Literature Review on Tuberculosis in Prisons

Background

The first *Guidelines for the Control of Tuberculosis in Prisons* were developed and published by the World Health Organization (WHO) and the International Committee of the Red Cross (ICRC) in 1998. At that time, there was little data on the rates of tuberculosis infection and disease; however, the studies that had been done showed alarming TB rates in prisoners. The TB case rates found in prisons were the highest among any population ever recorded. In 1998, many countries with the highest burden of TB were beginning to implement DOTS, the WHO-recommended TB strategy. It would be several more years before National TB Control Programmes were able to report that the majority of their TB patients were detected and treated under the DOTS strategy, and it would be even longer before many of the prison systems of these countries would start implementing sound TB control practices.

In 2006, a new comprehensive TB control strategy, the Stop TB Strategy, was developed and endorsed by the international TB control community. The Stop TB Strategy expands and enhances the basic components of DOTS and includes TB control strategies to address TB/HIV, multidrug-resistant TB and other challenged populations like prisoners. At the same time, the International Standards for TB Care were developed and describes a widely accepted level of care that all practitioners should follow for persons suspected of or having TB. It is in this context of the Stop TB Strategy and the International Standards for TB Care, and increasing evidence of significant burdens of TB disease in prisons that the *Guidelines for the Control of Tuberculosis in Prisons* are being revised.

Search Strategy

A systematic review of published reports of studies on tuberculosis in prisons was done in late 2007. PubMed was searched for combinations of the terms “tuberculosis” and “prisons” or “correctional” or “penitentiary”. Included were reports of studies published in English between 1997 and 2007. The search returned 178 reports that were carefully reviewed and assessed to see if the information in the report was relevant to this literature review. Entries that did not report on a study of TB control in prisons were deleted and included entries that:

- Included TB as a characteristic or outcome of a larger prison health study
- Looked at prison as a risk factor of a general TB population
- Explored the general health of prisoners
- Described molecular epidemiology studies of TB strains in prisons
- Highlighted an outbreak or contact investigation of a single case of TB in a prison
- Features case reports, lectures, editorials or letters

Once these entries were deleted, the final list of reports included 58 relevant articles that provided pertinent information on TB control in prisons.

Summary of Studies

TB control themes:

Major categories or themes of TB control emerged from the 58 relevant articles (the percentage refers to the percent of the 58 relevant articles that included data or results supporting this theme. Some articles included information on more than 1 theme):

1. Prevalence of latent TB infection or active TB disease or MDR-TB cases in a particular prison population **(58%)**.
2. Risk factors associated with latent TB infection or active TB disease or MDR-TB cases in inmates or staff working in prisons **(31%)**.
3. Treatment outcomes of latent TB infection or active TB disease or MDR-TB cases **(24%)**.
4. Screening or identification of TB suspects or active TB cases **(17%)**.
5. General guidelines, recommendations or evaluation of TB control programs in prison, jail or other correctional facility systems **(10%)**.

Geographical distribution of studies:

There were 24 countries or regions represented in the 58 relevant articles (Table 1). The United States (n=17 or 29%) and Russia (n=8 or 14%) were the most common settings for studies of TB control in prisons included in this review. Overall, there was good representation of most of the regions in the world in this literature review, however, the theme of the article/study often varied by the country or region. Studies in the United States often focused on assessment of prison and jail systems, recommendations, treatment of inmates with latent TB infection and related contact investigations. Studies in countries of the former Soviet Union primarily showed risk factors associated with TB disease and treatment outcomes in prisons, especially for MDR-TB cases, and follow-up of prisoners on treatment after release. Many of the studies in Africa and Asia were concerned with determining the prevalence of TB infection and disease in a population in order to determine the magnitude of the problem in their country.

Table 1. Geographical representation of TB control in prison articles

Country or Region	Number of articles
United States	17 (29%)
Countries of the Former Soviet Union • Russian Federation (8) • Azerbaijan (2) • Georgia	11 (19%)
Europe • Spain (3) • England • European Region • France • Italy • Spain • Turkey	8 (14%)
Asia • Thailand (5) • Hong Kong • Singapore • Taiwan	8 (14%)

Africa • Botswana • Cameroon • Ivory Coast • Malawi • Tanzania • Zambia	6 (10%)
Pakistan	3 (5%)
Western Pacific • Australia (2) • Western Pacific Region	3 (5%)
Brazil	2 (3%)

Summary article information:
Table 2 lists summary information for each of the 58 relevant articles including the setting, year, methods used, main results, and main themes. The main themes are abbreviated as follow:

- PREVALENCE = prevalence of latent TB infection or active TB disease or MDR-TB cases in a particular prison population
- RISK FACTORS = Risk factors associated with latent TB infection or active TB disease or MDR-TB cases in inmates or staff working in prisons
- TREATMENT = Treatment outcomes of latent TB infection or active TB disease or MDR-TB cases
- SCREENING = Screening or identification of TB suspects or active TB cases
- GENERAL = General guidelines, recommendations or evaluation of TB control programs in prison, jail or other correctional facility systems

Russia, Georgia, Azerbaijan: Prisons in countries of the former Soviet Union have some of the highest MDR-TB rates in the world. In the studies from Russia, the percentage of MDR-TB in prison populations ranged from 12% to 55% in previously treated patients. In one study in Georgia, 78% of prisoners were resistant to any drug, and 13% were MDR. In a study of inmates not responding to TB treatment in Azerbaijan, 89% were MDR-TB. These countries also have some of the highest prevalence rates of TB anywhere: in one Russian study, the prevalence was 4,560/100,000 and in one Georgian study, the prevalence was 5,995/100,000.

Western Europe: The studies from Western Europe showed higher rates of TB infection and disease in prisoners than in civilian populations. Both studies in Turkey and France showed high rates of prevalence: 341/100,000 and 215/100,000, respectively. In the English study of prison staff, 1.5% of the staff had had TB disease. 17.9% of inmates had TB infection in Italy, and Spanish prisoners with TB were also co-infected with HIV 17.9% of the time.

Asia: Countries in Asia have high rates of TB in prisons as evidenced by Thailand (568/100,000) and Taiwan (259/100,000). There are also high rates of death, transferred out and failure rates in these populations. Singapore and Hong Kong studies showed 1.1-1.2% active TB cases in their prison populations. Thailand studies showed high rates of drug resistance: 50% resistance to at least 1 drug, 39% resistance to isoniazid, and 19% MDR.

Africa: Some countries in Africa have extremely high rates of TB in their prison populations: 4,000/100,000 in Zambia and 3,797/100,000 in Botswana. In one study in Tanzania, 41% of prisoners had active TB. In Cameroon, Ivory Coast and Malawi, the amount of active TB ranged from 3.5% to 5.8%. The Zambian study showed 9.5% MDR, yet there was nearly no drug resistance in the Botswana study. As expected, there was a very high rate of HIV co-infection in many of the studies, ranging from 26% in Tanzania to 73% in Malawi.

Pakistan: The 3 studies done in Pakistan showed 3.9% prevalence of TB disease in inmates, a 3.8 times higher rate of TB than in the general population, and high rates of latent TB infection (48%).

Australia: One study in Australia showed an annual risk of TB infection of 3.1%, and the other study showed that 13% of inmates given a TST were positive.

Brazil: The 2 Brazilian studies focused on the different scoring methods for screening possible TB suspects and found that most of the traditional methods missed many potential cases. One study showed a prevalence of TB disease of 4.6%.

Table 2. Summary of 58 Relevant "TB Control in Prison" Studies *(studies in order of published date)*

Setting	Year	Method	Main results	Main themes
Zambia[1]	2000	Case-finding study in 13 prisons (1080/6118 inmates).	• 245/1080 inmates with culture-positive TB. • 9.5% of the isolates were MDR. • Prevalence of TB infection at least 4%.	PREVALENCE
Australia[2]	2001	Cross-sectional random sample of 104 prisoners from 29 correctional facilities.	• Annual risk of TB infection was 3.1% for continuously detained prisoners. • Prevalence of TB infection increased among prisoners from Asian backgrounds from 21% in 1996 to 47% in 2001.	PREVALENCE
Thailand[3]	2007*	One-time mass screening of 71,594 prisoners in 27 prisons.	• 30.9% of those screened were identified as TB suspects, and 1.1% of those were confirmed as TB cases. • Positive predictive value of screening using the International Standards of TB Care was 5.9% compared to 1.2% using the WHO criteria.	PREVALENCE SCREENING
Russia[4]	2002	Retrospective matched case-control study of 114 prisoners in 2 prisons.	• Risk factors for developing TB included: narcotic drug use, low income, high ratio of prisoners per available bed, not having own bed clothes, little time outdoors, good housing before imprisonment.	RISK FACTORS
WHO European Region[5]	2002	Questionnaire sent to 52 EuroTB members asking for 2002 TB prison data (response rate of 42%).	• Prisoners had up to 84 times more TB than civilians. • 91% of countries reported performing active screening for TB on entry into prison. • Median TB detection rate of 393/100,000.	PREVALENCE
Brazil[6]	2006*	Systematic chest x-ray screening was carried out in 2 prisons (n=1910).	• 3 different screening scoring systems missed many TB cases including the WHO criteria. • Among TB suspects, the probability of finding TB cases was low.	SCREEN
United States[7]	2006	Developed recommendations based on published guidelines and literature review.	• Effective TB prevention and control can be obtained in prisons by implementing a number of activities that are periodically evaluated. • Activities include early identification f TB cases, treatment of TB disease and infection, use of airborne precautions, discharge planning, and contact investigation.	GENERAL
Cameroon[8]	2006*	Screened 2,474 out of 2,830 inmates (87.4%) in 1 central prison.	• 87 cases of TB were detected (prevalence of 3.5%). • Risk factors for pulmonary TB included a low BMI, prison stay of less than or equal to 12 months, and history of previous incarceration.	PREVALENCE RISK FACTORS
Russia[9]	2000	Retrospective case review of all patients enrolled in a DOTS-Plus program from September 2000 – September 2002, including inmates	• Among the 244 MDR-TB patients who received treatment, 77% were cured, 5% died, 7% failed and 12% defaulted. • Alcohol consumption and presence of both cavitary and bilateral disease were associated with poor treatment outcomes.	TREATMENT
United States[10]	2006*	Assessed implementation of TB recommendations in 20 large jail systems by collecting data through questionnaires, observation at jails, and medical record review.	• 55% of jail systems monitor TST conversions of inmates and staff. • 65% keep TB records. • 45% have policies to offer HIV testing and counseling to TB patients. • 75% screen HIV-infected inmates for TB. • 75% have polices to isolate patients with suspected or confirmed TB.	GENERAL

Setting	Year	Method	Main results	Main themes
Singapore[11]	1999	Compared TST readings of 704 correctional facility TB contacts screened from 1999-2001 with 2,729 household contacts screened in 2000.	• 8 (1.1%) and 20 (0.7%) active TB cases were detected among the correctional facility and household contacts, respectively. • LTBI treatment was started in 65% of the correctional facility contacts with 87% completion.	PREVALENCE TREATMENT
United States[12]	1993-2003	Analyzed data reported to the national TB surveillance system from 1993-2003; compared characteristics between inmate and non-inmate men aged 15-64.	• 3.8% of all TB cases during this time were reported from correctional facilities. • Federal and state prison TB rates were 29.4 and 24.2 per 100,000, which was considerably higher than the rate in the non-inmate population (6.7 per 100,000). • Inmates with TB were more likely to have 1 TB risk factor, receive DOT and not complete treatment than non-inmates.	RISK FACTORS TREATMENT
Russia[13]	2002	Questionnaires were administered to 60 prisoners and 40 former prisoners, and interviews were performed with prison and TB dispensary staff.	• Of 80 released prisoners with active TB in 2002, 26.3% continued their care in civilian society. • Barriers to complete TB in this population included homelessness, unemployment, alcoholism, drug addiction, and HIV and hepatitis comordity.	TREATMENT
Russia[14]	2000-2002	Identified all diagnosed cases of TB in a 3-year period in 2 remand prisons in St. Petersburg.	• There were a total of 876 prisoners with TB in the 2 prisons during this time. • 432 cases were diagnosed at entry into the prison, and 444 developed TB during incarceration.	PREVALENCE
Brazil[15]	2002	Cross-sectional study of inmate TB screening with chest radiographs and AFB examination. 3 targeted screening strategies were used to identify TB suspects.	• Prevalence of TB disease was 4.6% among inmates. • Each of the screening strategies (cough > 3 weeks; WHO score; presence of at least one TB symptom) missed a high percentage of cases.	PREVALENCE SCREENING
Hong Kong[16]	2001	814 male prisoners without TB were screened for TB by chest x-ray.	• Of 53 cases with abnormal chest x-rays, 10 (1.2%) had TB disease. • Risk factors for TB disease included incarceration at least 2 years, being in current prison for at least 2 years, and not having a chest x-ray in last 2 years.	SCREENING
United States[17]	2005*	Self-administered survey, clinical interview and TST of healthcare workers	• Point prevalence of TB infection was 17.7%, reactivity rate was 2.2%, and annual incidence was 1.3%. • Only origin of birth was significantly associated with prevalence of TB infection.	RISK FACTORS
Italy[18]	2005*	Multicenter cross-sectional study of 1,247 inmates from 9 prisons screened for TB.	• 17.9% of 448 evaluated inmates had TB infection. • TB infection associated with age, being foreign-born, low education, and increased length of detention.	PREVALENCE RISK FACTORS
Pakistan[19]	2003*	Study of 386 inmates in a juvenile jail (mean age=17.7 years)	• 3.9% prevalence of TB disease in the inmates compared to estimated 1.1% in the general population of Pakistan. • Family history of TB was a significant risk factor for TB infection.	PREVALENCE RISK FACTORS

Setting	Year	Method	Main results	Main themes
United States[20]	1999-2000	A cross-match was used to identify persons reported with TB in 1999-2000 in one county who also had a history of incarceration.	• 24.3% of TB cases had a history of incarceration in the county jail. • 82.8% of these cases were not screened for TB while in jail.	SCREENING
Russia[21]	2001-2002	A cross sectional survey was undertaken of 600 patients (309 civilians, 291 prisoners) with pulmonary TB from 2001-2002.	• Prevalence of MDR-TB in new prison cases was 37% and 55% in previously treated cases (higher than in civilian cases: 20% and 46%). • Factors associated with drug resistance include previous treatment for more than 4 weeks, smoking, cavitary disease, and imprisonment.	PREVALENCE RISK FACTORS
Pakistan[22]	2002	Screening of inmates during a 2-week visit to a jail	• Out of 4,870 prisoners, 79 (1.6%) were TB suspects, of which 32 had TB disease. • The rate of TB in the jail was 3.8 times higher than the general population.	PREVALENCE
United States[23]	2004*	Data were collected through questionnaires, interviews and on-site observation in 20 large jail systems.	• 35% of jail systems reporting having effective collaboration with local health departments. • 4 barriers were reported by a majority of the jail systems: funding, staffing, training and communication. • Lack of advance warning of an inmate's release was reported as the greatest barrier to discharge planning activities.	GENERAL
Thailand[24]	1999-2002	Review of TB treatment outcomes in 16 prisons in 4 geographic regions in Thailand.	• Of 1,158 new smear-positive TB cases, 68.7% were cured, 0.5% completed treatment, 17.6% died, 10.6% were transferred and 2.6% failed. • DOTS implementation in these prisons did not achieve the national target to cure 85% of new smear-positive cases.	TREATMENT
United States[25]	1998-2000	Retrospective review of TB records from January 1998 to December 2000 in a county jail.	• Of 2,127 inmates who were TST positive, 146 were started on treatment. • Completion rates were 88% for the 2-month rifampin and pyrazinamide course of LTBI treatment, and 74% for the 6- to 12-month isoniazid course of treatment. • Both regimens were similarly tolerated but inmates on isoniazid were more likely to be released from jail and not complete treatment.	TREATMENT
Thailand[26]	2003*	Drug susceptibility testing to the 4 first-line anti-TB drugs was performed on 165 *M. tb* isolates in 3 prisons.	• Drug resistance to at least 1 drug was 50%. • MDR-TB was identified in 19% of the isolates. • The only factor significantly associated with drug resistance was a history of previous TB treatment.	PREVALENCE RISK FACTORS
United States[27]	2000-2001	Review of records of 56 inmates who had recently been evaluated for TB disease and 376 inmates who were diagnosed with or confirmed to have LTBI in 20 large US jail systems.	• In 14% of 56 inmates evaluated for TB disease and 24% of inmates with LTBI, chest radiographs were either not performed or not documented. • Of 48 inmates evaluated for TB disease who were not receiving treatment when admitted to jail, 10 had no record of sputum collection. • A mean delay of 3.1 days occurred from symptom report to respiratory isolation.	SCREENING

Setting	Year	Method	Main results	Main themes
Pakistan[28]	2003*	Arandom sample of 425 inmates from 6,607 male prisoners in 5 central prisons was interviewed and tuberculin skin tested.	• Overall prevalence of LTBI was 48%. • Factors significantly associated with risk of LTBI included age, educational level, smoking status, duration of current incarceration, and average accommodation area of 60 sq. feet or less.	PREVALENCE RISK FACTORS
Thailand[29]	2000	In a cross-sectional study, DST and interviews were performed on 154 consecutive TB patients with at least 1 positive sputum smear and culture registered between May 1 and October 31, 2000.	• Resistance to at least 1 drug was found in 50.6% of the subjects including MDR-TB in 19.5%. • Previous TB treatment was the only factor significantly associated with drug resistance.	PREVALENCE RISK FACTORS
Botswana[30]	2002	Screening of 1,027 prisoners and 263 guards at 4 prisons during April-May 2002.	• Point prevalence of TB disease among prisoners was 3,797/100,000; among guards it was 2,662/100,000. • 2 prisoners had resistance to isoniazid; 1 guard was resistant to isoniazid, ethambutol and streptomycin. • Risk factors associated with TB in prisoners included incarceration >6 months and residence in prison A.	PREVALENCE RISK FACTORS
United States[31]	2003*	Inmates in 49 correctional facilities in 12 states were tested for LTBI using TST.	• The mean skin test positivity rate was 17%. • Of those with a known HIV result, 14.5% tested positive for HIV. • Inmates with a positive TST were 4.2 times more likely to be HIV-infected than those with a negative TST. • LTBI treatment was completed for 56% of inmates. • Patients who were HIV-positive and started on a 12-month regimen were less likely to complete LTBI treatment than HIV-negative inmates.	PREVALENCE TREATMENT
Turkey[32]	1997-2001	Data obtained between 1997 and 2001 during the systematic annual TB screening program undertaken in Nazilli District Prison were evaluated retrospectively.	• Over the 5-year period, 99.8% of prisoners were screened. • The mean point prevalence of TB was 341/100,000. • The total number of active TB cases was 13. • All cases were either classified as treatment completion or cure.	PREVALENCE TREATMENT
Spain[33]	1987-2000	Quantitative indicators were assessed for the prison TB control program over the period 1987-2000.	• Statistically significant trends were found for incidence rates, infection prevalence, treatment adherence rates among smear-positive cases and percentage of patients on DOT.	GENERAL
Taiwan[34]	1998-1999	Prisoners in 24 prisons and 5 jails from July 1998-June 1999 were screened for TB.	• Out of 51,496 inmates screened, pulmonary TB was diagnosed in 107 (258.7/100,000). • Of TB cases, 80.4% completed treatment, 15.9% were lost to follow-up after release from prison, and 3.7% died.	PREVALENCE TREATMENT

Setting	Year	Method	Main results	Main themes
Russia[35]	1999-2000	DST records from July 1999 to June 2000 for patients with smear-positive pulmonary TB in one oblast in Russia were reviewed, including prisons.	• 212 smear-positive isolates had DST results. • Any drug resistance was more common among prison than community patients (44% vs. 30%). • MDR-TB was more prevalent in prison compared to community patients (12% vs. 5%).	PREVALENCE
Russia[36]	1998	Detainee release from 3 remand prisons was reviewed, and TB patient files evaluated from 1 remand prison in one oblast in Russia.	• Among detainees not released, 60% are not moved during the first 6 months of detention. • The incidence of active TB detected upon entry to one remand prison was 4,560/100,000.	PREVALENCE GENERAL
United States[37]	1993-1997	Records of prisoners referred for LTBI treatment between January 1993 and June 1997 in one state were reviewed.	• 168 records were reviewed. • The mean duration of LTBI treatment completed before release from prison was 8 weeks. • 57% of subjects never came to clinic after release. Of the 43% who came to clinic after release, 55% completed IPT (n=35). • Estimated that $32,866 was spent on the program but $42,093 in future costs associated with reactivation TB was prevented.	TREATMENT
United States[38]	1999	A cohort of inmates entering a city detention center from Feb 1 to June 30, 1999 was analyzed to assess risk factors for LTBI.	• Foreign-born inmates were 5.9 times more likely to have a positive TST than US-born, and accounted for 60% of recently diagnosed TB cases. • Chest radiograph screening of all inmates entering the facility reduced exposure time to active TB cases by 75%, but TB incidence remained unchanged.	RISK FACTORS
Thailand[39]	1997-1998	304 of 4,751 inmates were screened for TB in 4 provincial prisons in Southern Thailand.	• Prevalence of smear-positive pulmonary TB was 568/100,000. • 39% of the isolates were resistant to INH.	PREVALENCE
Spain[40]	1991-1999	A cohort study was done between 1991 and 1999 to determine TB incidence and associated variables.	• Of 1,050 people studied, 10% were co-infected with TB and HIV. • 23 cases of TB were detected (incidence rate of 6.4/1000 person years of follow-up). • Persons infected with both HIV and TB who did not undergo LTBI treatment were at greatest risk for developing TB.	PREVALENCE
Tanzania[41]	1994-1997	Case notes of 501 prisoners in 1 prison from Jan 1994 to Dec 1997 were retrieved and reviewed.	• 204 (40.7%) had smear-positive TB. • HIV co-infection was recorded for 25.9% of TB cases. • The mean length of imprisonment at the time of diagnosis was 19 months.	PREVALENCE
United States[42]	2001*	Decision analysis was use to assess the cost-effectiveness of screening with chest x-ray.	• It cost an average of $6.60 per inmate for routine screening on admission to jail. • The cost of screening for active TB with chest x-ray was estimated to be $9,600 per case identified compared with $32,100 per case with TST and $54,100 per case with symptom screening.	SCREENING

Setting	Year	Method	Main results	Main themes
United States[43]	1998-1999	Prospective cohort study of all inmates admitted to a large urban county jail with positive TST results, and offered 2 months of rifampin and pyrazinamide for LTBI.	• Of 1,360 new inmates with a positive TST and normal chest x-ray, 168 were expected to be incarcerated at least 60 days. • 48% completed 2RZ treatment while incarcerated and 44% were released before completion. • 21 inmates completed INH therapy the year before, and 9 completed INH concurrently with the 2RZ regimen.	TREATMENT
England[44]	2000*	Staff were interviewed at a local prison using a standardized questionnaire, and examined for a BCG scar.	• 265 of 350 staff were interviewed. • 1.5% had had TB disease. • 53% considered their risk for TB infection as greater than average; 35% thought the risk was less than other professions. • 83% did not recall being screened for LTBI and 66% had a discernible BCG scar.	RISK FACTORS
Georgia[45]	2000*	Prisoners were screened for TB in 12 prisons between July 1997 and August 1998.	• The prevalence of smear or culture positive TB was 5,995 per 100,000. • 77.9% were resistant to at least 1 drug, and 13% were MDR. • Risk factors for TB disease included prison stay >=2 years, low BMI, accommodation in a large size prison, previous TB treatment, cough of >=2 weeks, loss of appetite. • Risk factors associated with MDR included stay of <2 years and age >25 years.	PREVALENCE RISK FACTORS
France[46]	2000*	All inmates admitted to 10 correctional facilities in Paris during the period June 1994 to July 1995 were screened for TB.	• The incidence of TB was 215/100,000 inmates. • 72% had pulmonary TB. • No MDR-TB cases were observed.	PREVALENCE
United States[47]	1994	All inmates in a state correctional system were included whose skin test converted from negative to positive at annual screening.	• Probable exposure to a diagnosed source case was found in 13% of converters, possible exposure in 10% and no exposure in 72% (exposure status not determined in 5%).	SCREENING RISK FACTORS
Western Pacific Region[48]	1997	A questionnaire was sent to the prison health services of member states of the WHO Western Pacific Region.	• 15 of 26 countries (57%) responded to the questionnaire, for a total population response of 65,154,000 out of 1,580,000,000 (4%). • 69% stated that the prison health services were independent of the custodial service; 86% notified TB cases to national health authorities; 84% used DOT; 76% reported that patients were transferred on release to community treatment services.	GENERAL
Azerbaijan[49]	1995-1998	467 patients with smear-positive TB were evaluated for drug resistance and treatment outcome.	• Of 131 patients with DST, 55% had a strain of TB resistant to 2 or more drugs. • 54% successfully completed treatment, 22% failed, 11% died, 13% defaulted. • Risk factors for treatment failure include drug resistance, a positive sputum at the end of treatment, cavitary disease, and poor compliance.	PREVALENCE TREATMENT

Setting	Year	Method	Main results	Main themes
Russia[50]	1996-1997	Reviewed treatment outcomes for 210 initially smear-positive patients placed on Category 2 therapy from June 1996 through March 1997 in 1 oblast in Russia.	• 35% failed treatment. • Among the 164 with DST results, initial resistance to INH and RIF was 22.6%.	PREVALENCE TREATMENT
Australia[51]	1996	Cross sectional random sample of 789 adult inmates from 27 New South Wales correctional centers between May and August 1996.	• 13% of the 639 inmates given a TST were TST positive. • A higher proportion of male inmates (14%) were TST positive compared to females (8%). • Independent predictors of TST positivity were being male, age > 25 years, Aboriginal, foreign-born, and resident at a jail with a recent TB outbreak.	PREVALENCE RISK FACTORS
United States[52]	1991-1995	Data abstraction was done from prison, medical and health department records for all patients treated in a state prison system from 1991 through 1995.	• A total of 142 cases of TB were treated in the prison during the 5-year period for a prevalence of 113/100,000. • Approximately 2/3 were detected by active case finding, either at the county jail prior to transfer to the prison (31%) or at the prison intake evaluation (37%). • Contact investigations were carried out in county jails or in the community for only 25% of cases detected at entry to prison. • 38% of inmates on treatment when released were lost to follow-up.	PREVALENCE SCREENING
Spain[53]	1995	Reviewed the DOT program for 62 TB patients from a men's penitentiary in Barcelona in 1995.	• Of the patients, 43 were intravenous drug users, 46 were HIV-infected, 19 previously had TB, and 32 were released from prison during TB treatment. • Overall treatment adherence was 89%; 97% among those who completed treatment in prison, and 79% among those who completed outside prison. • Factors associated with better compliance included DOT and incarceration throughout treatment.	TREATMENT
Azerbaijan[54]	1998	Case study in the Central Penitentiary Hospital in Baku of 28 patients not responding to standard TB treatment, and 38 consecutive TB patients at admission.	• All 28 non-responding patients had TB strains resistant to at least 1 drug. • 89% of these patients and 24% of the consecutive patients had MDR-TB strains.	PREVALENCE
United States[55]	1994	The records of male inmates in a county jail screened for 6 months in 1994 were reviewed.	• Of 3,352 screened, 553 (16.5%) reported a prior positive TST • 330 (26.9%) of 1,229 tests placed and read were positive. • 45.8% of those with positive TSTs began INH. • 61.6% of the inmates were released before INH completion, and only 3.2% went to the TB clinic within a month.	SCREENING

Setting	Year	Method	Main results	Main themes
United States[56]	1992	Conversions among 24,487 state prison employees in 1992 were analyzed by prison and job category.	• The conversion rate was 1.9%. • Employees in prisons with TB cases had a higher conversion rates than employees in prisons with no cases. • Employees with greater prisoner contact (guards and medical personnel) had higher conversion rates than employees with little prisoner contact.	PREVALENCE RISK FACTORS
Malawi[57]	1996	A case-finding survey was done between May and July 1996 in Zomba Central Prison, Malawi.	• 914 of 1,315 prisoners were screened. • 47 (5%) had pulmonary TB. • 16 of 22 TB patients tested for HIV were HIV-infected. • In all prisoners except one, symptoms of TB had developed after entering prison.	PREVALENCE
Ivory Coast[58]	1990-1992	The study included 108 cases of smear positive pulmonary TB who had never been treated previously.	• The incidence of smear-positive TB was 5.8%. • TB infection was associated with malnutrition, anemia and dermatoses. • HIV infection was reported in 30% of the cases, alcohol and tobacco dependence in 50% of cases. • 74.1% of the cases were cured but 24% died.	PREVALENCE RISK FACTORS

* year published

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