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

US Case Study
US Table of Contents

- TB Control in the US
- Procurement and distribution of TB Drugs in the US
- Value and Volume of the US TB Market
- Appendix
TB Control in the US

After a resurgence of TB cases between 1989-1993, the TB incidence has substantially been reduced

- 14,093 cases documented in 2005
- Overall number of cases in the US has dropped 41% since peak in 1992
- Resurgence of TB cases between 1985 and 1992 due to expansion of:
  - HIV infection,
  - Nosocomial transmission of *M. tuberculosis*
  - Increased immigration from counties with a high incidence of TB
- The fed re-established categorical grants specific for TB in 1992
- Funding increased drastically after resurgence in 1992 and 1993

Note: Source did not indicate whether or not the funding was adjusted for inflation

Source: Institute of Medicine, *Ending Neglect- The Elimination of Tuberculosis in the United States*
TB cases in foreign-born persons have remained fairly constant

- In 2005, the rate of TB in foreign born persons was 8.7 times that of US born making up 54% of total cases
- Ratio of foreign born to US born increased at a steady rate of 6.6% /yr between 1993-2002, but has dropped to only 0.5%/yr since
- Over half of all foreign born cases were reported in immigrants from Mexico(25.2%), Philippines (10.8%), Vietnam (7.5%), India (7.4%), and China (5.1%)

TB cases are disproportionately found in border and high immigration states

- The top seven states* account for 60% of the national total
- Overall case rate has declined by 3.8% since 2004
- Total case declines in many counties has led to:
  - Public TB clinic funding and technical expertise became unsustainable in many areas
  - A push of TB treatment to the private sector
- MDR TB remains a growing concern, increasing 13.3% from 2003 to 2004

*CA, FL, GA, IL, NJ, NY, TX

The National CDC and State Health Departments are the two critical entities for TB control and funding in the US.

<table>
<thead>
<tr>
<th>Role</th>
<th>National CDC</th>
<th>State Department of Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funding for Drugs</td>
<td>No drug funding</td>
<td>State funded procurement or funds distributed directly to local health departments for procurement</td>
</tr>
<tr>
<td>Funding for treatment and case detection</td>
<td>Fund states based on a weighted algorithm including case detection rate and severity of cases</td>
<td>Fund case detection, treatment, and contact screening</td>
</tr>
<tr>
<td>Monitoring and Reporting</td>
<td>Analyzes data across the US for guideline changes and funding distribution</td>
<td>Responsible for monitoring all TB cases and implementing DOT when necessary - send periodic reports to CDC</td>
</tr>
<tr>
<td>Guidelines/Policy establishment</td>
<td>Establish national guidelines to provide consistent case detection and treatment across the country</td>
<td>Follow the CDC guidelines – create state specific guidelines</td>
</tr>
<tr>
<td>Drug Procurement</td>
<td>Not involved</td>
<td>Some states procure their own drugs, others relegate it to local health departments</td>
</tr>
<tr>
<td>Education and Outreach</td>
<td>Main advocators and funders for education and case management programs - fund out-reach workers</td>
<td>Provide training to local health care workers; responsible for assigning treatment partners*</td>
</tr>
</tbody>
</table>

Note: Treatment partners can be out-reach workers or family members who support and monitor patient throughout therapy.

Source: Institute of Medicine, Ending Neglect - The Elimination of Tuberculosis in the United States
The National TB Program falls under control of the CDC as a subpart of the Coordinating Center for Infectious Disease.

Source: National Coalition for the Elimination of Tuberculosis – Federal Task Force on Tuberculosis Summary Fact Sheet; www.cdc.gov
Although the CDC funds a variety of NTP control activities, it is not involved in drug procurement.

- **Research**
  - Funding programs e.g. TBTC (TB Trials Consortium) to expand the clinical and epidemiological knowledge of TB

- **State/Municipal Health Dept.**
  - Based on historically distributed funding, current morbidity, as well as other factors that complicate the care of patients to:
    - Support staffing
    - Provide outreach workers who aid program in DOTS implementation, contact investigation and surveillance/reporting of newly diagnosed patients
    - Improve and increase TB control and surveillance

- **Community Health Centers/ VA hospitals**
  - Provide comprehensive primary/preventive health care through grants under the U.S. Public Health Service Act or meet the standards for fed funding

- **Regional Training and Medical Consultation Centers**
  - Fund “model TB centers” (however, do not provide drug funding)
    - These act as reference center for designated region and provide training and consultation
    - Current model does not provide funding for direct patient care

The CDC developed a set of guidelines for the use of funding and treatment regimens

**CDC national recommendations:**

1. **Use of funding**
   - Federal funding should supplement local funding based on disease burden and control of TB - increase of federal funding should not result in any loss of state funding
   - Federal funding may not be used for drug procurement

2. **Treatment**
   - All states should impose regulations that mandate completion of therapy
   - All treatments should be administered in the context of patient-centered programs that consider the individual patient needs and characteristics
   - Services should never be denied due to a patient’s inability to make co-pay

3. **Billing for Reimbursement**
   - Public and Private health insurance programs should be billed for TB diagnosis and treatment

Source: Institute of Medicine, Ending Neglect- The Elimination of Tuberculosis in the United States
As well as four regional centers providing training and medical consultation

Regional Coverage of 4 Regional Training and Medical Consultation Centers

- 4 Regional Training and Medical Consultation Centers (RTMCC) established in CA, TX, FL, and NJ to:
  - Provide training and technical assistance to increase human resource development in TB programs;
  - Develop TB educational materials; and
  - Provide medical consultation to TB programs and medical providers
- Current model does not provide funding for direct patient care
- Particularly important for areas who see little TB and particularly low MDR-TB
- CDC is the major funder for these centers but does not provide funds for drug procurement

Source: CDC Interviews;
Source 2: [http://www.cdc.gov/nchstp/tb/rtmcc.htm](http://www.cdc.gov/nchstp/tb/rtmcc.htm)
All treatment guidelines are evidence based and frequently updated with newly released clinical results.

**1994**
- Latest version of treatment guidelines established
- Updated based on newly released clinical studies

**2003**
- Guidelines revised to include Rifapentine in continuation phase
  - Studies indicated that Rifapentine was effective in certain groups of patients, in whom it had similar relapse rates as rifampin

**Future Changes**
- Currently sponsoring Moxifloxacin (TB 2nd line) trials
  - If demonstrating equivalence to current treatment or improvement, guidelines will be updated
- Adoption of new guidelines generally within a year of the study
  - Expedited based on the degree of importance
- New guidelines are disseminated through state and local TB programs, professional organizations, other partners, and campaigns to the public

*Source: CDC Interviews*
Patent flow for initial diagnosis

**Patient flow through the public/private sector**

Most patients present to the public health department facilities or in the hospital and should be referred immediately to a specialist. Severe cases present at the emergency room.

Immigrants entering the country are required to receive TB testing prior to obtaining a Visa. Any suspected cases are immediately referred to local health department upon entry.

Outpatient Setting ➔ Emergency Room ➔ Port of Entry

Patients are then diagnosed through clinical evaluation and laboratory testing and are treated with a 4 drug regimen until drug sensitivity is evident.

Patient who is suspected of having TB after demonstrating smear positive are sometimes hospitalized for 2-3 weeks. They are released upon demonstration of smear negative results.

Many physicians refer patients to a state funded facility to enable them to receive free medications/treatment.

Source: CDC Guidelines, Interviews
Patients are then typically treated in an outpatient setting...

**Patient flow through the public/private sector**

Person at high risk of TB or with symptoms of TB disease is evaluated

- Latent TB*
  - Hospital out-patient
  - Retail pharmacy
- Active TB
  - Assigned Case Manager
  - Outpatient pharmacy
- Drug resistant TB
  - Assigned Case Manager
  - Hospital In-patient
  - Under exceptional circumstances e.g. homeless or acutely ill patient will be isolated in the hospital

Patients with latent TB are evaluated for treatment and high risk individuals are recommended to receive treatment.

Documented cases are reported to the local health department and assigned a case manager to follow up with treatment, ensure no adverse reactions or resistance, and enforce compliance.

Patients can collect their drugs from State or City Health Department Clinics, hospital outpatient or retail pharmacies on a monthly basis to ensure regularly scheduled follow-up.

*Treatment for Latent TB is not mandatory

Source: CDC guidelines, Interviews
...following guidelines established by the CDC, the American Thoracic Society and the Institute of Medicine

<table>
<thead>
<tr>
<th>Treatment options</th>
<th>Length of Time</th>
<th>Indications</th>
<th>Initial Phase of treatment</th>
<th>Continuation Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>6 months</td>
<td>Pulmonary and extra pulmonary TB in adults and children</td>
<td>Daily for 8 weeks: Isoniazid, rifampin, pyrazinamide + ethambutol or streptomycin</td>
<td>Daily or 2 or 3 times/week for 16 weeks: Isoniazid + rifampin</td>
</tr>
<tr>
<td>Option 2</td>
<td>6 months</td>
<td>Pulmonary and extra pulmonary TB in adults and children</td>
<td>Daily for 2 weeks and then 2 times/week for 6 weeks: Isoniazid, rifampin, pyrazinamide + ethambutol or streptomycin</td>
<td>2 times/week for 16 weeks: Isoniazid + rifampin</td>
</tr>
<tr>
<td>Option 3</td>
<td>6 months</td>
<td>Pulmonary and extra pulmonary TB in adults and children</td>
<td>3 times/week for 6 months: Isoniazid, rifampin, pyrazinamide + ethambutol or streptomycin</td>
<td>NA</td>
</tr>
<tr>
<td>Option 4</td>
<td>4 months</td>
<td>Pulmonary and extra pulmonary TB in adults</td>
<td>Follow option 1, 2, or 3 interval and duration for 8 weeks: Isoniazid, rifampin, pyrazinamide + ethambutol or streptomycin</td>
<td>Daily or 2 or 3 times/week for 8 weeks: Isoniazid, rifampin, pyrazinamide, +ethambutol or streptomycin</td>
</tr>
<tr>
<td>Option 5</td>
<td>9 months</td>
<td>For smear and culture negative pulmonary TB in adults</td>
<td>Daily for 8 weeks: Isoniazid, rifampin + ethambutol or streptomycin</td>
<td>Daily or 2 times/week for 24 weeks: Isoniazid + rifampin</td>
</tr>
</tbody>
</table>

Source: CDC Report - Best Practices of Medicine - TB
These guidelines include treatment algorithms to ensure consistent therapy across the country.

**INITIAL PHASE**

- Patient with high clinical suspicion for active TB
  - INH/RIF/
  - EMB*/PZA**

- No cavitation on Chest X-ray AND negative AFB smear at 2 months
  - INH/RIF

**CONTINUATION PHASE**

- 2 month culture-neg
  - INH/RIF

- 2 month culture-pos
  - No Cavitation
    - INH/RIF

- Cavitation
  - INH/RIF

- 2 month culture-neg
  - INH/RIF

- 2 month culture-pos
  - INH/RPT

△ = end of treatment

* EMB may be discontinued when results of drug susceptibility testing indicate no resistance
** PZA may be discontinued after taken for 2 months

Source: Treatment of Tuberculosis, American Thoracic Society, CDC, and Infectious Diseases Society of America, June 20, 2003
As well as suggested regimens for latent and drug resistant cases

<table>
<thead>
<tr>
<th>Type of TB</th>
<th>Length of Treatment</th>
<th>Treatment Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latent TB</td>
<td>9 months</td>
<td>INH daily or Twice weekly under DOT</td>
</tr>
<tr>
<td></td>
<td>4 months</td>
<td>Rifampin daily</td>
</tr>
<tr>
<td>INH (±SM) resistance</td>
<td>6 months</td>
<td>Rifampin, Pyrazinamide + Ethambutol (a Fluroquinolone may strengthen regimen for those with extensive disease)</td>
</tr>
<tr>
<td>INH and RIF (±SM) resistance</td>
<td>18-24 months</td>
<td>Fluroquinolone, Pyrazinamide + Ethambutol, Injectable Agent, + Alternative Agent*</td>
</tr>
<tr>
<td>INH, RIF, (±SM) + EMB/PZA resistance</td>
<td>24 months</td>
<td>Fluroquinolone (Ethambutol or Pyrazinamide if active), Injectable Agent, +2 alternative agents*</td>
</tr>
<tr>
<td>RIF resistance</td>
<td>12-18 months</td>
<td>Isoniazid, Ethambutol, Fluroquinolone, supplemented with PZA for 1st two months (an Injectable Agent may be included for the first 2-3 months for patients with extensive disease)*</td>
</tr>
</tbody>
</table>

*Injectable Agent: Includes aminoglycosides (streptomycin, amikacin, kanamycin) or polypeptide capreomycin
Alternative Agents: Ethionamide, Cycloserine, PAS, clarithromycin, amoxicillin-clavulanate, linezolid

Source: CDC TB Treatment Guidelines
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5211a1.htm
Source 2: CDC Targeted TB Testing and Treatment of Latent TB Infection
http://www.cdc.gov/mmwr/PDF/rr/rr4906.pdf
### Treatment guidelines also provide recommended and maximum daily doses for 1st and 2nd line drugs

<table>
<thead>
<tr>
<th>1st line drug</th>
<th>Daily max (dosage)</th>
<th>Thrice weekly dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isoniazid</td>
<td>300mg (5mg/kg)</td>
<td>900mg (15mg/kg)</td>
</tr>
<tr>
<td>Rifampin</td>
<td>600mg (10mg/kg)</td>
<td>600mg (10mg/kg)</td>
</tr>
<tr>
<td>Pyrazinamide</td>
<td>No max (20-25mg/kg)</td>
<td>NA</td>
</tr>
<tr>
<td>Ethambutol</td>
<td>No max (15-20mg/kg)</td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2nd line drug</th>
<th>Daily max (dosage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streptomycin</td>
<td>1 gram (15mg/kg)</td>
</tr>
<tr>
<td>Amikacin</td>
<td>1 gram (15mg/kg)</td>
</tr>
<tr>
<td>Capreomycin</td>
<td>1 gram (15mg/kg)</td>
</tr>
<tr>
<td>Kanamycin</td>
<td>1 gram (15mg/kg)</td>
</tr>
<tr>
<td>Ethionamide</td>
<td>1 gram (15-20mg/kg)</td>
</tr>
<tr>
<td>Cycloserine</td>
<td>1 gram (10-15mg/kg)</td>
</tr>
<tr>
<td>PAS</td>
<td>No max (8-12g/day)</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>500-1000mg daily</td>
</tr>
<tr>
<td>Moxifloxacin</td>
<td>400mg daily (not yet FDA approved for TB)</td>
</tr>
<tr>
<td>Gatifloxacin</td>
<td>400mg daily (not yet FDA approved for TB)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FDC</th>
<th>Dosage per unit</th>
<th>Dose per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rifamate</td>
<td>Rif-300mg, INH-150mg</td>
<td>2 capsules</td>
</tr>
<tr>
<td>Rifater</td>
<td>Rif-120mg, INH-50mg, PZA 300mg</td>
<td>≤44kg = 4 tablets, 45-54kg = 5 tablets, ≥55kg = 6 tablets</td>
</tr>
</tbody>
</table>

**FDCs are rarely used in the US; most physicians utilize the 4 drug regimen (separate pills) for all TB patients**

Source: CDC TB Treatment Guidelines
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5211a1.htm
In an effort to maintain records, all state/municipal health departments are required to submit periodic reports.

Flow of reporting:
Physician sends all sputum smears to either their local health departments or the state department depending on their location and the structure established in the state.

- Specialist
- Local Health Department
- State/Municipal Health Department
- Centers for Disease Control and Prevention

All physicians are required to report cases to local health department, where detailed information is collected for all cases. Many states have a computerized system which is updated daily. States and municipalities are required to submit quarterly reports to the CDC.

This data is analyzed and used for funding allocation, recognizing trends, and guideline changes.

Source: Interviews
Although receiving some federal funding, state TB programs are also heavily self-supporting...

**State/County Taxes**
- Provides salaries of public health workers
- Act as case manager for TB patients
  - Monitor treatment adherence
  - Adverse reactions
  - Contact investigations
  
**Public Health Workers**

**CDC**

**DOT Housing**
- Provide housing or hospital stay for those patients likely to be non compliant (e.g., homeless, poor, high risk of default)

**TB Drug Procurement**
- Procure drugs directly through state health department or...
  - Provide funding to cities/jurisdictions to procure their own drugs

**State/Municipal Health Departments**
- Fully fund state and city run health departments which provide TB services
- All patients able to receive drugs and treatment free of charge

*Source: Interviews*
...and have autonomy in determining how to implement their own TB programs

<table>
<thead>
<tr>
<th>State</th>
<th>Guideline Implementation</th>
<th>Funding allocation</th>
<th>DOTS mandated</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>Each city and jurisdiction is responsible for TB guidelines and implementation</td>
<td>State funds distributed to cities based on morbidity SF, SD, LA all receive direct CDC funding as well</td>
<td>No- case by case based on risk level</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>Cities and counties follow state set guidelines</td>
<td>State distributes funding to city/county health depart and will reimburse drug costs for public hospitals with TB clinics</td>
<td>No- case by case based on risk level</td>
</tr>
<tr>
<td>New York- NYC</td>
<td>NYC established guidelines and implementation</td>
<td>NYC receives direct CDC funding in addition to state and local funds and allocates 60% of total funds to case contact/management activities- the remaining to city health clinics</td>
<td>No- Case by Case For ss+ over 80% receive DOT</td>
</tr>
<tr>
<td>Texas</td>
<td>Each region and local health department is responsible for TB guidelines and implementation</td>
<td>Previously allocated to region/local health dept based on morbidity Now use a formula based on risk factors Houston receives direct CDC funding as well</td>
<td>Yes- policy mandated by the state</td>
</tr>
</tbody>
</table>

Source: Interviews
Regardless of where patients receive their TB medication, there are a variety of payers responsible for coverage.

**Payers**
- Private
- Medicare/Medicaid
- VA
- Patient Assistance Programs
- Self
- State TB programs
- Public Hospitals

**Drug Dispensing Channels**
- Retail Pharmacy
- Physician Office*
- Hospital Pharmacy
- Public Health Facility (Fed, State, Local)
- Long Term Care/Home Health
- Correctional Facilities

*Injectables only

Source: Interviews
Insurance schemes include private insurance, Medicare, Medicaid, and VA with additional payment out-of-pocket

<table>
<thead>
<tr>
<th>Funded</th>
<th>Private</th>
<th>Medicare</th>
<th>Medicaid</th>
<th>VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employer/Employee premium</td>
<td>Federal Funding</td>
<td>State and federal funding</td>
<td>Federal Funding</td>
<td></td>
</tr>
<tr>
<td>Patient type</td>
<td>Employed individuals, Self-employed and those with no employer based health care, dependants</td>
<td>US citizens 65 or older, specified people under 65 with long-term disabilities</td>
<td>Indigent population-families w/ dependant children, the aged, the blind, and disabled who meet established poverty level</td>
<td>Active and retired members of the uniformed services and veterans of the Armed forces - includes their dependants and any survivors</td>
</tr>
<tr>
<td>Drug Coverage and Costs</td>
<td>Monthly premium and additional co-pays typically $5-10 as most are generic</td>
<td>As of 2006 drug benefit program with monthly premium and co-pays typically $5-10 as most are generic</td>
<td>Full coverage of Medicaid preferred drugs with minimal to no co-pay</td>
<td>All products available on VA hospital/center formulary provided for free to patients who are “service connected”</td>
</tr>
<tr>
<td>Location</td>
<td>All facilities</td>
<td>All facilities</td>
<td>All facilities</td>
<td>Only VA Hospitals and clinics</td>
</tr>
</tbody>
</table>

Source: IMS Research
Some states opt to include supplemental Medicaid coverage for TB patients who could not otherwise qualify.

- Omnibus Budget Reconciliation Act of 1993 (OBRA ’93), enabled states to offer supplemental Medicaid coverage
  - Available to low income individuals infected with TB not typically qualified for Medicaid
  - In 2005 only 9 states along with D.C., and Puerto Rico offered this service
- This coverage, however is limited to the following services:
  - Prescribed drugs
  - Physician/clinic services (hospital outpatient, rural health clinics and federally qualified health center services)
  - Laboratory and x-ray services
  - Case management services and those services included in the extended DOTS program

Supplemental Medicaid coverage by State (US, 2005)

Source: CMS- Medicaid at a glance 2005
Despite available coverage in the current insurance schemes, many patients are still uninsured.

The majority of these patients are not insured through either Employer Private Insurance, Medicaid, or Medicare.

- Services provided either for free or based on a sliding scale of income
- Hospitals typically refer patients who cannot afford treatment to the state health departments or, assist patients unaware of qualified status for health benefits
- Typically through emergency Medicaid coverage
- Public hospitals not funded through the state ultimately must pay for patients unable to obtain coverage- these costs typically made up through “disproportionate payment system”
- Many 2nd line drugs provided free through Patient Assistance Programs i.e. Lilly Cares

Note: Categories are not mutually exclusive

Source: Reported Tuberculosis in the United States 2004 – CDC Surveillance Report
Source 2: Trends in Tuberculosis 2005
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## Procurement and Distribution of TB Drugs

A variety of payers are involved in negotiating contracts directly with manufacturers for TB meds

<table>
<thead>
<tr>
<th>Payer</th>
<th>Customers</th>
<th>Negotiation</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Federal Government</strong></td>
<td>Federally covered entities (i.e. Federal Prisons, state clinics, VA hospitals...)</td>
<td>Typically bidding process - fed price level is set at or below the “best price” manu offers to commercial plans&lt;br&gt;Manufacturers must place bid with that price or lower</td>
<td>Federal Supply Schedule Price&lt;br&gt;Veteran’s Association FSS price&lt;br&gt;340 B public health rate</td>
</tr>
<tr>
<td><strong>State Government</strong></td>
<td>Medicaid</td>
<td>States negotiate separately or in small groups with manu to obtain rates at/below the “best price” for drugs on their preferred drug list</td>
<td>Medicaid Rate</td>
</tr>
<tr>
<td><strong>Pharmacy Benefit Managers</strong></td>
<td>Health Plans, Hospitals, Retail Pharmacy</td>
<td>Use member size to leverage volume power with manufacturers to obtain lower rates&lt;br&gt;Formularies are used to increase negotiating power</td>
<td>Typically obtain access or performance based rebate at years end&lt;br&gt;Around WAC*</td>
</tr>
<tr>
<td><strong>Health Plans</strong></td>
<td>Self-employed, hospitals, LTC, retail pharmacy, employers, employees</td>
<td>Use member size to leverage volume power with manufacturers to obtain lower rates&lt;br&gt;Formularies are used to increase negotiating power</td>
<td>Typically obtain access or performance based rebate at years end&lt;br&gt;Around WAC*</td>
</tr>
<tr>
<td><strong>Group Purchasing Organization</strong></td>
<td>Small hospitals or retail pharmacies</td>
<td>Use size of hospital base, patient volume, and formulary access to leverage negotiation power</td>
<td>Volume based discounts for formulary access&lt;br&gt;Around WAC*</td>
</tr>
</tbody>
</table>

*WAC stands for Wholesaler Acquisition Cost and is typically set at 20% below Average Wholesale Price

Source: IMS Research
There are ultimately a range of costs for agents across the different settings.

The industry standard sets Wholesaler Acquisition Cost (WAC) at 20% below Average Wholesale Price (AWP) however the AWP is only a published price used to negotiate discounts and is never the actual acquired price.

The main distribution mechanism of TB drugs is identical to all other pharmaceutical products.

**Drug Flow**

1st point of sale: Manufacturers supply drugs via the contracted distributor or direct to facility at the agreed price.

2nd point of sale: Drug distributors supply drugs through contracts with facilities at varied negotiated prices.

The major drug distributors include:
- McKesson
- AmeriSource Bergen
- Versapharm
- Cardinal Health

Source: Kaiser; Follow the Pill - Understanding the US Commercial Pharmaceutical Supply Chain, interviews
TB meds are acquired and dispensed through numerous channels to insured and uninsured patients.

**Patient**

**Payers**
- Private
- Medicare/Medicaid
- VA
- Patient Assistance Programs

**Drug Dispensing Channels**
- Retail Pharmacy
- Physician Office*
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- Public Health Facility (Fed, State, Local)
- Long Term Care/Home Health
- Correctional Facilities

*Injectables only

Source: Interviews
All public/private hospitals and pharmacies typically acquire drugs at the determined “market price”

**Drug Flow: Public/Private Hospitals**

1st point of sale: Manufacturers supply drugs at Wholesaler Acquisition Cost (WAC)- “Market Price” to distributors

2nd point of sale: Hospital/Pharmacy Acquisition Cost is typically WAC +% price

Final sale: Drugs administered in hospital inpatient fall under the hospital DRG (case rate) at no direct cost to patient

Drugs dispensed in outpatient pharmacy where cost to patient is dependant on insurance coverage

Source: Kaiser; Follow the Pill- Understanding the US Commercial Pharmaceutical Supply Chain, interviews
Other entities are able to obtain drugs at the federal 340B price, typically a 30% discount to WAC

**What 340B is**
- A discounted drug program offering significant savings on outpatient drugs to specific federally funded “covered entities” serving the most vulnerable patient populations

**How it works**
- Manufacturers with drugs covered by the Medicaid program provide discounts on covered drugs purchased by “covered entities”
- The amount discounted is calculated using rebate formulas specified in OBRA ’90
- Agreement prevents manufacturers from charging more than the 340B price regardless of procurement mechanism

**Who it applies to**
- 8,900 eligible covered entities participate including: community health centers, non-profit disproportionate share hospitals owned by or under contract with state or local government, federally qualified health centers (FQHC), public housing primary care clinics, homeless clinics, and several others...

These entities include state and municipal health departments who then distribute free TB meds

**Drug Flow: State/Municipal Health Clinic**

1st point of sale: Manufacturers supply drugs at 340 B price to all federally funded “covered entities” - typically through a major wholesaler

2nd point of sale: State health departments and clinics are able to acquire drugs at discounted rate

Final sale: These facilities provide drugs free of cost to their patients - typically dispensed on a monthly basis

Some facilities receive additional reimbursement through patient private and government insurance

Source: Kaiser; Follow the Pill- Understanding the US Commercial Pharmaceutical Supply Chain, interviews
## Procurement and Distribution of TB Drugs

The process of drug procurement and distribution can differ across states.

<table>
<thead>
<tr>
<th>State</th>
<th>Drug Procurement</th>
<th>Drug Distribution</th>
</tr>
</thead>
</table>
| **California**| State does not procure any drugs- cities and counties are responsible for procuring and distributing own drugs  
Cities qualified for 340B price may procure drugs at this rate | Counties and cities have their own separate procurement mechanism  
Distributed directly to city or county clinics  
Typically maintain 3 month buffer stock in city/county health department |
| **Florida**   | State procures drugs from one wholesaler based on bidding process  
Uses 340 B public health drug rate | State has central procurement mechanism  
Drugs are ordered monthly based on historical ordering patterns and stored in Tallahassee warehouse with 3 month buffer stock  
Distributed directly to state/locally funded health care facilities – for smaller counties without a pharmacy- drugs are mail ordered from central health dept |
| **New York- NYC** | NYC procures drugs through multiple wholesalers and repackaging suppliers through bidding process  
Uses 340 B public health drug rate | City has central procurement mechanism  
City Health Department order drugs on a bi-weekly basis to maintain adequate stock and distributes directly to local City TB clinics and community based organizations: 3-6 month buffer stock required depending on drug |
| **Texas**     | State procures directly though one wholesaler through bidding process  
Uses 340 B public health drug rate* | State has central procurement mechanism  
Distributed through electronic system PIC (pharmacy inventory center) to local or regional health clinics- replenished based on need- required to maintain 3 month buffer stock |

*340 B Public Health drug rate is a discounted drug rate, based on negotiations between the federal government and manufacturers, that is available to federally funded “covered entities”

Source: Interviews
Procurement and Distribution of TB Drugs

VA hospitals and federal prisons also receive TB drugs at a discount through the Federal Supply Schedule contracts

Drug Acquisition

1st point of sale: Qualified Manufacturers supply drugs at Federal Supply Schedule price to distributors (VA typically obtain a deeper discount than typical FSS)

2nd point of sale: VA Hospitals and Federal Prisons then obtain these products at the discounted price from wholesalers

Final sale: VA Hospitals dispense all drugs for free to patients that are service connected

Federal prisons provide drugs for free to inmates

Source: Kaiser; Follow the Pill- Understanding the US Commercial Pharmaceutical Supply Chain, interviews
US Table of Contents

- TB Control in the US
- Procurement and distribution of TB Drugs in the US
- Value and Volume of the US TB Market
- Appendix
Value and Volume of the US TB Market

There were several key data sources and assumptions incorporated into the TB market calculations

- **Data Sources:**
  - NSP Sales Data: National Sales Perspective
    - Calculated through total prescriptions sold through manufacturers or wholesalers to each of the defined channels
    - Cost is based on the acquisition cost for the channel
  - NPA Sales Data: National Prescription Audit
    - Provides total extended units based on a prescription audit capturing retail, LTC, and mail order pharmacies
  - NDTI data: National Disease and Therapeutic Index
    - Provides % of each drug’s prescription for TB use vs. prescriptions for all other use
    - Percentages were then applied to total NSP and NPA values

- **Topline Assumptions:**
  - NSP value data is based on acquisition cost for the channel (e.g., hospital/pharmacy/clinic), this would include any markups from the wholesaler. In order to align cost with the WAC price, a 10% markup was removed from the topline IMS figure
  - In order to avoid overstatement of each product’s use in TB, NDTI prescription % was applied to both the value and volume numbers for all TB meds

- **Bottom up Assumptions**
  - Latent TB patients were provided by a quarterly report from the CDC reporting total states Latent TB cases completing treatment (only 75% reporting) – however it has been greater than 10 years since CDC collected these quarterly reports
  - Public price utilized Florida and Texas 340 B Prices while Private price was stated at WAC pricing
  - Included 85% completion and 10% re-treatment rate for 1st line
  - Most facilities maintain at least a 3 month buffer stock for 1st line drugs and a 1-1½ month for 2nd line drugs that would be included in the total IMS value and volume. In order to align the top down and bottom up calculations a 25% buffer stock was added to the final 1st line bottom up value and a 10% buffer stock was added to the final 2nd line bottom up value figure
The total US market is valued at approximately 20.21 M USD, the majority of which is 1st line products.

A predominantly first line market:

- The majority of TB cases are non-resistant with a total recorded 14,093 TB patients as of 2005.
- Although MDR-TB represents a growing concern, it only affects about 1% of all TB cases, total of 128 patients in 2004.
- The high costs of MDR-TB drugs results in a disproportionate value vs. first line drugs.

Source: NSP/NDTI - IMS Data
The $16M USD 1st line market is split between a range of products.

**Total 1st Line TB Market Value by Drug in 2005 (16.2M USD)**

- Ethambutol 43%
- Rifampin 22%
- Pyrazinamide 17%
- Mycobutin 1.24%
- Rifater 0.32%
- Myambutol 0.07%
- Rifamate 0.24%
- Isoniazid 11%

**Total 1st Line TB Market Volume by Drug in 2005 (24.3M units)**

- Isoniazid 72%
- rifampin 8%
- Ethambutol 16%
- Pyrazinamide 4%
- Rifamate 0.24%
- Rifater 0.18%
- Mycobutin 0.09%
- Myambutol 0.07%

*Note*: Only covers retail market - does not include clinics or hospitals dispensing drugs.

Volume refers to the number of units (e.g. tablets) dispensed.

Source: NSP/NDTI-IMS Data
Within the 1st line market, the US relies on loose generic products

**Total 1st Line TB Market Value by Drug in 2005 (16.2M USD)**

- FDCs only account for 6% of the total market value – $968 K USD
  - Rifamate (combination of rifampicin and isoniazid) accounts for $893 K USD and 92% of FDC sales
  - Rifater (combination of rifampicin, isoniazid and pyrazinamide) – accounts for $75K USD and 8% of FDC sales mainly because of its cost

- Physicians in the US tend to veer away from the FDCs for two reasons:
  - Compliance is not a high concern
  - Although FDCs are cheaper most patients are covered through insurance or the government and therefore cost is less of a problem

Source: NSP/NDTI - IMS Data
Value and Volume of the US TB Market

Although the bottom up calculations demonstrate a market size of 12.0 M...

### 1st Line TB Market 2005 ($MM): Topline vs. Bottom up Values

<table>
<thead>
<tr>
<th></th>
<th>Total Patients</th>
<th>Public Cost/Regimen (USD)</th>
<th>Private Cost/Regimen (USD)</th>
<th>Total Public Value</th>
<th>Total Private Value</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First line</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>123</td>
<td>$188.60</td>
<td>$586.97</td>
<td>$13,798</td>
<td>$29,474</td>
<td>$43,273</td>
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<tr>
<td>IRZ</td>
<td>526</td>
<td>$274.88</td>
<td>$747.62</td>
<td>$85,807</td>
<td>$160,177</td>
<td>$245,985</td>
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<tr>
<td>IRZE</td>
<td>7575</td>
<td>$409.79</td>
<td>$966.19</td>
<td>$1,840,857</td>
<td>$2,978,937</td>
<td>$4,819,794</td>
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<tr>
<td>RZE- I resistant</td>
<td>838</td>
<td>$830.40</td>
<td>$1,665.74</td>
<td>$539,798</td>
<td>$737,032</td>
<td>$1,276,830</td>
</tr>
<tr>
<td>IRE- ss negative</td>
<td>4245</td>
<td>$364.51</td>
<td>$933.13</td>
<td>$917,681</td>
<td>$1,612,381</td>
<td>$2,530,062</td>
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<tr>
<td><strong>Latent</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INH</td>
<td>14904</td>
<td>$7.17</td>
<td>$10.49</td>
<td>$63,351</td>
<td>$63,631</td>
<td>$126,982</td>
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<tr>
<td>RIF</td>
<td>2630</td>
<td>$55.61</td>
<td>$176.02</td>
<td>$173,459</td>
<td>$376,842</td>
<td>$550,301</td>
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<tr>
<td><strong>Buffer Stock</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25%</td>
<td></td>
<td></td>
<td></td>
<td>$908,688</td>
<td>$1,489,619</td>
<td>$2,398,306</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>$4,543,439</td>
<td>$7,448,093</td>
<td>$11,991,532</td>
</tr>
</tbody>
</table>

**Public Price:** Based on 340B Price obtained through Fla State Health Department and Texas State Health Department

**Private Price:** MedImmune PriceRx – Based on WAC Prices

*See appendix for calculations of prices

...the discrepancy can be explained by several factors

- In calculating bottom up value, we assumed an average weight of 55-60kg per person
  - This could be less than the average weight of patients and therefore is underestimating the dosing size and ultimately the total units of TB meds prescribe

- The bottom up approach does not account for treatment regimens deviating from the standardized guidelines

- Total latent prescribing may be greater than accounted for due to the 10+ year period that Latent TB reports have been collected

- WAC prices were based on the average prices procured through Versapharm (distributor) which may slightly differ from the median price of the private market.

- Florida and Texas state health department prices were utilized for the 340 B rate; however this may not be the same exact rate across the public market
The 2nd line market is valued at $4.01M USD, also driven primarily by generic products.

**Total 2\textsuperscript{nd} Line TB Market Value by Drug in 2005 (4.01M USD)**

- **Levaquin**: 26%
- **Seromycin**: 15%
- **Ciprofloxacin**: 11%
- **Amikacin Sulfate**: 0.02%
- **Trecator**: 0.02%
- **Capastat Sulfate**: 1%
- **Clarithromycin**: 3%

**Total 2\textsuperscript{nd} Line TB Market Value by Brand (2005)**

- **Generics**: $2,470,000
- **Branded**: $1,500,000

Note: PAS is not included in total top line value due to lack of data through IMS NSP channel. Seromycin was not adjusted down due to lack of prescribing data from NDTI and may be over-accounted for. Source: NSP/NDTI - IMS Data

* Generics include: Amikacin Sulfate (443K), Ciprofloxacin (1.78MM), and Clarithromycin (111K)
* Levaquin remains the major branded agent making up 62% of branded agent value and 1.04 MM

* Data was not available for all 2\textsuperscript{nd} line drugs used in this country. Drugs listed do not comprise full 2\textsuperscript{nd} line treatment regimen used in this country.
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- Procurement and distribution of TB Drugs
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- Appendix
Topline value figures and bottoms-up calculations suggest that the 2nd line TB market value is 2.66 to 4.01M USD

### 2nd Line TB Market 2005 ($MM): Topline* vs. Bottom Up Values

<table>
<thead>
<tr>
<th></th>
<th>Total Pts</th>
<th>Public Cost/Regimen (USD)</th>
<th>Private Cost/Regimen (USD)</th>
<th>Total Public Value</th>
<th>Total Private Value</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MDR-TB</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EZ+ Capreo, Ethio, Leva</strong></td>
<td>115</td>
<td>$12,744</td>
<td>$21,164</td>
<td>$870,580</td>
<td>$992,322</td>
<td>$1,862,901</td>
</tr>
<tr>
<td><strong>4 drug Resistant</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Capreo, Ethio, Cyclo, Leva</strong></td>
<td>13</td>
<td>$13,698</td>
<td>$21,624</td>
<td>$103,974</td>
<td>$112,653</td>
<td>$216,628</td>
</tr>
<tr>
<td><strong>XDR-TB</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Patient specific</strong></td>
<td>6</td>
<td>$30,000</td>
<td>$45,000</td>
<td>$227,712</td>
<td>$109,714</td>
<td>$337,426</td>
</tr>
<tr>
<td><strong>Buffer Stock</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>10%</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>$1,322,493</td>
<td>$1,336,158</td>
<td>$2,658,650</td>
</tr>
</tbody>
</table>

Note: PAS is not included in total top line value due to lack of data through IMS NSP channel. Seromycin was not adjusted down due to lack of prescribing data from NDTI and may be over-accounted for.

*See appendix for calculations of prices

Source: DxTx: Interviews, Kenneth Castro; Reported Tuberculosis in the United States 2004 – CDC Surveillance Report
Public Price: Based on 340B Price obtained through Fla State Health Department and Texas State Health Department

XDR-TB: U.S. Tuberculosis Rate at All-Time Low; California Healthcare Foundation 03/24/06
Both 1st and 2nd line products have fluctuated over the past few years with a drastic 2nd line increase in 2004.

**Sales of 1st and 2nd line TB Drugs (2001-2005)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Extended Units</th>
<th>Total Value (USD)</th>
<th>Ave. Cost/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>12,364,973</td>
<td>$592,993</td>
<td>.048</td>
</tr>
<tr>
<td>2004</td>
<td>31,346,705</td>
<td>$9,396,818</td>
<td>.300</td>
</tr>
<tr>
<td>2005</td>
<td>47,490,808</td>
<td>$1,779,543</td>
<td>.038</td>
</tr>
</tbody>
</table>

The significant increase in 2004 second line value is likely due to the launch and initial high utilization of ciprofloxacin upon genericisation in late 2003 and the rapid drop in price with increased competition.

Source: NSP/NDTI - IMS Data

Note: PAS is not included in total top line value due to lack of data through IMS NSP. Channel Seromycin was not adjusted down due to lack of prescribing data from NDTI and may be over-accounted for.
Appendix: Price per Patient Calculations, 1st line Loose Drugs

**First Line**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Formulation</th>
<th>Dose</th>
<th>Daily Units</th>
<th>Total Days Initial Phase</th>
<th>Total Days Continuation Phase</th>
<th>Total Units</th>
<th>Cost 340 B</th>
<th>Cost WAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isoniazid</td>
<td>300 mg tab</td>
<td>300 mg</td>
<td>1</td>
<td>56</td>
<td>128</td>
<td>184</td>
<td>$5.89</td>
<td>$8.62</td>
</tr>
<tr>
<td>Rifampin</td>
<td>300 mg capsule</td>
<td>600 mg</td>
<td>2</td>
<td>56</td>
<td>128</td>
<td>368</td>
<td>$182.71</td>
<td>$578.35</td>
</tr>
<tr>
<td>Pyrazinamide</td>
<td>500 mg tab</td>
<td>1500 mg</td>
<td>3</td>
<td>56</td>
<td>168</td>
<td>368</td>
<td>$86.28</td>
<td>$160.66</td>
</tr>
<tr>
<td>Ethambutol</td>
<td>400 mg tab</td>
<td>1200 mg</td>
<td>3</td>
<td>56</td>
<td>168</td>
<td>368</td>
<td>$134.91</td>
<td>$218.57</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$409.79</td>
<td>$966.19</td>
</tr>
<tr>
<td><strong>INH resistant</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rifampin</td>
<td>300 mg capsule</td>
<td>600 mg</td>
<td>2</td>
<td>168</td>
<td>336</td>
<td>368</td>
<td>$166.82</td>
<td>$528.06</td>
</tr>
<tr>
<td>Pyrazinamide</td>
<td>500 mg tab</td>
<td>1500 mg</td>
<td>3</td>
<td>168</td>
<td>504</td>
<td>968</td>
<td>$258.84</td>
<td>$481.98</td>
</tr>
<tr>
<td>Ethambutol</td>
<td>400 mg tab</td>
<td>1200 mg</td>
<td>3</td>
<td>168</td>
<td>504</td>
<td>968</td>
<td>$404.73</td>
<td>$655.70</td>
</tr>
<tr>
<td>Levaquin*</td>
<td>500 mg tab</td>
<td>1000 mg</td>
<td>2</td>
<td>168</td>
<td>336</td>
<td>368</td>
<td>$1,705.74</td>
<td>$3,301.54</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$2,536.13</td>
<td>$4,967.27</td>
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<tr>
<td><strong>First Line-Smear Negative</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isoniazid</td>
<td>300 mg</td>
<td>300 mg</td>
<td>1</td>
<td>56</td>
<td>168</td>
<td>224</td>
<td>$7.17</td>
<td>$10.49</td>
</tr>
<tr>
<td>Rifampin</td>
<td>300 mg</td>
<td>600 mg</td>
<td>2</td>
<td>56</td>
<td>168</td>
<td>448</td>
<td>$222.43</td>
<td>$704.08</td>
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<tr>
<td>Ethambutol</td>
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<td>1200 mg</td>
<td>3</td>
<td>56</td>
<td>168</td>
<td>368</td>
<td>$134.91</td>
<td>$218.57</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$364.51</td>
<td>$933.13</td>
</tr>
</tbody>
</table>

*Based on recommended dosing in CDC Treatment Guidelines
Assumes daily dosing for 60kg patient
Appendix: Price per Patient Calculations, Latent and 2nd line

### Latent TB

<table>
<thead>
<tr>
<th>Drug</th>
<th>Formulation</th>
<th>Dose</th>
<th>Daily Units</th>
<th>Total Days</th>
<th>Total Units</th>
<th>340 B</th>
<th>WAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>INH</td>
<td>300 mg tab</td>
<td>300 mg</td>
<td>1</td>
<td>224</td>
<td>224</td>
<td>$7.17</td>
<td>$10.49</td>
</tr>
<tr>
<td>RIF</td>
<td>300 mg tab</td>
<td>600 mg</td>
<td>2</td>
<td>112</td>
<td>224</td>
<td>$111.22</td>
<td>$352.04</td>
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</table>

### Second Line

<table>
<thead>
<tr>
<th>Drug</th>
<th>Formulation</th>
<th>Dose</th>
<th>Daily Units</th>
<th>Total Days</th>
<th>Total Units</th>
<th>Cost</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capreomycin</td>
<td>1g vial</td>
<td>1g</td>
<td>1</td>
<td>364</td>
<td>364</td>
<td>$6,129.76</td>
<td>$9,296.56</td>
</tr>
<tr>
<td>Ethionamide</td>
<td>250 mg</td>
<td>500 mg</td>
<td>2</td>
<td>728</td>
<td>728</td>
<td>$1,480.61</td>
<td>$2,249.52</td>
</tr>
<tr>
<td>Cycloserine</td>
<td>250 mg</td>
<td>500 mg</td>
<td>2</td>
<td>728</td>
<td>728</td>
<td>$2,392.03</td>
<td>$2,924.74</td>
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<tr>
<td>Levaoquin</td>
<td>500 mg</td>
<td>1000 mg</td>
<td>2</td>
<td>728</td>
<td>728</td>
<td>$3,695.76</td>
<td>$7,153.33</td>
</tr>
</tbody>
</table>

#### 4 Drug Resistance

Total: $13,698.16 | $21,624.15

#### INH/Rif Resistance

<table>
<thead>
<tr>
<th>Drug</th>
<th>Formulation</th>
<th>Dose</th>
<th>Daily Units</th>
<th>Total Days</th>
<th>Total Units</th>
<th>Cost</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capreomycin</td>
<td>1g vial</td>
<td>1g</td>
<td>1</td>
<td>364</td>
<td>364</td>
<td>$6,129.76</td>
<td>$9,296.56</td>
</tr>
<tr>
<td>Ethionamide</td>
<td>250 mg</td>
<td>500 mg</td>
<td>2</td>
<td>728</td>
<td>728</td>
<td>$1,480.61</td>
<td>$2,249.52</td>
</tr>
<tr>
<td>Ethambutol</td>
<td>400 mg</td>
<td>1200 mg</td>
<td>3</td>
<td>1092</td>
<td>1092</td>
<td>$876.91</td>
<td>$1,420.69</td>
</tr>
<tr>
<td>Pyrazidamide</td>
<td>500 mg tab</td>
<td>1500 mg</td>
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<td>1092</td>
<td>1092</td>
<td>$560.83</td>
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<tr>
<td>Levaoquin</td>
<td>500 mg</td>
<td>1000 mg</td>
<td>2</td>
<td>728</td>
<td>728</td>
<td>$3,695.76</td>
<td>$7,153.33</td>
</tr>
</tbody>
</table>

Total: $12,743.87 | $21,164.38

#### XDR-TB

<table>
<thead>
<tr>
<th>Drug</th>
<th>Formulation</th>
<th>Cost</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>multiple drugs - up to 250,000 per patient for 2 yrs</td>
<td></td>
<td>$30,000.00</td>
<td>$45,000.00</td>
</tr>
</tbody>
</table>

*Based on recommended dosing in CDC Treatment Guidelines
Assumes daily dosing for 60kg patient
## Appendix: Interviewed Stakeholders

<table>
<thead>
<tr>
<th>Individual</th>
<th>Organization</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Kenneth Castro</td>
<td>Division of Tuberculosis Elimination Centers for Disease Control and Prevention</td>
<td>Medical Director</td>
</tr>
<tr>
<td>Dr. Lee Reichman</td>
<td>New Jersey Medical School National Tuberculosis Center</td>
<td>Executive Director</td>
</tr>
<tr>
<td>Dr. Sonal S. Munsiff</td>
<td>Bureau of Tuberculosis Control, The City of New York and Centers for Disease Control and Prevention</td>
<td>Director and Medical Officer</td>
</tr>
<tr>
<td>Ms. Susan Spieldenner</td>
<td>TB Control Branch- California Department of Health Services</td>
<td>Public Health Advisor</td>
</tr>
<tr>
<td>Dr. Charles Wallace</td>
<td>TB Control Branch- Texas Department of State Health Services</td>
<td>Program Manager</td>
</tr>
<tr>
<td>Mike Ehren</td>
<td>Florida State Health Dept. Broward County Tuberculosis Control Clinic</td>
<td>Pharmacist</td>
</tr>
<tr>
<td>MaryAnn O'Brien</td>
<td>Quincy Medical Center</td>
<td>Pharmacist</td>
</tr>
<tr>
<td>Dr. Muhammad Anwar</td>
<td>St. Joe’s Hospital</td>
<td>Pulmonologist</td>
</tr>
</tbody>
</table>