Correctional Service Canada
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TUBERCULOSIS SURVEILLANCE

IN CANADIAN FEDERAL PENITENTIARIES 1999-2001

REPORTED RESULTS OF THE CORRECTIONAL SERVICE CANADA TUBERCULOSIS TRACKING SYSTEM

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MISSION OF THE CORRECTIONAL SERVICE OF CANADA

The Correctional Service of Canada, as part of the criminal justice system and respecting the rule of law, contributes to the protection of society by actively encouraging and assisting inmates to become law-abiding citizens, while exercising reasonable, safe, secure and humane control.

Tuberculosis Surveillance in Canadian Federal Penitentiaries is published in both English and French for the staff, management and inmates of Correctional Service Canada (CSC), officials and academics in public health in Canada, the international corrections community and the general public. It is prepared by the Tuberculosis Prevention and Control Program (TBPC) and the Public Health Agency of Canada (PHAC), with collaboration from CSC Health Services.

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

FOREWORD

I am pleased to provide this report on the tuberculosis surveillance system for the prevention and control of tuberculosis among inmates and staff in federal penitentiaries in Canada 1999-2001.

Tuberculosis (TB) among incarcerated populations around the world is recognized as a public health concern. After years of successful control, the public health threat of emergent multi-drug resistant TB among inmates in the former Soviet Union demonstrates the importance of maintaining vigilance in the fight against the spread of TB.

Inmates are often at increased risk of TB due to the social and behavioural risk characteristics that define this population before they even enter the prison gates. By the very nature of incarceration, the risk of contracting TB may be heightened among inmates at close proximity with shared ventilation.

The Correctional Service of Canada (CSC) has partnered with the Public Health Agency of Canada (PHAC) in the surveillance of TB among inmates and staff in Canadian federal penitentiaries. Inmates are offered screening for TB on admission and are followed throughout their incarceration for any sign or symptom that might indicate infection with TB or progression to active disease. Our nursing staff represents the front line workers in this most important battle against the spread of one of the world's leading killers.

The challenge posed by TB to CSC and to public health in Canada should not be taken lightly; indeed, constant vigilance to the task is required, as the tools available to public health for the control and detection of latent TB infection (LTBI) and active TB disease are cumbersome and logistically difficult to administer. Together, with our provincial, territorial, and federal colleagues, CSC is working to control the spread of tuberculosis among those incarcerated and those who work in our institutions.

Sincerely,

Dr Françoise Bouchard, MD, MPH, FRCP(C)
Director General, Health Services
Correctional Service of Canada

FOREWORD

In the mid 1990's, an alarm was raised in several Ontario institutions about a number of simultaneous active tuberculosis cases and the possibility of an outbreak of tuberculosis (TB). While fortunately this did not turn out to be the case, thus began an active collaboration between Correctional Service Canada and the Public Health Agency of Canada (then Health Canada). Since then, Tuberculosis Prevention and Control Program has continued to be involved in the tuberculosis prevention and control program at CSC.

A system for tracking tuberculosis among inmates and staff was designed, built and implemented. The CSC Tuberculosis Tracking System, or TBTS, is a database that electronically stores the results of the tuberculosis assessments among inmates and staff and facilitates the analysis of these data and the production of reports such as this one. However, it is but one part of the whole prevention and control program at CSC, which depends on the attention, understanding, and dedication of the nurses and health services staff, from the institutions, regions, and national teams within CSC.

This report contains a number of detailed tables and analyses on the results of the tuberculosis assessments in CSC from 1999-2001. While of more of an historical importance, they allow public health officials to measure tuberculosis infections among inmates and staff; they allow a comparison of results to other national and international data in order to better understand TB among those living or working in Canadian federal penitentiaries; and they allow an assessment of the prevention and control program itself which suggests changes and adjustments in order to improve TB prevention and control activities in CSC.

TBPC and PHAC remain committed to our involvement with our federal, provincial and territorial departmental partners in promoting and maintaining the health of all Canadians. Indeed, the relationship between CSC and PHAC has grown to include technical and scientific services and advice on a number of infectious diseases and issues. We look forward to the continued partnership on this important public health issue.

Sincerely,

Dr Edward Ellis, MD, MPH, FRCP(C)
Manager, Tuberculosis Prevention and Control Program
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Public Health Agency of Canada

SUMMARY

Participation of inmates in tuberculosis (TB) screening was high at 77.3%, 76.0%, and 73.8% for 1999, 2000 and 2001 respectively. However, the participation rate for staff was low at 28.4%, 23.1%, and 22.1%. Results relating to staff must be interpreted with caution as the low rate of participation means the results may not be representative of the general population of staff members working within federal correctional institutions. Efforts should be made to identify any barriers to staff participation in TB screening assessments.

On the Initial Assessment,[1] 17.9%, 19.2%, and 19.9% of inmates in 1999 to 2001 respectively had a significant tuberculin test (TST) result. Among staff, the proportion significant on Initial Assessment was 7.5%, 10.1%, and 8.3%. Generally, this represents admission to a federal institution for inmates and employment for staff, although this may not always be the case. Of concern, 38.2%, 27.4%, and 26.3% of staff in 1999-2001 did not have a complete or valid baseline two-step TST. The functional reasons behind this finding should be investigated and attempts made to remove barriers to completion of testing.

One of the objectives of the TB prevention and control program at Correctional Service of Canada is the identification of those who convert their TB infection status – that is, they have a significant TST while they are incarcerated. Among inmates having an Ongoing Non-significant Assessment,[2] 1.7%, 1.4%, and 2.7% for 1999-2001 had a significant TST result. It is unclear whether the observed rise in the significant rate in 2001 can be ascribed to increased vigilance for TB, or whether it represents a true increase in the transmission of TB among inmates who are incarcerated. Among those who tested significant, not all had a documented Previous Non-significant TST and could be considered converters;[3] the annual conversion rate among inmates for 1999-2001 was estimated to be of 1.04%, 0.86%, and 1.9%.

Among staff, the proportion testing significant on an Ongoing Non-significant Assessment was 0.7%, 0.5%, and 0.4% for 1999-2001 respectively. However, given the low participation rate among staff, it is unclear whether the observed downward trend among staff in the significance rate on the Ongoing Non-significant Assessment is reflective of a true decrease in TB transmission. The annual conversion rate among staff was estimated to be 0.30%, 0.23%, and 0.28% for 1999-2001 respectively.

Overall, the proportion of inmates TST significant and therefore considered to have latent TB infection (LTBI) was 21.9%, 20.5%, and 21.1% for 1999-2001 respectively; the highest prevalence was reported in Quebec, Ontario, and Prairie regions. Higher rates of LTBI were reported among foreign-born and Aboriginal inmates. The overall proportion of staff TST significant and therefore considered to have LTBI was 11.2%, 11.5%, and 7.5% for 1999-2001 respectively. The highest LTBI rates among staff were reported in Prairie and Pacific regions, and among staff of foreign-born or Aboriginal origin.

The CSC TB Tracking System (TBTS) was designed to capture data on LTBI. Epidemiological data on cases of active TB disease are essential to understand the scope of TB transmission within Canadian federal correctional facilities. The TB surveillance system has been updated to systematically capture this information as of the beginning of 2005.

These findings highlight the importance of screening and tracking of TB in penitentiaries and emphasize the public health role that CSC plays in the prevention and control of this disease in Canada.

[1] Initial Assessment is a two-step TST process to determine baseline TB infection status (see Glossary).

[2] An Ongoing Non-significant Assessment includes follow-up TST among those who are considered not to be infected with TB (see Glossary).

[3] To be considered a converter, an individual must have a documented previous Non-significant Assessment (see Glossary) and an increase in induration consistent with Canadian guidelines.

SECTION A

PART 1: INTRODUCTION

BACKGROUND

The Correctional Service of Canada Tuberculosis Tracking System (CSC TBTS) was developed in 1997 in conjunction with the Public Health Agency of Canada (PHAC - then Health Canada) to capture information on reported tuberculosis (TB) screening results. CSC nurses in all federal correctional facilities across Canada report their results on inmate TB screening to the National Infectious Disease Program (NIDP), Health Services Branch, CSC National Headquarters (NHQ); Workplace and Public Safety Program (WHPSP) nurses report their results on staff TB screening separately to Tuberculosis Prevention and Control (TBPC) at the PHAC. TBPC subsequently analyze the collected data and together with the other members of the CSC Infectious Diseases Surveillance Committee (CSC IDSC, Appendix 1) produce surveillance reports. A former surveillance report on tuberculosis in CSC was published in 2000 (CSC, 2000). This second report *Tuberculosis Surveillance in Canadian Federal Penitentiaries, 1999-2001*, contains TB screening information collected on inmates and staff for 1999-2001.

This report consists of eight parts. Part 1 gives an introduction to the Correctional Service of Canada and the tuberculosis surveillance system. Part 2 gives the background, definitions, and methods. Parts 3-5 gives the results, for each of the three years 1999, 2000, and 2001. For each year, the results are listed separately for inmates and staff. The results are presented by assessment type – initial two-step tuberculin skin test (TST) at baseline and follow-up assessments for those with a non-significant TST – and are displayed by age, place of origin, and gender. Finally, the distribution by age, place of origin, and gender are displayed for all those with a significant TST – including those with a follow-up assessment for a Previous Significant TST.

Part 6 provides a brief discussion of the findings of this report. Parts 7 and 8 discuss the limitations of these results and list some aspirations for the TB surveillance program at CSC.

TUBERCULOSIS (TB)

There are three health-related outcomes for TB: latent TB infection (LTBI), active TB disease, and in persons with active disease, the potential to spread TB infection to others (TB infectiousness).

TB is caused by the bacterium Mycobacterium tuberculosis. Most adults who become infected with TB never develop active TB disease. A person with LTBI does not feel sick or have any symptoms and **cannot spread TB to others**. Factors that weaken the immune system increase the risk of progression to active TB disease in persons with LTBI. These factors include human immunodeficiency virus (HIV) infection, diabetes mellitus, substance abuse, being more than 10% underweight, end-stage kidney disease, silicosis, receipt of an organ transplant, cancer in the head or neck, lymphoma or leukemia, anti-cancer drug therapy, radiotherapy, and steroid use. The weakened immune system is less able to stop the TB bacteria from growing and spreading within the body, and symptoms begin to appear (Long, 2000).

People with active TB disease feel sick. Although the symptoms a person develops will depend on where in their body TB disease develops, active TB disease of the lungs or vocal cords classically causes a prolonged cough (≥three weeks). After a few weeks of appropriate antibiotic treatment, most people will no longer be infectious and will feel much better. However, completing the full course of treatment (at least six months) is needed to kill all the TB bacteria and to prevent the recurrence of active TB disease or the development of drug-resistant TB disease.

A person with active TB disease of the lungs or vocal cords can spread TB by coughing or sneezing. M. tuberculosis goes into the air and people nearby can inhale the bacterium and become infected. TB is not as contagious as chickenpox or measles; people with active TB disease are most likely to infect people whom they spend time with every day.

THE CORRECTIONAL SERVICE OF CANADA (CSC)

CSC is responsible for the administration of correctional sentences of two years or more and for the preparation of inmates for their successful return and reintegration into the community. CSC operates 53 correctional institutions, which include

minimum, medium, maximum and multi-level security facilities in five regions. Five of the facilities are dedicated to women inmates and are located in Atlantic, Quebec, Ontario and Prairie regions. In Pacific region, women inmates are housed in a provincial facility through an Exchange of Service Agreement with the province of British Columbia.[4] In addition, a small number of women inmates are held in dedicated sections of male institutions in several CSC regions (see Appendix 2).

PART 2: METHODS

TUBERCULOSIS (TB) SCREENING ASSESSMENT OF INMATES

The *Technical Annex on Screening, 1996* (CSC, 1996), guided tuberculosis prevention and control activities 1999-2001. Participation in TB screening is not mandatory for inmates.

An inmate entering the federal correctional system through a reception facility is given an initial health assessment on admission. To screen for TB infection and disease, a tuberculin skin test (TST) and a review for symptoms consistent with active TB disease is recommended for all new inmates. A chest x-ray is recommended if the TST is significant or if the inmate refuses the assessment. A chest x-ray is strongly recommended for all inmates who report symptoms suggestive of active TB disease. Inmates with an initial non-significant TST are offered a second TST one to three weeks later to provide an adequate two-step baseline. Inmates suspected of having active TB disease are isolated from other inmates until investigations can verify (or rule out) the diagnosis and determine the infectious risk. Inmates with latent TB infection (LTBI) (significant TST) or active TB disease are offered appropriate antibiotic therapy.

Thereafter, an annual Ongoing Assessment of TB status occurs while the inmate is incarcerated. An inmate who is released from a CSC facility, but subsequently re-enters a federal correctional institution is evaluated as an Ongoing Assessment if their TST status has been previously reported to the CSC Tuberculosis Tracking System (CSC TBTS). If the previously recorded TST was non-significant, the inmate is offered a TST and symptom review (Ongoing Non-Significant – see Glossary). A chest x-ray is offered if the TST was refused or is now interpreted as significant (i.e., a conversion) and/or if symptoms suggestive of active TB disease are reported. If the previously recorded TST was significant, an Ongoing Significant Assessment (see Glossary) is conducted (risk and symptom check, chest X-ray if warranted). The results of this screening assessment for risks and symptoms indicative of progression to active TB disease are recorded on the same form.

An inmate who enters a CSC institution with active TB disease or who develops active TB disease within the correctional environment can be identified via the Initial Assessment, routine annual screening or by spontaneously reporting symptoms. An inmate suspected of having active TB disease is isolated (preferably in a negative pressure isolation room) until active TB disease is verified (or ruled out). If active TB disease is diagnosed while the inmate is in a federal correctional facility, the institution's Chief of Health Services and the Regional Infectious Diseases Coordinator ensure that appropriate contact tracing occurs in collaboration with local and/or provincial/territorial public health authorities.

Each of the identified contacts living or working within areas where transmission may have occurred (e.g., cell blocks), with a documented non-significant TST or unknown TST status, are offered a TST to determine the likelihood of TB infection. An initial TST followed by a repeat TST three months later, as per the Canadian Tuberculosis Standards, is the recommended testing regimen for identified contacts. Chest x-rays and symptom checks to rule out active TB disease are recommended for contacts with significant TST results (previously known TST significant and converters). Because the initial symptoms of active TB disease are somewhat non-specific, an inmate may be infectious to others for a prolonged period of time before the possibility of active TB disease is raised and the inmate isolated. With frequent movement of inmates between correctional facilities and with releases into the community, contact tracing investigations may involve more than one institution and/or region and require close collaboration with local public health officials.

CSC Health Services staff monitors active cases of TB disease among inmates. The local Medical Officer of Health receives a copy of laboratory-confirmed M. tuberculosis reports of all residents within their jurisdiction, including inmates.

TB screening assessments and treatment are voluntary activities for an inmate. A minority of inmates refuse initial TST and/or symptom checks on admission to a CSC facility. Similarly, some inmates refuse TST and/or symptom checks in the

[4] As of April 1 2004, a new facility in Pacific Region (Fraser Valley Institute for Women) houses women inmates in this region.

context of annual ongoing screening or contact tracing. Refusal of one modality to monitor TB status (e.g., TST) does not necessarily imply refusal to assess TB status through other means (e.g., chest x-ray, symptom check). Although inmates cannot be forced to participate in TB screening assessments, if an inmate has signs and symptoms of active pulmonary TB disease they can be isolated until active TB disease is verified (or ruled out). An inmate with active infectious TB disease can be isolated until they are determined to no longer pose a risk of transmitting TB infection to others (i.e., no longer infectious).

TB SCREENING ASSESSMENT OF STAFF

The Workplace Health & Public Safety Programme, Health Canada is responsible for providing TB screening assessments to CSC employees. *The Technical Annex on Screening, 1996* (CSC, 1996) guided TB prevention and control activities in 1999. TB screening assessments and subsequent treatment are voluntary activities for staff.

A staff member is offered TST testing and symptom review during a pre-employment assessment. If the initial TST result is non-significant, the employee is offered a second TST one to three weeks later to provide an adequate two-step baseline to determine TB infection status. A worker with a significant TST result and/or symptoms suggestive of active TB disease is referred to his or her physician for further investigation, including a chest x-ray.

Thereafter, the employee is offered an annual TB assessment. If the previously recorded TST was non-significant, the employee is offered a TST and symptom review. A chest x-ray by his or her physician is recommended if the TST is refused or is now interpreted as significant (i.e., a conversion) and/or if symptoms suggestive of active TB disease are reported. The information is recorded on an Ongoing Non-significant Assessment form (see Glossary). If the previously recorded TST was significant, an Ongoing Significant Assessment (see Glossary) is conducted. The results of this screening assessment for risks and symptoms indicative of progression to active TB disease are recorded on the same form.

An employee with symptoms suggestive of active TB disease can be identified through the Initial or Ongoing Assessment, by spontaneous reporting of symptoms, or by observation of symptoms by others in the workforce. The employee is asked by their manager to remain off work until their physician could rule out the diagnosis. Cases of active TB disease in an employee of a federal correctional facility are not reported to the WHPSP or CSC, as there is no legislation governing reporting to these agencies. Provincial legislation mandates the reporting of active TB cases to the local Medical Officer of Health; therefore, a case of active TB disease in a federal correctional facility employee will appear in the provincial population burden of TB disease statistics. However, unlike with inmates, cases of active TB disease in an employee within a federal correctional facility cannot be distinguished from TB cases occurring in the general population.

A worker who is identified as a contact of an active case of TB disease within a CSC institution is offered a TST initially upon identification and at three months since last contact with the case. WHPSP staff performs the TST. An employee contact with either a previously documented significant TST or a TST conversion is referred to his or her physician to rule out active TB disease (i.e., symptom check and chest x-ray, ±sputum examination). Identified contacts who are contract employees or volunteers are notified of their exposure and contact tracing activities are performed by the local public health agency.

TB screening assessments and treatment are voluntary activities for a federal correctional facility employee. A staff member who chooses not to participate in WHPSP TB screening may go to his or her own family doctor, a TB clinic or the local public health agency to determine their TB status.

DATA ENTRY

Data entry of inmate assessments was performed at CSC and then the data were forwarded to Tuberculosis Prevention and Control, Health Canada. Data entry of staff assessments was performed at Tuberculosis Prevention and Control, Health Canada. All data entry occurred via three remote stand-alone personal computers and exported/imported to the master database periodically. Data confidentiality was strictly preserved at each step of data collection, storage and entry. Inmate and staff assessment forms were stored separately.

CSC TBTS data were exported from the production machine and analyzed using SAS statistical software. Each variable was investigated for outliers and possible data entry errors using the entire dataset. Assessments with an assessment date falling in 1999 were included in this report.

DATA ANALYSIS

All the CSC TBTS data were imported into SAS software, and staff and inmate demographic data were linked to their assessment records via the unique identifier, assessment date, and assessment type (i.e., initial or ongoing). Missing inmate data on date of birth, gender, and ethnicity were obtained from the Offender Management System (OMS) and incorporated electronically into the analysis.

Note that an individual can have more than one TB screening assessment performed in a calendar year (e.g., screening done as a result of an Ongoing Assessment and a contact investigation). In order to reflect the volume of screening and testing that CSC carries out in TB prevention work, the tests were analyzed and presented according to the 'type' of assessment. Only one record was kept for each person per assessment type; records were selected based on date (first record for a duplicate based on exact date of assessment, latest record for multiple records with the same TST result, and record with most important TST result based on a hierarchy of selection (significant > non-significant > others).

The CSC TBTS system collects information on the indication for and the interpretation of the results of TSTs of inmates and staff of federal correctional facilities. Regardless, in the production dataset completion of the TST, interpretation remains substantially incomplete. A complete review and update of the 1996 Technical Annex for TB Screening (CSC, 1996) was undertaken in winter 2004 and provisional guidelines are now in place, with final edits and printing pending (CSC, 2004). The TST result reported herein is the result of the methodological analysis of the data with respect to the TB guidelines (for instance, a 'valid' TST interpretation of 'non-significant' must be read within 48-72 hours of the administration of the tuberculin antigen).

TST results are indicated 'significant' or 'non-significant' as warranted by the provisional CSC guidelines (CSC, 2004). In general, for screening purposes, an induration of ≥10 mm in HIV-negative persons is considered significant, while an induration of ≥5 mm in HIV-positive persons is considered significant; in the context of a contact investigation, an induration of 5 mm is considered significant. Based on the timing of the reading of the TST and the administration of the second step of the TST, the following outcome categories are possible:

First TST of two-step OR annual follow-up TST:

i) Significant;
ii) Non-significant;
iii) A 'read no-show,' where tuberculin is administered but the induration is not read
iv) An 'invalid' TST, where the induration is read as non-significant BUT is read outside the prescribed guidelines of 48-72 hours.

Second TST of a two-step TST:

i) Significant;
ii) Non-significant;
iii) An 'invalid' TST, where the induration is read as non-significant BUT the time to read is outside the prescribed guide lines of 48-72 hours.
iv) An incomplete two-step TST, where a second TST is not performed to complete the baseline measurement where warranted, based on a non-significant first step;
v) A 'read no-show,' where tuberculin is administered but the induration is not read;
vi) an invalid two-step TST, where the second step of the two-step is not administered within the prescribed timeframe of 7 to 365 days[5] of the first administration of tuberculin.

In addition, several instances render the TST 'unusable,' unknown, or indeed, even unnecessary. These are the following:

i) a refusal by the inmate to take the test at the outset;
ii) a medical contraindication to TST testing, such as an allergy;
iii) a blank or unknown result;
iv) a Previous Significant TST, where the individual is already known to be TB-infected based on a previous test, conducted either within CSC or in the community.

[5] This time frame differs from that recommended in the Canadian Tuberculosis Standards 5th Ed. but was allowed in the surveillance definition used in this report.

These outcome categories are coded for in the analysis in a hierarchical fashion, since the categories are mutually exclusive. A TST invalidated in both the first and second steps of the two-step TST is categorized according to the first of the two tests.

Despite being incarcerated for sentences of ≥2 years, inmates in federal correctional facilities do not represent a static population. Persons remanded to a federal institution are first processed through a reception unit, where they are orientated to their new surroundings and environment. In general, each region has a centralized reception centre, with the exception of Prairie region, which has several due to its geographical dispersion. Inmates transfer on a regular basis between correctional facilities. The total federal correctional facility inmate population in 1999 was estimated by adding the number of inmates admitted during 1999 to the census population on January first of that year. This method may overestimate the true number of inmates within federal correctional facilities in 1999.

The proportion of newly significant TST was calculated using the number of persons with newly significant TST results as the numerator, divided by the total number of individuals with TSTs (persons with newly significant plus persons with non-significant TST) as the denominator. Persons without a valid TST result (Previous Significant TST, medically contraindicated, invalid TST, refusals, and blank/unknowns) are not included in the calculation.

By definition, a converter must have a previously documented non-significant TST result and subsequently test significant on an Ongoing Assessment. The overall, or adjusted conversion rate was calculated as the number of people in a year who had a significant TST on an Ongoing Non-significant Assessment (numerator), divided by those with a valid TST in that year who had a previously documented non-significant TST result in CSC TBTS.

Tuberculosis Prevention and Control, Health Canada performed the data analysis for inmates and staff and prepared this report. The report was approved by the CSC Infectious Disease Surveillance Committee (CSC IDSC) before distribution to the Regional Infectious Disease Coordinators (RIDC) and Regional WHPSP staff for feedback and comments.

SECTION B

PART 3: 1999 RESULTS

3.I. INMATES

3.I.A. DEMOGRAPHICS 1999

The number of inmates in federal correctional facilities across Canada as of January 1, 1999, was 13,003. New admissions to federal institutions in 1999 accounted for an additional 4,319 inmates for an estimated maximum inmate population of 17,322 persons.

The average age of inmates in the Correctional Service of Canada TBTS in 1999 was 34.9 years (range: 17 to 82). The largest age group at 35% was 30-39, followed closely by the 20-29 age group at 33%. Ninety seven percent were male.

3.I.B. PARTICIPATION IN CSC TBTS SCREENING ACTIVITIES – 1999

A total of 14,576 assessments were performed among inmates in 1999. After selecting one record per person per assessment type, a total of 13,839 assessments were included in the analysis. Since some people are included in multiple tables, the total number of inmates included in the analysis is 13,384. The participation rate for inmates in TB screening in 1999 is therefore 13,384/17,322 or 77.3%.

Of the 13,839 TB screening assessments conducted by CSC nurses in 1999 included in this analysis, 4,368 (32%) were for an Initial Assessment, 7,346 (53%) were for annual follow ups on known TST non-significant inmates, and 2,125 (15%) were on known TB-infected inmates. Of all these, 376 (3%) assessments were the result of contact tracing investigations for a known or suspected case of active TB disease or conversion.

3.I.C. RESULTS OF SCREENING FOR TUBERCULOSIS, INMATES – 1999

i. Latent TB Infection (LTBI) on Admission to CSC Institutions

There were 4,401 Initial Assessments conducted in 1999 that were reported to CSC TBTS. After selecting one assessment per inmate, 4,368 records remained.

Overall in 1999, 3,696 or 84.6% of the two-step TST assessments among inmates were valid; of these, 660 or 17.9% were found to be TST significant (Table 3.1). This proportion varies by region, with Quebec having the highest rate at 22.6% (n=173), followed closely by Ontario at 20.1% (n=179). Atlantic region had the lowest rate of significant results at Initial Assessment at 5.5% (n=26). A very small number of inmates (n=43, or 1%) were reported to have a Previous Significant TST result.

Inspection of Table 3.1 indicates that of the total number of TST-1 and TST-2 results deemed to be invalid (n=402, or 9.2%), the majority, or 331 (82.4%) are associated with administration of the second TST procedure. Of these, 136 of 331 (41%) were invalidated because the second step was administered outside of the 7 to 365 day window (data not shown). Overall, the combined proportion of assessments classified as invalid ranged from 11.7% in Pacific region (n=53), 11.7% in Prairie region (n=164) to 4.5% in Ontario region (n=44) (Figure 3.1).

The overall refusal rate was 3.1% (n=134). Quebec region had the highest refusal rate at 11.1% (n=111) as compared to the other regions (Ontario: 0.1%, Pacific: 0.4%, Prairie: 0.8%, Atlantic: 1.7%). Roughly half as many reports at 1.5% (n=65) were blank or unknown, which may also be indicative of a refusal. A small number of the Initial Assessments were not done due to medical contraindications (0.6% or n=27).

Table 3.1: Reported TST Results on Initial Assessment by Region – Inmates, 1999

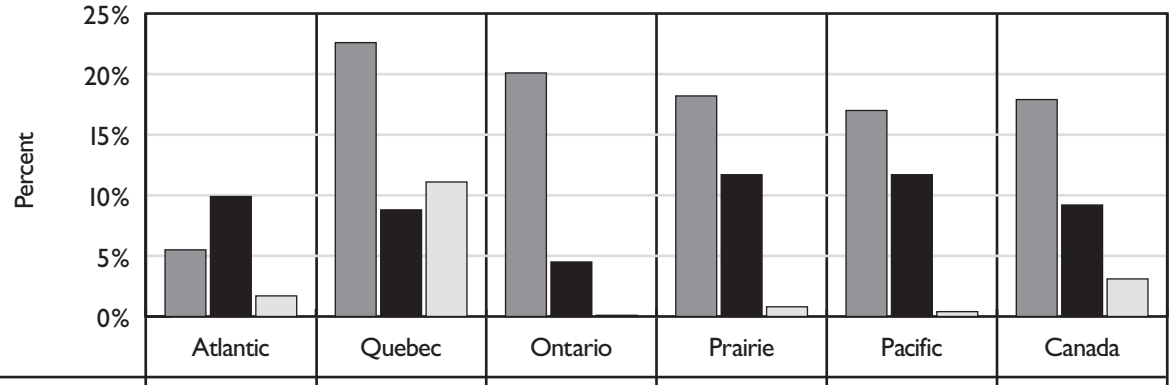
TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Tested Significant	26 (5.5%)	173 (22.6%)	179 (20.1%)	216 (18.2%)	66 (17.0%)	**660 (17.9%)**
Tested Non-significant	443 (94.5%)	591 (77.4%)	712 (79.9%)	968 (81.8%)	322 (83.0%)	**3,036 (82.1%)**
Previous Significant	3	4	9	24	3	**43**
Contraindicated[1]	1	3	7	14	3	**28**
Invalid TST-1[2]	6	10	8	29	18	**71**
Invalid TST-2[3]	47	78	36	135	35	**331**
Refused TST	9	111	1	11	2	**134**
Blank / Unknown	1	31	24	6	3	**65**
TOTAL (%)	**536 (12.3%)**	**1,001 (22.9%)**	**976 (22.3%)**	**1,403 (32.1%)**	**452 (10.3%)**	**4,368**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

[2] - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

[3] - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of the 7 to 365 days of the first tuberculin administration.

Figure 3.1: Selected Initial TST Outcome Results by Region – Inmates, 1999



	Atlantic	Quebec	Ontario	Prairie	Pacific	Canada
Positivity Rate	5.5%	22.6%	20.1%	18.2%	17.0%	17.9%
Invalid Rate	9.9%	8.8%	4.5%	11.7%	11.7%	9.2%
Refusal Rate	1.7%	11.1%	0.1%	0.8%	0.4%	3.1%

ii. Routine Screening – Newly Significant TST Among Ongoing Non-significant Inmates

A total of 7,860 assessments on previously non-significant TST inmates ('Ongoing Non-significant') were performed in 1999. After selecting only one record per inmate, 7,346 unique records were included in the analysis (see Table 3.2).

Overall, 107 (1.7%) were found on testing to be TST significant. The vast majority of the tests however, at 98.3% (n=6255) remained non-significant for LTBI. The proportion of inmates with a significant TST on Ongoing Non-significant tests showed strong regional variation, with Quebec region having the highest rate at 4.1% (n=45), followed by Pacific region at 3.0% (n=18) and Prairie region at 2.1% (n=35). The Atlantic and Ontario regions had a smaller proportion of inmates with a significant TST, at 0.6% (n=4) and 0.2% (n=5) respectively (see Figure 3.2).

Nationally, the proportion of previously non-significant TST inmates refusing testing on their annual assessment was 10.8% (n=797; see Table 3.2 and Figure 3.2). The highest refusal rate was seen in Quebec region at 29.6% (n=478), followed by Pacific region at 10.7% (n=76) and by Prairie region at 7.2% (n=131).

The proportion of all assessments classified as invalid was 1.2% (n=87). This did show regional variation with Pacific having the highest rate at 3.5% (n=25), followed by Prairie region at 1.6% (n=29). The other three regions had rates that were less than 1%.

Table 3.2 Reported TST Results on Ongoing Non-significant Assessment by Region – Inmates, 1999

TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Tested Significant	4 (0.6%)	45 (4.1%)	5 (0.2%)	35 (2.1%)	18 (3.0%)	**107 (1.7%)**
Tested Non-significant	700 (99.4%)	1,040 (95.9%)	2,318 (99.8%)	1,608 (97.9%)	589 (97.0%)	**6,255 (98.3%)**
Contraindicated[1]	0	0	7	1	1	**9**
Invalid TST-1[2]	4	12	17	29	25	**87**
Refused TST	36	478	76	131	76	**797**
Blank / Unknown	5	42	27	13	4	**91**
TOTAL (%)	**749 (10.2%)**	**1,617 (22.0%)**	**2,450 (33.4%)**	**1,817 (24.7%)**	**713 (9.7%)**	**7,346**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

[2] - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

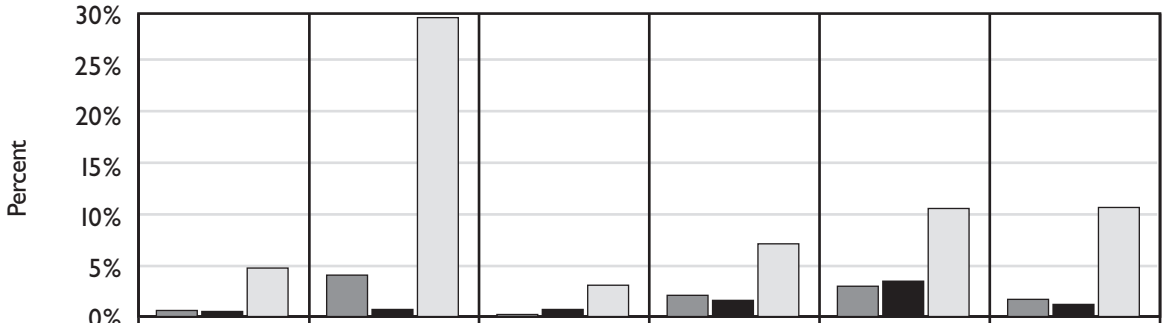
Examination of the 'converters' provides an estimate of the annual rate of LTBI conversion among inmates in federal correctional facilities. By definition, a converter must have a documented non-significant TST baseline status (see Glossary). Of the 107 inmates with a significant TST result on an Ongoing Non-significant Assessment in 1999, 52 (49%) had a previously documented non-significant TST in the CSC TBTS; of these, there were six instances where the increase in induration was less than 10 mm on a previous result size of 5-9 mm;[6] in this case, these six records cannot be considered converters since the increase in induration does not meet the criterion for a converter (see Glossary).

Of the 6,362 inmates with a valid result on an Ongoing Non-significant Assessment conducted in 1999, there were 4,419 (69%) with records in the CSC TBTS of a Previous Non-significant result. Therefore, the calculated conversion rate is (52-6)/4,419 or 1.04%.

[6] None of these six cases were HIV positive nor was the reason for these assessments a contact investigation.

Of the 46 converters, 22 (48%) were from Quebec region and 16 (35%) were from Prairie region. In fact, 56% were from four institutions alone (n=9 from La Macaza, n=5 from Archambault in Quebec region, n=8 from Bowden Institution, and n=3 from Edmonton Institution in Prairie region). Forty-four percent were between 30-39 years old, 89% were male, and 20% were aboriginal (the rest were unknown). None of the documented converters showed any symptoms of active disease and none reported to be in contact of known active TB cases.

Figure 3.2: Selected Ongoing Non-significant TST Outcome Results – Inmates, 1999



	Atlantic	Quebec	Ontario	Prairie	Pacific	Canada
Positivity Rate	0.6%	4.1%	0.2%	2.1%	3.0%	1.7%
Invalid Rate	0.5%	0.7%	0.7%	1.6%	3.5%	1.2%
Refusal Rate	4.8%	29.6%	3.1%	7.2%	10.7%	10.8%

iii. Medical Surveillance of Known LTBI – Ongoing Significant Screening

Inmates with a Previous Significant TST (i.e., ongoing significant annual screenings) are assessed for medical and risk factors that may place them at higher risk for developing active TB, as well as for symptoms that may be indicative of active disease (e.g., weight loss, persistent cough). Inmates requiring medical follow-up are referred or tested accordingly. There were 2,306 Ongoing Significant Assessments conducted for inmates in 1999; after selecting one record per inmate, 2,125 were included in the analysis. The results of risk and symptom screening for these inmates are included in the section discussed below (see section 3.I.E).

iv. TB Infectiousness – Results of Contact Screening Among Inmates

A total of 455 assessments were done among inmates as result of contact investigations in 1999; after selecting only one record per inmate, 376 records were included the analysis.

Based upon the date of the TB assessment associated with a contact investigation, there were four major contact investigations involving inmates in federal correctional facilities in 1999. The first contact investigation at the end of April with follow up in August involved 107 inmates in Quebec region. During this investigation, five inmates (5.4%) were found to be TST significant;[7] two on Initial Assessment and three on an Ongoing Non-significant Assessment (see Table 3.3 and Figure 3.3).

[7] In the context of a contact investigation, for those with a previous TST result between 5-9 mm, an increase of 6 mm was considered a significant TST; in persons with a previous TST <5 mm, a TST reading of 5 mm or more was considered significant.

A second contact investigation took place in Ontario involving 87 inmates, at the end of July, with follow up in October. There were no newly diagnosed TB infections found as a result of this investigation.

There were 163 inmates from Pacific region involved in two separate investigations, where one inmate (0.7%) was reported to be significant on an Ongoing Non-significant Assessment. Of the remaining contact investigations, there was one inmate in Prairie region (8.3%) found to be infected with TB as a result of a contact investigation.

Overall the newly TST-significant rate among inmates on contact investigations was 2.3%. The refusal rate among contacts was 3.7% (n=14) and showed strong regional variation, although the absolute numbers in some regions were small. The proportion of invalid TST results was low, at 1.9% (n=7) of all assessments.

Table 3.3: Reported TST Results on Contact Tracing by Region – Inmates, 1999

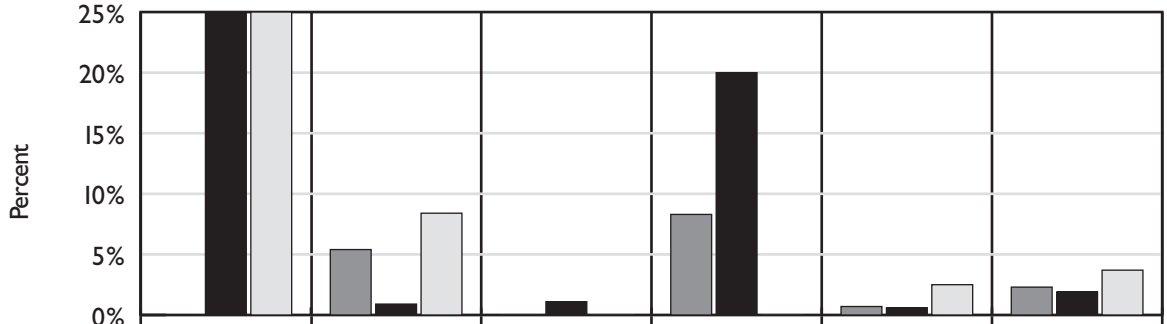
TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Tested Significant	0 (0.0%)	5 (5.4%)	0 (0.0%)	1 (8.3%)	1 (0.7%)	**7 (2.3%)**
Tested Non-significant	2 (100.0%)	88 (94.6%)	66 (100.0%)	11 (91.7%)	137 (99.3%)	**304 (97.7%)**
Previous Significant	0	4	18	0	19	**41**
Contraindicated[1]	0	0	0	0	1	**1**
Invalid TST-1[2]	0	0	1	0	1	**2**
Invalid TST-2[3]	1	1	0	3	0	**5**
Refused TST	1	9	0	0	4	**14**
Blank / Unknown	0	0	2	0	0	**2**
TOTAL (%)	**4 (1.1%)**	**107 (28.5%)**	**87 (23.1%)**	**15 (4.0%)**	**163 (43.4%)**	**376**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

[2] - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

[3] - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of 7 to 365 days of the first tuberculin administration.

Figure 3.3: Selected TST Outcome Results for Contact Tracing – Inmates, 1999



	Atlantic	Quebec	Ontario	Prairie	Pacific	Canada
Positivity Rate	0.0%	5.4%	0.0%	8.3%	0.7%	2.3%
Invalid Rate	25.0%	0.9%	1.1%	20.0%	0.6%	1.9%
Refusal Rate	25.0%	8.4%	0.0%	0.0%	2.5%	3.7%

3.I.D. DEMOGRAPHIC CHARACTERISTICS OF NEWLY TST-SIGNIFICANT INMATES – 1999

i. Age

The mean age of inmates with a newly significant TST in 1999 (n=766) was 37.2, with an interquartile range of 29-44 (see Table 3.4). The age of inmates with a newly significant TST did show variation across Canada, with the youngest cases in Prairie and Ontario, followed by Pacific and Quebec. Atlantic Canada had the oldest average age at 45.4 years. The difference in mean age of inmates with a newly significant TST compared to those without[8] reached statistical significance in all regions (including Canada overall), with the exception of Ontario.

Table 3.5 indicates the prevalence of newly significant TST by age category among those undergoing initial or ongoing non-significant screening. Overall, 6.7% of inmates undergoing an Initial or Ongoing Non-significant Assessment were newly found to have a significant TST.

Table 3.4: Average Age of Newly TST Significant and Other Inmates by Region, 1999

MEAN AGE (YRS) (RANGE)[1]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Newly TST Significant	45.4 (40-50)	40.4 (33-46)	35.1 (25-43)	34.6 (26-41)	38.7 (32-47)	**37.2 (29-44)**
Other[2]	33.0 (24-40)	34.5 (27-40)	35.3 (28-41)	31.4 (24-37)	36.1 (27-43)	**33.9 (26-40)**

1 - Interquartile range 25th and 75th percentiles.

2 - Population of inmates undergoing TST testing EXCLUDING those with a newly significant TST having an Initial or Ongoing Non-significant Assessment.

8 Adjusted for multiple comparisons.

Table 3.5: Newly Significant TST[1] by Age Group and Region – Inmates, 1999

FREQ (%)[2] / AGE GROUP	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
17-19	0 (0.0%)	3 (7.5%)	6 (15.8%)	16 (9.6%)	2 (7.1%)	**27 (8.2%)**
20-29	3 (0.6%)	26 (3.2%)	56 (5.4%)	72 (5.1%)	18 (5.6%)	**175 (4.3%)**
30-39	4 (1.0%)	82 (8.2%)	58 (4.5%)	87 (8.5%)	29 (8.1%)	**260 (6.4%)**
40-49	14 (6.1%)	65 (13.2%)	46 (7.5%)	54 (13.2%)	19 (7.8%)	**198 (9.9%)**
50-59	5 (6.0%)	30 (15.5%)	16 (5.7%)	14 (10.6%)	12 (11.2%)	**77 (9.7%)**
60 +	4 (14.3%)	11 (20.4%)	2 (2.6%)	8 (13.6%)	4 (9.5%)	**29 (11.2%)**
TOTAL (%)	**30 (2.4%)**	**217 (8.4%)**	**184 (5.5%)**	**251 (7.8%)**	**84 (7.6%)**	**766 (6.7%)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

[2] - Cell frequency divided by the total number of inmates in that age group and region having an Initial or Ongoing Non-significant Assessment.

ii. Origin

Demographic data on the country of birth and Aboriginal status are requested on admission to CSC and are captured on the initial screening assessment. However, 68% were missing this information. Of the inmates who reported their country of birth and aboriginal status, persons of foreign birth had the highest rate of newly significant TST results at 37.3%, followed by Canadian-born Aboriginals at 9.2% (see Table 3.6).

Regional variation in these rates is observed as well. Newly significant TST rate among Canadian-born non-Aboriginals was highest in Quebec region at 13.1% and lowest in Atlantic region at 4.0%. Among Aboriginals, the highest regional rate was observed in Pacific region at 10.7% followed closely by Prairie region at 10.6%. The rate among foreign born was highest in Ontario at 40.6%. It is also important to note that due to small numbers in some cells, these rates may be unstable, making meaningful comparisons difficult to interpret.

Table 3.6: Newly Significant TST[1] by Origin and Region – Inmates, 1999

FREQ (%)[2] / ORIGIN	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Canadian Born	12 (4.0%)	50 (13.1%)	17 (4.8%)	13 (4.2%)	7 (5.7%)	**99 (6.7%)**
Aboriginal	1 (1.6%)	12 (9.2%)	10 (3.5%)	128 (10.6%)	24 (10.7%)	**175 (9.2%)**
Foreign Born	0 (0.0%)	23 (38.3%)	52 (40.6%)	27 (37.5%)	8 (33.3%)	**110 (37.3%)**
Unknown	17 (1.9%)	132 (6.5%)	105 (4.1%)	83 (5.2%)	45 (6.2%)	**382 (4.9%)**
Total (%)	**30 (2.4%)**	**217 (8.4%)**	**184 (5.5%)**	**251 (7.8%)**	**84 (7.6%)**	**766 (6.7%)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments

[2] - Cell frequency divided by the total number of inmates in that origin category and region having an Initial or Ongoing Non-significant Assessment.

iii. Gender

The distribution of newly significant TST inmates by gender is shown in Table 3.7. Overall, the proportion of males newly TST significant in 1999 was lower than that of females at 6.7% versus 10.1% respectively.

Regionally, Quebec had the highest proportion of males TST positive at 8.5%, while among females the highest rate was found in Prairie region at 13.0%.

Table 3.7: Newly Significant TST[1] by Gender – Inmates, 1999

FREQ (%)[2] / GENDER	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC[3]	CANADA
Male	30 (2.5%)	211 (8.5%)	174 (5.5%)	230 (7.7%)	82 (7.6%)	**727 (6.7%)**
Female	0 (0.0%)	5 (9.6%)	10 (9.6%)	18 (13.0%)	0 (0.0%)	**33 (10.1%)**
Unknown	0 (0.0%)	1 (1.6%)	0 (0.0%)	3 (4.7%)	2 (11.8%)	**6 (2.4%)**
Total (%)	**30 (2.4%)**	**217 (8.4%)**	**184 (5.5%)**	**251 (7.8%)**	**84 (7.6%)**	**766 (6.7%)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

[2] - Cell frequency divided by the total number of inmates in that gender group and region having an Initial or Ongoing Non-significant Assessment.

[3] - Federally incarcerated females in Pacific region are generally kept in provincial institutions and there were no females in Pacific region included in Table 3.7.

3.I.E. BURDEN OF TUBERCULOSIS IN CSC: SCREENING FOR ACTIVE TB DISEASE, INMATES – 1999

i. Comorbidity and Risk Factors for Progression to Active TB

Including Yes, No, and Unknown as valid response choices, 11,828 of 13,839 (85%) of the records in 1999 had data on comorbidities or other risk factors that increase the likelihood of progression to active TB disease if infected with TB. The distribution of the responses is shown according to TST outcome and assessment type in Table 3.8.

Of those answering risk questions, 87% (n=10,304) did not report any medical comorbidities or risk factors. Of the 1,524 assessments with at least one comorbidity/risk factor reported, injection drug use (n=1200) was the leading risk identified (see Table 3.8). The next most common medical conditions/risk factors were HIV infection (n=169), steroid injection (n=81), and diabetes (n=75). Of the inmates reporting a risk factor, 97 (6.3%) reported multiple risks. Note that the risk factors in Table 3.8 are intended to evaluate the risk of progression to active TB disease, and should not necessarily be interpreted as risk factors for acquisition.

Table 3.8: Reported Comorbidity and Risk Factors[1] by TST Result – Inmates, 1999

TEST TYPE / RISK FACTOR	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=766	n=43	n=2,125	N=2,934	n=9,291	n=1,613	N=10,904	N=13,838
Diabetes	5	0	0	**5**	58	12	**70**	**75**
Hemodialysis	3	0	0	**3**	9	3	**12**	**15**
Silicosis	3	1	0	**4**	10	1	**11**	**15**
Transplant	3	0	0	**3**	6	1	**7**	**10**
Injection Drug User	90	3	11	**104**	909	187	**1,096**	**1,200**
Lymphoma	6	0	0	**6**	13	0	**13**	**19**
HIV/AIDS	8	2	3	**13**	134	22	**156**	**169**
Chemotherapy	2	0	1	**3**	22	2	**24**	**27**
Inject Steroids	8	1	0	**9**	58	14	**72**	**81**
TB Case Contact	1	0	0	**1**	13	0	**13**	**14**
TOTAL	**129**	**7**	**15**	**151**	**1,232**	**242**	**1,474**	**1,625**

1 - Numbers in the table reflect those answering 'Yes' to the presence of the condition/risk factor – individuals may report multiple risk factors.

2 - Includes newly significant TST results from Initial and Ongoing Non-significant Assessments.

3 - Previously significant TST accepted on Initial Assessment – see Table 3.1.

4 - 'Other' result includes medically contraindicated, invalid TST-1 (single test), invalid TST-2 (second of two-step TST), refused, and blank/unknown.

Examination of the report of risks by assessment type reveals that while more than 99% of inmates having an Initial or Ongoing Non-significant Assessment had a valid risk screen, only 6% of the Ongoing Significant assessment records included a screen for risk factors leading to active TB disease (data not shown).

ii. Symptoms Suggestive of Active TB Disease

Half, or 49% (n=6,775) of the records reported in 1999 had a valid symptom screen (that is, they had a response of Yes, No, or Unknown). Of these, 16% (n=1,048) reported at least one symptom potentially consistent with active TB disease. Half of those with symptoms reported more than one symptom.

The most common symptom (see Table 3.9) self-reported by inmates was fatigue (n=465), followed by chest pain (n=361), cough productive of sputum (n=302), and night sweats (n=265). A small number of inmates (n=22) reported a constellation of fatigue, fever, nightsweats, and cough productive of sputum.

Examination of the completion of the symptom screen by assessment type reveals that although over 99% of inmates received a symptom screen during the Initial and Ongoing Significant Assessments, only 4% reported any valid symptom results for the Ongoing Non-significant screening assessments.

Table 3.9: Self Reported Symptoms[1] by TST Result – Inmates, 1999

TEST TYPE / SYMPTOM	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=766	n=43	n=2,125	N=2,934	n=9,291	n=1,613	N=10,904	N=13,838
Fatigue	34	1	245	**280**	150	35	**185**	**465**
Fever	11	1	48	**60**	25	5	**30**	**90**
Weight Loss	13	1	81	**95**	72	11	**83**	**178**
Loss of Appetite	15	3	128	**146**	62	17	**79**	**225**
Night Sweats	24	1	132	**157**	92	16	**108**	**265**
Hoarseness	12	1	92	**105**	25	6	**31**	**136**
Coughing Sputum	17	2	191	**210**	76	16	**92**	**302**
Coughing Blood	11	0	41	**52**	37	8	**45**	**97**
Chest Pains	30	2	149	**181**	157	23	**180**	**361**
TOTAL	**167**	**12**	**1,107**	**1,286**	**696**	**137**	**833**	**2,119**

[1] - Numbers in the table reflect those answering 'Yes' to the presence of the condition/risk factor – individuals may report multiple symptoms.

[2] - Includes newly significant TST results from Initial and Ongoing Non-significant Assessments.

[3] - Previously significant TST accepted on Initial Assessment – see Table 3.1.

[4] - 'Other' result includes medically contraindicated, invalid TST-1 (single test), invalid TST-2 (second of two-step TST), refused, and blank/unknown.

iii. Active Cases of TB Disease

Although not captured by the CSC TBTS surveillance system, there were 5 cases of active TB disease among inmates reported to CSC National Headquarters in 1999. Of the 5 cases, 2 occurred in Prairie region, 1 was in Ontario region, and 2 were in Quebec region. Three of the cases were confirmed as respiratory TB cases and potentially infectious, while 2 of the cases are unknown pathology. Unfortunately, it is not possible to reconcile the active TB case reports with the CSC TBTS screening data at this time, as these are based on aggregate or non-nominal reports.

Based on the estimated at-risk inmate population of 17,072 this translates into an annual TB case rate of 29.3 cases per 100,000 inmates for 1999.

3.I.F. DEMOGRAPHIC CHARACTERISTICS OF LTBI AMONG INMATES – 1999

The burden of LTBI among inmates in CSC is estimated by combining the newly discovered TST-significant cases with those inmates with previously known significant TST result. This provides a 'snapshot' of inmates with LTBI in a given year.

i. LTBI Among Inmates by Age – 1999

LTBI among inmates categorized by age category and region is shown in Table 3.10. The proportion of inmates with LTBI increases with age, from 9.6% among the youngest age group, to 31.5% among those 50-59 years old. And 37.3% of inmates over 60 years of age were infected with TB. Overall, 21.9% of inmates who were screened in 1999 were infected with tuberculosis.

Table 3.10: LTBI[1] by Age Group and Region – Inmates, 1999

FREQ (%)[2] / AGE GROUP	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
17-19	0 (0.0%)	3 (7.5%)	8 (20.5%)	19 (11.3%)	2 (7.1%)	**32 (9.6%)**
20-29	19 (3.8%)	123 (13.9%)	206 (17.7%)	216 (14.2%)	37 (10.9%)	**601 (13.6%)**
30-39	47 (10.9%)	305 (25.6%)	342 (22.2%)	284 (23.7%)	63 (16.4%)	**1,041 (21.9%)**
40-49	60 (22.0%)	263 (39.1%)	232 (29.7%)	180 (35.2%)	73 (25.2%)	**808 (32.0%)**
50-59	22 (22.0%)	98 (38.7%)	115 (30.9%)	56 (32.9%)	30 (24.2%)	**321 (31.5%)**
60 +	11 (32.4%)	30 (42.9%)	46 (38.3%)	28 (37.8%)	16 (30.2%)	**131 (37.3%)**
TOTAL (%)	**159 (11.4%)**	**822 (26.4%)**	**949 (23.6%)**	**783 (21.5%)**	**221 (18.1%)**	**2,934 (21.9%)**

[1] - Includes all inmates with a significant TST result, either newly diagnosed on Initial or Ongoing Non-significant Assessments, Previous Significant on Initial Assessment, or Ongoing Significant Assessments.

[2] - Frequency calculated by dividing the number significant by the number of inmates participating in CSC TBTS screening per origin group and region.

ii. LTBI Among Inmates by Origin – 1999

The burden of LTBI among inmates in 1999, categorized by origin (see Table 3.11) was highest among those foreign born at 46.8%, followed by those of Aboriginal origin (28.4%), and Canadian born (10.3%). Of those of unknown origin, 21.3% were found to have LTBI.

LTBI by origin showed regional variation. Quebec region had the highest proportion of LTBI in Canadian-born inmates at 17.4% and among Aboriginal inmates at 37.2%; of foreign-born inmates, the highest rate was found in Ontario at 51.8%. Of those of unknown origin, the highest rate was in Quebec region at 26.6%.

Table 3.11: LTBI[1] by Origin and Region – Inmates, 1999

FREQ (%)[2] / ORIGIN	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Canadian Born	20 (6.5%)	68 (17.4%)	39 (10.7%)	19 (6.1%)	9 (7.3%)	**155 (10.3%)**
Aboriginal	25 (29.1%)	67 (37.2%)	92 (25.6%)	424 (29.1%)	53 (21.2%)	**661 (28.4%)**
Foreign Born	1 (9.1%)	26 (42.6%)	72 (51.8%)	39 (50.6%)	8 (33.3%)	**146 (46.8%)**
Unknown	113 (11.4%)	661 (26.6%)	746 (23.7%)	301 (16.7%)	151 (18.4%)	**1,972 (21.3%)**
TOTAL (%)	**159 (11.4%)**	**822 (26.4%)**	**949 (23.6%)**	**783 (21.5%)**	**221 (18.1%)**	**2,934 (21.9%)**

1 - Includes all inmates with a significant TST result, either newly diagnosed on Initial or Ongoing Non-significant Assessments, Previous Significant on Initial Assessment, or Ongoing Significant Assessments.

2 - Frequency calculated by dividing the number significant by the number of inmates participating in CSC TBTS screening per origin group and region.

iii. LTBI Among Inmates by Gender – 1999

The distribution of LTBI by gender according to region for inmates participating in TB screening in 1999 is shown in Table 3.12. The proportion found to be LTBI are very similar between males and females (21.8% vs 21.1% respectively). Among those of unknown gender, 26.0% were found to be LTBI.

Regionally, Quebec had the highest proportion LTBI among males (26.5%) followed by Ontario (23.4%). Ontario had the highest proportion of females LTBI at 26.5%. Atlantic region had the lowest rates among both males and females at 11.4% and 5.9% respectively.

Table 3.12: LTBI[1] by Gender and Region – Inmates, 1999

FREQ (%)[2] / GENDER	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC[3]	CANADA
Male	150 (11.4%)	787 (26.5%)	890 (23.4%)	732 (21.5%)	215 (18.0%)	**2,774 (21.8%)**
Female	2 (5.9%)	14 (24.1%)	30 (26.5%)	29 (19.5%)	0 (0.0%)	**75 (21.1%)**
Unknown	7 (16.7%)	21 (26.3%)	29 (28.2%)	22 (26.8%)	6 (30.0%)	**85 (26.0%)**
TOTAL (%)	**159 (11.4%)**	**822 (26.4%)**	**949 (23.6%)**	**783 (21.5%)**	**221 (18.1%)**	**2,934 (21.9%)**

[1] - Includes all inmates with a significant TST result, either newly diagnosed on Initial or Ongoing Non-significant Assessments, Previous Significant on Initial Assessment, or Ongoing Significant Assessments.

[2] - Frequency calculated by dividing the number significant by the number of inmates participating in CSC TBTS screening per gender and region.

[3] - Federally incarcerated females in Pacific region are generally kept in provincial institutions and there were no females in Pacific region included in Table 3.12.

3.II. STAFF

3.II.A. DEMOGRAPHICS

The number of staff working for CSC across Canada during 1999 was 14,124. The average age of staff in the CSC TBTS in 1999 was 39.2 years (range 18 to 69). The vast majority of staff (80%) is between 20 and 49 years of age. Forty-six percent of the staff records were missing gender information; of those records with known gender, 56% were male.

3.II.B. PARTICIPATION IN CSC TBTS SCREENING ACTIVITIES

A total of 4,089 assessments were performed for 4,007 individual staff members in 1999. After selecting one unique record per person per assessment type (see Methods section), a total of 4,036 assessments are included in the analysis. This gives a participation rate of 4,007/14,124, a participation rate of 28.4%.[9] Of the staff assessments included in the analysis, 1,037 (26%) were Initial Assessments (which involve a two-step TST), 2,618 (65%) were Ongoing Non-significant Assessments, and 381 (9%) were Ongoing Significant assessments. There were 138 staff members who had assessments as part of contact investigations for known or suspected cases of active TB disease.

3.II.C. RESULTS OF SCREENING FOR TB, STAFF – 1999

i. LTBI on Initial Assessment Among Staff

There were 1,040 Initial Assessments done for staff in 1999; after applying the hierarchical methodology and retaining only one assessment per person, 1,037 assessments were included in the analysis. Region was unknown on Initial Assessment for two staff members, one of whom was TST significant (see Table 3.13).

Overall, 7.5% of staff (n=47) undergoing initial two-step TB screening in 1999 were found to be TST significant (see Table 3.13 and Figure 3.4). This finding shows regional variation with Quebec region reporting the highest significant TST rate among staff at 15.4% (n=14), followed by Prairie region at 10.9% (n=17) and Pacific region at 9.1% (n=10).

[9] The staff total includes those working in institutions, at parole offices, and at Regional and National Headquarters.

Table 3.13: Reported TST Results on Initial Assessment by Region – Staff, 1999

FREQ (%) / TST RESULT	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	UNKNOWN	CANADA
Tested Significant	3 (4.6%)	14 (15.4%)	2 (1.0%)	17 (10.9%)	10 (9.1%)	1 (100%)	**47 (7.5%)**
Tested Non-significant	62 (95.4%)	77 (84.6%)	198 (99.0%)	139 (89.1%)	100 (90.9%)	0 (0.0%)	**576 (92.5%)**
Previous Significant	0	0	1	1	1	0	**3**
Contraindicated[1]	0	0	0	1	0	0	**1**
Invalid TST-1[2]	22	0	2	4	2	0	**30**
Invalid TST-2[3]	80	31	22	160	72	1	**366**
Refused TST	0	0	1	4	2	0	**7**
Blank / Unknown	0	2	0	4	1	0	**7**
TOTAL (%)	**167 (16.1%)**	**124 (12.0%)**	**226 (21.8%)**	**330 (31.8%)**	**188 (18.1%)**	**2 (0.2%)**	**1,037**

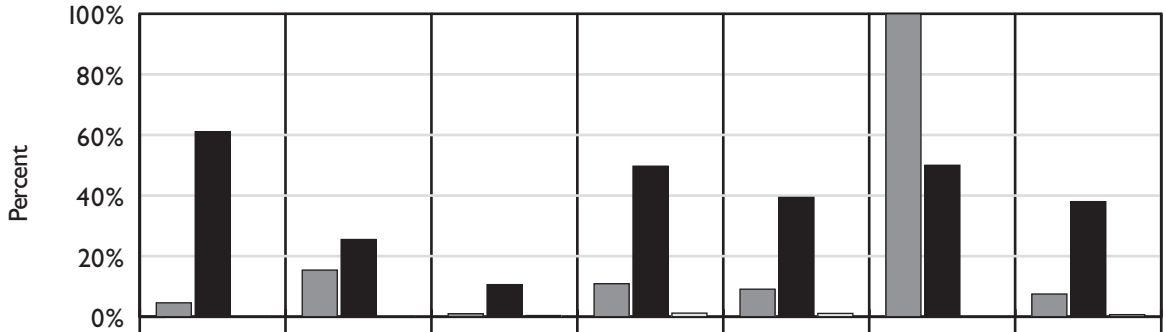
1 - Medically contraindicated (i.e., tuberculin allergy, etc.).

2 - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

3 - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of the 7 to 365 days of the first tuberculin administration.

Inspection of Table 3.13 indicates that of all Initial Assessments undertaken among staff in 1999, more than one third or 38.2% (n=396) were ultimately invalid due to a number of reasons. Of these, the vast majority (n=366) were invalidated due to administrative problems associated with the administration of the second TST of the two-step baseline TST; n=66 (18%) were due to the administration of the second step outside of the 7 to 365 day time period, while n=288 (79%) were incomplete two-steps (i.e., the second step was never conducted). Overall, the proportion of test results deemed invalid for any reason showed strong regional variation; it was the highest in Atlantic region at almost two-thirds or 61.1%, followed by Prairie region at 49.7%, Pacific region at 39.4%, and Quebec at 25.0% (see Figure 3.4). Refusal of the TST was virtually nonexistent at 0.7% (n=7; see Figure 3.4).

Figure 3.4: Selected TST Outcome Results on Initial Assessment – Staff, 1999



	Atlantic	Quebec	Ontario	Prairie	Pacific	Blank	Canada
Positivity Rate	4.6%	15.4%	1.0%	10.9%	9.1%	100.0%	7.5%
Invalid Rate	61.1%	25.0%	10.6%	49.7%	39.4%	50.0%	38.2%
Refusal Rate	0.0%	0.0%	0.4%	1.2%	1.1%	0.0%	0.7%

ii. Routine Screening – Newly Significant TST Among Ongoing Non-significant Assessments

A total of 2,662 assessments on staff members with a Previous Non-significant result ('Ongoing Non-significant') were performed in 1999. Of these, 2,618 unique assessments were selected as per the hierarchical methodology (see Methods section).

Nationally, 0.7% (n=17) of staff undergoing annual screening for TB were found on testing to be TST significant. The vast majority of the tests at 99.3% (n=2,283) remained non-significant.

The proportion of newly significant TST results on Ongoing Non-significant tests showed regional variation, with Pacific region having the highest rate at 2.3% (n=10), followed by Quebec region at 1.9% (n=2), and Prairie region at 0.9% (n=5). The Atlantic and Ontario regions did not report any staff significant on Ongoing TST Non-significant Assessments for 1999.

Nationally, the proportion of staff members with a Previous Non-significant TST result who refused TST testing on their annual assessment was 7.1% (n=186; Table 3.14 and Figure 3.5). Refusal of ongoing TST testing (see Figure 3.5) was highest in Pacific region (10.5%) and Ontario region (9.6%), followed by Prairie region (5.3%).

The proportion of all assessments classified as invalid was 3.7% (n=96). This showed a strong regional variation with Atlantic region having the highest rate at 15.2% (n=62), followed by Ontario region at 2.5% (n=24). The other three regions had rates that were between 0% in Quebec and 1.1% in Prairie region (see Figure 3.5).

Table 3.14: Reported TST Results on Ongoing Non-significant Assessment by Region – Staff, 1999

TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Tested Significant	0 (0.0%)	2 (1.9%)	0 (0.0%)	5 (0.9%)	10 (2.3%)	**17 (0.7%)**
Tested Non-significant	339 (100.0%)	102 (98.1%)	852 (100.0%)	570 (99.1%)	420 (97.7%)	**2,283 (99.3%)**
Contraindicated[1]	0	0	5	2	0	**7**
Invalid TST-1[2]	62	0	24	7	3	**96**
Refused TST	6	1	94	34	51	**186**
Blank / Unknown	0	7	4	18	0	**29**
TOTAL (%)	**407 (15.6%)**	**112 (4.2%)**	**979 (37.5%)**	**636 (24.3%)**	**484 (18.4%)**	**2,618**

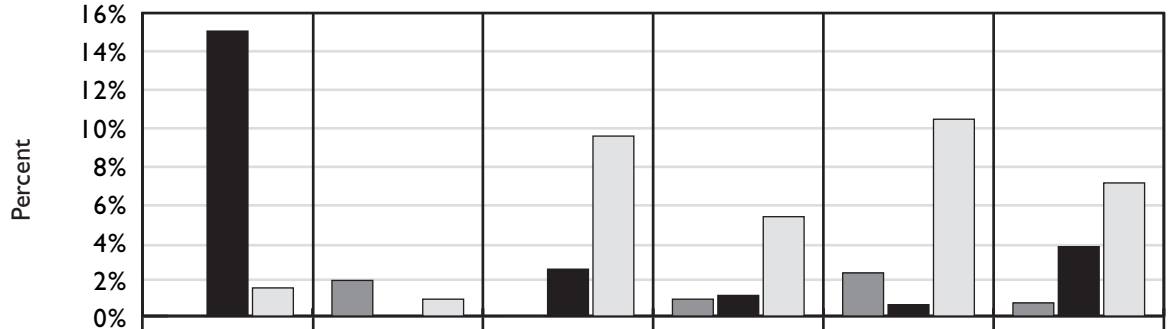
[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

[2] - An invalid TST includes a 'No show' for the read portion of the test, or a non-significant read after 72 hours.

Examination of the newly significant provides an estimate of the conversion rate among staff working in federal correctional facilities. By definition, a converter must have a previously documented Non-significant Assessment. Of the 17 staff with a significant TST result in 1999 on Ongoing Non-significant Assessment, only four (24%) had a previous documented Non-significant Assessment in the database. Of the four converters, three were from Pacific region and two were from one institution. One converter was from Quebec region. Two of the converters were in the 50-59 age category and two were male. None of the documented converters among staff reported any risk factors for progression to active TB disease or symptoms potentially consistent with active TB.

Of the 2,618 staff having an Ongoing Non-significant Assessment conducted in 1999, a total of 2,300 had a valid TST result in 1999 (Table 3.14); of these, there were 1,350 (59%) records in the 1998 data of a Previous Non-significant TST, whether on an Initial or an ongoing non-significant test. Therefore, the calculated conversion rate is 4/1,350 or 0.30%.

Figure 3.5: Selected TST Outcome Results on Ongoing Non-significant Assessments – Staff, 1999



	Atlantic	Quebec	Ontario	Prairie	Pacific	Canada
Positivity Rate	0.0%	1.9%	0.0%	0.9%	2.3%	0.7%
Invalid Rate	15.2%	0.0%	2.5%	1.1%	0.6%	3.7%
Refusal Rate	1.5%	0.9%	9.6%	5.3%	10.5%	7.1%

iii. Medical Surveillance of Known LTBI – Ongoing Significant Screening

A total of 387 Ongoing Positive Assessments were conducted among staff in 1999; of these 381 unique assessments per staff member were included for analysis. Staff with previously significant TST result (i.e., ongoing significant annual screenings) are assessed for medical and risk factors that may place them at higher risk for developing active TB, as well as for symptoms that may be indicative of active disease (e.g., weight loss, persistent cough). Staff requiring medical follow-up are referred to their own personal physician. The results of risk and symptom screening for the 381 staff are discussed below (see section 3.II.E).

iv. TB Infectiousness – Results of Contact Screening Among Staff

A total of 138 staff members were assessed as a result of a contact investigation and are included in Table 3.15 (see also Figure 3.6). The only newly significant TST found among staff at CSC during contact investigations were in Quebec region, where two significant TST results were found (associated with the same investigation in April documented among inmates – see section 3.I.C.iii). A large investigation including 89 staff in Ontario during late July/early August revealed no persons newly infected with TB, while a follow up of 39 staff from Prairie region in two separate investigations revealed no new TB infections. Based on the two reported significant staff members, this translates to a TST positivity rate among staff who received a TST as part of the contact investigations of 1.9% (Table 3.15).

There were no refusals or blank/unknowns; of 27 invalid assessments, 22 were in Prairie region. Of the 24 invalid initial two-step TST, 20 were incomplete (i.e., the second step was never performed). Overall, 19.6% of the assessments were classified as invalid.

Table 3.15: Reported TST Results on Contact Tracing by Region – Staff, 1999

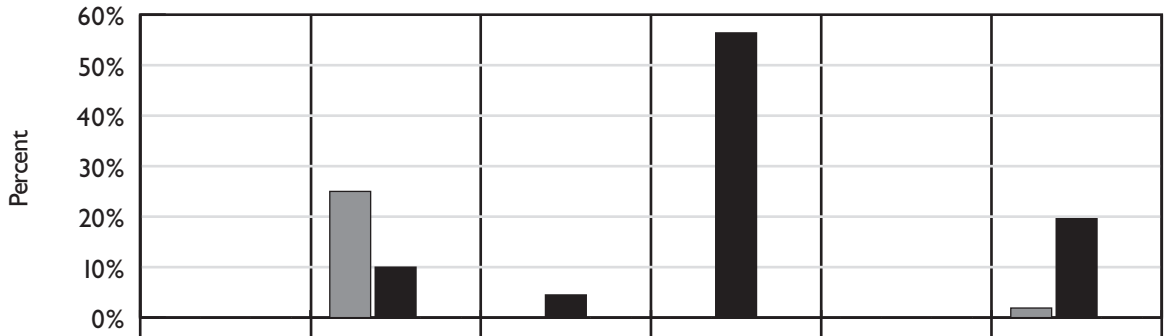
TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Tested Significant	0 (0.0%)	2 (25.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**2 (1.9%)**
Tested Non-significant	0 (0.0%)	6 (75.0%)	80 (100.0%)	17 (100.0%)	0 (0.0%)	**103 (98.1%)**
Previous Significant	0	1	5	0	0	**6**
Contraindicated[1]	0	0	0	0	0	**0**
Invalid TST-1[2]	0	0	3	0	0	**3**
Invalid TST-2[3]	0	1	1	22	0	**24**
Refused TST	0	0	0	0	0	**0**
Blank / Unknown	0	0	0	0	0	**0**
TOTAL (%)	**0 (0.0%)**	**10 (7.2%)**	**89 (64.5%)**	**39 (28.3%)**	**0 (0.0%)**	**138**

1 - Medically contraindicated (i.e., tuberculin allergy, etc.).

2 - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

3 - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of the 7 to 365 days of the first tuberculin administration.

Figure 3.6: Selected TST Outcome Results on Contact Tracing – Staff, 1999



	Atlantic	Quebec	Ontario	Prairie	Pacific	Canada
Positivity Rate	0.0%	25.0%	0.0%	0.0%	0.0%	1.9%
Invalid Rate	0.0%	10.0%	4.5%	56.4%	0.0%	19.6%
Refusal Rate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

3.II.D. DEMOGRAPHIC CHARACTERISTICS OF NEWLY SIGNIFICANT TST STAFF – 1999

i. Age

The mean age of staff with a newly significant TST result on Initial or Ongoing Non-significant test (n=64) was slightly higher than staff members with other TST results, but did not reach statistical significance (Tables 3.16). The low number of TST-significant staff in some regions results in statistically unstable means. Table 3.17 shows the distribution and percentage of newly significant staff by region and age category.

Table 3.16: Mean Age of Newly Significant TST[1] and Other Staff by Region[2], 1999

MEAN AGE (YRS) (RANGE)[3]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Newly TST Significant	37.0 (34-40)	42.0 (34-49)	24.0 (23-25)	39.2 (34-46)	42.8 (38-50)	**40.3 (34-49)**
Other[4]	40.1 (33-47)	39.8 (32-47)	38.3 (30-46)	37.7 (29-46)	39.2 (29-49)	**38.7 (30-47)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

2 - One record with a significant TST result had a 'Blank' region (not shown).

3 - Interquartile range 25th and 75th percentiles

4 - Population of staff undergoing Initial or Ongoing Non-significant Assessment TST EXCLUDING those with a significant TST result.

Table 3.17: Newly Significant TST[1] by Age Group and Region – Staff, 1999

FREQ (%)[2] / AGE GROUP	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
17-19	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (25.0%)	1 (33.3%)	0 (0.0%)	**2 (25.0%)**
20-29	0 (0.0%)	2 (4.8%)	2 (0.7%)	1 (0.4%)	2 (1.1%)	1 (100%)	**8 (0.9%)**
30-39	2 (1.1%)	4 (6.1%)	0 (0.0%)	9 (2.9%)	3 (2.0%)	0 (0.0%)	**18 (1.6%)**
40-49	1 (0.5%)	7 (8.5%)	0 (0.0%)	8 (3.2%)	7 (4.0%)	0 (0.0%)	**23 (2.2%)**
50-59	0 (0.0%)	3 (7.1%)	0 (0.0%)	3 (2.2%)	7 (4.7%)	0 (0.0%)	**13 (2.1%)**
60 +	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
TOTAL (%)	**3 (0.5%)**	**16 (6.8%)**	**2 (0.2%)**	**22 (2.3%)**	**20 (3.0%)**	**1 (50.0%)**	**64 (1.8%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

2 - Frequency calculated by dividing the number of newly significant by the number of staff participating in CSC TB screening having an Initial or Ongoing Non-significant Assessment per age group and region.

ii. Origin

Data on the country of birth and Aboriginal status are requested on the initial TB screening assessment; however for 83% these data are missing. Those of foreign birth had the highest rate of significant TST results (21.2%), followed by Aboriginals (7.0%) and Canadian born (4.5%). Among those of unknown origin, 1.0% were newly TST positive. Caution should be taken in interpreting these rates as they are based on small numbers and may be statistically unstable (Table 3.18).

Table 3.18: Newly Significant TST[1] by Origin and Region – Staff, 1999

FREQ (%)[2] / ORIGIN	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Canadian Born	0 (0.0%)	13 (11.9%)	0 (0.0%)	7 (4.3%)	3 (3.7%)	1 (50.0%)	**24** **(4.5%)**
Aboriginal	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (5.3%)	2 (18.2%)	0 (0.0%)	**3** **(7.0%)**
Foreign Born	0 (0.0%)	1 (50.0%)	1 (8.3%)	1 (14.3%)	4 (40.0%)	0 (0.0%)	**7** **(21.2%)**
Unknown	3 (0.6%)	2 (1.7%)	1 (0.1%)	13 (1.7%)	11 (1.9%)	0 (0.0%)	**30** **(1.0%)**
Total **(%)**	**3** **(0.5%)**	**16** **(6.8%)**	**2** **(0.2%)**	**22** **(2.3%)**	**20** **(3.0%)**	**1** **(50.0%)**	**64** **(1.8%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

2 - Frequency calculated by dividing the number of newly significant by the number of staff participating in CSC TB screening having an Initial or Ongoing Non-significant Assessment per origin category and region.

iii. Gender

Data on gender are requested of staff undergoing Initial and Ongoing Assessments. Almost one half (45%) did not provide these data. Of those found to have a newly significant TST, a slightly higher proportion of females (2.7%) were newly TST significant versus males (2.0%). Of those without gender data, 0.9% were newly TST significant (Table 3.19).

Table 3.19: Newly Significant TST[1] by Gender and Region – Staff, 1999

FREQ (%)[2] / GENDER	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Male	1 (0.5%)	6 (5.1%)	0 (0.0%)	8 (3.0%)	9 (5.2%)	1 (50.0%)	**25 (2.2%)**
Female	2 (1.1%)	6 (6.0%)	2 (1.0%)	10 (3.9%)	4 (2.6%)	0 (0.0%)	**24 (2.7%)**
Unknown	0 (0.0%)	4 (23.5%)	0 (0.0%)	4 (0.9%)	7 (2.0%)	0 (0.0%)	**15 (0.9%)**
Total (%)	**3 (0.5%)**	**16 (6.8%)**	**2 (0.2%)**	**22 (2.3%)**	**20 (3.0%)**	**1 (50.0%)**	**64 (1.8%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

2 - Frequency calculated by dividing the number of newly significant by the number of staff participating in CSC TB screening having an Initial or Ongoing Non-significant Assessment per gender and region.

3.II.E. BURDEN OF TB IN CSC: SCREENING FOR ACTIVE TB DISEASE, STAFF – 1999

i. Comorbidity and Risk Factors for Progression to Active TB

Response to questions about risk factors among staff during assessments was excellent, at 92% (i.e., a response of 'Yes,' 'No,' or 'Unknown' was provided). However, the vast majority of those with a valid response did not report any risk factors – only 3.0% (n=121) reported one or more risks. The distribution of risks among staff is shown in Table 3.20.

The most frequently reported risk factors for progression to active tuberculosis disease among staff was injection of steroids (n=30), followed closely by diabetes (n=28) and contact with an active case (n=26).

Table 3.20: Reported Comorbidity and Risk Factors[1] by TST Result – Staff, 1999

TEST TYPE / RISK FACTOR	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=64	n=3	n=381	N=448	n=2,859	n=729	N=3,588	N=4,036
Diabetes	0	0	5	**5**	20	7	**27**	**32**
Hemodialysis	0	0	0	**0**	3	0	**3**	**3**
Silicosis	0	0	0	**0**	1	0	**1**	**1**
Transplant	0	0	0	**0**	3	0	**3**	**3**
Injection Drug User	0	0	1	**1**	12	6	**18**	**19**
Lymphoma	0	0	0	**0**	1	1	**2**	**2**
HIV/AIDS	1	0	0	**1**	18	1	**19**	**20**
Chemotherapy	1	0	1	**2**	12	0	**12**	**14**
Inject Steroids	0	0	0	**0**	24	6	**30**	**30**
TB Case Contact	5	0	0	**5**	16	6	**22**	**27**
TOTAL	**7**	**0**	**7**	**14**	**110**	**27**	**137**	**151**

[1] - Numbers in the table reflect those answering 'Yes' to the presence of the condition/risk factor. Individuals may report multiple risk factors.

[2] - Tested significant on Initial or Ongoing Non-significant Assessments.

[3] - Accepted Previous Significant TST on Initial Assessment – see Table 3.13.

[4] - 'Other' result includes Previous Significant TST, medically contraindicated, invalid TST-1, invalid TST-2, refused, and blank/unknown.

As was noted with inmates, the proportion of valid risk responses varied by assessment type; while virtually 100% complete for Initial and Ongoing Non-significant Assessments, only 18.1% of Ongoing Significant Assessments included a screen for risk factors for progression to active TB.

ii. Symptoms Suggestive of Active TB Disease

Symptom screening among staff in 1999 was 42.2% (i.e., had a 'valid' response of 'Yes,' No,' or 'Unknown'). Of these, 92% reported no symptoms. The distribution of reported symptoms are shown in Table 3.21.

The most common self-reported symptom was fatigue (n=72), followed by night sweats (n=48), and cough productive of sputum (n=33). None of the staff reported a constellation of fatigue, fever, nightsweats, and cough productive of sputum.

Table 3.21: Reported Symptom[1] by TST Result – Staff, 1999

TEST TYPE / SYMPTOM	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=64	n=3	n=381	N=448	n=2,859	n=729	N=3,588	N=4,036
Fatigue	2	0	38	**40**	17	15	**32**	**72**
Fever	2	0	3	**5**	1	1	**2**	**7**
Weight Loss	0	0	3	**3**	1	0	**1**	**4**
Loss of Appetite	0	0	0	**0**	0	1	**1**	**1**
Night Sweats	3	0	34	**37**	4	7	**11**	**48**
Hoarseness	0	0	10	**10**	2	4	**6**	**16**
Coughing Sputum	0	0	18	**18**	7	8	**15**	**33**
Coughing Blood	0	0	0	**0**	0	0	**0**	**0**
Chest Pains	1	0	14	**15**	2	2	**4**	**19**
TOTAL	**8**	**0**	**120**	**128**	**34**	**38**	**72**	**200**

[1] - Numbers in the table reflect those answering 'Yes' to the presence of the symptom – individuals may report multiple symptoms.

[2] - Includes significant TST results from Initial and Ongoing Non-significant Assessments.

[3] - Accepted Previous Significant TST on Initial Assessment – see Table 3.13.

[4] - 'Other' result includes Previous Significant TST, medically contraindicated, invalid TST-1, invalid TST-2, refused, and blank/unknown.

Examination of the presence of symptom information by assessment type indicates that a symptom screen was conducted for all Initial and Ongoing Significant Assessments for staff in 1999. However, only 10.8% of Ongoing Non-significant Assessments included a symptom screen.

iii. Active Cases of TB Disease

Cases of active TB disease among CSC staff are not captured by the CSC TBTS surveillance system.

3.II.F. DEMOGRAPHIC CHARACTERISTICS OF LTBI AMONG STAFF – 1999

The burden of LTBI among staff in CSC was estimated by combining the newly discovered TST-significant cases with those staff previously known to be TST significant*(i.e., previously significant on Initial Assessment and Ongoing Significant). This provides a 'snapshot' of all prevalent TST-significant staff in that year.

i. LTBI Among Staff by Age Group – 1999

LTBI among staff categorized by age category and region is shown in Table 3.22. The proportion of staff with a significant TST generally increases with age. Although there is a large proportion (25%) TST significant among the 17-19 age group, this is based on a small number of staff in a limited number of regions and may be statistically unstable. For staff 20 years of age or older, the proportion TST significant increases from 4.2% to 17.1% in those under 60. Among staff over 60, 13.5% were infected with TB.

Overall, 11.2% (n=448) of staff for whom data on region were available and who were screened for TB in 1999 had a significant TST result and were considered infected with TB. Inspection of Table 3.22 shows regional variation with higher overall LTBI rates found in Prairie and Pacific regions.

Table 3.22: LTBI[1] by Age Group and Region – Staff, 1999

AGE GROUP / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
17-19	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (25.0%)	1 (33.3%)	0 (0.0%)	**2 (25.0%)**
20-29	0 (0.0%)	2 (4.8%)	13 (4.4%)	10 (3.9%)	11 (6.0%)	1 (100.0%)	**37 (4.2%)**
30-39	4 (2.2%)	5 (7.6%)	17 (4.3%)	54 (15.2%)	18 (10.8%)	0 (0.0%)	**98 (8.4%)**
40-49	11 (5.3%)	7 (8.5%)	36 (10.2%)	85 (25.9%)	41 (19.7%)	1 (100.0%)	**181 (15.3%)**
50-59	9 (8.4%)	3 (7.1%)	22 (10.6%)	44 (24.7%)	45 (24.2%)	0 (0.0%)	**123 (17.1%)**
60 +	0 (0.0%)	0 (0.0%)	4 (19.0%)	1 (9.1%)	2 (15.4%)	0 (0.0%)	**7 (13.5%)**
TOTAL (%)	**24 (4.0%)**	**17 (7.3%)**	**92 (7.2%)**	**195 (17.2%)**	**118 (15.5%)**	**2 (66.7%)**	**448 (11.2%)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments plus all staff with an Ongoing Significant Assessment in 1999.

[2] - Frequency calculated by dividing the number TST significant by the number of staff participating in CSC TBTS screening per age group and region.

ii. LTBI Among Staff by Origin – 1999

The burden of LTBI among staff in 1999, categorized by origin (see Table 3.23) was highest among those foreign born at 24.2%, followed by those of Aboriginal origin (7.0%), and Canadian born (5.8%). Of those of unknown origin, 11.2% were found to have LTBI.

LTBI by origin showed regional variation. Among Canadian born, Quebec region had the highest proportion at 12.8%; among Aboriginal staff, the highest proportion LTBI was in Pacific region at 18.2%; of those foreign born, the highest rate was found in Quebec although this was based on small numbers. Of those of unknown origin, the highest rate was in Prairie region at 19.6%.

Table 3.23: LTBI[1] by Origin and Region – Staff, 1999

ORIGIN / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Canadian Born	0 (0.0%)	14 (12.8%)	3 (3.4%)	7 (4.3%)	6 (7.2%)	1 (50.0%)	**31 (5.8%)**
Aboriginal	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (5.3%)	2 (18.2%)	0 (0.0%)	**3 (7.0%)**
Foreign Born	0 (0.0%)	1 (50.0%)	2 (16.7%)	1 (14.3%)	4 (40.0%)	0 (0.0%)	**8 (24.2%)**
Unknown	24 (4.9%)	2 (1.7%)	87 (7.4%)	186 (19.6%)	106 (16.1%)	1 (100.0%)	**406 (12.0%)**
Total (%)	**24 (4.0%)**	**17 (7.3%)**	**92 (7.2%)**	**195 (17.2%)**	**118 (15.5%)**	**2 (66.7%)**	**448 (11.2%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments plus all staff with an Ongoing Significant Assessment in 1999.

2 - Frequency calculated by dividing the number TST significant by the number of staff participating in CSC TBTS screening per origin category and region.

iii. LTBI Among Staff by Gender – 1999

The distribution of LTBI by gender according to region for staff participating in TB screening in 1999 is shown in Table 3.24. Although the proportion of female staff found to have LTBI is slightly higher than among males, the rates are very similar (9.0% vs 8.3% respectively). Among those for whom gender was unknown, 14.1% were found to have LTBI.

Regionally, Pacific region had the highest proportion of males with LTBI (16.1%) followed by Prairie (11.3%). Prairie region had the highest proportion of females with LTBI at 13.7%.

Table 3.24: LTBI[1] by Gender and Region – Staff, 1999

GENDER / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Male	6 (2.7%)	6 (5.1%)	23 (6.2%)	33 (11.3%)	31 (16.1%)	1 (50.0%)	**100 (8.3%)**
Female	4 (2.1%)	6 (6.0%)	16 (7.5%)	39 (13.7%)	21 (12.4%)	0 (0.0%)	**86 (9.0%)**
Unknown	14 (7.7%)	5 (29.4%)	53 (7.6%)	123 (22.0%)	66 (16.5%)	1 (100.0%)	**262 (14.1%)**
Total (%)	**24 (4.0%)**	**17 (7.3%)**	**92 (7.2%)**	**195 (17.2%)**	**118 (15.5%)**	**2 (66.7%)**	**448 (11.2%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments plus all staff with an Ongoing Significant Assessment in 1999.

2 - Frequency calculated by dividing the number TST significant by the number of staff participating in CSC TBTS screening per gender category and region.

PART 4: 2000 RESULTS

4.I. INMATES

4.I.A. DEMOGRAPHICS

The number of inmates in federal correctional facilities across Canada as of January 1, 2000, was 12,696. New admissions to federal institutions in 2000 accounted for an additional 4,302 inmates for an estimated maximum inmate population of 16,998 persons.

The average age of inmates in the Correctional Service of Canada Tuberculosis Tracking System (CSC TBTS) in 2000 was 35.3 years (range: 17 to 83 years). The 30-39 age group represented 35% of the population, and the 30-39 age group, 32%. Less than 1% were missing gender data and 97% were male.

4.I.B. PARTICIPATION IN CSC TBTS SCREENING ACTIVITIES

A total of 13,631 assessments were performed among inmates in 2000. After selecting one record per person per assessment type, a total of 13,106 assessments were included in the analysis. Since some people are included in multiple tables, the total number of people included in the analysis is 12,923. Therefore an estimated 76.0% of inmates participated in TB screening assessments in 2000.

Of the 13,106 TB screening assessments conducted by CSC nurses in 2000 included in this analysis, 4,047 (31%) were for an Initial Assessment, 7,184 (55%) were annual follow ups on known tuberculin skin test (TST) non-significant inmates, and 1,875 (14%) were on previously TST-significant inmates. Of all these, only 5 (<1%) of the assessments were the result of contact tracing investigations for a known or suspected case of active TB disease or conversion.

4.I.C. RESULTS OF SCREENING FOR TUBERCULOSIS, INMATES – 2000

i. Latent TB Infection (LTBI) on Admission to CSC Institutions

There were 4,068 Initial Assessments conducted in 2000 that were reported to CSC TBTS. After selecting one assessment per inmate, 4,047 records remained.

Overall in 2000, 3,437 or 85% of the two-step TST assessments among inmates were valid; of these, 661 or 19.2% were found to be TST significant (Table 4.1). This proportion varies by region, with Quebec having the highest rate at 24.3% (n=201), followed closely by Pacific at 20.0% (n=75) and Ontario at 19.5% (n=191). Atlantic region had the lowest rate of significant results at Initial Assessment at 9.0% (n=38). Twenty-seven, or <1% of the inmates were reported to have a Previous Significant TST result.

Inspection of Table 4.1 indicates that of the total number of TST results deemed to be invalid (n=459, or 11.3%), the majority, or 403 (87.8%) are associated with administration of the second TST procedure. Of these, 121 of 403 (30%) were invalidated because the second step was administered outside of the 7 to 365 day window and 229 (57%) were invalidated because the second step of the two-step procedure was not done (data not shown). Overall, the combined proportion of assessments classified as invalid ranged from 18.8% in Atlantic region (n=100), 16.2% in Prairie region (n=168) to 5.9% in Ontario region (n=63) (Figure 4.1).

A small fraction at 2.0% (n=82) refused the TST. Quebec region had the highest refusal rate at 6.4% (n=63) as compared to the other regions (see Figure 4.1). The proportion of reports that were blank or unknown was 0.6% (n=23). A small fraction, 0.5% (n=19) of the Initial Assessments were not done due to a medical contraindication.

Table 4.1: Reported TST Results on Initial Assessment by Region – Inmates, 2000

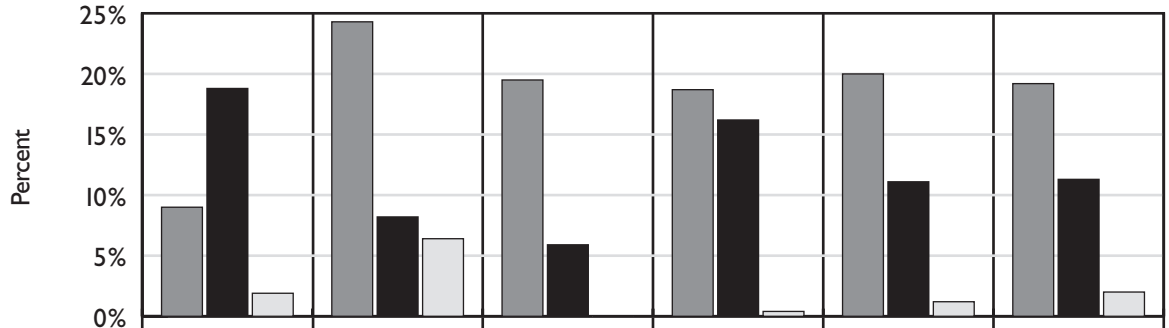
TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Tested Significant	38 (9.0%)	201 (24.3%)	191 (19.5%)	156 (18.7%)	75 (20.0%)	**661 (19.2%)**
Tested Non-significant	383 (91.0%)	626 (75.7%)	790 (80.5%)	677 (81.3%)	300 (80.0%)	**2,776 (80.8%)**
Previous Significant	0	3	7	17	0	**27**
Contraindicated[1]	1	0	4	11	3	**19**
Invalid TST-1[2]	8	7	11	17	13	**56**
Invalid TST-2[3]	92	73	52	151	35	**403**
Refused TST	10	63	0	4	5	**82**
Blank / Unknown	1	7	12	3	0	**23**
TOTAL (%)	**533 (13.2%)**	**980 (24.2%)**	**1,067 (26.4%)**	**1,036 (25.6%)**	**431 (10.6%)**	**4,047**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

[2] - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

[3] - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of the 7 to 365 days of the first tuberculin administration.

Figure 4.1: Selected Initial TST Outcome Results by Region – Inmates, 2000



	Atlantic	Quebec	Ontario	Prairie	Pacific	Canada
Positivity Rate	9.0%	24.3%	19.5%	18.7%	20.0%	19.2%
Invalid Rate	18.8%	8.2%	5.9%	16.2%	11.1%	11.3%
Refusal Rate	1.9%	6.4%	0.0%	0.4%	1.2%	2.0%

ii. Routine Screening – Newly Significant TST Among Ongoing Non-significant Inmates

A total of 7,552 assessments on previously non-significant TST inmates ('Ongoing Non-significant') were performed in 2000. After selecting only one record per inmate, 7,184 unique records were included in the analysis (see Table 4.2). Of these, 6,166 or 85.8% of the assessments had a valid outcome.

Overall, 87 (1.4%) were found on testing to be TST significant. The vast majority of the tests however, at 98.6% (n=6,079), remained non-significant for LTBI. Quebec region had the highest rate at 3.5% (n=38), followed by Prairie region at 1.7% (n=28) and Pacific region at 1.5% (n=10). The Atlantic and Ontario regions had a smaller proportion of inmates with a significant TST, at 0.6% (n=4) and 0.3% (n=7) respectively (see Figure 4.2).

Nationally, the proportion of previously non-significant TST inmates refusing testing on their annual assessment was 11.6% (n=832; see Table 4.2 and Figure 4.2). The highest refusal rate was seen in Quebec region at 31.1% (n=515). The next highest refusal rate was seen in Pacific region at 10.9% (n=90), followed by Prairie region at 6.6% (n=122).

The proportion of all assessments classified as invalid was low at 1.4% (n=103). This did show regional variation with Pacific having the highest rate at 3.5% (n=29), followed by Atlantic region at 1.8% (n=18) and Prairie at 1.7% (n=122).

Table 4.2: Reported TST Results on Ongoing Non-significant Assessment by Region – Inmates, 2000

FREQ (%) / TST RESULT	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Tested Significant	4 (0.6%)	38 (3.5%)	7 (0.3%)	28 (1.7%)	10 (1.5%)	0 (0.0%)	**87 (1.4%)**
Tested Non-significant	621 (99.4%)	1,055 (96.5%)	2,070 (99.7%)	1,655 (98.3%)	677 (98.5%)	1 (100.0%)	**6,079 (98.6%)**
Contraindicated[1]	1	6	3	4	2	0	**16**
Invalid TST-I[2]	12	12	18	32	29	0	**103**
Refused TST	18	515	87	122	90	0	**832**
Blank / Unknown	0	32	10	4	21	0	**67**
TOTAL (%)	**656 (9.1%)**	**1,658 (23.1%)**	**2,195 (30.6%)**	**1,845 (25.7%)**	**829 (11.5%)**	**1 (0.0%)**	**7,184**

1 - Medically contraindicated (i.e., tuberculin allergy, etc.).

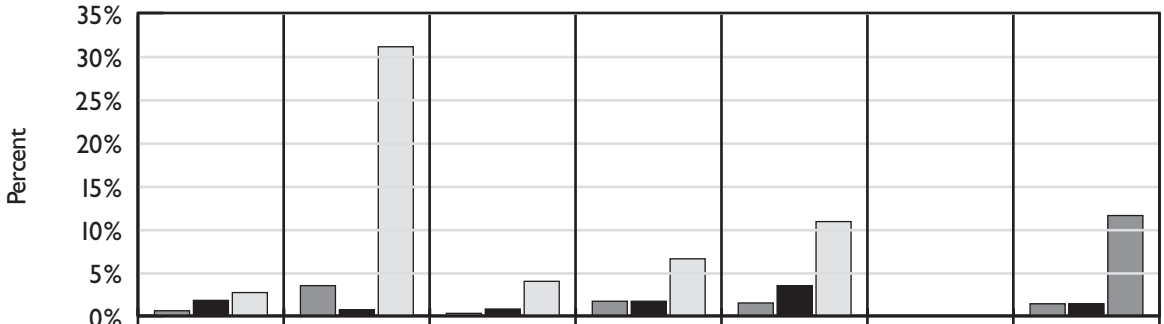
2 - An invalid TST includes a 'No show' for the read portion of the test, or a non-significant read after 72 hours.

Examination of the 'converters' (see Glossary) provides an estimate of the annual rate of LTBI conversion among inmates in federal correctional facilities. By definition, a converter must have a documented non-significant TST baseline status (see Glossary). Of the 87 inmates with a significant TST result on an Ongoing Non-significant Assessment in 2000, 50 (57%) had a previously documented non-significant TST in the CSC TBTS. Of the 50 significant TST results in 2000 with prior documentation in the dataset, there were seven instances where the increase in induration was less than 10 mm on a previous result size of 5-9 mm;[10] in this case, these five records cannot be considered converters since the increase in induration does not meet the criterion for a converter (see Canadian TB Guidelines).

Of the 7,184 inmates having an Ongoing Non-significant Assessment conducted in 2000, there were 5,554 (77%) records in the CSC TBTS data of a Previous Non-significant, whether on an Initial or an ongoing non-significant test. Of these, 4,975 had a valid TST result in 2000. Therefore the calculated conversion rate is (50 – 7)/4,975 or 0.86%.

Of the 43 converters, 20 (47%) were from Quebec region and 14 (33%) were from Prairie region; the other nine were from Pacific (n=4), Ontario (n=3), and Atlantic (n=2). Six (14%) were from La Macaza (Quebec region), 3 (7%) were from Bowden Institution (Prairie region) and 3 (7%) were from Saskatchewan Penitentiary. Sixty-five percent were between 30-49 years old, 95% were male, and 77% were of unknown origin. Symptoms of active disease reported by the converters included fatigue, weight loss, loss of appetite, nightsweats, cough productive of sputum, and chest pains. None of the converters reported to have been a contact of an active case.

Figure 4.2: Selected Ongoing Non-significant TST Outcome Results – Inmates, 2000



	Atlantic	Quebec	Ontario	Prairie	Pacific	Blank	Canada
Positivity Rate	0.6%	3.5%	0.3%	1.7%	1.5%	0.0%	1.4%
Invalid Rate	1.8%	0.7%	0.8%	1.7%	3.5%	0.0%	1.4%
Refusal Rate	2.7%	31.1%	4.0%	6.6%	10.9%	0.0%	1.6%

[10] None of the converters was involved in a contact investigation.

iii. Medical Surveillance of Known LTBI – Ongoing Significant Screening

Inmates with a Previous Significant TST (i.e., ongoing significant annual screenings) are assessed for medical and risk factors that may place them at higher risk for developing active tuberculosis, as well as for symptoms that may be indicative of active disease (i.e., weight loss, persistent cough). Inmates requiring medical follow-up are referred or tested accordingly. There were 2,008 Ongoing Significant assessments conducted for inmates in 2000; after selecting one record per inmate, 1,875 were included in the analysis. The results of risk and symptom screening for these records are included in the section discussed below (see section 4.I.E).

iv. TB Infectiousness – Results of Contact Screening Among Inmates

A total of 10 assessments were done among inmates as result of contact investigations in 2000 and were entered into CSC TBTS; after selecting only one record per inmate, only five records were included in the analysis.

All five assessments included in a contact investigation were reported from Prairie region (see Table 4.3). None were significant.

Table 4.3: Reported TST Results on Contact Tracing by Region – Inmates, 2000

TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Tested Significant	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
Tested Non-significant	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (100.0%)	0 (0.0%)	**4 (100.0%)**
Previous Significant	0	0	0	0	0	**0**
Contraindicated[1]	0	0	0	0	0	**0**
Invalid TST-1[2]	0	0	0	0	0	**0**
Invalid TST-2[3]	0	0	0	1	0	**1**
Refused TST	0	0	0	0	0	**0**
Blank / Unknown	0	0	0	0	0	**0**
TOTAL (%)	**0 (0.0%)**	**0 (0.0%)**	**0 (0.0%)**	**5 (100.0%)**	**0 (0.0%)**	**5**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

[2] - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

[3] - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of the 7 to 365 days of the first tuberculin administration.

4.I.D. DEMOGRAPHIC CHARACTERISTICS OF NEWLY TST-SIGNIFICANT INMATES – 2000

i. Age

The mean age of inmates with a newly significant TST in 2000 (n=748) was 37.1, with an interquartile range 30-43 (see Table 4.4). The age of inmates with a newly significant TST varied across region, with the youngest cases in Prairie (34.4) and Pacific (36.2), followed by Ontario and Quebec. Atlantic Canada had the oldest average age at 39.7 years. Also, analysis of Table 4.4 using Student's T-test[11] by region indicates that the difference in mean age of inmates with a newly significant TST compared to those without reached statistical significance in all regions (including Canada overall) with the exception of Pacific region.

Table 4.5 shows the prevalence of newly significant TST by age category among those undergoing initial or ongoing non-significant screening. Overall, 6.7% of inmates undergoing an Initial or Ongoing Non-significant Assessment were newly found to have a significant TST.

Table 4.4: Average Age of Newly TST Significant and Other Inmates by Region, 2000

MEAN AGE (YRS) (RANGE)[1]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Newly TST Significant	39.7 (33-45)	39.0 (32-44)	37.3 (30-44)	34.4 (26-41)	36.2 (28-43)	**37.1 (30-43)**
Other[2]	33.0 (24-39)	34.7 (28-40)	35.5 (28-41)	32.2 (24-38)	36.5 (28-43)	**34.3 (26-40)**

1 - Interquartile range 25th and 75th percentiles.

2 - Population of inmates undergoing TST testing EXCLUDING those with a newly significant TST having an Initial or Ongoing Negative Assessment.

Table 4.5: Newly Significant TST[1] by Age Group and Region – Inmates, 2000

FREQ (%)[2] / AGE GROUP	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
17-19	3 (4.6%)	1 (3.6%)	2 (5.9%)	6 (6.5%)	0 (0.0%)	**12 (5.0%)**
20-29	7 (1.6%)	34 (4.4%)	45 (4.5%)	59 (4.8%)	26 (7.4%)	**171 (4.5%)**
30-39	14 (3.8%)	98 (9.3%)	76 (6.2%)	65 (7.2%)	30 (6.6%)	**283 (7.1%)**
40-49	9 (4.6%)	73 (13.4%)	49 (8.0%)	40 (9.6%)	22 (8.6%)	**193 (9.5%)**
50-59	4 (5.3%)	27 (15.5%)	21 (7.6%)	10 (6.6%)	3 (2.5%)	**65 (8.1%)**
60 +	5 (15.6%)	6 (13.3%)	5 (5.6%)	4 (7.1%)	4 (8.7%)	**24 (9.0%)**
TOTAL (%)	**42 (3.5%)**	**239 (9.1%)**	**198 (6.1%)**	**184 (6.4%)**	**85 (6.8%)**	**748 (6.7%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

2 - Cell frequency divided by the total number of inmates in that age group and region having an Initial or Ongoing Non-significant Assessment.

[11] Significance level was adjusted for multiple comparisons.

II. Origin

Demographic data on the country of birth and Aboriginal status are requested on admission to CSC and are captured on the initial screening assessment; however, 69% were missing this information. Of the inmates who reported their country of birth and aboriginal status, persons of foreign birth had the highest rate of newly significant TST results at 42.6%. Canadian-born non-Aboriginals at 8.9% and Aboriginals at 8.7% had similar rates (see Table 4.6).

Regional variation in these rates is observed as well. Newly significant TST rate among Canadian-born non-Aboriginals was highest in Quebec region at 15.3% and lowest in Prairie region at 5.2%. Among Aboriginals, the highest regional rate was also observed in Prairie region at 11.1%. The rate among foreign born was highest in Pacific region (71.4%).

Table 4.6: Newly Significant TST[1] by Origin and Region – Inmates, 2000

FREQ (%)[2] / ORIGIN	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Canadian Born	15 (5.4%)	54 (15.3%)	35 (9.0%)	14 (5.2%)	7 (6.5%)	**125 (8.9%)**
Aboriginal	3 (5.1%)	16 (11.1%)	14 (4.9%)	100 (9.6%)	23 (8.8%)	**156 (8.7%)**
Foreign Born	3 (30.0%)	15 (45.5%)	52 (39.4%)	23 (37.1%)	20 (71.4%)	**113 (42.6%)**
Unknown	21 (2.5%)	154 (7.4%)	97 (4.0%)	47 (3.2%)	35 (4.1%)	**354 (4.6%)**
Total (%)	**42 (3.5%)**	**239 (9.1%)**	**198 (6.1%)**	**184 (6.4%)**	**85 (6.8%)**	**748 (6.7%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

2 - Cell frequency divided by the total number of inmates in that gender group and region having an Initial or Ongoing Non-significant Assessment.

iii. Gender

Only a small fraction of records were missing information on gender (0.5%). The distribution of newly significant TST inmates by gender is shown in Table 4.7. Overall, the proportion of males newly TST significant in 2000 was lower than that of females at 6.7% versus 7.7% respectively.

Regionally, Quebec had the highest proportion of males TST positive at 9.1%, while among females the highest rate was found in Prairie region at 8.5%. The Atlantic region had the lowest proportion for both males and females.

Table 4.7: Newly Significant TST[1] by Gender – Inmates, 2000

FREQ (%)[2] / GENDER	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC[3]	CANADA
Male	41 (3.6%)	234 (9.1%)	193 (6.1%)	172 (6.4%)	85 (6.8%)	**725 (6.7%)**
Female	1 (3.6%)	5 (8.2%)	5 (7.2%)	12 (8.5%)	0 (0.0%)	**23 (7.7%)**
Unknown	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
Total (%)	**42 (3.5%)**	**239 (9.1%)**	**198 (6.1%)**	**184 (6.4%)**	**85 (6.8%)**	**748 (6.7%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

2 - Cell frequency divided by the total number of inmates in that gender group and region having an Initial or Ongoing Non-significant Assessment.

3 - Federally incarcerated females in Pacific region are generally kept in provincial institutions and there were no females in Pacific region included in Table 4.7.

4.I.E. BURDEN OF TUBERCULOSIS AT CSC: SCREENING FOR ACTIVE TB DISEASE, INMATES – 2000

i. Comorbidity and Risk Factors for Progression to Active TB

Including Yes, No, and Unknown as valid response choices, 13,036 of 13,106 (99%) of the inmates undergoing a TB screening assessment in 2000 responded to questions regarding the presence of medical comorbidities or other risk factors that increase the likelihood of progression to active TB disease if infected with TB. The distribution of the responses is shown according to TST outcome and assessment type in Table 4.8.

Of those answering risk questions, 85% did not report any medical comorbidities or risk factors. Of the 1,774 assessments with at least one comorbidity/risk factor reported, injection drug use (n=1,325) was the leading risk identified (see Table 4.8); this was followed by contact of a TB case (n=204), followed by HIV infection (n=191), steroid injection (n=155), and diabetes (n=122). Of the inmates reporting a risk factor, 82 (4.9%) reported multiple risks.

Table 4.8: Reported Comorbidity and Risk Factors[1] by TST Result – Inmates, 2000

TEST TYPE / RISK FACTOR	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=748	n=27	n=1,875	N=2,650	n=8,855	n=1,601	N=10,456	N=13,106
Diabetes	6	0	28	**34**	77	11	**88**	**122**
Hemodialysis	0	0	3	**3**	16	1	**17**	**20**
Silicosis	1	0	3	**4**	7	0	**7**	**11**
Transplant	2	0	4	**6**	15	1	**16**	**22**
Injection Drug User	112	3	137	**252**	893	180	**1,073**	**1,325**
Lymphoma	3	0	3	**6**	12	4	**16**	**22**
HIV/AIDS	13	1	27	**41**	124	26	**150**	**191**
Chemotherapy	1	0	1	**2**	11	6	**17**	**19**
Inject Steroids	9	1	13	**23**	109	23	**132**	**155**
TB Case Contact	53	2	16	**71**	122	11	**133**	**204**
TOTAL	**200**	**7**	**235**	**442**	**1,386**	**263**	**1,649**	**2,091**

[1] - Numbers in the table reflect those answering Yes to the presence of the condition/risk factor – individuals may report multiple risks.

[2] - Includes newly significant TST results from Initial and Ongoing Non-significant Assessments.

[3] - Previously significant TST accepted on Initial Assessment – see Table 4.1.

[4] - 'Other' result includes medically contraindicated, invalid TST-1 (single test), invalid TST-2 (second of two-step TST), refused, and blank/unknown.

ii. Symptoms Suggestive of Active TB Disease

Of the total number of TB assessments conducted in 2000, the vast majority or 98% (n=12,832) reported a valid symptom screen (that is, they had a response of Yes, No, or Unknown). Of these, 13% (n=1,682) reported at least one symptom potentially consistent with active TB disease. Half of those with symptoms reported more than one symptom.

The most common symptom (see Table 4.9) self-reported by inmates was fatigue (n=674), followed by chest pain (n=548), cough productive of sputum (n=452), weight loss (n=411), and night sweats (n=409). A small number of inmates (n=23) reported a constellation of fatigue, fever, nightsweats, and cough-productive sputum.

Table 4.9: Self Reported Symptoms[1] by TST Result - Inmates, 2000

TEST TYPE / SYMPTOM	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=748	n=27	n=1,875	N=2,650	n=8,855	n=1,601	N=10,456	N=13,106
Fatigue	72	0	158	**230**	376	68	**444**	**674**
Fever	10	0	25	**35**	59	17	**76**	**111**
Weight Loss	55	1	57	**113**	242	56	**298**	**411**
Loss of Appetite	49	0	77	**126**	206	45	**251**	**377**
Night Sweats	49	2	85	**136**	219	54	**273**	**409**
Hoarseness	30	0	60	**90**	135	22	**157**	**247**
Coughing Sputum	38	0	137	**175**	229	48	**277**	**452**
Coughing Blood	11	0	27	**38**	87	20	**107**	**145**
Chest Pains	55	2	130	**187**	305	56	**361**	**548**
TOTAL	**369**	**5**	**756**	**1,130**	**1,858**	**386**	**2,244**	**3,374**

[1] - Numbers in the table reflect those answering Yes to the presence of the symptom – individuals may report multiple symptoms.

[2] - Includes newly significant TST results from Initial and Ongoing Non-significant Assessments.

[3] - Previously significant TST accepted on Initial Assessment – see Table 4.1.

[4] - 'Other' result includes medically contraindicated, invalid TST-1 (single test), invalid TST-2 (second of two-step TST), refused, and blank/unknown.

iii. Active Cases of TB Disease

Although not currently captured by the CSC TBTS surveillance system, there were two cases of active TB disease among inmates reported to CSC National Headquarters in 2000. One was in Ontario region, and one was in Quebec region. Unfortunately, it is not possible to reconcile the active TB case reports with the CSC TBTS screening data at this time as the active case reports are based on aggregate or non-nominal reports.

Based on the estimated at-risk inmate population of 16,998 this translates into a TB case rate of 11.8 cases per 100,000 inmates per year for 2000.

4.I.F. DEMOGRAPHIC CHARACTERISTICS OF LTBI AMONG INMATES – 2000

The burden of latent TB infection among inmates in CSC is estimated by combining the newly discovered TST-significant cases with those inmates with previously known significant TST result. This provides a 'snapshot' of inmates with LTBI in a given year.

i. LTBI Among Inmates by Age – 2000

LTBI among inmates categorized by age category and region is shown in Table 4.10. The proportion of inmates with LTBI increases with age, from 5.0% among the 17-19 age group, to 29.8% among those 40-49 years old and 33.4% among inmates 60+ years of age. Overall, 20.5% of inmates who were screened in 2000 were infected with TB.

Overall, the proportion of inmates LTBI varied by region; this was highest in Prairie region at 23.5%, followed by Quebec region (22.4%) and Ontario (20.8%).

Table 4.10: LTBI[1] by Age Group and Region – Inmates, 2000

FREQ (%)[2] / AGE GROUP	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
17-19	3 (4.6%)	1 (3.6%)	2 (5.9%)	6 (6.5%)	0 (0.0%)	**12 (5.0%)**
20-29	14 (3.1%)	82 (10.0%)	164 (14.9%)	202 (14.8%)	43 (11.8%)	**505 (12.3%)**
30-39	45 (11.4%)	260 (21.6%)	273 (19.3%)	292 (26.4%)	81 (16.2%)	**951 (20.6%)**
40-49	40 (17.9%)	228 (32.9%)	205 (26.9%)	210 (36.6%)	69 (22.8%)	**752 (29.4%)**
50-59	21 (22.8%)	89 (37.9%)	104 (29.1%)	64 (31.4%)	30 (20.7%)	**308 (29.8%)**
60 +	14 (34.1%)	20 (33.9%)	41 (32.8%)	31 (37.3%)	16 (28.1%)	**122 (33.4%)**
TOTAL (%)	**137 (10.7%)**	**680 (22.4%)**	**789 (20.8%)**	**805 (23.5%)**	**239 (17.2%)**	**2,650 (20.5%)**

[1] - Includes all inmates with a significant TST result, either newly diagnosed on Initial and Ongoing Non-significant Assessments, Previous Significant on Initial Assessment, and Ongoing Significant Assessments.

[2] - Frequency calculated by dividing the number significant by the number of inmates participating in CSC TBTS screening per age group and region.

ii. LTBI Among Inmates by Origin – 2000

The burden of LTBI among inmates in 2000, categorized by origin (see Table 4.11), was highest among those foreign born at 47.1%, followed by those of Aboriginal origin (30.5%), and Canadian born (10.8%). Of those of unknown origin, 18.7% were TST significant.

LTBI by origin showed regional variation. Quebec region had the highest proportion of LTBI inmates for Canadian born at 17.3% and among Aboriginal inmates at 34.6%; of foreign-born inmates, the highest rate was found in Pacific at 75.0%. Of those of unknown origin, the highest rate was in Quebec region at 21.9%.

Table 4.11: LTBI[1] by Origin and Region – Inmates, 2000

FREQ (%)[2] / ORIGIN	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Canadian Born	16 (5.7%)	62 (17.3%)	49 (12.3%)	19 (7.0%)	8 (7.3%)	**154 (10.8%)**
Aboriginal	20 (26.3%)	64 (34.6%)	80 (23.2%)	474 (34.1%)	62 (20.8%)	**700 (30.5%)**
Foreign Born	3 (30.0%)	16 (47.1%)	60 (43.5%)	29 (45.3%)	21 (75.0%)	**129 (47.1%)**
Unknown	98 (10.8%)	538 (21.9%)	600 (20.6%)	283 (16.6%)	148 (15.5%)	**1,667 (18.7%)**
TOTAL (%)	**137 (10.7%)**	**680 (22.4%)**	**789 (20.8%)**	**805 (23.5%)**	**239 (17.2%)**	**2,650 (20.5%)**

[1] - Includes all inmates with a significant TST result, either newly diagnosed on Initial and Ongoing Non-significant Assessments, Previous Significant on Initial Assessment, and Ongoing Significant Assessments.

[2] - Frequency calculated by dividing the number significant by the number of inmates participating in CSC TBTS screening per origin group and region.

iii. LTBI Among Inmates by Gender – 2000

The distribution of LTBI by gender according to region for inmates participating in TB screening in 2000 is shown in Table 4.12. The proportion found to be LTBI was slightly higher for males compared to females (20.6% vs 17.7% respectively). Among those for whom gender was unknown, 14.0% were found to be LTBI.

Regionally, Prairie region had the highest proportion LTBI among males (23.6%) followed by Quebec (22.7%). Prairie also had the highest proportion of females LTBI at 21.6%. Atlantic region had the lowest overall proportion for both males and females at 10.8% and 10.0% respectively.

Table 4.12: LTBI[1] by Gender and Region – Inmates, 2000

FREQ (%)[2] / GENDER	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC[3]	CANADA
Male	133 (10.8%)	671 (22.6%)	774 (21.0%)	767 (23.6%)	239 (17.2%)	**2,584 (20.6%)**
Female	3 (10.0%)	8 (12.9%)	12 (16.2%)	35 (21.6%)	0 (0.0%)	**58 (17.7%)**
Unknown	1 (8.3%)	1 (33.3%)	3 (12.0%)	3 (18.8%)	0 (0.0%)	**8 (14.0%)**
TOTAL (%)	**137 (10.7%)**	**680 (22.4%)**	**789 (20.8%)**	**805 (23.5%)**	**239 (17.2%)**	**2,650 (20.5%)**

[1] - Includes all inmates with a significant TST result, either newly diagnosed on Initial and Ongoing Non-significant Assessments, Previous Significant on Initial Assessment, and Ongoing Significant Assessments.

[2] - Frequency calculated by dividing the number significant by the number of inmates participating in CSC TBTS screening per gender and region.

[3] - Federally incarcerated females in Pacific region are generally kept in provincial institutions and there were no females in Pacific region included in Table 4.12.

4.II. STAFF

4.II.A. DEMOGRAPHICS

The number of staff working for CSC across Canada during 2000 was 14,500. The average age of staff in the CSC TBTS in 2000 was 39.5 years (range 18 to 68). Eighty percent (80%) are between 20 and 49 years of age. Although 28% of the records were missing gender information; of those with known gender, 54% of staff was male.

4.II.B. PARTICIPATION IN CSC TBTS SCREENING ACTIVITIES

A total of 3,457 assessments were performed for 3,349 individual staff members in 2000. After selecting one unique record per person per assessment type (see Methods section), a total of 3,387 assessments are included in the analysis. This gives a participation rate of 3,349/14,500, or 23.1%.[12] Of the staff assessments included in the analysis, 938 (28%) were Initial Assessments (which involves a two-step TST), 2,142 (63%) were Ongoing Non-significant Assessments, and 307 (9%) were staff with previously significant TST followed up for Ongoing Significant Assessments. There were 18 staff members who received these assessments as part of contact investigations for known or suspected cases of active TB disease.

4.II.C. RESULTS OF SCREENING FOR TUBERCULOSIS, STAFF – 2000

i. LTBI on Initial Assessment Among Staff

There were 939 Initial Assessments done in 2000; after applying the hierarchical methodology and retaining only one assessment per person, 938 assessments were included in the analysis (see Table 4.13).

Overall, 10.1% of staff (n=67) undergoing initial two-step TB screening in 2000 was found to be TST significant (see Table 4.13 and Figure 4.4). This finding shows regional variation with Quebec region reporting the highest significant TST rate among staff at 16.7% (n=18), followed by Prairie region at 12.8% (n=25) and Pacific region at 12.4% (n=15).

Table 4.13: Reported TST Results on Initial Assessment by Region – Staff, 2000

TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	UNKNOWN	CANADA
Tested Significant	4 (3.4%)	18 (16.7%)	2 (1.8%)	25 (12.8%)	15 (12.4%)	3 (42.9%)	**67 (10.1%)**
Tested Non-significant	114 (96.6%)	90 (83.3%)	111 (98.2%)	171 (87.2%)	106 (87.6%)	4 (57.1%)	**596 (89.9%)**
Previous Significant	0	0	1	0	0	0	**1**
Contraindicated[1]	0	0	0	2	0	0	**2**
Invalid TST-1[2]	1	0	2	5	0	0	**8**
Invalid TST-2[3]	10	34	30	114	56	5	**249**
Refused TST	0	0	0	0	0	0	**0**
Blank / Unknown	0	0	0	12	3	0	**15**
TOTAL (%)	**129 (14.1%)**	**142 (14.3%)**	**146 (22.2%)**	**329 (34.6%)**	**180 (19.9%)**	**12 (1.1%)**	**938**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

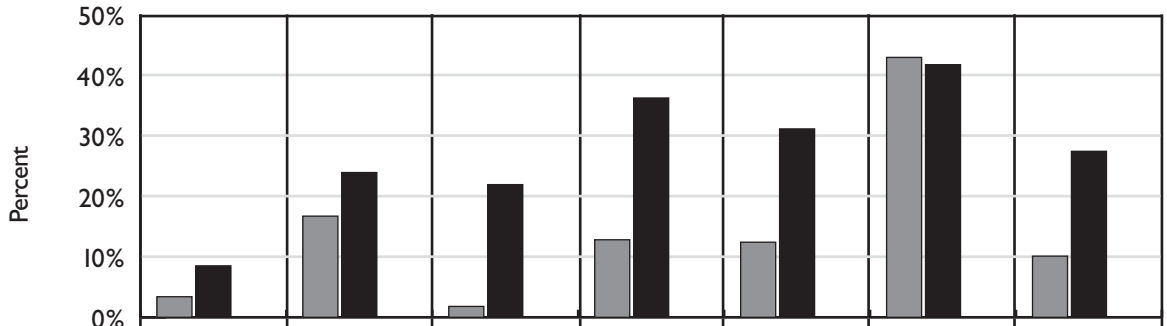
[2] - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

[3] - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of the 7 to 365 days of the first tuberculin administration.

[12] The staff total includes those working in penitentiaries as well as those at Regional and National Headquarters.

Inspection of Table 4.13 indicates that of all Initial Assessments undertaken among staff in 2000, 27.4% (n=257) were ultimately invalid due to a number of reasons. Of these, 96.7% (n=249) were invalidated due to administrative problems associated with the administration of the second TST of the two-step baseline TST. Of these, n=17 (6.8%) were due to the administration of the second step outside of 7 to 365 day time period, while n=231 (92.8%) were incomplete two-steps (i.e., the second step was never conducted). Overall, the proportion of test results deemed invalid for any reason showed strong regional variation; it was the highest in Prairie region at 36.2%, followed by Pacific region at 31.1%, Quebec region at 23.9% and Ontario at 21.9% (see Figure 4.4). There were no refusals recorded for staff on Initial Assessment in 2000.

Figure 4.3: Selected TST Outcome Results on Initial Assessment – Staff, 2000



	Atlantic	Quebec	Ontario	Prairie	Pacific	Blank	Canada
Positivity Rate	3.4%	16.7%	1.8%	12.8%	12.4%	42.9%	10.1%
Invalid Rate	8.5%	23.9%	21.9%	36.2%	31.1%	41.7%	27.4%
Refusal Rate	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

ii. Routine Screening – Newly Significant TST Among Ongoing Non-significant Assessments

A total of 2,191 assessments on staff members with a Previous Non-significant result ('Ongoing Non-significant') were performed in 2000 (see Table 4.14). Of these, 2,142 unique assessments were selected as per the hierarchical methodology (see Methods section).

Nationally, 0.5% (n=9) of staff undergoing annual screening for TB was found on testing to be TST significant. The vast majority of the tests however, at 99.5% (n=1,905), remained non-significant.

The proportion of newly significant TST results on Ongoing Non-significant tests were very similar with Atlantic region having the highest rate at 1.0% (n=2), followed by Pacific region at 0.9% (n=4). Ontario region did not report any staff significant on Ongoing TST Non-significant Assessments for 2000.

Nationally, the proportion of staff members with a Previous Non-significant TST result who refused TST testing on their annual assessment was 0.4% (n=8; see Table 4.14 and Figure 4.4). The proportion of all assessments classified as invalid was 1.2% (n=26). This showed a slight regional variation from Ontario region at 2.3% to 0.3% in Prairie region (see Figure 4.4).

Table 4.14: Reported TST Results on Ongoing Non-significant Assessment by Region – Staff, 2000

FREQ (%) / TST RESULT	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	UNKNOWN	CANADA
Tested Significant	2 (1.0%)	1 (0.8%)	0 (0.0%)	2 (0.3%)	4 (0.9%)	0 (0%)	**9 (0.5%)**
Tested Non-significant	194 (99.0%)	129 (99.2%)	577 (100.0%)	576 (99.7%)	428 (99.1%)	1 (100%)	**1,905 (99.5%)**
Contraindicated[1]	0	0	2	2	0	0	**4**
Invalid TST-1[2]	3	2	16	2	3	0	**26**
Refused TST	2	0	3	2	1	0	**8**
Blank / Unknown	9	3	104	51	23	0	**190**
TOTAL (%)	**210 (9.8%)**	**135 (6.3%)**	**702 (32.8%)**	**635 (29.6%)**	**459 (21.4%)**	**1 (0.0%)**	**2,142**

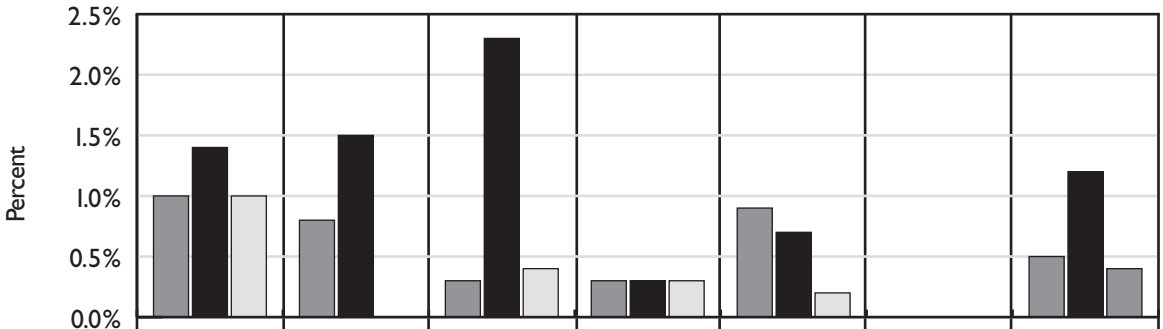
1 - Medically contraindicated (i.e., tuberculin allergy, etc.).

2 - An invalid TST includes a 'No show' for the read portion of the test, or a non-significant read after 72 hours.

Examination of the 'converters' (see Glossary) provides an estimate of the conversion rate among staff working in federal correctional facilities. By definition, a converter must have a previously documented Non-significant Assessment. Of the nine staff with a significant TST result in 2000 on Ongoing Non-significant Assessment, only three (33%) had a previous documented Non-significant Assessment in the database. Of the three converters, there were one each from Atlantic, Prairie, and Pacific regions. Two of the converters were female and origin was unknown for all three. None of the documented converters among staff reported any risk factors for progression to active TB disease or symptoms potentially consistent with active TB.

Of the 2,142 staff having an Ongoing Non-significant Assessment conducted in 2000, a total of 1,914 had a valid TST result in 2000 (see Table 4.14); of these, there were 1,310 (68%) records in the CSC TBTS data of a Previous Non-significant TST, whether on an Initial or an ongoing non-significant test. Therefore, the calculated conversion rate is 3/1,310 or 0.23%.

Figure 4.4: Selected TST Outcome Results on Ongoing Non-Significant Assessments – Staff, 2000



	Atlantic	Quebec	Ontario	Prairie	Pacific	Blank	Canada
Positivity Rate	1.0%	0.8%	0.0%	0.3%	0.9%	0.0%	0.5%
Invalid Rate	1.4%	1.5%	2.3%	0.3%	0.7%	0.0%	1.2%
Refusal Rate	1.0%	0.0%	0.4%	0.3%	0.2%	0.0%	0.4%

iii. Medical Surveillance of Known LTBI – ongoing Significant Screening

A total of 327 Ongoing Positive Assessments were conducted among staff in 2000; of these, 307 unique assessments per staff member were included for analysis. Staff with previously significant TST result (i.e., ongoing significant annual screenings) are assessed for medical and risk factors that may place them at higher risk for developing active TB, as well as for symptoms that may be indicative of active disease (e.g., weight loss, persistent cough). Staff requiring medical follow-up are referred to their own personal physician. The results of risk and symptom screening for the 302 staff are discussed below (see section 4.II.E).

iv. TB Infectiousness – Results of Contact Screening Among Staff

A total of 18 staff members were reported as part of a contact investigation (see Table 4.15). None were duplicate records for the same individual. Twelve records were from Ontario, and six records were from Prairie region. None were significant, although two (11%) were invalid and four (22%) were blank.

Table 4.15: Reported TST Results on Contact Tracing by Region – Staff, 2000

TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Tested Significant	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
Tested Non-significant	0 (0.0%)	0 (0.0%)	5 (100.0%)	4 (100.0%)	0 (0.0%)	**9 (100.0%)**
Previous Significant	0	0	2	1	0	**3**
Contraindicated[1]	0	0	0	0	0	**0**
Invalid TST-1[2]	0	0	0	0	0	**0**
Invalid TST-2[3]	0	0	1	1	0	**2**
Refused TST	0	0	0	0	0	**0**
Blank / Unknown	0	0	4	0	0	**4**
TOTAL (%)	**0 (0.0%)**	**0 (0.0%)**	**12 (66.7%)**	**6 (28.3%)**	**0 (0.0%)**	**18**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

[2] - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

[3] - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of the 7 to 365 days of the first tuberculin administration.

4.II.D. DEMOGRAPHIC CHARACTERISTICS OF NEWLY SIGNIFICANT TST STAFF – 2000

i. Age

The mean age of staff with a newly significant TST result on Initial or Ongoing Non-significant test (n=76) was slightly higher than staff members with other TST results (40.6 vs 38.7 – see Table 4.16). The low number of TST-significant staff in some regions results in statistically unstable means. Table 4.17 shows the distribution and percentage of newly significant staff by region and age category.

Table 4.16: Mean Age of Newly Significant TST[1] and Other Staff by Region, 2000

MEAN AGE (YRS) (RANGE)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Newly TST Significant	38.8 (36-45)	42.7 (38-49)	37.0 (26-48)	38.6 (28-46)	42.4 (34-50)	39.0 (31-47)	**40.6 (33-48)**
Other[3]	36.7 (29-44)	40.0 (34-46)	40.0 (32-48)	37.5 (29-45)	39.5 (29-49)	41.5 (38-48)	**38.7 (30-47)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

[2] - Interquartile range 25th and 75th percentiles.

[3] - Population of staff undergoing Initial or Ongoing Non-significant TST EXCLUDING those with a significant TST result.

Table 4.17: Newly Significant TST[1] by Age Group and Region – Staff, 2000

AGE GROUP / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	**1 (20.0%)**
17-19	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (100.0%)	**0 (0.0%)**
20-29	1 (1.2%)	1 (2.2%)	1 (0.6%)	7 (2.7%)	3 (1.9%)	0 (0.0%)	**13 (1.9%)**
30-39	3 (2.6%)	6 (8.3%)	0 (0.0%)	6 (2.1%)	4 (2.7%)	1 (33.3%)	**20 (2.2%)**
40-49	1 (1.2%)	8 (6.8%)	1 (0.4%)	10 (3.8%)	6 (3.6%)	1 (16.7%)	**27 (3.0%)**
50-59	1 (2.4%)	4 (9.8%)	0 (0.0%)	3 (2.3%)	6 (4.3%)	0 (0.0%)	**14 (2.7%)**
60 +	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (9.1%)	0 (0.0%)	0 (0.0%)	**1 (2.8%)**
TOTAL (%)	**6 (1.8%)**	**19 (6.9%)**	**2 (0.2%)**	**27 (2.8%)**	**19 (3.0%)**	**3 (23.1%)**	**76 (2.5%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

2 - Frequency calculated by dividing the number of newly significant by the number of staff participating in CSC TB screening having an Initial or Ongoing Non-significant Assessment per age group and region.

ii. Origin

Data on the country of birth and Aboriginal status are requested on the Initial TB screening assessment; however, for 77% of these, data were missing. Those of foreign birth had the highest rate of significant TST results (16.3%), followed by Aboriginals (6.9%) and Canadian born (5.7%) (Table 4.18). Among those of unknown origin, 1.3% was newly TST positive. Caution should be taken in interpreting these rates as they are based on small numbers and may be statistically unstable.

Table 4.18: Newly Significant TST[1] by Origin and Region – Staff, 2000

ORIGIN / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Canadian Born	1 (1.3%)	16 (13.2%)	0 (0.0%)	9 (5.0%)	5 (5.4%)	2 (25.0%)	**33 (5.7%)**
Aboriginal	2 (12.5%)	0 (0.0%)	0 (0.0%)	3 (9.4%)	0 (0.0%)	0 (0.0%)	**5 (6.9%)**
Foreign Born	0 (0.0%)	2 (66.7%)	1 (11.1%)	2 (11.8%)	2 (13.3%)	1 (25.0%)	**8 (16.3%)**
Unknown	3 (1.3%)	1 (0.7%)	1 (0.1%)	13 (1.8%)	12 (2.4%)	0 (0.0%)	**30 (1.3%)**
Total (%)	**6 (1.8%)**	**19 (6.9%)**	**2 (0.2%)**	**27 (2.8%)**	**19 (3.0%)**	**3 (23.1%)**	**76 (2.5%)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

[2] - Frequency calculated by dividing the number of newly significant on both the Initial and Ongoing Assessments divided by the number of staff participating in CSC TB screening having an Initial or Ongoing Non-significant Assessment per origin category and region.

iii. Gender

Data on gender are requested of staff undergoing Initial and Ongoing Negative Assessments. Almost one half (26%) did not provide these data. Of those providing gender data, a slightly higher proportion of females (3.3%) were newly TST significant, versus males (3.0%). Of those without gender data, 0.3% were newly TST significant.

Table 4.19: Newly Significant TST[1] by Gender and Region – Staff, 2000

GENDER / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Male	2 (1.5%)	10 (7.9%)	0 (0.0%)	13 (3.4%)	12 (5.2%)	2 (28.6%)	**39 (3.0%)**
Female	4 (4.0%)	9 (7.0%)	2 (0.7%)	13 (4.1%)	6 (3.4%)	1 (20.0%)	**35 (3.3%)**
Unknown	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.4%)	1 (0.5%)	0 (0.0%)	**2 (0.3%)**
Total (%)	**6 (1.8%)**	**19 (6.9%)**	**2 (0.2%)**	**27 (2.8%)**	**19 (3.0%)**	**3 (23.1%)**	**76 (2.4%)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

[2] - Frequency calculated by dividing the number of newly significant TST on both the Initial and Ongoing Assessments divided by the number of staff participating in CSC TB screening having an Initial or Ongoing Non-significant Assessment per gender and region.

4.II.E. BURDEN OF TB AT CSC: SCREENING FOR ACTIVE TB DISEASE, STAFF – 2000

i. Comorbidity and Risk Factors for Progression to Active TB

Response to questions about risk factors among staff during assessments was excellent, at 99% (i.e., a response of 'Yes,' 'No,' or 'Unknown' was provided). However, only 3.1% (n=104) reported one or more risks. The distribution of risks among staff is shown in Table 4.20.

The most frequently reported risk factors for progression to active TB disease among staff was contact with an active case (n=92), followed by inject steroids (n=39) and by injection drug user (n=20).

Table 4.20: Reported Comorbidity and Risk Factors[1] by TST Result – Staff, 2000

TEST TYPE / RISK FACTOR	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=76	n=1	n=307	N=384	n=2,501	n=502	N=3,003	N=3,387
Diabetes	0	0	1	**1**	12	0	**12**	**13**
Hemodialysis	0	0	0	**0**	1	0	**1**	**1**
Silicosis	0	0	0	**0**	0	1	**1**	**1**
Transplant	0	0	0	**0**	3	1	**4**	**4**
Injection Drug User	1	0	3	**4**	13	3	**16**	**20**
Lymphoma	0	0	2	**2**	7	0	**7**	**9**
HIV/AIDS	0	0	2	**2**	8	4	**12**	**14**
Chemotherapy	0	0	1	**1**	4	0	**4**	**5**
Inject Steroids	1	0	5	**6**	26	7	**33**	**39**
TB Case Contact	6	0	13	**19**	54	19	**73**	**92**
TOTAL	**8**	**0**	**27**	**35**	**128**	**35**	**163**	**198**

[1] - Numbers in the table reflect those answering 'Yes' to the presence of the condition/risk factor – individualscan report multiple risk factors.

[2] - Tested significant on Initial or Ongoing Non-significant Assessments.

[3] - Accepted Previous Significant TST on Initial Assessment – see Table 4.13.

[4] - 'Other' result includes medically contraindicated, invalid TST-1, invalid TST-2, refused, and blank/unknown.

ii. Symptoms Suggestive of Active TB Disease

Symptom screening among staff in 2000 was excellent at 96% (i.e., had a 'valid' response of 'Yes,' No,' or 'Unknown'). Of these, 7% reported symptoms, shown in Table 4.21.

The most common self-reported symptom was fatigue (n=111), followed by cough productive of sputum (n=70), hoarseness (n=63), and nightsweats (n=59). There were three staff who reported a constellation of fatigue, fever, nightsweats, and cough productive of sputum.

Table 4.21: Reported Symptom[1] by TST Result – Staff, 2000

TEST TYPE / SYMPTOM	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=76	n=1	n=307	N=384	n=2,501	n=502	N=3,003	N=3,387
Fatigue	2	0	31	**33**	59	19	**78**	**111**
Fever	0	0	1	**1**	8	0	**8**	**9**
Weight Loss	0	0	2	**2**	5	1	**6**	**8**
Loss of Appetite	1	0	9	**10**	8	4	**12**	**22**
Night Sweats	1	0	22	**23**	28	8	**36**	**59**
Hoarseness	1	0	14	**15**	39	9	**48**	**63**
Coughing Sputum	1	0	19	**20**	34	16	**50**	**70**
Coughing Blood	0	0	1	**1**	2	0	**2**	**3**
Chest Pains	0	0	11	**11**	25	3	**28**	**39**
TOTAL	**6**	**0**	**110**	**116**	**208**	**60**	**268**	**384**

[1] - Numbers in the table reflect those answering 'Yes' to the presence of the symptom – individuals may report multiple symptoms.

[2] - Includes significant TST results from Initial and Ongoing Non-significant Assessments.

[3] - Accepted Previous Significant TST on Initial Assessment – see Table 4.13.

[4] - 'Other' result includes medically contraindicated, invalid TST-1, invalid TST-2, refused, and blank/unknown.

iii. Active Cases of TB Disease

Cases of active TB disease among CSC staff are not captured by the CSC TBTS surveillance system.

4.II.F. DEMOGRAPHIC CHARACTERISTICS OF LATENT TUBERCULOSIS INFECTION AMONG STAFF – 2000

The burden of LTBI among staff at CSC was estimated by combining the newly discovered TST-significant cases with those staff previously known to be TST significant (i.e., previously significant on Initial Assessment and Ongoing Significant). This provides a 'snapshot' of all prevalent TST-significant staff in a given year.

i. LTBI Among Staff by Age Group – 2000

LTBI among staff categorized by age category and region is shown in Table 4.22. The proportion of staff with a significant TST increases with age. For staff 20 years of age or older, the proportion TST significant increases from 3.7% to 16.4% in those under 60. Among staff over 60, 30.0% were infected with TB.

Overall, 11.5% (n=384) of staff who were screened for TB in 2000 had a significant TST result. Inspection of Table 4.22 shows regional variation; the highest rate was seen in Prairie region (18.0%), followed by Pacific region (13.6%). The lowest rate was in Ontario region (4.5%).

Table 4.22: LTBI[1] by Age Group and Region – Staff, 2000

AGE GROUP / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	**1 (20.0%)**
17-19	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
20-29	1 (1.2%)	1 (2.2%)	3 (1.9%)	15 (5.8%)	6 (3.8%)	0 (0.0%)	**26 (3.7%)**
30-39	6 (5.0%)	6 (8.3%)	8 (3.0%)	39 (12.1%)	11 (7.1%)	2 (50.0%)	**72 (7.6%)**
40-49	9 (9.7%)	8 (6.8%)	18 (6.8%)	104 (29.3%)	31 (16.0%)	1 (16.7%)	**171 (16.6%)**
50-59	7 (14.6%)	4 (9.8%)	7 (4.0%)	36 (22.4%)	45 (25.3%)	0 (0.0%)	**99 (16.4%)**
60 +	1 (50.0%)	0 (0.0%)	4 (28.6%)	7 (41.2%)	3 (18.8%)	0 (0.0%)	**15 (30.0%)**
TOTAL (%)	**24 (6.9%)**	**19 (6.9%)**	**40 (4.5%)**	**201 (18.0%)**	**96 (13.6%)**	**4 (28.6%)**	**384 (11.5%)**

1 - Includes newly diagnosed significant TST result on either Initial and Ongoing Non-significant Assessments plus all staff with an Ongoing Significant Assessment in 2000.

2 - Frequency calculated by dividing the number TST significant by the number of staff participating in CSC TBTS screening per age group and region.

ii. LTBI Among Staff by Origin – 2000

The burden of LTBI among staff in 2000, categorized by origin (see Table 4.23) was highest among those foreign born at 16.3%, followed by those of Aboriginal origin (9.6%), and Canadian born (6.3%). Of those of unknown origin, 11.5% were found to have LTBI.

LTBI by origin showed regional variation. Among Canadian born, Quebec region had the highest proportion at 13.2%; among Aboriginal staff, the highest rate was in Prairie region at 15.2%; of those foreign born, the highest rate was found in Quebec (although this was based on small numbers). Of those of unknown origin, the highest rate was in Prairie region at 20.8%.

Table 4.23: LTBI[1] by Origin and Region – Staff, 2000

ORIGIN / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Canadian Born	1 (1.3%)	16 (13.2%)	1 (1.1%)	10 (5.5%)	6 (6.4%)	2 (25.0%)	**36 (6.3%)**
Aboriginal	2 (12.5%)	0 (0.0%)	0 (0.0%)	5 (15.2%)	0 (0.0%)	0 (0.0%)	**7 (9.6%)**
Foreign Born	0 (0.0%)	2 (66.7%)	1 (11.1%)	2 (11.8%)	2 (13.3%)	1 (25.0%)	**8 (16.3%)**
Unknown	21 (8.2%)	1 (0.7%)	38 (4.9%)	184 (20.8%)	88 (15.1%)	1 (50.0%)	**333 (12.6%)**
Total (%)	**24 (6.9%)**	**19 (6.9%)**	**40 (4.5%)**	**201 (18.0%)**	**96 (13.6%)**	**4 (28.6%)**	**384 (11.5%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments plus all staff with an Ongoing Significant Assessment in 2000.

2 - Frequency calculated by dividing the number TST significant by the number of staff participating in CSC TBTS screening per origin category and region.

iii. LTBI Among Staff by Gender – 2000

The distribution of LTBI by gender according to region for staff participating in TB screening in 2000 is shown in Table 4.24. The proportion of female staff found to have LTBI was higher than that among males, at 12.3% and 8.7% respectively. Among those of unknown gender, 14.3% were found to have LTBI.

Regionally, Prairie had the highest proportion with LTBI among males (13.1%) followed by Pacific (11.3%). Prairie had the highest proportion of females with LTBI at 19.3%.

Table 4.24: LTBI[1] by Gender and Region – Staff, 2000

GENDER / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Male	4 (3.0%)	10 (7.9%)	12 (3.4%)	56 (13.1%)	28 (11.3%)	3 (37.5%)	**113 (8.7%)**
Female	9 (8.6%)	9 (7.0%)	15 (4.9%)	72 (19.3%)	32 (15.6%)	1 (20.0%)	**138 (12.3%)**
Unknown	11 (9.7%)	0 (0.0%)	13 (5.8%)	73 (23.0%)	36 (14.2%)	0 (0.0%)	**133 (14.3%)**
Total (%)	**24 (6.9%)**	**19 (6.9%)**	**40 (4.5%)**	**201 (18.0%)**	**96 (13.6%)**	**4 (28.6%)**	**384 (11.5%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments plus all staff with an Ongoing Significant Assessment in 2000.

2 - Frequency calculated by dividing the number TST significant by the number of staff participating in CSC TBTS screening per gender category and region.

PART 5: 2001 RESULTS

5.I. INMATES

5.I.A. DEMOGRAPHICS

The number of inmates in federal correctional facilities across Canada as of January 1, 2001, was 12,681 (12,325 males and 356 females). New admissions to federal institutions in 2001 accounted for an additional 4,288 (4,057 males and 231 females) inmates for an estimated maximum inmate population of 16,969 persons.

The average age of inmates in the Correctional Service of Canada Tuberculosis Tracking System (CSC TBTS) in 2001 was 35.7 years (range: 17 to 83). The largest age group at 35% was 30-39, followed closely by the 20-29 age group at 30%. Of the records with gender (<1% were missing), 97% were male.

5.I.B. PARTICIPATION IN CSC TBTS SCREENING ACTIVITIES

A total of 13,111 assessments were performed among inmates in 2001. After selecting one record per person per assessment type, a total of 12,727 assessments were included in the analysis. Since some people are included in multiple tables, the total number of people included in the analysis is 12,603. Therefore, an estimated 12,603/16,969 = 73.8% of inmates participated in TB screening assessments in 2001. Of the 12,727 TB screening assessments conducted by CSC nurses in 2001 included in this analysis, 3,826 (30%) were for an Initial Assessment, 7,056 (55%) were annual follow up on known tuberculin skin test (TST) non-significant inmates, and 1,845 (15%) were on known TB-infected inmates. Of all these, only 11 (<1%) of the assessments were the result of contact tracing investigations for a known or suspected case of active TB disease or conversion.

5.I.C. RESULTS OF SCREENING FOR TUBERCULOSIS, INMATES – 2001

i. Latent TB Infection (LTBI) on Admission to CSC Institutions

There were 3,844 Initial Assessments conducted in 2001 that were reported to CSC TBTS. After selecting one assessment per inmate, 3,826 records remained.

Overall in 2001, 3220 or 84% of the two-step TST assessments among inmates were valid; of these, 641 or 19.9% were found to be TST significant (Table 5.1). This proportion varies by region, with Ontario having the highest rate at 23.2% (n=223), followed closely by Pacific at 20.6% (n=74). Atlantic region had the lowest rate of significant result at Initial Assessment at 11.6% (n=38). Nineteen (n=19, or <1%) were reported to have a Previous Significant TST result.

Inspection of Table 5.1 indicates that of the total number of TST results deemed to be invalid (n=495, or 12.9%), the majority, or 364 (73.5%), are associated with administration of the second TST procedure. Of these, 47 of 364 (13%) were invalidated because the second step was administered outside of the 7 to 365 day window and 258 (71%) were invalidated due to the lack of required second TST of the two-step procedure (data not shown). Overall, the combined proportion of assessments classified as invalid ranged from 20.5% in Prairie region (n=181), 20.2% in Atlantic region (n=88) to 4.6% in Ontario region (n=47) (Figure 5.1).

The proportion of inmates who refused the TST was 1.7% (n=64). Quebec region had the highest proportion of inmates who refused a TST on the Initial Assessment at 4.4% (n=46), as compared to the other regions (see Figure 5.1). A small number of reports at 0.3% (n=10) were blank or unknown. Lastly, only a small fraction at 0.5% (n=19) of the Initial Assessments, were not done due to a medical contraindication.

Table 5.1: Reported TST Results on Initial Assessment by Region – Inmates, 2001

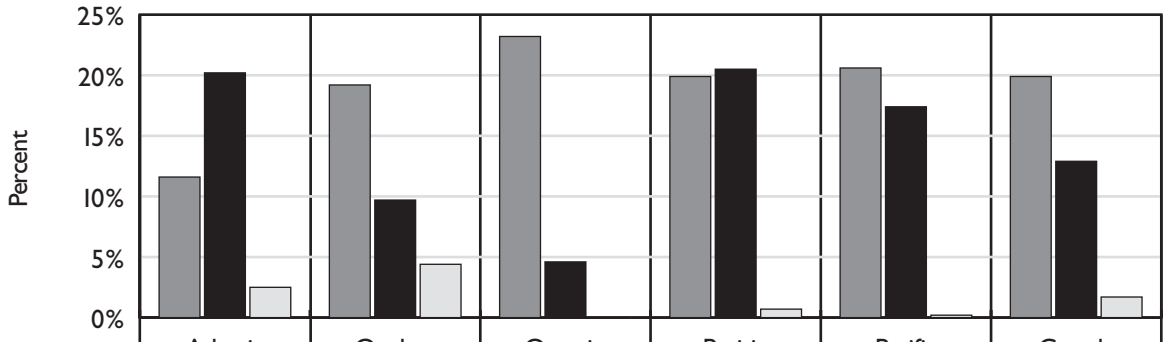
TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Tested Significant	38 (11.6%)	171 (19.2%)	223 (23.2%)	135 (19.9%)	74 (20.6%)	**641 (19.9%)**
Tested Non-significant	291 (88.4%)	720 (80.8%)	738 (76.8%)	544 (80.1%)	286 (79.4%)	**2,579 (80.1%)**
Previous Significant	6	2	3	8	0	**19**
Contraindicated[1]	1	4	4	5	4	**18**
Invalid TST-1[2]	9	12	5	74	31	**131**
Invalid TST-2[3]	79	90	42	107	46	**364**
Refused TST	11	46	0	6	1	**64**
Blank / Unknown	1	5	0	4	0	**10**
TOTAL	**436 (11.4%)**	**1,050 (27.4%)**	**1,015 (26.5%)**	**883 (23.1%)**	**442 (11.6%)**	**3,826**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

[2] - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

[3] - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of the 7 to 365 days of the first tuberculin administration.

Figure 5.1: Selected Initial TST Outcome Results by Region – Inmates, 2001



	Atlantic	Quebec	Ontario	Prairie	Pacific	Canada
Positivity Rate	11.6%	19.2%	23.2%	19.9%	20.6%	19.9%
Invalid Rate	20.2%	9.7%	4.6%	20.5%	17.4%	12.9%
Refusal Rate	2.5%	4.4%	0.0%	0.7%	0.2%	1.7%

ii. Routine Screening – Newly Significant TST Among Ongoing Non-significant Inmates

A total of 7,303 assessments on previously non-significant TST inmates ('Ongoing Non-significant') were performed in 2001. After selecting only one record per inmate, 7,056 unique records were included in the analysis (see Table 5.2). Of these, 5,763 or 81.7% of the assessments had a valid outcome.

Overall, 153 (2.7%) were found on testing to be TST significant. The vast majority of the tests however, at 97.3% (n=5,610), remained non-significant for LTBI. The proportion of inmates with a significant TST on Ongoing Non-significant tests showed strong regional variation, with Quebec region having the highest rate at 4.3% (n=57), followed by Pacific region at 3.1% (n=21) and Prairie region at 2.7% (n=42). The Ontario and Atlantic regions had a smaller proportion of inmates with a significant TST, at 1.6% (n=25) and 1.1% (n=8) respectively (see Figure 5.2).

Nationally, the proportion of previously non-significant TST inmates refusing testing on their annual assessment was 10.7% (n=757; see Table 5.2 and Figure 5.2). The highest refusal rate was seen in Quebec region at 22.6% (n=427), followed by Pacific region at 13.6% (n=138), followed by Ontario region at 5.7% (n=99).

The proportion of all assessments classified as invalid was low at 2.3% (n=160). This did show regional variation with Pacific having the highest rate at 5.6% (n=57), followed by Prairie region at 3.4% (n=58) and Atlantic at 1.4% (n=10). The other two regions had rates that were close to 1%.

Table 5.2: Reported TST Results on Ongoing Non-significant Assessment by Region – Inmates, 2001

TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Tested Significant	8 (1.2%)	57 (4.3%)	25 (1.6%)	42 (2.7%)	21 (3.1%)	0 (0.0%)	**153 (2.7%)**
Tested Non-significant	662 (98.8%)	1,284 (95.7%)	1,509 (98.4%)	1,503 (97.3%)	649 (96.9%)	3 (100.0%)	**5,610 (97.3%)**
Contraindicated[1]	2	6	37	13	5	0	**63**
Invalid TST-I[2]	10	16	19	58	57	0	**160**
Refused TST	30	427	99	63	138	0	**757**
Blank / Unknown	0	101	54	14	144	0	**313**
TOTAL (%)	**712 (10.1%)**	**1,891 (26.8%)**	**1,743 (24.7%)**	**1,693 (24.0%)**	**1,014 (14.4%)**	**3 (0.0%)**	**7,056**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

[2] - An invalid TST includes a 'No show' for the read portion of the test, or a non-significant read after 72 hours.

Examination of the 'converters' provides an estimate of the annual rate of LTBI conversion among inmates in federal correctional facilities. By definition, a converter must have a documented non-significant TST baseline status (see Glossary). Of the 153 inmates with a significant TST result on an Ongoing Non-significant Assessment in 2001, 102 (66%) had a previously documented non-significant TST in the CSC TBTS. Of the 102 significant TST results in 2001 with prior documentation in the dataset, there were ten instances where the increase in induration was less than 10 mm on a previous result size of 5-9 mm;[13] in this case, these records cannot be considered converters since the increase in induration does not meet the criterion for a converter (Long, 2000).

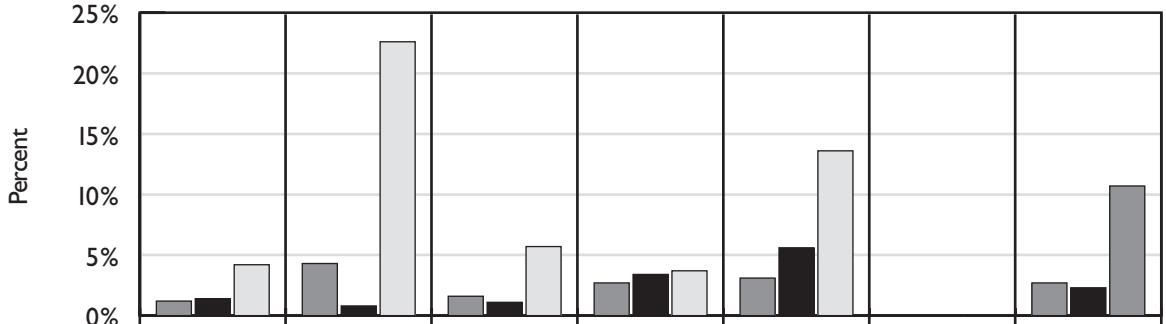
[13] None of the converters was involved in a contact investigation.

Of the 7,056 inmates having an Ongoing Non-significant Assessment conducted in 2001, there were 5,672 (80%) records in the CSC TBTS data of a Previous Non-significant, whether on an Initial or an ongoing non-significant test. Of these, 4,778 had a valid TST result in 2001. Therefore, the calculated conversion rate is (102-10)/4,778 or 1.9%.

Of the 92 converters, 32 (35%) were from Quebec region, 20 (22%) were from Prairie region, 19 (21%) were from Ontario, and 15 (16%) were from Pacific region, with the remainder (n=6, or 7%) from Atlantic. Thirteen (13) were from La Macaza (Quebec region), seven were from Ferndale Institution (Pacific region) and six (7%) were from Joyceville (Ontario region). Seventy percent were between 30-49 years old, 98% were male, and 79% were of unknown origin.

Several of the converters reported symptoms consistent with active TB disease, including fatigue (9%), cough productive of sputum (9%), loss of appetite (4%) and nightsweats (4%).

Figure 5.2: Selected Ongoing Non-significant TST Outcome Results – Inmates, 2001



	Atlantic	Quebec	Ontario	Prairie	Pacific	Blank	Canada
Positivity Rate	1.2%	4.3%	1.6%	2.7%	3.1%	0.0%	2.7%
Invalid Rate	1.4%	0.8%	1.1%	3.4%	5.6%	0.0%	2.3%
Refusal Rate	4.2%	22.6%	5.7%	3.7%	13.6%	0.0%	10.7%

iii. Medical Surveillance of Known LTBI – Ongoing Significant Screening

Inmates with a Previous Significant TST (i.e., ongoing significant annual screenings) are assessed for medical and risk factors that may place them at higher risk for developing active TB, as well as for symptoms that may be indicative of active disease (e.g., weight loss, persistent cough). Inmates requiring medical follow-up are referred or tested accordingly. There were 1,940 Ongoing Significant assessments conducted for inmates in 2001; after selecting one record per inmate, 1,845 were included in the analysis. The results of risk and symptom screening for these inmates are discussed below (see section 5.I.E).

iv. TB Infectiousness – Results of Contact Screening Among Inmates

A total of 11 assessments recorded in CSC TBTS were done among inmates as result of a contact investigation; after examining these records for multiple records per person, all 11 records remained in the analysis.

All 11 assessments included in contact investigation were reported from either Prairie or Quebec regions (see Table 5.3). One record was newly TST significant in Pacific region.

Table 5.3: Reported TST Results on Contact Tracing by Region – Inmates, 2001

TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Tested Significant	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (25.0%)	0 (0.0%)	**1 (25.0%)**
Tested Non-significant	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (75.0%)	0 (0.0%)	**3 (75.0%)**
Previous Significant	0	3	0	3	0	**6**
Contraindicated[1]	0	0	0	0	0	**0**
Invalid TST-1[2]	0	0	0	0	0	**0**
Invalid TST-2[3]	0	0	0	1	0	**1**
Refused TST	0	0	0	0	0	**0**
Blank / Unknown	0	0	0	0	0	**0**
TOTAL (%)	**0 (0.0%)**	**3 (27.3%)**	**0 (0.0%)**	**8 (72.7%)**	**0 (0.0%)**	**11**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

[2] - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

[3] - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of the 7 to 365 days of the first tuberculin administration.

5.I.D. DEMOGRAPHIC CHARACTERISTICS OF NEWLY TST-SIGNIFICANT INMATES – 2001

i. Age

The mean age of inmates with a newly significant TST in 2001 (n=794) was 37.7, with an interquartile range 30-43 (see Table 5.4). The age of inmates with a newly significant TST varied across Canada, with the youngest cases in Prairie and Ontario, followed by Pacific and Atlantic. Quebec had the oldest average age at 40.6 years. The difference in mean age of inmates with a newly significant TST compared to those without reached statistical significance in all regions (including Canada overall) with the exception of Ontario and Pacific regions.

Table 5.5 indicates the prevalence of newly significant TST by age category and region among those undergoing initial or ongoing non-significant screening.

Table 5.4: Average Age of Newly TST Significant and Other Inmates by Region, 2001

MEAN AGE (YRS) (RANGE)[1]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Newly TST Significant	39.6 (30-47)	40.7 (35-47)	36.4 (29-43)	34.9 (26-42)	38.0 (30-47)	**37.7 (30-44)**
Other[2]	33.9 (25-41)	35.4 (28-41)	35.5 (28-41)	32.6 (25-39)	36.5 (28-43)	**34.8 (27-41)**

[1] - Interquartile range 25th and 75th percentiles.

[2] - Inmates undergoing TST EXCLUDING those with a newly significant TST having an Initial or Ongoing Negative Assessment.

Table 5.5: Newly Significant TST[1] by Age Group and Region – Inmates, 2001

FREQ (%[2]) / AGE GROUP	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (50.0%)	0 (0.0%)	**1 (25.0%)**
17-19	2 (5.7%)	1 (2.3%)	1 (2.7%)	8 (10.7%)	2 (8.3%)	**14 (6.5%)**
20-29	8 (1.9%)	31 (3.9%)	68 (8.3%)	47 (4.4%)	18 (4.5%)	**172 (4.9%)**
30-39	10 (2.9%)	75 (6.6%)	91 (8.7%)	65 (8.2%)	40 (7.6%)	**281 (7.3%)**
40-49	18 (7.5%)	78 (11.9%)	59 (10.7%)	40 (9.7%)	20 (6.7%)	**215 (10.0%)**
50-59	7 (8.4%)	33 (14.8%)	23 (10.1%)	14 (9.5%)	12 (8.1%)	**89 (10.7%)**
60 +	1 (3.3%)	10 (15.4%)	6 (9.4%)	2 (4.7%)	3 (6.3%)	**22 (8.8%)**
TOTAL (%)	**46 (4.0%)**	**228 (7.8%)**	**248 (9.0%)**	**177 (6.9%)**	**95 (6.6%)**	**794 (7.3%)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

[2] - Cell frequency divided by the total number of inmates in that age group and region having an Initial or Ongoing Non-significant Assessment.

ii. Origin

Demographic data on the country of birth and Aboriginal status are requested on admission to CSC and are captured on the initial screening assessment. However, the majority of records, 61%, were missing this information. Inmates of foreign birth had the highest rate of newly significant TST results at 47.7%. Canadian-born non-Aboriginals at 10.8% had a higher rate than that of Aboriginals at 8.5% (see Table 5.6).

Regional variation in these rates is observed as well. Newly significant TST rate among Canadian-born non-Aboriginals was highest in Quebec region at 14.8% and lowest in Pacific region at 6.5%. Among Aboriginals, the highest regional rate was observed in Atlantic at 9.7% and Prairie at 9.6%. The rate among foreign born was high, at 55.6%. It is also important to note that due to small numbers in some cells, these rates may be unstable, making meaningful comparisons difficult to interpret.

Table 5.6: Newly Significant TST[1] by Origin and Region – Inmates, 2001

FREQ (%)[2] / ORIGIN	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Canadian Born	24 (7.8%)	99 (14.8%)	67 (11.5%)	26 (7.6%)	15 (6.5%)	**231 (10.8%)**
Aboriginal	6 (9.7%)	8 (5.2%)	21 (8.9%)	91 (9.6%)	20 (6.5%)	**146 (8.5%)**
Foreign Born	5 (31.3%)	35 (42.2%)	99 (55.6%)	25 (35.2%)	30 (50.8%)	**194 (47.7%)**
Unknown	11 (1.5%)	86 (4.3%)	61 (3.5%)	35 (2.9%)	30 (3.6%)	**223 (3.4%)**
Total (%)	**46 (4.0%)**	**228 (7.8%)**	**248 (9.0%)**	**177 (6.9%)**	**95 (6.6%)**	**794 (7.3%)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

[2] - Cell frequency divided by the total number of inmates in that gender group and region having an Initial or Ongoing Non-significant Assessment.

iii. Gender

Only a small fraction of records were missing information on gender (0.2%). The distribution of newly significant TST inmates by gender is shown in Table 5.7. Overall, the proportion of males newly TST significant in 2001 was lower than that of females at 7.2% versus 12.3% respectively.

Regionally, Ontario had the highest proportion of males TST positive at 8.8%. Among females, the highest rate was found in Atlantic region at 25%, although this was based on small numbers. The second highest rate was in Ontario at 18.1%.

Table 5.7: Newly Significant TST[1] by Gender – Inmates, 2001

FREQ (%)[2] / GENDER	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC[3]	CANADA
Male	44 (3.9%)	219 (7.7%)	235 (8.8%)	166 (6.9%)	94 (6.6%)	**758 (7.2%)**
Female	2 (25.0%)	9 (12.0%)	13 (18.1%)	11 (8.6%)	0 (0.0%)	**35 (12.3%)**
Unknown	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (33.3%)	**1 (5.9%)**
Total (%)	**46 (4.0%)**	**228 (7.8%)**	**248 (9.0%)**	**177 (6.9%)**	**95 (6.6%)**	**794 (7.3%)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

[2] - Cell frequency divided by the total number of inmates in that gender group and region having an Initial or Ongoing Non-significant Assessment.

[3] - Federally incarcerated females in Pacific region are generally kept in provincial institutions and there were no females in Pacific region included in Table 5.7.

5.I.E. BURDEN OF TB IN CSC: SCREENING FOR ACTIVE TB DISEASE, INMATES – 2001

i. Comorbidity and Risk Factors for Progression to Active TB

Including Yes, No, and Unknown as valid response choices, all 12,727 records had data on medical comorbidities or other risk factors. The distribution of the responses is shown according to TST outcome and assessment type in Table 5.8.

Eighty-six percent did not report any medical comorbidities or risk factors. Of the 1,736 assessments with at least one comorbidity/risk factor reported, injection drug use (n=1,254) was by far the leading risk identified (see Table 5.8). The next was injecting steroids (n=219), followed by HIV infection (n=187), and previous contact with an active TB case (n=148). Of the inmates reporting a risk factor, 97 (5.6%) reported multiple risks.

Table 5.8: Reported Comorbidity and Risk Factors[1] by TST Result – Inmates, 2001

TEST TYPE / RISK FACTOR	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=794	n=19	n=1,845	N=2,658	n=8,189	n=1,880	N=10,069	N=12,727
Diabetes	6	1	22	**29**	64	10	**74**	**103**
Hemodialysis	1	0	2	**3**	6	0	**6**	**9**
Silicosis	0	0	1	**1**	9	0	**9**	**10**
Transplant	2	0	4	**6**	5	4	**9**	**15**
Injection Drug User	107	3	143	**253**	786	215	**1,001**	**1,254**
Lymphoma	0	0	3	**3**	13	4	**17**	**20**
HIV/AIDS	12	0	24	**36**	117	34	**151**	**187**
Chemotherapy	3	0	5	**8**	9	2	**11**	**19**
Inject Steroids	16	0	19	**35**	154	30	**184**	**219**
TB Case Contact	38	2	35	**75**	61	12	**73**	**148**
TOTAL	**185**	**6**	**258**	**449**	**1,224**	**311**	**1,535**	**1,984**

[1] - Numbers in the table reflect those answering 'Yes' to the presence of the condition/risk factor – individuals may report multiple risk factors.

[2] - Includes newly significant TST results from Initial and Ongoing Non-significant Assessments.

[3] - Previously significant TST accepted on Initial Assessment – see Table 5.1.

[4] - 'Other' result includes medically contraindicated, invalid TST-1 (single test), invalid TST-2 (second of two-step TST), refused, and blank/unknown.

ii. Symptoms Suggestive of Active TB Disease

Of the 12,727 assessments conducted in 2001, 99.7% reported a valid symptom screen (that is, they had a response of Yes, No, or Unknown). Of these, 18% (n=2,330) reported at least one symptom potentially consistent with active TB disease. Forty-seven percent reported more than one symptom.

The most common symptom (see Table 5.9) self-reported by inmates was fatigue (n=917), followed by chest pain (n=748), cough productive of sputum (n=625), loss of appetite (n=583), and night sweats (n=542). A small number of inmates (n=28) reported a constellation of fatigue, fever, nightsweats, and cough productive of sputum.

Table 5.9: Self Reported Symptoms[1] by TST Result - Inmates, 2001

TEST TYPE / SYMPTOM	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=794	n=19	n=1,845	N=2,658	n=8,189	n=1,880	N=10,069	N=12,727
Fatigue	62	0	192	**254**	572	91	**663**	**917**
Fever	11	0	28	**39**	95	12	**107**	**146**
Weight Loss	46	0	81	**127**	341	48	**389**	**516**
Loss of Appetite	42	1	100	**143**	373	67	**440**	**583**
Night Sweats	42	0	99	**141**	339	62	**401**	**542**
Hoarseness	31	0	78	**109**	257	35	**292**	**401**
Coughing Sputum	51	1	134	**186**	393	46	**439**	**625**
Coughing Blood	14	0	14	**28**	91	17	**108**	**136**
Chest Pains	48	2	153	**203**	471	74	**545**	**748**
TOTAL	**347**	**4**	**879**	**1,230**	**2,932**	**452**	**3,384**	**4,614**

[1] - Numbers in the table reflect those answering 'Yes' to the presence of the condition/risk factor – individuals may report multiple symptoms.

[2] - Includes newly significant TST results from Initial and Ongoing Non-significant Assessments.

[3] - Previously significant TST accepted on Initial Assessment – see Table 5.1.

[4] - 'Other' result includes medically contraindicated, invalid TST-1 (single test), invalid TST-2 (second of two-step TST), refused, and blank/unknown.

iii. Active Cases of TB Disease

Active TB cases were not captured by the CSC TBTS surveillance system in 2001. There were no active TB cases reported within CSC in 2001.

5.I.F. DEMOGRAPHIC CHARACTERISTICS OF LTBI AMONG INMATES – 2001

The burden of latent TB infection among inmates in CSC is estimated by combining the newly discovered TST-significant cases with those inmates with previously known significant TST results. This provides a 'snapshot' of inmates with LTBI in a given year.

i. LTBI Among Inmates by Age – 2001

LTBI among inmates categorized by age category and region is shown in Table 5.10. The proportion of inmates with LTBI increases with age, from 8.3% among the 17-19 age group, to 32.0% among those less than 59 years old. Among inmates over 60, 33.0% were infected with TB. Overall, 21.1% of inmates who were screened in 2001 were infected with TB.

Inspection of Table 5.10 shows regional variation. Overall, Quebec had the highest proportion significant with 24.2% (n=858), followed by Prairie at 22.7% (n=692). Atlantic region had the lowest overall proportion estimated LTBI at 11.1% (n=136).

Table 5.10: LTBI[1] by Age Group and Region – Inmates, 2001

FREQ (%)[2] / AGE GROUP	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Missing	1 (50.0%)	0 (0.0%)	0 (0.0%)	1 (50.0%)	0 (0.0%)	**2 (40.0%)**
17-19	2 (5.7%)	2 (4.5%)	1 (2.7%)	11 (14.5%)	2 (8.3%)	**18 (8.3%)**
20-29	13 (3.0%)	88 (10.3%)	149 (16.6%)	153 (13.0%)	47 (11.1%)	**450 (11.9%)**
30-39	37 (10.2%)	300 (22.1%)	241 (20.2%)	261 (26.6%)	104 (18.0%)	**943 (21.1%)**
40-49	47 (18.4%)	297 (34.2%)	181 (27.0%)	181 (33.0%)	80 (22.4%)	**786 (29.1%)**
50-59	25 (25.0%)	137 (42.0%)	73 (26.4%)	66 (33.0%)	46 (25.3%)	**347 (32.0%)**
60 +	11 (27.5%)	34 (38.2%)	28 (32.6%)	19 (32.2%)	20 (30.8%)	**112 (33.0%)**
TOTAL (%)	**136 (11.1%)**	**858 (24.2%)**	**673 (21.3%)**	**692 (22.7%)**	**299 (18.3%)**	**2,658 (21.1%)**

[1] - Includes all inmates with a significant TST result either newly diagnosed on Initial and Ongoing Non-significant Assessments, Previous Significant on Initial Assessment, and Ongoing Significant Assessments.

[2] - Frequency calculated by dividing the number significant by the number of inmates participating in CSC TBTS screening per age group and region.

ii. LTBI Among Inmates by Origin 2001

The burden of LTBI among inmates in 2001, categorized by origin (see Table 5.11) was highest among those foreign born at 49.3%, followed by those of Aboriginal origin (29.2%), and Canadian born (11.6%). Of those of unknown origin, 20% were found to have LTBI.

LTBI by origin showed regional variation. Quebec region had the highest proportion of LTBI inmates for Canadian born at 15.4%. Among Aboriginal inmates, the highest rate was seen in Prairie region at 32.3%; among foreign-born inmates, the highest rate was found in Ontario at more than one-half (57.0%). Of those of unknown origin, the highest rate was in Quebec region at 25.6%.

Table 5.11: LTBI[1] by Origin and Region – Inmates, 2001

FREQ (%)[2] / ORIGIN	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Canadian Born	29 (9.4%)	104 (15.4%)	70 (12.0%)	29 (8.5%)	17 (7.3%)	**249 (11.6%)**
Aboriginal	21 (28.0%)	56 (27.7%)	67 (23.8%)	402 (32.3%)	88 (23.7%)	**634 (29.2%)**
Foreign Born	5 (31.3%)	37 (44.0%)	102 (57.0%)	28 (38.9%)	30 (50.8%)	**202 (49.3%)**
Unknown	81 (9.8%)	661 (25.6%)	434 (20.5%)	233 (16.8%)	164 (17.0%)	**1,573 (20.0%)**
TOTAL (%)	**136 (11.1%)**	**858 (24.2%)**	**673 (21.3%)**	**692 (22.7%)**	**299 (18.3%)**	**2,658 (21.1%)**

1 - Includes all inmates with a significant TST result either newly diagnosed on Initial and Ongoing Non-significant Assessments, Previous Significant on Initial Assessment, and Ongoing Significant Assessments.

2 - Frequency calculated by dividing the number significant by the number of inmates participating in CSC TBTS screening per origin group and region.

iii. LTBI Among Inmates by Gender – 2001

The distribution of LTBI by gender according to region for inmates participating in TB screening in 2001 is shown in Table 5.12. The proportion found to have LTBI was slightly higher for males compared to females (21.1% vs 19.7% respectively). Among those in whom gender was unknown, 15.8% were found to have LTBI.

Regionally, Quebec region had the highest proportion LTBI among males (24.3%), followed by Prairie (23.0%). Atlantic region had the highest LTBI rate among females at 50%, followed by Ontario at 20.5%.

Table 5.12: LTBI[1] by Gender and Region – Inmates, 2001

FREQ (%)[2] / GENDER	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Male	130 (10.8%)	842 (24.3%)	657 (21.3%)	667 (23.0%)	298 (18.3%)	**2,594 (21.1%)**
Female	6 (50.0%)	15 (18.5%)	15 (20.5%)	25 (17.7%)	0 (0.0%)	**61 (19.7%)**
Unknown	0 (0.0%)	1 (50.0%)	1 (12.5%)	0 (0.0%)	1 (33.3%)	**3 (15.8%)**
TOTAL (%)	**136 (11.1%)**	**858 (24.2%)**	**673 (21.3%)**	**692 (22.7%)**	**299 (18.3%)**	**2,658 (21.1%)**

1 - Includes all inmates with a significant TST result either newly diagnosed on Initial and Ongoing Non-significant Assessments, Previous Significant on Initial Assessment, and Ongoing Significant Assessments.

2 - Frequency calculated by dividing the number significant by the number of inmates participating in CSC TBTS screening per gender and region.

5.II. STAFF

5.II.A. DEMOGRAPHICS

The number of staff working for CSC across Canada during 2001 was 14,876 (8,645 males, 6,231 females). The average age of staff in the CSC TBTS in 2001 was 39.8 years (range 18 to 75) and 80% are between 20 and 49 years of age. Although 24% of the records were missing gender information, of those with known gender, 54% of staff were male.

5.II.B. PARTICIPATION IN CSC TBTS SCREENING ACTIVITIES

A total of 3,326 assessments were performed for 3,287 individual staff members in 2001. After selecting one unique record per person per assessment type (see Methods section), a total of 3,297 assessments are included in the analysis. This gives a participation rate of 3,287/14,876, a participation rate of 22.1%.[14] Of the staff assessments included in the analysis, 756 (23%) were Initial Assessments (which involves a two-step TST), 2,345 (71%) were Ongoing Non-significant Assessments, and 196 (6%) were staff with previously significant TST followed up for Ongoing Significant Assessments. There were 22 staff members who received these assessments as part of contact investigations for known or suspected cases of active TB disease.

5.II.C. RESULTS OF SCREENING FOR TB, STAFF – 2001

i. LTBI on Initial Assessment Among Staff

There were 757 Initial Assessments done in 2001; after applying the hierarchical methodology and retaining only one assessment per person, 756 assessments remained in the analysis (see Table 5.13).

Overall, 8.3% of staff (n=44) undergoing initial two-step TB screening in 2001 were found to be TST significant (see Table 5.13 and Figure 5.3). This finding shows regional variation with Quebec region reporting the highest significant TST rate among staff at 19.5% (n=17), followed by Prairie region at 11.2% (n=13) and Pacific region at 6.5% (n=7).

Table 5.13: Reported TST Results on Initial Assessment by Region – Staff, 2001

FREQ (%) / TST RESULT	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	UNKNOWN	CANADA
Tested Significant	1 (1.6%)	17 (19.5%)	6 (6.1%)	13 (11.2%)	7 (6.5%)	0 (0.0%)	**44 (8.3%)**
Tested Non-significant	61 (98.4%)	70 (80.5%)	92 (93.9%)	103 (88.8%)	100 (93.5%)	59 (100.0%)	**485 (91.7%)**
Previous Significant	0	0	1	0	0	0	**1**
Contraindicated[1]	0	0	0	0	0	1	**1**
Invalid TST-1[2]	5	0	1	0	3	2	**11**
Invalid TST-2[3]	15	18	27	60	55	13	**188**
Refused TST	0	0	0	0	0	1	**1**
Blank / Unknown	1	4	2	7	7	4	**25**
TOTAL (%)	**83 (11.0%)**	**109 (14.4%)**	**129 (17.1%)**	**183 (24.2%)**	**172 (22.8%)**	**80 (10.6%)**	**756**

1 - Medically contraindicated (i.e., tuberculin allergy, etc.).

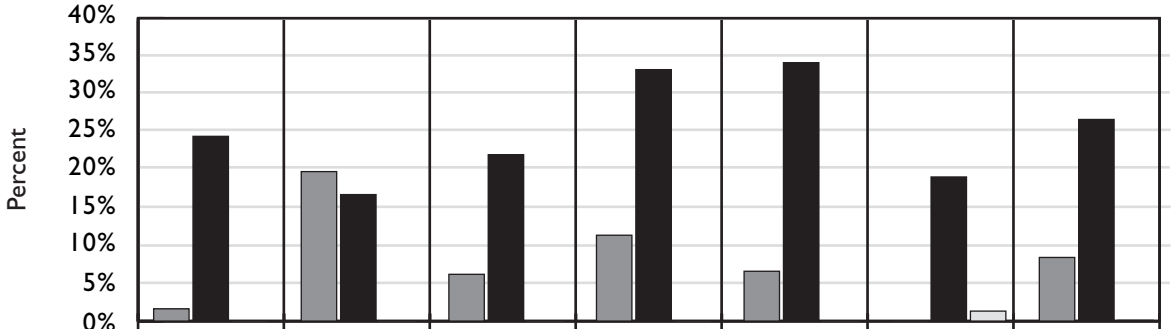
2 - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

3 - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of the 7 to 365 days of the first tuberculin administration.

14 The staff total includes those working in penitentiaries, parole offices, and at Regional And National Headquarters.

Inspection of Table 5.13 indicates that of all Initial Assessments from staff in 2001, 26.3% (n=199) were ultimately invalid due to a number of reasons. Of these, 188 were invalidated due to administrative problems associated with the administration of the second TST of the two-step baseline TST. Of these, 179 (94%) were incomplete two-steps (i.e., the second step was never conducted). Overall, the proportion of test results deemed invalid for any reason showed strong regional variation; it was the highest in Prairie region at 33.1%, followed by Pacific region at 30.5%, Atlantic region at 24.1% and Ontario at 21.7% (see Figure 5.3).

Figure 5.3: Selected TST Outcome Results on Initial Assessment – Staff, 2001



	Atlantic	Quebec	Ontario	Prairie	Pacific	Blank	Canada
Positivity Rate	1.6%	19.5%	6.11%	1.2%	6.5%	0.0%	8.3%
Invalid Rate	24.1%	16.5%	21.7%	32.8%	33.7%	18.8%	26.3%
Refusal Rate	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.1%

ii. Routine Screening – Newly Significant TST Among Ongoing Non-significant Assessments

A total of 2,371 assessments on staff members with a Previous Non-significant result ('Ongoing Non-significant') were performed in 2001. Of these, 2,345 unique assessments were selected as per the hierarchical methodology (see Methods section).

Nationally, 0.4% (n=7) of staff undergoing annual screening for TB were found on testing to be TST significant. The proportion of newly significant TST results was highest in Prairie region at 1.1% (n=5), followed by Pacific region at 0.3% (n=1) and Ontario region at 0.1% (n=1). These rates are based on small frequencies and should be interpreted with some caution.

Nationally, the proportion of staff members with a Previous Non-significant TST result who refused TST testing on their annual assessment was 0.1% (n=2; see Table 5.14 and Figure 5.4).

The proportion of all assessments classified as invalid was 6.1% (n=143). This showed strong regional variation from Atlantic region at 18.4%, to 5.0% in Ontario, and 1.8% in Prairie region (see Figure 5.4).

Table 5.14: Reported TST Results on Ongoing Non-significant Assessment by Region – Staff, 2001

TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	UNKNOWN	CANADA
Tested Significant	0 (0.0%)	0 (0.0%)	1 (0.1%)	5 (1.1%)	1 (0.3%)	0 (0%)	**7 (0.4%)**
Tested Non-significant	376 (100.0%)	99 (100.0%)	670 (99.9%)	467 (98.9%)	304 (99.7%)	20 (100.0%)	**1,936 (99.6%)**
Contraindicated[1]	0	0	1	2	0	1	**4**
Invalid TST-1[2]	87	0	40	10	6	0	**143**
Refused TST	0	0	1	0	1	0	**2**
Blank / Unknown	9	4	82	70	85	3	**253**
TOTAL (%)	**472 (20.0%)**	**103 (4.4%)**	**795 (34.0%)**	**554 (23.5%)**	**397 (17.1%)**	**24 (1.0%)**	**2,345**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

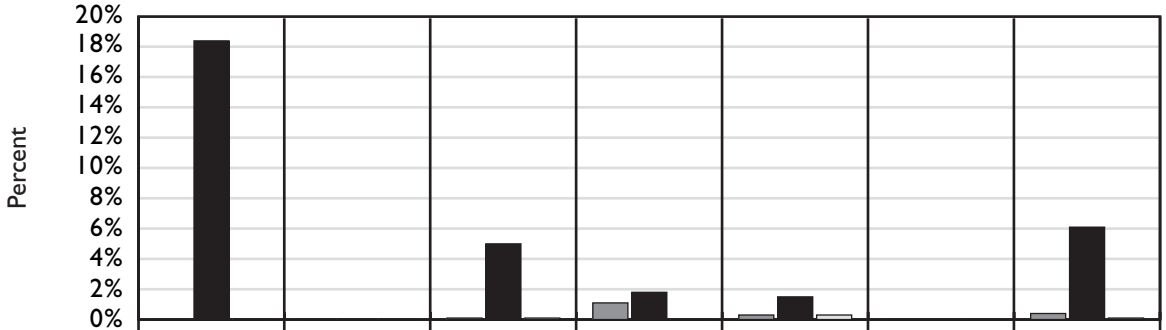
[2] - An invalid TST includes a 'No show' for the read portion of the test, or a non-significant read after 72 hours.

Examination of the 'converters' (see Glossary) provides an estimate of the conversion rate among staff working in federal correctional facilities. By definition, a converter must have a previously documented Non-significant Assessment. Of the seven staff with a significant TST result in 2001 on Ongoing Non-significant Assessment, five had a previous documented Non-significant Assessment in the database. However, one had an increase in induration of <10 mm on a previous result of 5-9 mm; therefore, this record cannot be considered a conversion.

Of the four converters, three were from Prairie region, and one was from Ontario region. Gender and origin were unknown for all four records. Apart from one report of nightsweats, none of the documented converters among staff reported any risk factors for progression to active TB disease or symptoms potentially consistent with active TB.

Of the 2,345 staff having an Ongoing Non-significant Assessment conducted in 2001, a total of 1,706 had a valid TST result in 2001 (see Table 5.14); of these, there were 1,413 records in the CSC TBTS data of a Previous Non-significant TST, whether on an Initial or an ongoing non-significant test. Therefore, the calculated conversion rate is (7-3)/1,413 or 0.28%.

Figure 5.4: Selected TST Outcome Results on Ongoing Non-significant Assessments – Staff, 2001



	Atlantic	Quebec	Ontario	Prairie	Pacific	Blank	Canada
Positivity Rate	0.0%	0.0%	0.1%	1.1%	0.3%	0.0%	0.4%
Invalid Rate	18.4%	0.0%	5%	1.8%	1.5%	0.0%	6.1%
Refusal Rate	0.0%	0.0%	0.1%	0.0%	0.3%	0.0%	0.1%

iii. Medical Surveillance of Known LTBI – Ongoing Significant Screening

A total of 198 Ongoing Positive Assessments were conducted among staff in 2001; of these, 196 unique assessments per staff member were included for analysis. Staff with previously significant TST result (i.e., ongoing significant annual screenings) are assessed for medical and risk factors that may place them at higher risk for developing active TB, as well as for symptoms that may be indicative of active disease (e.g., weight loss, persistent cough). Staff requiring medical follow-up are referred to their own personal physician. The results of risk and symptom screening for the 196 staff are discussed below (see section 5.II.E).

iv. TB Infectiousness – Results of Contact Screening

A total of 22 staff members were reported as contact investigations (see Table 5.15). None were duplicate records for the same individual. Of the 22, 21 were from Pacific region. None were significant, and six (27%) were invalid.

Table 5.15: Reported TST Results on Contact Tracing by Region – Staff, 2001

TST RESULT / FREQ (%)	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
Tested Significant	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
Tested Non-significant	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (100.0%)	13 (100.0%)	**14 (100.0%)**
Previous Significant	0	0	0	0	1	**1**
Contraindicated[1]	0	0	0	0	0	**0**
Invalid TST-1[2]	0	0	0	0	1	**1**
Invalid TST-2[3]	0	0	0	0	5	**5**
Refused TST	0	0	0	0	0	**0**
Blank / Unknown	0	0	0	0	1	**1**
TOTAL (%)	**0 (0.0%)**	**0 (0.0%)**	**0 (0.0%)**	**1 (4.5%)**	**21 (0.0%)**	**22**

[1] - Medically contraindicated (i.e., tuberculin allergy, etc.).

[2] - An invalid first TST includes a 'No show' for the read portion of the test or a non-significant read after 72 hours.

[3] - An invalid second TST includes a 'No show' for the read portion of the test, a non-significant read after 72 hours, a second test not done, or a test administered outside of the 7 to 365 days of the first tuberculin administration.

5.II.D. DEMOGRAPHIC CHARACTERISTICS OF NEWLY SIGNIFICANT TST STAFF – 2001

i. Age

Overall, the mean age of staff with a newly significant TST result on Initial or Ongoing Non-significant test (n=51) was slightly higher than staff members with other TST results, but this did not reach statistical significance (Table 5.16). The low number of TST-significant staff in some regions results in statistically unstable means. Table 5.17 shows the distribution and percentage of newly significant staff by region and age category.

Table 5.16: Mean Age of Newly Significant TST[1] and Other Staff by Region, 2001

MEAN AGE (YRS) (RANGE)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Newly TST Significant	38 (–)	43.5 (34-51)	40.0 (31-51)	40.3 (32-49)	34.3 (24-41)	– (–)	**40.4 (31-50)**
Other[3]	40.8 (34-48)	41.2 (34-48)	39.6 (32-47)	38.7 (30-46)	38.8 (29-48)	34.7 (26-41)	**39.4 (31-47)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

[2] - Interquartile range 25th and 75th percentiles.

[3] - Population of staff undergoing Initial or Ongoing Non-significant TST EXCLUDING those with a significant TST result.

Table 5.17: Newly Significant TST[1] by Age Group and Region – Staff, 2001

AGE GROUP / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
17-19	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
20-29	0 (0.0%)	3 (11.1%)	0 (0.0%)	4 (2.4%)	3 (1.9%)	0 (0.0%)	**10 (1.6%)**
30-39	1 (0.7%)	2 (3.4%)	4 (1.3%)	5 (2.2%)	3 (2.1%)	0 (0.0%)	**15 (1.6%)**
40-49	0 (0.0%)	5 (6.0%)	1 (0.4%)	5 (2.5%)	1 (0.7%)	0 (0.0%)	**12 (1.3%)**
50-59	0 (0.0%)	7 (17.5%)	2 (1.3%)	4 (3.7%)	1 (1.0%)	0 (0.0%)	**14 (2.7%)**
60 +	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
TOTAL (%)	**1 (0.2%)**	**17 (8.0%)**	**7 (0.8%)**	**18 (2.4%)**	**8 (1.4%)**	**0 (0.0%)**	**51 (1.6%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

2 - Frequency calculated by dividing the number of newly significant by the number of staff participating in CSC TB screening having an Initial or Ongoing Non-significant Assessment per age group and region.

ii. Origin

Data on the country of birth and Aboriginal status are requested on the initial TB screening assessment; however, for 76% of these, data were missing. Of the staff with a newly significant TST who reported this variable, those of foreign birth had the highest rate of significant TST results (19.2%), followed by Aboriginals (6.8%), and Canadian born (4.4%) (see Table 5.18). Among those of unknown origin, 0.4% were newly TST positive. Caution should be taken in interpreting these rates as they are based on small numbers and may be statistically unstable.

Table 5.18: Newly Significant TST[1] by Origin and Region – Staff 2001

ORIGIN / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Canadian Born	0 (0.0%)	14 (13.5%)	2 (2.1%)	6 (4.5%)	5 (3.7%)	0 (0.0%)	**27 (4.4%)**
Aboriginal	0 (0.0%)	1 (50.0%)	0 (0.0%)	4 (9.3%)	0 (0.0%)	0 (0.0%)	**5 (6.8%)**
Foreign Born	0 (0.0%)	2 (66.7%)	4 (23.5%)	2 (25.0%)	2 (11.1%)	0 (0.0%)	**10 (19.2%)**
Unknown	1 (0.2%)	0 (0.0%)	1 (0.1%)	6 (1.1%)	1 (0.2%)	0 (0.0%)	**9 (0.4%)**
Total (%)	**1 (0.2%)**	**17 (8.0%)**	**7 (0.8%)**	**18 (2.4%)**	**8 (1.4%)**	**0 (0.0%)**	**51 (1.6%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

2 - Frequency calculated by dividing the number of newly significant by the number of staff participating in CSC TB screening having an Initial or Ongoing Non-significant Assessment per origin category and region.

iii. Gender

Data on gender are requested of staff undergoing Initial and Ongoing Negative Assessments. Gender was unknown for 24% of the records. Of those providing gender data, a slightly higher proportion of males (2.3%) were newly TST significant, versus females (1.2%). Of those without gender data, 1.2% were newly TST significant.

Table 5.19: Newly Significant TST[1] by Gender and Region – Staff, 2001

GENDER / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Male	0 (0.0%)	12 (11.1%)	5 (1.4%)	7 (2.3%)	5 (2.0%)	0 (0.0%)	**29 (2.3%)**
Female	1 (0.4%)	5 (5.4%)	0 (0.0%)	6 (2.6%)	1 (0.5%)	0 (0.0%)	**13 (1.2%)**
Unknown	0 (0.0%)	0 (0.0%)	2 (0.7%)	5 (2.6%)	2 (1.5%)	0 (0.0%)	**9 (1.2%)**
Total (%)	**1 (0.2%)**	**17 (8.0%)**	**7 (0.8%)**	**18 (2.4%)**	**8 (1.4%)**	**0 (0.0%)**	**51 (1.6%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments.

2 - Frequency calculated by dividing the number of newly significant by the number of staff participating in CSC TB screening having an Initial or Ongoing Non significant Assessment per gender and region.

5.II.E. BURDEN OF TB IN CSC: SCREENING FOR ACTIVE TB DISEASE, STAFF – 2001

i. Comorbidity and Risk Factors for Progression to Active TB

Response to questions about risk factors among staff during assessments was 99% (i.e., a response of 'Yes,' 'No,' or 'Unknown' was provided). However, the majority of those with a valid response did not report any risk factors – only 3.5% (n=115) reported one or more risks. The distribution of risks among staff is shown in Table 5.20.

The most frequently reported risk factors for staff were contact with an active case (n=45), followed by inject steroids (n=43), diabetes (n=22), and HIV/AIDS (n=20).

Table 5.20: Reported Comorbidity and Risk Factors[1] by TST Result – Staff, 2001

TEST TYPE / RISK FACTOR	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=51	n=1	n=196	N=248	n=2,421	N=628	N=3,049	N=3,297
Diabetes	0	0	2	**2**	17	3	**20**	**22**
Hemodialysis	0	0	1	**1**	0	0	**0**	**1**
Silicosis	0	0	0	**0**	0	0	**0**	**0**
Transplant	0	0	0	**0**	4	0	**4**	**4**
Injection Drug User	0	0	5	**5**	12	0	**12**	**17**
Lymphoma	0	0	1	**1**	5	0	**5**	**6**
HIV/AIDS	0	0	7	**7**	9	4	**13**	**20**
Chemotherapy	0	0	1	**1**	6	4	**10**	**11**
Inject Steroids	0	0	4	**4**	28	11	**39**	**43**
TB Case Contact	1	0	5	**6**	26	19	**45**	**51**
TOTAL	**1**	**0**	**26**	**27**	**107**	**41**	**148**	**175**

[1] - Numbers in the table reflect those answering 'Yes' to the presence of the condition/risk factor.

[2] - Tested significant on Initial or Ongoing Non-significant Assessments.

[3] - Accepted Previous Significant TST on Initial Assessment – see Table 5.13.

[4] - 'Other' result includes Previous Significant TST, medically contraindicated, invalid TST-1, invalid TST-2, refused, and blank/unknown.

ii. Symptoms Suggestive of Active TB Disease

Symptom screening among staff in 2001 was 99% (i.e., had a 'valid' response of 'Yes,' 'No,' or 'Unknown'). Of these, the majority (92%) reported no symptoms. The distribution of reported symptoms are shown in Table 5.21.

The most common self-reported symptom was fatigue (n=99), followed by cough productive of sputum (n=87), hoarseness (n=77), and nightsweats (n=55). There was one staff who reported a constellation of fatigue, fever, nightsweats, and cough productive of sputum.

Table 5.21: Reported Symptom[1] by TST Result – Staff, 2001

TEST TYPE / SYMPTOM	SIGNIFICANT TST				NON-SIGNIFICANT TST			TOTAL
	NEWLY SIGNIFICANT[2]	PREVIOUS SIGNIFICANT[3]	ONGOING SIGNIFICANT	SUB-TOTAL	NON-SIGNIFICANT	OTHER[4]	SUB-TOTAL	
	n=51	n=1	n=196	N=248	n=2,421	N=628	N=3,049	N=3,297
Fatigue	1	0	16	**17**	65	17	**82**	**99**
Fever	0	0	0	**0**	4	1	**5**	**5**
Weight Loss	0	0	3	**3**	13	2	**15**	**18**
Loss of Appetite	0	0	2	**2**	14	3	**17**	**19**
Night Sweats	4	0	8	**12**	32	11	**43**	**55**
Hoarseness	2	0	5	**7**	62	8	**70**	**77**
Coughing Sputum	3	0	7	**10**	62	15	**77**	**87**
Coughing Blood	0	0	0	**0**	4	4	**8**	**8**
Chest Pains	0	0	5	**5**	35	12	**47**	**52**
TOTAL	**10**	**0**	**46**	**56**	**291**	**73**	**364**	**420**

1 - Numbers in the table reflect those answering 'Yes' to the presence of the symptom – individuals may report multiple symptoms.

2 - Includes significant TST results from Initial and Ongoing Non-significant Assessments.

3 - Accepted Previous Significant TST on Initial Assessment – see Table 5.13.

4 - 'Other' result includes Previous Significant TST, medically contraindicated, invalid TST-1, invalid TST-2, refused, and blank/unknown.

iii. Active Cases of TB Disease

Cases of active TB disease among CSC staff are not captured by the CSC TBTS surveillance system.

5.II.F. DEMOGRAPHIC CHARACTERISTICS OF LTBI AMONG STAFF – 2001

The burden of LTBI among staff in CSC was estimated by combining the newly discovered TST-significant cases with those staff previously known to be TST significant (i.e., previously significant on Initial Assessment and Ongoing Significant). This provides a 'snapshot' of all prevalent TST-significant staff in a given year.

i. LTBI Among Staff by Age Group – 2001

LTBI among staff categorized by age category and region is shown in Table 5.22. The proportion of staff with a significant TST generally increases with age. For staff 20 years of age or older, the proportion TST significant increases from 3.6% to 12.1% in those under 60. Among staff over 60, 10.0% were infected with TB.

Overall, 7.7% (n=248) of staff who were screened for TB in 2001 had a significant TST result and were considered infected with TB. Inspection of Table 5.22 shows regional variation; the highest rate was seen in Prairie region (12.3%), followed by Pacific (12.1%). The lowest rate was seen in Atlantic region (3.2%).

Table 5.22: LTBI[1] by Age Group and Region – Staff, 2001

AGE GROUP / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Missing	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (16.7%)	0 (0.0%)	**2 (5.6%)**
17-19	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	**0 (0.0%)**
20-29	1 (1.2%)	3 (11.1%)	3 (1.9%)	7 (4.2%)	7 (4.4%)	0 (0.0%)	**21 (3.6%)**
30-39	4 (2.6%)	2 (3.4%)	8 (2.6%)	17 (7.0%)	14 (9.2%)	1 (2.9%)	**46 (4.9%)**
40-49	5 (2.4%)	5 (6.0%)	12 (4.1%)	55 (22.0%)	22 (13.4%)	0 (0.0%)	**99 (10.3%)**
50-59	8 (7.2%)	7 (17.5%)	8 (5.0%)	20 (16.0%)	29 (22.3%)	2 (14.3%)	**74 (12.1%)**
60 +	0 (0.0%)	0 (0.0%)	1 (7.7%)	2 (11.8%)	3 (15.8%)	0 (0.0%)	**6 (10.0%)**
TOTAL (%)	**18 (3.2%)**	**17 (8.0%)**	**32 (3.4%)**	**101 (12.3%)**	**77 (12.1%)**	**3 (2.8%)**	**248 (7.5%)**

[1] - Includes newly diagnosed significant TST result on either Initial or Ongoing Non-significant Assessments, plus all staff with an Ongoing Significant Assessment in 2001.

[2] - Frequency calculated by dividing the number TST significant by the number of staff participating in CSC TBTS screening per age group and region.

ii. LTBI Among Staff by Origin – 2001

The burden of LTBI among staff in 2001, categorized by origin (see Table 5.23) was highest among those foreign born at 21.2%, followed by those of Aboriginal origin (6.8%), and Canadian born (4.4%). Of those of unknown origin, 8.0% were found to have LTBI.

LTBI by origin showed regional variation. Among Canadian born, Quebec region had the highest proportion at 13.5%; among Aboriginal staff, the highest proportion LTBI was in Quebec at 50%, although this was based on one case; Pacific region had a rate of 9.3%; of those foreign born, the highest rate was found in Quebec (66.7%) followed by Ontario at 29.4%. Of those of unknown origin, the highest rate was in Pacific region at 14.8%.

Table 5.23: LTBI[1] by Origin and Region – Staff, 2001

ORIGIN / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Canadian Born	0 (0.0%)	14 (13.5%)	2 (2.1%)	6 (4.5%)	5 (3.7%)	0 (0.0%)	**27 (4.4%)**
Aboriginal	0 (0.0%)	1 (50.0%)	0 (0.0%)	4 (9.3%)	0 (0.0%)	0 (0.0%)	**5 (6.8%)**
Foreign Born (21.2%)	0 (0.0%)	2 (66.7%)	5 (29.4%)	2 (25.0%)	2 (11.1%)	0 (0.0%)	**11 (21.2%)**
Unknown	18 (3.6%)	0 (0.0%)	25 (3.0%)	89 (14.0%)	70 (14.8%)	3 (11.1%)	**205 (8.0%)**
Total (%)	**18 (3.2%)**	**17 (8.0%)**	**32 (3.4%)**	**101 (12.3%)**	**77 (12.1%)**	**3 (2.8%)**	**248 (7.5%)**

[1] - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments plus all staff with an Ongoing Significant Assessment in 2001.

[2] - Frequency calculated by dividing the number TST significant by the number of staff participating in CSC TBTS screening per origin category and region.

iii. LTBI Among Staff by Gender – 2001

The distribution of LTBI by gender according to region for staff participating in TB screening in 2001 is shown in Table 5.24. The proportion of female and male staff found to be LTBI was essentially the same, at 7.0% and 6.7% respectively. Among those in whom gender was unknown, 9.7% were found to have LTBI.

Regionally, Quebec had the highest proportion with LTBI among males (11.1%) followed by Pacific (10.8%). Pacific had the highest proportion of females with LTBI at 15.1%.

Table 5.24: LTBI[1] by Gender and Region – Staff, 2001

GENDER / FREQ (%)[2]	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	BLANK	CANADA
Male	4 (1.9%)	12 (11.1%)	15 (4.0%)	30 (9.0%)	29 (10.8%)	0 (0.0%)	**90 (6.7%)**
Female	8 (3.3%)	5 (5.4%)	11 (3.7%)	29 (11.3%)	24 (11.4%)	3 (6.5%)	**80 (7.0%)**
Unknown	6 (5.0%)	0 (0.0%)	6 (2.2%)	42 (18.3%)	24 (15.1%)	0 (0.0%)	**78 (9.7%)**
Total (%)	**18 (3.2%)**	**17 (8.0%)**	**32 (3.4%)**	**101 (12.3%)**	**77 (12.1%)**	**3 (2.8%)**	**248 (7.5%)**

1 - Includes newly diagnosed significant TST result on both Initial and Ongoing Non-significant Assessments plus all staff with an Ongoing Significant Assessment in 2001.

2 - Frequency calculated by dividing the number TST significant by the number of staff participating in CSC TBTS screening per gender category and region.

SECTION C

PART 6: DISCUSSION

i. Inmates

The Correctional Service of Canada Tuberculosis Tracking System (CSC TBTS) database provides a comprehensive overview of latent TB infection (LTBI) for inmates within federal correctional facilities across Canada. The annual participation rate of inmates for TB screening in 1999-2001 was 77.3%, 76.0%, and 73.8% respectively. Although the participation rate is trending downwards, there is excellent representation from the entire inmate population.

The majority of inmates with a newly significant tuberculin skin test (TST) result were discovered on Initial Assessment where the TB status was previously unknown. Overall, the TST positivity rate on Initial Assessment among inmates was 17.9%, 19.2%, and 19.9% 1999-2001 respectively. These data, which represent the proportion of inmates who enter the federal system already infected with TB, are trending upwards.

The proportion of inmates testing significant for LTBI on an Ongoing Non-significant Assessment was 1.7%, 1.4%, and 2.7% 1999-2001. These data indicate a near doubling of infections detected among inmates from 2000 to 2001. However, since a number of these significant skin tests did not have a recorded previous Non-significant Assessment, they could not be considered 'conversions' based on the definition. The calculated conversion rate for 1999-2001 was estimated at 1.04%, 0.86%, and 1.9% respectively. These conversion estimates reflect the observed rise in the newly significant rate among Ongoing Non-significant Assessments for inmates in 2001.

The likelihood of having a documented prior assessment in the TBTS will increase over the observation time period since the inauguration of the surveillance system; over time, participants will have a longer period of observation corresponding to a higher probability of 'conversion.' This may partly explain the observed increase in the conversion rate from 1999 to 2001. Nonetheless, these findings emphasize the importance of adequate baseline documentation on TST status for the proper interpretation of TB infection among inmates. It is of interest to note that the observed conversion rate among Canadian inmates is higher than that in a report from Maryland (0.63%), where the reported active TB case rates are similar (MacIntyre et al., 1997).

These findings suggest that the majority of TB diagnosed within CSC is a pre-existing condition among new admissions. However it does not diminish the ongoing requirement for rigorous TB prevention and control within Canadian federal penitentiaries. The overall proportion of inmates estimated to be infected with tuberculosis based on having a significant TST result was 21.9%, 20.5%, and 21.1% in 1999-2001.

The prevalence of TB infection on admission compares with other reported rates among incarcerated populations. A 1992 study found 18% of state inmates in Maryland to be TST significant (MacIntyre et al., 1997), while a 1993 study among state inmates in Massachusetts found 10.8% TST significant (Johnsen et al., 1995). The overall TST significant prevalence of 21.9% of inmates in Canadian federal penitentiaries compares with other rates reported in the literature. A study of inmates in a San Francisco jail reported LTBI rates of 31.9% and 11.5% in 1994 and 1998 respectively (Castle White et al., 2001), while a 1993 study in New York City found 38% prevalence of TST significant among inmates (Layton et al., 1997).

The number of invalid records or refusals may bias the proportion of inmates testing TST significant at admission. The proportion of records deemed invalid was 9.2%, 11.3%, and 12.9% for 1999-2001 respectively. Atlantic had the highest proportion of invalid records in 2000 at 18.8%, while in 2001 ,Atlantic and Prairie regions had invalid rates of >20.0%. The proportion of records deemed invalid was trending upwards, which may be due to testing issues or to difficulties in the application of the two-step TST process.

The rates of refusal among inmates on Initial Assessment were 3.1%, 2.0%, and 1.7% for 1999-2001 respectively. Quebec had the highest rate of refusal in all three years. However, this may be a function of the submission of paperwork for refusals

by Quebec region; the downward trend in refusals may be a function of the non-submission of records of refusal by the other regions. Note that this hypothesis may be supported by the observed downward trend in overall participation rates.

The proportion of Ongoing Non-significant Assessments deemed invalid was 1.2%, 1.4%, and 2.3% for 1999-2001 respectively. This is lower than for the Initial Assessments and may be reflective of the increasing logistical ease of administering only one TST versus the two-step TST. However, the proportion of refusals on Ongoing Non-significant Assessments was 10.8%, 11.6%, and 10.7% for 1999-2001 respectively. Inmates may be more likely to refuse testing during their incarceration. Regionally, Quebec had the highest rates of refusal at 29.6%, 31.1%, and 22.6% for 1999-2001.

The proportion of significant TST results considered converters was 42%, 49%, and 60% respectively for 1999-2001. While several records in each case were not considered converters because of indurations inconsistent with the definition of a converter (see Glossary), most of the exclusions were due to the absence of a previous record in the TBTS database. The reason for exclusion may be due to a number of reasons:

i) acceptance of a non-significant result from a provincial corrections centre or remand facility;
ii) acceptance of a self-reported non-significant result by the inmate; or
iii) a CSC-documented non-significant result not entered into the CSC TBTS database (i.e., prior to 1997).

The overall proportion of inmates with a significant TST was highest among the foreign-born (46.8%, 47.1%, 49.3%), followed by Aboriginal Canadians (28.4%, 30.5%, 29.2%), and non-Aboriginal Canadians (10.3%, 10.8%, 11.6%). Of note, however, is the large proportion of inmates in the CSC TBTS database where origin is unknown; this has the potential of influencing the observed distribution of results should there prove to be a differential bias by place of origin in the data.

The number of assessments recorded to have been part of a contact investigation fell sharply from 1999 to 2000 and 2001. The reason for this is unclear, but it may simply be administrative or logistical; clearly, without these data, the ability of TBTS to make more definitive analyses of the transmission of TB via exposure is much reduced. A data quality review is currently underway with respect to contact investigations in CSC TBTS, but the process had not been completed by the time this report went to publication.

Since an estimated 30% of active TB cases are TST negative (Long, 2000), it is important that symptom and risk be a consistent part of the TB screening process. The observed lack of symptom and risk data on Ongoing Significant Assessments in 1999 was rectified by a revision to the forms in that year.

An inmate's status for human immunodeficiency virus (HIV) was self-reported and may be underestimated should an inmate not wish to self-disclose their serostatus, or if the HIV status was unknown.[15] HIV infection may result in a false-negative TST result if the true HIV status is unknown since the TST may be based on incorrect criteria, or if there is a lack of an immune response. Since HIV infection greatly increases the risk of active disease, those HIV positive with a significant TST should be closely monitored for symptoms of active disease and should be high-priority candidates for treatment of LTBI. Additionally, HIV-positive inmates should be encouraged to have a TB test if they have not already done so (Canadian Tuberculosis Committee, 2002).

The observed active TB case rate among federally incarcerated persons declined from 29.3/100,000 in 1999, to 11.8/100,000 in 2000. There were no active TB cases reported to CSC NHQ in 2001. The case rates in Canada for 1999-2001 respectively were reported at 5.9, 5.5, and 5.5 per 100,000 respectively (Public Health Agency of Canada, 2005). Compared to international TB rates, annual TB rates among incarcerated persons in France for 1994-1995 was calculated at 215/100,000 (Hanau-Berçot et al., 2000), in Spain at 2,283/100,000 (Chaves et al., 1997), and in former-Soviet Georgia at an alarming 5,995/100,000 (Aerts et al., 2000). In the United States, TB case rates among inmates have been reported as high as 767/100,000 in New York City (Layton et al., 1997) and as low as 58/100,000 in Maryland (MacIntyre et al., 1997).

[15] Note that of the HIV-positive cases, a significant proportion also reported to be injection drug users; while this simple prevalence cross-tabulation has limits in interpretability for TB and/or HIV risk acquisition associated with IDU, it does present a clear message for harm reduction and educational programs within CSC.

ii. Staff

The participation of staff in TB screening was 28.4%, 23.1%, and 22.1% for 1999-2001 respectively. This participation was much lower than that of inmates. As a consequence, the results of staff assessments may not be representative of CSC staff that did not participate in the screening program and generalizations to the wider staff population cannot be made.

Overall, the TST positivity rate on Initial Assessment among staff was 7.5%, 10.1%, and 8.3% for 1999-2001 respectively. Although staff are offered testing for TB on hire, the Initial Assessment may not be representative of new hires per se; note that in 1999, 45 of 138 (33%) contact investigations among staff were two-step TST assessments, indicating that baseline TST status was previously unknown; this finding emphasizes the importance of establishing a known TST status on hire for staff.

The proportion of staff testing significant for LTBI on an Ongoing Non-significant Assessment was 0.7%, 0.5%, and 0.4% for 1999-2001 respectively. These data indicate a general downward trend in new TB infections detected among staff from 2000 to 2001. However, since a number of these significant skin tests did not have a recorded previous Non-significant Assessment, they could not be considered 'conversions' based on the definition. The calculated conversion rate for staff in 1999-2001 was 0.30%, 0.23%, and 0.28% respectively. The observed conversion rates among staff are lower than that reported by staff at New York state correctional facilities in 1992 at 1.9% (Steenland et al., 1997).

The refusal rate on the Initial Assessment was quite low at 0.7%, 0%, and 0.1%, although this may be a function of refusals to participate that are not recorded and submitted to National Headquarters (thereby underestimating the true refusal rate among staff). However, the proportion of invalid two-step TST was 38.2%, 27.4%, and 26.3% for 1999-2001 respectively. This finding suggests that there are logistical difficulties in administering the two-step TST. Regionally, the proportion of records that were invalid on the Initial Assessment was highest in Atlantic in 1999 (61.1%), in Prairies (36.2%) and Pacific (31.1%) in 2000, and in Prairies (32.8%) and Pacific (33.7%) in 2001.

Of the Ongoing Assessments, the proportion of assessments deemed invalid was 3.7%, 1.2%, and 6.1% for 1999-2001 respectively. This finding is reflective of the comparative ease of the single TST versus the two-step process. The refusal rate among staff participating in the TB screening program was 7.1%, 0.4%, and 0.1%. These data are trending downward and may be also a function of the non-submission of refusals to NHQ.

Without an accurate baseline, the true burden of LTBI and infectious TB risk among CSC staff may be significantly underestimated. Administrative, perceptual and logistical issues surrounding the valid completion of Initial Assessments among staff should be determined and resolved.

Overall in 1999, 11.2%, 11.5%, and 7.5% of staff involved in tuberculosis screening was found to be LTBI based on a significant TST result for 1999-2001. The observed drop in overall TST significant prevalence in 2001 is difficult to assess; given the low participation rate and the rates of invalid or refusals of ongoing TST, this may not be subject to statistical fluctuation. Also, it may be that staff members who may have been exposed are going to their own doctor for assessment rather than taking part in the CSC screening. If so, then the results presented here are underestimates for the incidence and prevalence of TB among staff. This theory may in part explain the observed lack of records in the TBTS for staff contact investigations.

Results of TST screening among correctional workers have been reported in the literature. A 1995 study among provincial correctional staff in Montreal, Quebec found an overall prevalence of 32% TST significant (Jochem et al., 1997). This result is higher than the observed overall LTBI burden among staff for 1999 (11.2%) or for Quebec region (7.3%).

iii. BCG Vaccination

Overall, the proportion of inmates with a self-report of a previous Bacille Calmette-Guérin (BCG) vaccination was 10.2%, 4.7%, and 3.9%; the proportion of staff with a self-reported BCG vaccination was 5.2%, 3.9%, and 3.6% (see Table 6.1). Up to 15% of persons receiving BCG between 2-5 years of age and up to 25% of individuals vaccinated with BCG at six years of age or older will have persistently (20-25 years later) significant TST reactions upon subsequent testing (Long, 2000).

Of note is the regional variation, where staff in Quebec region had the highest BCG coverage by far. It may be that perceptions of TB risk and immunity given a previous BCG vaccination have lead to decreased impetus for participation, in CSC TBTS screening, as evident in the higher refusal rate among staff.

Table 6.1: Self-reported BCG Vaccination Coverage of Inmates and Staff by Region

GROUP	PROPORTION SELF REPORTING PREVIOUS BCG VACCINATION					
	ATLANTIC	QUEBEC	ONTARIO	PRAIRIE	PACIFIC	CANADA
INMATES						
1999	4.8%	15.0%	3.8%	14.4%	12.3%	10.2%
2000	1.3%	8.0%	2.2%	4.9%	7.2%	4.7%
2001	1.0%	5.4%	1.7%	4.8%	5.7%	3.9%
STAFF						
1999	2.4%	28.7%	4.0%	4.2%	3.5%	5.2%
2000	0.8%	26.4%	1.0%	1.9%	3.2%	3.9%
2001	0.9%	26.4%	2.2%	1.5%	1.6%	3.6%

iv. Conclusion

The risk of progression to active TB disease is 5% in the first two years after being infected and is approximately 5% for the remainder of life (in an otherwise healthy person). Identifying persons at highest risk of progressing to active TB disease provides dual protection: the individual can be counselled and offered treatment for their TB infection, and the population within the correctional facility, benefits from the increased surveillance and prevention of future cases of active TB disease. In 1999-2001 the CSC TBTS did not capture data on the number of converters offered, accepting and completing treatment for LTBI. Treatment of LTBI in a population at high risk for progression to active TB disease is an important element of TB prevention and would be valuable data to capture in a systematic manner such as through the CSC TBTS.

Any factors that decrease TST testing of persons assessed during TB screening activities diminish the representativeness of the results of the surveillance system. Therefore, it is important to identify and attempt to remedy any barriers to participation and TST testing within the CSC TBTS. Refusals and incomplete two-step baseline TST results are potential indications of a lack of acceptance and/or barriers to obtaining TST testing results.

The prison setting houses a population at disproportionately high risk for progression to active TB disease, if infected with TB, compared to the general population. Among inmates, injection drug use was the most commonly identified risk factor. As well as being a risk factor for progression from LTBI to active TB disease, it is also a risk factor for acquiring other communicable diseases such as HIV and viral hepatitis.

Due to overcrowding, decreased rates of ventilation and the duration of incarceration of inmates, the correctional environment can facilitate the transmission of TB infection by a person with active TB disease. However, the CSC TBTS currently does not capture any epidemiological data (e.g., number of cases; site of disease; age, sex and origin of cases; number of contacts; evidence of secondary cases, etc.) on inmates or staff members diagnosed with active TB disease in federal correctional facilities. It would be very useful if these data were captured in a systematic manner within the CSC TBTS so as to assist in providing a complete picture of the potential health outcomes of TB in the federal correctional setting.

The CSC TBTS database offers an opportunity to detect transmission of TB through the monitoring of TST status of inmates and staff, but its success depends on a high rate of participation by each group.

PART 7: LIMITATIONS

The turnover of inmates within federal correctional institutions can be quite high due to transfer of inmates between facilities and regions, as well as the releases of inmates to the community. In addition, the nature of the federal reception centres in receiving inmates from provincial or other remand facilities, and housing them for short periods of time for orientation, increases the number of potential contacts to active tuberculosis (TB) cases. Inmates are potentially also in contact with provincial inmates while at court. Not only does this emphasize the vigilance with which TB screening must be done, it also makes the estimate of a population size (denominator) at any given date in time (e.g., year-end) problematic; therefore, calculation of rates (e.g., participation) can be difficult unless estimates are made as to the average inmate population and average number of annual inmate admissions as was done for this report.

This report implicitly assumes that a significant tuberculin skin test (TST) result implies latent TB infection (LTBI). However, false-positive results are known to occur, notably due to infection with environmental (atypical) mycobacteria or previous Bacille Calmette-Guérin (BCG) vaccination. In Canada, many persons born in Quebec and Newfoundland from the 1940s until the early 1980s were vaccinated and some Aboriginal children on reserves continue to be vaccinated with BCG (see Table 6.1). Therefore, some of the inmates and staff in federal correctional facilities, depending upon their age at the time of BCG vaccination, may have significant TST results because of the residual effect of BCG rather than TB infection. However, the positive predictive likelihood of a significant TST, signifying true LTBI remains high in inmates as the prevalence of active TB disease is elevated compared to the general population of Canada. For staff, the positive predictive value of the TST test is less clear.

The TST may also result in false negatives. Persons with impaired cellular immunity (e.g., HIV/AIDS) may have a non-significant TST result despite having LTBI. In addition, 20-30% of persons with active TB disease can have a falsely non-significant TST result. As a consequence, all inmates reporting symptoms consistent with active TB disease are asked to undergo further medical investigations to rule out active TB disease, regardless of their TST status.

The prior movements of inmates who experienced TST conversions in 1999-2001 were not analyzed within the CSC TBTS to assist in the interpretation of the likely source of their TB infection. The TB infection is not necessarily acquired in the setting where the TST conversion was identified. For example, the exposure to the case of active TB disease could have occurred outside of the institution (e.g., in the community) or in another correctional facility (before the inmate was transferred). Similarly, other risk factors for staff conversion (e.g., travel to a TB endemic country) were not explored.

In 1998, logistical problems prevented Workplace Health and Public Safety Programme (WHPSP) (formerly the Occupational Health and Safety Agency, OHSA) from complying with the *Canadian Tuberculosis Standards* requirement that the second TST test of the two-step baseline testing protocol occur one to three weeks after the first test. However, it was realized that a significant TST result obtained using this protocol could not be properly interpreted to reliably distinguish between a booster effect and a true conversion. The CSC TBTS staff data have not been analyzed to see if this problem was rectified. However, as a proxy, almost one-third of all staff members undergoing initial TB screening assessment did not get an adequate two-step TST baseline. The high level of incomplete two-step TST testing in staff members should be investigated to determine the cause(s).

The CSC TBTS captures the TST results of contacts who have been tested in the context of a contact investigation, but the system does not capture persons identified as contacts but never assessed. Therefore, the CSC TBTS is not able to assess how complete follow up of identified contacts is within federal correctional facilities. In addition, the system currently does not capture the number of contact investigations that result from known or suspect cases of active TB disease. In this report, it was assumed that contact investigation-related TST tests performed around the same date within a single institution were part of the same contact investigation. From the 2000 and 2001 data, it appears that the number of assessments reported as part of a contact investigation was not accurately reported and recorded in the TBTS; this observation must be followed up.

Only the Initial Assessment form collects information on the person's country of origin, and whether the person self-identifies as an Aboriginal. This variable was not reported for the majority of both staff and inmate assessments, and better reporting is needed before reliable conclusions can be drawn. However, the reported origins of people with significant TST results (a proxy for TB infection) accorded well with the national surveillance database on the origins of reported cases of active TB disease.

The internal validity of inmate data is compromised by the lack of means to ensure the accuracy of the data recorded and entered into the database for each inmate assessed as part of TB screening activities. Extensive data validation would entail an immense workload in a non-automated environment (e.g., individual review of paper-based medical records). Conclusions are therefore tentative, but if the data are accurate, would be representative of the general inmate population, as the data capture for both infection and active disease is high.

Staff data can be validated, but selection bias compromises the external validity of these results. Conclusions are limited to the staff included in the database. No information on cases of active TB disease among staff were identified to the WHPSP or Tuberculosis Prevention and Control, Health Canada thereby limiting the discussion to TB infection. Increasing staff participation and addressing the logistical problems limiting accurate TST results will be necessary to improve the internal and external validity of the CSC TBTS results for staff.

In some cases, the time from inmate/staff assessment to data analysis remains more than two years. Data entry rules and recently introduced electronic verification methods should shorten this lag delay in the coming years, but the rate-defining steps will be the times between assessment, completion of the form, discrepancy follow-up and analysis. Data quality is a result of continual and ongoing data verification and cleaning processes.

PART 8: ASPIRATIONS

The value of formal linkage between the Correctional Service of Canada Tuberculosis Tracking System (CSC TBTS) and the Offender Management System (OMS) databases using a unique identifier has already been stated (CSC, 2000). The CSC TBTS currently captures data on TST status, while the OMS could provide information on the cumulative duration of incarceration of an inmate. Such a linkage could explore the relationship between person-years of incarceration until TST conversion, or to track the movement of converters to explore secondary risk (i.e., subsequent conversion risk among those uninfected). Data capture for inmates is high enough to support the external validity of these results. Indeed, recent initiatives to support the establishment of a Health Information system at CSC have been made.

The benefits of an automated, electronic system for infectious disease surveillance within federal correctional facilities have been itemized (CSC, 2000). More timely data analysis to facilitate contact tracing, outbreak support, and trend and risk factor analysis would result.

Expansion of the data collected by the CSC TBTS could also allow systematic evaluation of the success of TB prevention and control program efforts by monitoring the number of persons with latent TB infection (LTBI) who are offered, accept and successfully complete treatment for LTBI. These data could then be used to help predict the number of cases of active TB disease prevented and the number of future expected cases of active TB disease. A similar rationale can be used to argue for the expansion of data collection to include epidemiologic information on cases of active TB disease.

The identification of the strain of TB causing disease in a person with active TB disease within a federal correctional facility would also be helpful information that may provide insights as to transmission patterns of TB within the correctional setting. In addition, consideration should be given to specifically identifying and following known contacts of cases of active TB disease as a cohort within the CSC TBTS database as it may provide insight into the likelihood and timeframe for subsequent cases of active TB disease in the future.

As additional years' worth of information is collected, if it includes data on active cases of TB disease, future analyses regarding the specific medical conditions/risk factors for TB infection and subsequent development of active disease for inmates in the federal correctional system may be possible.

It will be important to continue efforts to increase the participation rate of staff in the TB screening assessment activities. If more staff can be recruited into the screening program, then it will be possible to develop a comprehensive picture of the occupational risk for TB transmission within Canadian federal correctional facilities. The current level of CSC staff participation in the CSC TBTS precludes the generalization of any of the findings to the general population of staff working within federal correctional facilities. CSC TBTS staff data also do not currently pertain to contract employees or volunteers who are not participants in the surveillance system. Consideration should be given to including this sub-population within staff surveillance activities.

Development of an automated, electronic system for infectious disease surveillance within federal correctional facilities would allow direct entry of inmate data into the CSC TBTS by CSC institutional health services. Discrepancy checks could be performed on site, thus facilitating timely data cleaning and leading to improved data quality and streamlined data entry. More timely data analysis with the potential to search for occult clusters of active TB cases or of TST conversions could also result. Eventually, as data trends from the initial years of surveillance create baseline-expected levels (e.g., for LTBI, conversions, cases, etc.) for each institution and region, the search could become automated with data analysis potentially identifying outliers in risk factors (e.g., clusters within Aboriginal or HIV-infected individuals). Automation would also facilitate the management of the CSC TBTS by CSC with assistance from Tuberculosis Prevention and Control.

GLOSSARY

Active TB disease: A person with latent tuberculosis (TB) infection (LTBI) who has progressed to active disease. People with active TB disease feel sick, with the symptoms that depend upon where in the body TB disease develops. Persons with active TB disease of the lungs or vocal cords usually have a prolonged cough (≥3 weeks), fever, night sweats, weight loss, loss of appetite and feeling very tired. The person may also complain of chest pain, coughing blood and a hoarse voice. Most TB disease remains within the lung (pulmonary TB) and about 50% of these people will have relatively high concentrations of TB bacteria in their sputum/phlegm (i.e., 'smear-positive'). Smear-positive pulmonary TB is considered more infectious than cases with relatively few/no TB bacteria in their sputum/phlegm (i.e., 'smear negative'). Some people develop TB disease outside the lung (i.e., extra-pulmonary), such as in the lymph nodes or bones; these people are not considered capable of transmitting TB infection to others. Antibiotic treatment for a minimum of six months is required to cure active TB disease.

Converter: A person with a previously documented non-significant tuberculin skin test (TST) result who now has a significant TST result. For routine screening purposes, if the previous TST result was 5-9 mm then an increase of 10 mm is required to be considered a converter. For contact screening, an increase of 6 mm is required. This means that infection with TB has occurred in the period between the previous TST and the present TST. Converters have a 5% risk of developing active TB disease within the first two years of infection. Antibiotic treatment of LTBI can reduce the risk of progression to active TB disease.

Drug resistant TB, Multidrug resistant TB (MDR-TB): Drug-resistant TB disease occurs when the TB bacteria can grow despite the presence of certain antibiotic(s) commonly used in the treatment of active TB disease. Therefore treatment for active TB disease should always be tailored to the antibiotic susceptibility of the TB bacteria. MDR-TB is defined as resistance to at least isoniazid (INH) and rifampin (RIF), two of the most effective antibiotics used to treat active TB disease. Drug-resistant TB is more complicated to treat and treatment takes longer as the alternative antibiotics are usually more expensive, not as effective and have more side effects. Drug-resistant TB is not more infectious than regular TB, and adults with an intact immune system have the same lifetime risk (10%) of developing active TB disease if infected with MDR-TB, as with drug sensitive strains. This is fortunate, as there are no proven antibiotic regimens to prevent MDR-TB infection from developing into active TB disease.

Initial Assessment: Inmates and staff living and working in Canadian federal correctional facilities are offered annual TST testing. To determine an accurate baseline for the interpretation of future tests, the Canadian Tuberculosis Standards recommends that persons who will have regular testing have an initial two-step TST. This means that all individuals with a non-significant initial TST result must have a second TST performed one to three weeks later (if the first test is significant, then there is no need for the second step of the two-step TST). For the Correctional Service of Canada, the decision was made to allow a valid TST if the second TST step was performed within 365 days of the first. The second test will be significant if the person was previously infected with TB but their immune system needed a little more time to mount a full response to the challenge of the TB protein. If the second TST is omitted, it is considered an incomplete two-step and their baseline TB infection status has not been properly established. If they are significant on their next routine annual screening TST, it is impossible to determine if this represents new TB infection (conversion) or the person needed the second TST to boost the immune system response (booster effect) to past infection. Adequate baseline data within the correctional facility environment requires a completed and valid two-step TST.

LTBI: A person can become infected with TB when the TB bacterium is inhaled into the body from someone who has infectious TB disease. Most adults with LTBI never go on to develop active TB disease. The TB bacteria become latent – that is, they are alive within the body but the immune system prevents the bacteria from growing or spreading. Changes in the lungs from TB infection can sometimes be seen on chest x-ray. Without treatment, approximately 10% of infected adults may progress to active TB disease at some point during their lifetime, with the risk being greatest (5%) within the first two years after infection. Antibiotic treatment can reduce the risk of subsequently developing active TB disease. People with LTBI do not have any symptoms and cannot transmit the TB bacterium to anyone else.

Old TB disease: A person with a past history of active TB disease that was either treated or healed spontaneously. The person will have no symptoms of active disease and their TST is usually significant for the rest of their life. They cannot transmit TB infection to others. Their chest x-ray may reveal findings characteristic of past TB disease that may pose a small risk (e.g., calcified apical nodules) or a relatively greater risk (e.g., fibrotic scars) of reactivating into active TB disease in the future. Persons with fibrotic scars on their chest x-ray suggestive of old TB and a significant TST should be considered strong candidates for antibiotic treatment of LTBI, regardless of age.

Ongoing Non-significant Assessment: Inmates testing non-significant on an Initial Assessment, or who have an accepted non-significant TB status from prior testing, are given an Ongoing Non-significant Assessment. This consists of a single TST, a symptom screen, and a risk factor screen. Inmates refusing a TST may be offered a pulmonary x-ray.

Ongoing Significant Assessment: Inmates testing significant on an Initial Assessment, or who have an accepted significant TB status from prior testing, are given an Ongoing Significant Assessment. This involves a symptom check, a risk factor screen, and if warranted, an x-ray and/or referral to a medical specialist.

TST: A small amount of tuberculin protein is injected under the skin of the forearm. In persons who are infected with TB, the body recognizes this protein and the immune system will react. This reaction can be felt as an induration (swelling or bump) at the injection site. The reaction to the test is measured 48-72 hours later. Interpretation of the test depends not only upon the size of the reaction, but also on the possible causes of falsely significant and falsely non-significant reactions (see Limitations) and the person's risk of progressing to active TB disease if infected. In general, if the induration diameter is ≥5 mm (for those who are contacts of known TB disease or HIV infected) or ≥10 mm for others, the test is considered to be significant.

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APPENDIX 2: FEDERAL INSTITUTIONS PARTICIPATING IN THE CORRECTIONAL SERVICE OF CANADA TUBERCULOSIS TRACKING SYSTEM (CSC TBTS)

Institutions (by region)	Level of security	Inmate Gender		Total inmate population					
				1999		2000		2001	
		Male	Female	General Population	New Admissions	General Population	New Admissions	General Population	New Admissions
CSC Total	–	–	–	13,003	4,319	12,696	4,302	12,681	4,288
Male	–	–	–	12,665	4,093	12,366	4,073	12,325	4,057
Female	–	–	–	338	226	330	229	356	231
Atlantic				**1,180**	**475**	**1,127**	**464**	**1,176**	**454**
Atlantic Institution	Maximum	✓		–	2	–	2	159	–
Dorchester Penitentiary	Medium	✓		–	2	–	2	382	1
Nova Institution for Women	Multi-level		✓	–	25	–	21	39	11
Springhill Institution	Medium	✓	✓	–	362	–	350	357	370
Westmorland Institution	Minimum	✓		–	2	–	–	173	1
Other				–	82	–	89	66	71
Ontario				**3,439**	**1,048**	**3,389**	**1,074**	**3,337**	**1,106**
Bath Institution	Medium	✓		–	–	–	–	311	–
Beaver Creek Institution	Minimum	✓		–	–	–	–	176	–
Collins Bay Institution	Medium	✓		–	–	–	–	214	–
Fenbrook Institution	Medium	✓		–	6	–	9	390	14
Frontenac Institution	Minimum	✓		–	–	–	–	159	–
Grand Valley Institution for Women	Multi-level		✓	–	55	–	64	75	67
Isabel McNeill House	Minimum		✓	–	–	–	–	9	–
Joyceville Institution	Medium	✓		–	–	–	–	418	–
Kingston Penitentiary	Maximum	✓		–	–	–	–	332	–
Millhaven Institution	Maximum	✓		–	981	–	983	159	1,017
Pittsburgh Institution	Minimum	✓		–	–	–	–	177	–
Regional Treatment Centre	Maximum	✓		–	–	–	–	120	–
Warkworth Institution	Medium	✓		–	–	–	–	546	–
Other				–	6	–	18	251	8
Pacific				**1,766**	**484**	**1,757**	**465**	**1,769**	**475**
Elbow Lake Institution	Minimum	✓		–	–	–	–	44	–
Ferndale Institution	Minimum	✓		–	–	–	–	115	–
Kent Institution	Maximum	✓		–	–	–	1	236	1
Matsqui Institution	Medium	✓		–	–	–	3	374	–
Mission Institution	Medium	✓		–	2	–	1	285	–
Mountain Institution	Medium	✓		–	–	–	–	329	–
Regional Health Centre Pacific	Maximum	✓		–	–		2	122	1
Regional Reception Assessment Centre	Multi-level	✓		–	461	–	437	8	450
William Head Institution	Medium	✓		–	–	–	–	217	–
Other				–	21	–	21	39	23
Prairie				**3,240**	**1,340**	**3,178**	**1,319**	**3,147**	**1,253**
Bowden Institution	Medium/Minimum	✓		–	82	–	236	573	208
Drumheller Institution	Medium/Minimum	✓		–	94	–	243	609	112
Edmonton Institution	Maximum	✓		–	513	–	33	200	90

Institutions (by region)	Level of security	Inmate Gender		Total inmate population					
				1999		2000		2001	
		Male	Female	General Population	New Admissions	General Population	New Admissions	General Population	New Admissions
Edmonton Institution for Women	Multi-level		✓	–	67	–	67	61	68
Grand Cache Institution	Minimum	✓		–	116	–	293	256	212
Grierson Centre	Minimum	✓		–	–	–	–	27	–
Okimaw Ohci Healing Lodge	Medium/Minimum		✓	–	2	–	11	29	9
Pê Sâkâstêw Centre	Minimum	✓		–	–	–	–	34	–
Regional Psychiatric Centre	Multi-level	✓	✓	–	3	–	–	185	1
Riverbend Institution	Minimum	✓		–	–	–	1	102	1
Rockwood Institution	Minimum	✓		–	–	–	–	159	–
Saskatchewan Penitentiary	Medium	✓	✓	–	177	–	148	409	220
Saskatchewan Penitentiary Maximum	Maximum	✓		–	–	–	6	69	7
Stony Mountain Institution	Medium	✓		–	237	–	248	384	307
Other				–	49	–	33	50	18
Quebec				3,378	972	3,245	980	3,252	1,000
Archambault Institution	Medium	✓		–	–	–	–	269	–
Cowansville Institution	Medium	✓		–	–	–	–	451	–
Donnacona Institution	Maximum	✓		–	–	–	–	280	–
Drummond Institution	Medium	✓		–	–	–	1	252	–
Federal Training Centre	Minimum	✓		–	–	–	–	369	–
Joliette Institution	Multi-level		✓	–	28	–	26	62	37
La Macaza Institution	Medium	✓		–	–	–	–	288	–
Leclerc Institution	Medium	✓		–	–	–	–	347	–
Montée Saint-François Institution	Minimum	✓		–	–	–	–	214	–
Port-Cartier Institution	Maximum	✓		–	–	–	–	190	–
Regional Reception Centre	Maximum	✓	✓	–	943	–	953	318	963
Sainte-Anne-des-Plaines Institution	Minimum	✓		–	–	–	–	164	–
Other				–	1	–	–	48	–

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