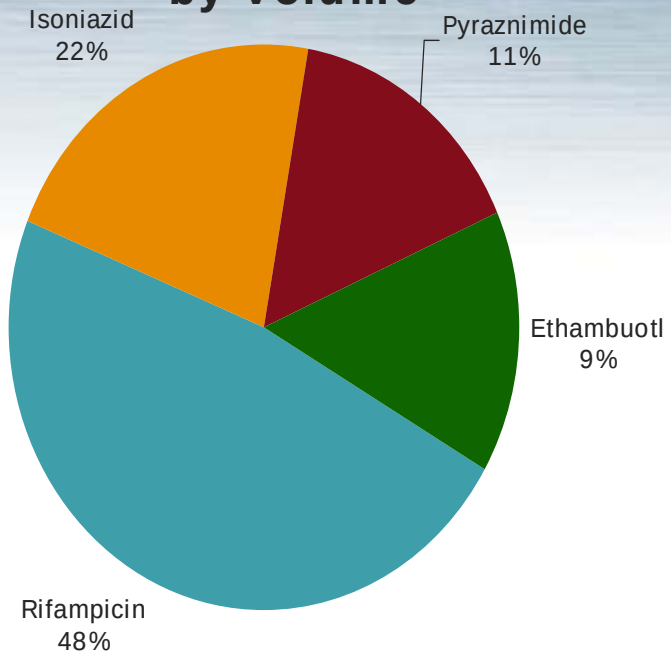
Source: Interviews with Shanghai and Guandong CDC; data provided by CDC-NCTB

The remainder of the 1st line market is procured through other distribution channels

TB 1st line "Local" Sector (Approximately $8.9 M USD)



TB 1st line "Local" Sector by Volume

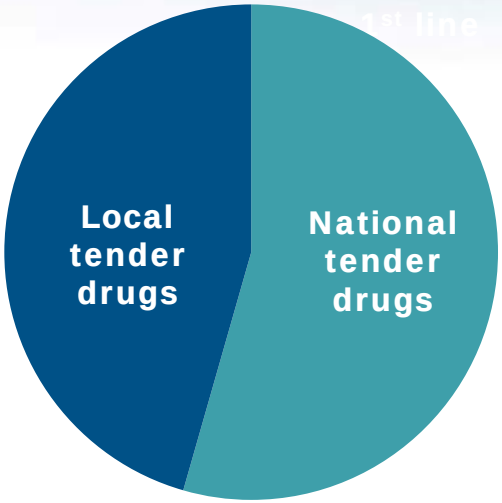


Here the market is defined by distribution channel, i.e. drugs that are procured by hospitals and distributed through commercial channels. This could include specialized hospitals procuring 1st line medicines for TB or MDR-TB for paying patients. This could also include provinces that reimburse patients for drugs procured through commercial channels (i.e. Shanghai).

Source: IMS Data 2006

Top-line sales figures from IMS indicate the value of the remaining TB market is 8.9 M USD – mostly public

1st line TB Market Value by Sector in 2005 (Approx 8.9 M USD)



- Locally procured 1st line drugs includes both private and public sectors*:
- Private:
  - Patients seeking treatment at specialized pulmonary hospital and paying out of pocket or getting reimbursed by private insurance
- Public:
  - Patients seeking treatment at hospitals and getting reimbursed through government insurance
  - Patients in provinces/ autonomous regions that procure their own medicines and distribute through commercial channels or reimburse patients after treatment (e.g. Shanghai)

**Data provided by IMS is captured at the hospital pharmacy level. Break-out between private and public is unavailable though private is qualitatively estimated to be very small. Definition of "locally procured drugs" refers to the procurement and distribution channels. Drugs are purchased locally by the province or the hospital. Drugs are both publicly financed (through insurance or the province) and privately financed (through private insurance or out-of-pocket).*

Source: IMS Data 2006; IMS interviews

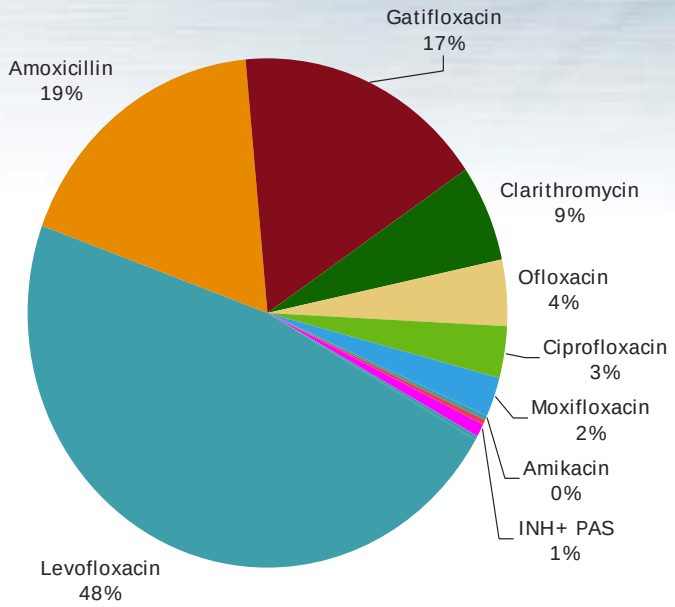
The exact value of the 2nd line market is less certain; estimates are based on the following sales for TB versus other indications and yields an estimate of 25 M USD

Product	% of total sales for TB
LEVOFLOXACIN	5%
AMOXICILLIN	5%
GATIFLOXACIN	5%
CLARITHROMYCIN	5%
OFLOXACIN	5%
CIPROFLOXACIN	5%
MOXIFLOXACIN	5%
AMIKACIN	5%
AMINOSALICYLIC ACID	
PAS	30%
ISONIAZID+PAS	100%
SOD. AMINOSALICYLA	30%
STREPTOMYCIN	20%
CAPREOMYCIN	5%
KANAMYCIN	10%

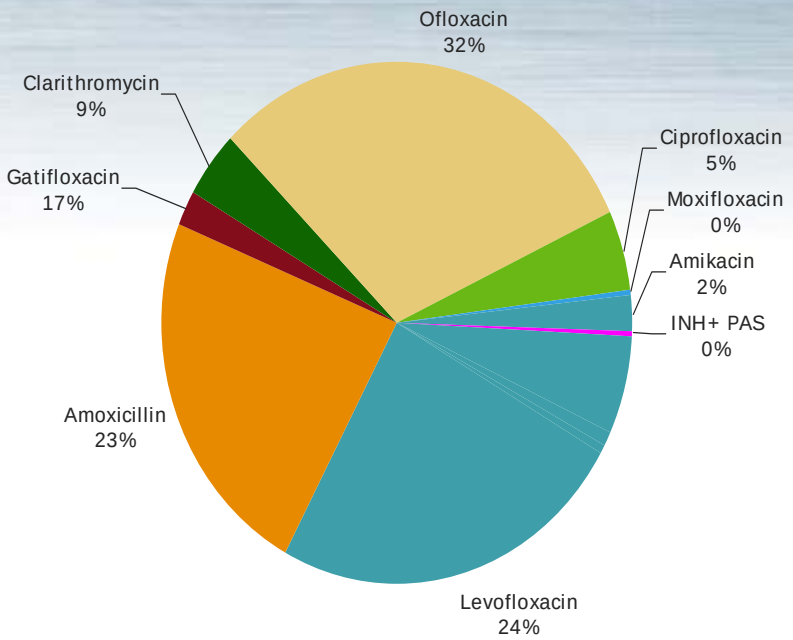
Source: Aggregate sales from IMS Data 2006; Estimates on % use in TB based on discussions with physicians;

The 2nd line market is valued at 25 M USD and includes all drugs procured through traditional commercial channels

TB 2nd line Private Market Sector (Approximately $25 M USD)



TB 2nd line Private Market Sector by Volume (in 1,000s)



Here the CDC-NCTB does not procure and provide drugs for free to patients. Hospitals procure through traditional commercial channels (i.e. direct from a manufacturer through a tender process) and patients pay out-of-pocket or are reimbursed by insurance.

Note: Sales data for each product not available bu indication. Therefore, for each product, a % estimated use in TB was applied to total sales figures to derive the total 2nd line market value. % use estimated based upon very limited qualitative input and thus represent a lower confidence interval compared to 1st line figures.

Source: IMS Data 2006;

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Appendix: Interviewed Stakeholders

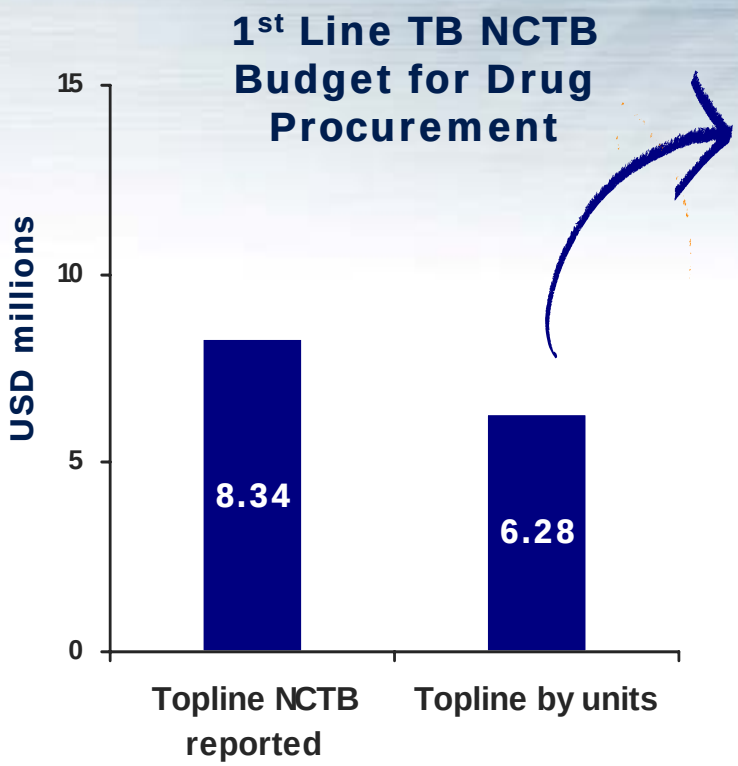
Individual	Organization	Position
Dr Liu Jianjun	NCTB, CDC	Director of NCTB, CDC, China
Dr Lai Yuji	NCTB, CDC	Department of Drug and Facility Resources
Dr Wang Lin	NCTB, CDC	Associate Researcher, Direct Dept for Health Promotion, Dir, Dept for Drug and Facility Resources
Wang Ni	NCTB, CDC	Department of Drug and Facility Resources
Ms. Wang Xiaomei	China Global Fund TB Program	Program Officer
Dr Wang Zhao	CDC	Former Director of CDC of China
Dr. Mei Jian	Shanghai CDC	Director of TB Prevention Department
Dr. Shen Mei	Shanghai CDC	Associate Director of TB Prevention Department
Mr. Lin Fen	Hainan CDC	Hainan CDC Director
Ms. Chen Yanbing	Guangdong CDC	Assistant of Guangdong CDC Director
Dr. Sun Chenguang	Shanghai CDC	Director of Shanghai Changning District CDC
Dr. Li Hongdi	Shanghai Changning CDC	Doctor in Charge, Manager of TB Prevention Section
Dr Zhang Yu Wen	Hainan Dong Chuang County CDC	Physician at Hainan CDC
Dr. Li	Hainan Dong Chuang County CDC	Physician at Hainan CDC

Appendix: Interviewed Stakeholders (continued)

Individual	Organization	Position
Zhang Xi	Beijing Thoracic Tumor and TB Hospital	Manager of Pharmacy
Dr. Fu Yu	Beijing Thoracic Tumor and TB Hospital	Director, TB Clinical Center, President of Beijing Thoracic Tumor and TB Hospital
Dr. Xiao Fan	Guangzhou Thoracic Hospital	Physician & Director of Internal Medicine
Dr. Zhang Qiang	Guangzhou Thoracic Hospital	Surgeon and Deputy Director
Tao Tao	Guangzhou Thoracic Hospital	Director of Pharmacy
Xu Ying	Guangdong Panyu County Chronic Diseases Hospital	Director of Pharmacy
Dr Cornelia M Hennig	WHO	Medical Officer, STB
Dr Daniel Chin	WHO	Medical Officer, STB
Vimal Dias*	MSH	MSH Project - RPM Plus
Dr Shuo Zhang*	World Bank	Health Operations Officer, Human Development Sector
n/a	1st line supplier	Vice General Manager
n/a	2nd line supplier	Sales and Marketing Director
n/a	National Distributor	Vice General Manager

**via email*

Appendix: The NCTB's drug allocation was estimated to be $8.34 M in 2005, representing 22% of total TB budget



NCTB Spend:	Source:
Top-line budgetary figure	The NCTB estimated that in 2005, about 22% of their budget, or 8.34 M USD, was allocated to drug procurement.
Per unit calculation	A bottoms up calculation was conducted using the actual units purchased X price per unit = 6.28 M USD.

Source: IMS interviews with CDC-NCTB;

See appendix units and price data and calculations.

Appendix: price per regimen for centrally financed drugs (2005)

			Intensified			Continuation			Total Cost RMB	Total Cost USD
Regimen			Per unit RMB	# per week	# of months	Per unit RMB	# per week	# of months		
Cat I	HRZE	HR	2.1	3	2	0.82	3	4	81	$10.13
Cat II	HRZE	HRE	2.1	3	2	1.52	3	6	138	$17.26
Cat III	HRZ	HR	1.25	3	2	0.82	3	4	66	$8.65

Cost per regimen (assuming 3 months intensified phase)			Intensified			Continuation			Total Cost RMB	Total Cost USD
Regimen			Per unit RMB	# per week	# of months	Per unit RMB	# per week	# of months		
Cat I	HRZE	HR	2.1	3	3	0.82	3	4	115	$14.37
Cat II	HRZE	HRE	2.1	3	3	1.52	3	6	185	$23.13
Cat III	HRZ	HR	1.25	3	3	0.82	3	4	84	$10.55

Appendix: price per regimen for JICA funded centrally procured drugs (2005)

			Intensified			Continuation			Total Cost RMB	Total Cost USD
Regimen			Per unit RMB	# per week	# of months	Per unit RMB	# per week	# of months		
Cat I	HRZE	HR	1.57	3	2	0.62	3	4	67	$8.41
Cat II	HRZE	HRE	1.57	3	2	1.14	3	6	120	$14.94

Cost per regimen (assuming 3 months intensified phase)			Intensified			Continuation			Total Cost RMB	Total Cost USD
Regimen			Per unit RMB	# per week	# of months	Per unit RMB	# per week	# of months		
Cat I	HRZE	HR	1.57	3	3	0.62	3	4	86	$10.79
Cat II	HRZE	HRE	1.57	3	3	1.14	3	6	139	$17.33

Appendix: price per regimen for DFID/ WB funded centrally procured drugs (2005)

			Intensified			Continuation			Total Cost RMB	Total Cost USD
Regimen			Per unit	# per week	# of months	Per unit	# per week	# of months		
Cat I	HRZE	HR	2.44	3	2	0.93	3	4	103	$12.88
Cat II	HRZE	HRE	2.44	3	2	1.76	3	6	185	$23.12

Cost per regimen (assuming 3 months intensified phase)			Intensified			Continuation			Total Cost RMB	Total Cost USD
Regimen			Per unit	# per week	# of months	Per unit	# per week	# of months		
Cat I	HRZE	HR	2.44	3	3	0.93	3	4	133	$16.56
Cat II	HRZE	HRE	2.44	3	3	1.76	3	6	215	$26.82

Appendix: assumptions for use of 2nd line products in TB vs other indications

Product	% of total sales for TB
LEVOFLOXACIN	5%
AMOXICILLIN	5%
GATIFLOXACIN	5%
CLARITHROMYCIN	5%
OFLOXACIN	5%
CIPROFLOXACIN	5%
MOXIFLOXACIN	5%
AMIKACIN	5%
AMINOSALICYLIC ACID	
PAS	30%
ISONIAZID+PAS	100%
SOD. AMINOSALICYLA	30%
STREPTOMYCIN	20%
CAPREOMYCIN	5%
KANAMYCIN	10%