



Health Canada and the Public
Health Agency of Canada

Santé Canada et l'Agence
de la santé publique du Canada

Evaluation of the Public Health Agency of Canada's Tuberculosis Activities 2009-2010 to 2014-2015

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List of Acronyms

AB	Alberta
AIDS	Acquired Immune Deficiency Syndrome
ADM	Assistant Deputy Minister
BC	British Columbia
BCG	Bacille Calmette-Guérin (vaccine)
CBSA	Canadian Border Services Agency
CCDIC	Centre for Communicable Disease and Infection Control
CDCEG	Communicable Disease Committee Expert Group
CDC	U.S. Centers for Disease Control and Prevention
CIC	Citizenship and Immigration Canada
CIDSC	Communicable and Infectious Disease Steering Committee
CIHR	Canadian Institutes for Health Research
CPHLN	Canadian Public Health Laboratory Network
CSC	Correctional Services Canada
CTC	Canadian Tuberculosis Committee
CTBRS	Canadian Tuberculosis Reporting System
CTBLSS	Canadian Tuberculosis Laboratory Surveillance System
DG	Director General
F/P/T	Federal/Provincial/Territorial
FNIHB	First Nations and Inuit Health Branch
Gs & Cs	Grants and Contributions
HC	Health Canada
IDPC	Infectious Disease Prevention and Control
ISO	International Organization for Standardization
LTBI	Latent Tuberculosis infection
MDR-TB	Multi-drug resistant Tuberculosis
NGO	Non-governmental organization
NML	National Microbiology Laboratory
NWT	Northwest Territories
OGD	Other Government Departments
PAA	Program Alignment Architecture
PHAC	Public Health Agency of Canada
PHN	Public Health Network
PHTR	Public Health Travel Restrictions
RCA SC	Reference Centre Advisory Subcommittee
TB	Tuberculosis
TBAT	Tuberculosis and Air Travel
TST	Tuberculin Skin Test
WHO	World Health Organization

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Executive Summary

This evaluation covered the Public Health Agency of Canada (PHAC, the Agency's) tuberculosis (TB) activities for the period from April 2009 to March 2015. The evaluation was undertaken in fulfillment of the Treasury Board of Canada's *Policy on Evaluation* (2009).

Evaluation Purpose and Scope

The purpose of the evaluation was to assess the relevance and performance of the Agency's TB activities. The scope of the evaluation covered the period from fiscal year 2009-10 to 2014-15, and included TB diagnostics, prevention and control activities performed by the Centre for Communicable Disease and Infection Control; the National Microbiology Laboratory; and, TB Projects funded through the Lung Health Program of the Centre for Chronic Disease Prevention. This evaluation did not cover non-TB related projects funded through the Lung Health Program or co-morbidity activities covered under areas such as the Federal Initiative to Address HIV/AIDS.

Program Description

Within the Agency, TB activities are led by the Infectious Disease Prevention and Control (IDPC) Branch. Primary activities include policy and public health practice development (including revisions of the *TB Standards*), surveillance, laboratory reference and diagnostic services, public awareness, as well as response activities.

CONCLUSIONS - RELEVANCE

Continued Need

TB remains a major global public health issue and there is a continued need to prevent and control TB both in Canada and globally. Overall, Canada's TB rate, at 4.7 cases per 100,000 population, is low by global standards. However, foreign-born individuals from countries with high incidence of TB and Canadian-born Aboriginals are at higher risk for active TB, and have higher than national average incidence rates of TB. TB is a health and social issue; the social determinants of health (e.g., housing, health care access, education and income) have been associated with TB transmission and the progression of latent TB infection to active TB disease. Finally, while rates of drug resistance in Canada are well below international levels, drug resistance is one of the most challenging aspects of global TB control: drug-resistant TB strains are more difficult and costly to treat and have greater associated morbidity and mortality, highlighting the importance of adequate and continuous monitoring of TB cases.

Alignment with Government Priorities

TB prevention and control is a priority of the Government of Canada and the Public Health Agency of Canada, as reflected in a variety of planning and corporate documents.

Alignment with Federal Roles and Responsibilities

As the prevention and control of TB is a shared responsibility, the Agency is one among many players within the federal government, and provinces and territories with activities in this area. The Agency's TB activities align broadly with its mandate. There is an appropriate role for the Agency in surveillance, provision of public health guidance, outbreak response, public awareness, program and policy development (including community interventions, mobilization and awareness) although there are no cabinet authorities which group all TB activities into one program.

CONCLUSIONS – PERFORMANCE

Achievement of Expected Outcomes (Effectiveness)

The Agency's activities appear to be effective in supporting public health actions, planning and decision making in the prevention and control of TB. The Agency continues to work with provincial/territorial partners, as well as other government departments, to identify specific areas of action related to departmental or organizational mandates. Part of this work culminated in the development of the *2014 Tuberculosis Prevention and Control in Canada: A Federal Framework for Action*. Since the release of the federal TB Framework, some progress has been made in working with key partners and stakeholders to address TB in at-risk populations. Opportunities may exist to review continued or alternative approaches in using the Framework to support continued public health action.

Many of the products and services developed by the Agency (alone or in partnership) are considered useful, timely and appropriate by stakeholders. This includes the Agency's laboratory and diagnostic services, as well as the development/revision of products such as the *Canadian TB Standards* (and educational modules produced to support dissemination of the Standards) and the *Guidance for TB Prevention and Control Programs in Canada*. Similarly, national surveillance reports on TB cases and outcomes are used by multiple audiences and for many different purposes.

There is recognition that the rates of TB have remained largely unchanged, and there are pockets where latent TB remains a concern. Some of the Agency's related activities may provide some guidance with respect to addressing these concerns, such as the TAIMA TB project (funded through the Lung Health Program), which demonstrated considerable success in preventing and controlling TB, although the focus was on one key population (Aboriginals) in one community. Therefore, lessons can be learned for future community engagement in preventing and controlling TB: factors such as community involvement, culturally appropriate messaging and infrastructure appeared to be critical for success.

Demonstration of Economy and Efficiency

The Agency's TB activities have not been established as a program. While the evaluation found lines of evidence to retrospectively assess the use and impact of the Agency's TB activities, a logic model and performance measurement strategy have not been developed to articulate the Agency's approach and goals to prevent and control TB, within a federal public health mandate.

However, efficiencies were demonstrated in the Agency's activities. For example, as Canada has a low number of new TB cases per year (approximately 1,600), it is more efficient for one lab to maintain expertise and technology to help support those provinces with very few cases per year.

More broadly, it appears more efficient to enhance efforts to identify and treat latent TB with a goal to prevent active cases of the disease. In 2004, total TB-related expenditures in Canada were estimated at \$74 million, with the average cost of treating a case of active TB being approximately \$47,000. Treatment for latent TB infection, on the other hand, is estimated to be less than \$1000 per patient.¹ The higher costs associated with treating active TB cases may, however, be offset by community mobilization projects similar to TAIMA TB, as the project's general awareness campaign resulted in an increase in walk-ins for TB testing (from an average of 25 to an average of 50 people per month). No evidence has been provided at this time on the success of replicating, adapting or broadening a project such as TAIMA TB.

RECOMMENDATIONS

Recommendation 1

Review the way forward for the Agency to advance its activities for the prevention and control of TB, with consideration of the Agency's mandate and the roles and responsibilities of others.

There is evidence that the Agency's current products and services are timely and used. There is also recognition, however, that the rate of TB amongst Canada's foreign-born population is disproportionately high and has remained relatively stable at approximately 70% of all reported TB cases over the past decade. In low-incidence countries like Canada, the elimination of TB becomes more difficult as rates decline and level off, and global concerns about antimicrobial resistance necessitates a context for continued vigilance.

The Agency is one of many players involved in preventing and controlling TB and the recently released 2014 federal TB Framework outlines the Agency's national leadership role related to the public health aspects of the disease. There is evidence that priorities have been established with partners (both federal and provincial/territorial) for future activities, but there is no established plan focussing on how the Agency's activities are working together to advance this issue. With no logic model outlining the strategic goals of the Agency in this area, it is difficult to see how the Agency will work towards decreasing the overall rate of TB in Canada, as committed to by the Government of Canada in line with the post 2015 World Health Organization End TB Strategy.

Recommendation 2

Review activities related to the public health response to active TB

The volume of TB response activities has increased since 2009. The quantity of airline contact notification cases submitted to the Agency for action has also increased and the volume of cases submitted to the Agency on a yearly basis is greater than the number of cases submitted to the U.S. Centers for Disease Control and Prevention (CDC). This may likely be due to the greater stringency of Canadian guidelines for initiation of an airline contact investigation. As the risk of TB transmission during travel on commercial aircraft remains uncertain, there is a need for a strengthened evidence base in the case of TB and air travel and for a review of Canadian guidelines for TB and air travel contact notifications. As an added benefit, this review could also lead to cost savings.

Recommendation 3

Engage stakeholders more effectively.

As noted previously, the *Canadian TB Standards* were considered useful, timely and appropriate by stakeholders participating in data collection for this evaluation. Updating these standards requires work from external experts and partners when new information becomes available. For this type of public health guidance and other related TB activities, there is no current forum to discuss best practices across the broader continuum of TB prevention and control, and a few external key informants noted a need to exchange information to ensure public health practice, program and policy improvement on an ongoing basis. Providing this mechanism will be important as the scientific landscape for TB advances (such as updated medications, laboratory and public health practices).

Management Response and Action Plan

for the Public Health Agency of Canada's Tuberculosis Activities – 2009-2010 to 2014-2015

Recommendations	Response	Action Plan	Deliverables	Expected Completion Date	Accountability	Resources
Review the way forward for the Agency in advancing the prevention and control of TB, with consideration of the Agency's mandate and the roles and responsibilities of others.	Agree. The development of the Implementation Plan for the Agency's component of the Federal Framework will allow the Agency to reinforce its forward-looking strategic goals for TB prevention and control and confirm that the necessary programmatic infrastructure is in place for their achievement.	<ul style="list-style-type: none"> Develop an Implementation Plan in consultation with federal partners. Consult with surveillance and laboratory leads on AMR to assess and identify opportunities. 	<ul style="list-style-type: none"> Implementation Plan for the Agency. 	<ul style="list-style-type: none"> December 2015 	ADM, Infectious Disease Prevention and Control Branch DG, Centre for Communicable and Infectious Diseases	<ul style="list-style-type: none"> To be completed using existing resources.
	In light of the threat posed by resistant tuberculosis in some countries, the Agency will look for opportunities to align with priority files such as AMR – to be incorporated in the TB plan as appropriate.	<ul style="list-style-type: none"> Develop a performance measurement strategy, including logic model that reflects the Agency's strategic goals in the prevention and control of TB. 	<ul style="list-style-type: none"> Logic Model 	<ul style="list-style-type: none"> September 2015 	ADM, Infectious Disease Prevention and Control Branch DG, Centre for Communicable and Infectious Diseases	<ul style="list-style-type: none"> To be completed using existing resources.

Recommendations	Response	Action Plan	Deliverables	Expected Completion Date	Accountability	Resources
	In support of the implementation of <i>Tuberculosis in Canada: A Federal Framework</i> (the “Federal Framework”), the Agency has undertaken the development of a performance measurement strategy, including logic model, for its TB prevention and control activities. The logic model and performance measurement strategy are being developed to align with a common approach to measurement for communicable and infectious diseases that will support meaningful measurement of impact along strategic, functional, and operational lines.		<ul style="list-style-type: none"> Performance Measurement Strategy 	<ul style="list-style-type: none"> March 2016 	ADM, Infectious Disease Prevention and Control Branch DG, Centre for Communicable and Infectious Diseases	<ul style="list-style-type: none"> To be completed using existing resources.
Review activities related to the public health response to active tuberculosis.	Agree. The Agency will review the way it manages its public health response activities in the broader context of infectious diseases (including active tuberculosis) with particular emphasis on air travel and other conveyances. The Agency will leverage this process to verify its approach to managing contact notifications and travel restrictions for active TB in the Canadian context.	<ul style="list-style-type: none"> Lead an assessment of the way the Agency manages public health response activities (e.g. contact tracing, travel restrictions) to infectious diseases and travel. Assess the Agency’s response related to the risk of TB transmission during air travel. 	<ul style="list-style-type: none"> Assessment report, including options and recommendations Results of analysis (report) 	<ul style="list-style-type: none"> August 2015 December 2015 	ADM, Strategic Policy, Planning and International Affairs Branch DG, Strategic Policy and Ministerial Services ADM, Infectious Disease Prevention and Control Branch DG, Centre for Communicable and Infectious Diseases	<ul style="list-style-type: none"> To be completed using existing resources. To be completed using existing resources.

Recommendations	Response	Action Plan	Deliverables	Expected Completion Date	Accountability	Resources
Engage stakeholders more effectively.	<p>Agree.</p> <p>The Agency recognizes the value of the exchange of information and ideas amongst stakeholders and is committed to playing a leadership role in fostering this kind of exchange in a way that complements the efforts of its partners.</p>	<ul style="list-style-type: none"> • Use the principles and criteria defined in CCDIC’s Stakeholder Engagement Framework to develop a multi-pronged stakeholder engagement strategy that will identify: <ul style="list-style-type: none"> ○ key TB stakeholders (including groups, funded organizations and experts) ○ opportunities for meaningful engagement ○ A calendar of milestones and/or events • Continue supporting Stop TB Canada monthly conference calls. 	<ul style="list-style-type: none"> • Stakeholder assessment, mapping, and engagement strategy. • Development of a stakeholder engagement calendar to highlight opportunities for engagement. • Provision of conference call line 	<ul style="list-style-type: none"> • October 2015 • Ongoing • Ongoing 	<p>ADM, Infectious Disease Prevention and Control Branch</p> <p>DG, Centre for Communicable and Infectious Diseases</p> <p>ADM, Infectious Disease Prevention and Control Branch</p> <p>DG, Centre for Communicable and Infectious Diseases</p> <p>ADM, Infectious Disease Prevention and Control Branch</p> <p>DG, Centre for Communicable and Infectious Diseases</p>	<ul style="list-style-type: none"> • To be completed using existing resources. • To be completed using existing resources • To be completed using existing resources

1.0 Evaluation Purpose

The purpose of the evaluation was to assess the relevance and performance of the Public Health Agency of Canada's tuberculosis (TB) activities for the period of 2009-10 to 2014-15. It was required by the Treasury Board of Canada's *Policy on Evaluation* (2009) and was designed to provide information to senior management to assist in enhancements to the Agency's prevention and control activities.

2.0 Program Description

2.1 Program Context

TB is a preventable and curable infectious disease, and yet it remains a significant global public health challenge.² In 2004, the Public Health Agency of Canada assumed responsibility from Health Canada as the federal public health lead on the prevention and control of TB. In addition to working collaboratively with domestic and international partners to address TB prevention through standards and guidelines, TB control programs also identify active cases and monitor trends in disease occurrence, treatment outcome and drug resistance. In Canada, the collection of statistics on people diagnosed with active TB first began in 1924, and the need for reliable statistics has remained continuous as TB is viewed by public health officials as an important public health event to be monitored with vigilance – both globally and domestically.³

There are many players who play a role in the prevention and control of TB in Canada – at the local, provincial/territorial and federal levels. Provincial, territorial, and local level governments are responsible for TB surveillance, case management, and control within their jurisdictions. On the federal scene, partners working with the Public Health Agency of Canada include:⁴

- First Nations and Inuit Health Branch (FNIHB), Health Canada, which is responsible for TB prevention and control activities for on-reserve communities;
- Health Products and Food Branch, Health Canada, which is responsible for monitoring and regulating medical devices and therapeutics used in the treatment of TB;
- Canadian Institutes of Health Research, which funds research initiatives relating to TB;
- Citizenship and Immigration Canada, which is responsible for Canada's Immigration Medical Examination Program, including targeted screening for TB;
- Correctional Service Canada, which is responsible for federally incarcerated population and staff working in institutions;

- Aboriginal Affairs and Northern Development Canada, which supports Aboriginal peoples (First Nations, Inuit and Métis) and Northerners in their efforts to improve social well-being and economic prosperity and develop healthier, more sustainable communities; and,
- The Canadian Northern Economic Development Agency, which works with communities to develop and diversify local economies.

Within the Agency, TB activities are led by the Infectious Disease Prevention and Control (IDPC) Branch. Within the IDPC Branch, TB diagnostics, prevention and control activities are conducted by the Centre for Communicable Disease and Infection Control (CCDIC) and the National Microbiology Laboratory (NML).

2.2 Program Profile

The Agency's activities to prevent and control TB include the following components:

National Policy Development and Leadership

Within its federal responsibilities and mandate, the Agency develops strategic policy directions to provide national leadership on the public health aspects of TB in Canada. As noted earlier, the prevention and control of TB is a shared responsibility that involves multiple players, so the Agency has developed a coordinated approach to working with domestic and international partners on TB prevention and control at the federal level to support the goals set out in *Tuberculosis Prevention and Control in Canada: A Federal Framework for Action (2014)*.

National Public Health Practice

The Agency develops and shares guidance for health care professionals and public health authorities on best practices in prevention, diagnosis, treatment and control through the documents such as the *Canadian TB Standards* and several educational/training modules.

National Surveillance and Epidemiology

The Agency maintains two national database systems to support the surveillance and epidemiology of TB cases and TB drug resistance - the Canadian TB Reporting System (CTBRS) and the Canadian TB Laboratory Surveillance System (CTBLSS). The data necessary for these database systems to function effectively originates from local level input, which is ultimately informed by medical and laboratory records collected by law at the provincial and territorial level.

Upon request, CCDIC provides technical assistance to provincial and territorial public health authorities to support TB surveillance system strengthening and capacity building.

National Laboratory Reference and Diagnostic Services

The Agency provides, upon request, national laboratory reference services (through the National Microbiology Laboratory – NML) to provincial and territorial partners. The Agency supports TB outbreak response by providing laboratory consult, conducts reference, diagnostic testing and research, as well as testing for rapid detection of TB from clinical samples, mycobacterial identification, TB genotyping and susceptibility testing patterns.

National TB Response

The Agency conducts TB response activities in partnership with provincial and territorial TB control programs, and with federal partners. The Agency supports the prevention and control of TB transmission in the context of commercial travel, including travel restrictions and contact notifications (facilitated by provincial and territorial TB programs). Upon request, the Agency provides assistance, including laboratory support, in establishing continuity of care for cases that change their jurisdiction of residence, as well as cases that have travelled or will be travelling and require medical assistance during their stay. Upon request, the Agency's laboratory performs TB genotyping for all Canadian provinces and territories except Ontario.

In addition, CCDIC can provide outbreak management support upon request during TB outbreaks by deploying subject-matter experts to the field, and providing on-going remote support to stakeholders.

Community Level Interventions

The Agency has funded two community-level projects aimed at increasing awareness, enhancing screening and offering treatment for latent TB among at-risk Aboriginal northern communities. These two TB-specific projects were part of the Agency's Lung Health Program (implemented through the Centre for Chronic Disease Prevention and Control) to support initiatives to improve Canadians' awareness of prevention, early detection, and management of lung diseases.

2.3 Program Logic Model and Narrative

The Agency's TB activities are conducted by the four functional areas within IDPC's Centre for Communicable Diseases and Infection Control and by NML's National Reference Centre for Mycobacteriology. As these activities have not been grouped into a program formally, there is no logic model or performance strategy dedicated to TB activities at the Agency.

2.4 Program Alignment and Resources

TB activities are part of the Agency's 2014-2015 Program Alignment Architecture (PAA): Program 1.2 Health Promotion and Disease Prevention; Sub-Program 1.2.1 Infectious Disease Prevention and Control; Sub-Sub Program 1.2.1.2 Infectious and Communicable Disease.

The financial data for the years 2009-2010 through 2013-2014 are presented below (Table 1). Overall, the Agency spent \$10.6M over five years on TB-related activities that are covered within this evaluation.

Table 1: Actual Agency Expenditures on TB Activities (\$)

Year*	Gs&Cs**	O&M	Salary***	Total
2009-2010	\$17,000.00	\$361,691	\$1,360,891	\$1,739,583
2010-2011	\$240,006.00	\$440,967	\$1,344,778	\$2,025,752
2011-2012	\$948,573.00	\$346,150	\$1,257,754	\$2,552,478
2012-2013	N/A	\$582,326	\$1,655,226	\$2,237,554
2013-2014	N/A	\$584,576	\$1,490,876	\$2,075,453
Total	\$1,205,579	\$2,315,710	\$7,109,525	\$10,630,820

* During this time period, the Agency recorded \$485,062 in capital expenditures for laboratory equipment (reflected in O&M column above).

** These figures represent the funding provided (through the Centre for Chronic Disease Prevention) to the two TB-related projects under the Lung Health Program (2009-2012).

*** Salary data includes the addition of two staff from the NML TB-HIV program, which was outside the scope of this evaluation. These figures exclude TB related projects funded through the Genomics Research and Development Initiative (GRDI).

3.0 Evaluation Description

3.1 Evaluation Scope, Approach and Design

The scope of the evaluation covered the period from fiscal year 2009-10 to 2014-15, and included TB diagnostics, prevention and control activities performed by the Centre for Communicable Disease and Infection Control, the National Microbiology Laboratory as well as TB Projects funded through the Lung Health Program of the Centre for Chronic Disease Prevention.

The evaluation issues were aligned with the Treasury Board of Canada's *Policy on Evaluation* (2009) and considered the five core issues under the two themes of relevance and performance, as shown in Appendix 1. Corresponding to each of the core issues, specific questions were developed based on program considerations and these guided the evaluation process.

An important point to note is that TB activities are not framed by a defined program, so the approach of this evaluation was designed to evaluate a cluster of activities focussed on TB prevention and control (surveillance, response, guidance and diagnostics) undertaken by the Agency. The evaluation team worked with the various activity areas to determine relevant outputs and outcomes in order to focus evaluation questions appropriately.

The Treasury Board’s *Policy on Evaluation* (2009) also guided the identification of the evaluation design and data collection methods so that the evaluation would meet the objectives and requirements of the policy. A non-experimental, retrospective design was used based on an evaluation matrix, which detailed the evaluation strategy for these activities.

Data for the evaluation were collected using various methods, which included a literature review, a document review, file review, key informant interviews, an international analysis, and a survey. More specific details on the data collection and analysis methods are described in Appendix 1. In addition, data were analyzed by triangulating information gathered from the different methods listed above. The use of multiple lines of evidence and triangulation were intended to increase the reliability and credibility of the evaluation findings and conclusions. Finally, the evaluation piloted an economic evaluation methodology with support from the Agency’s Centre for Public Health Information and Surveillance Strategy which examines the economic burden of illness and the contribution community mobilization initiatives may have in mitigating that burden.

3.2 Limitations and Mitigation Strategies

Most evaluations face constraints that may have implications for the validity and reliability of evaluation findings and conclusions. The table below outlines the limitations encountered during the implementation of the selected methods for this evaluation. Also noted are the mitigation strategies put in place to ensure that the evaluation findings can be used with confidence to guide program planning and decision making.

Table 2: Limitations and Mitigation Strategies

Limitation	Impact	Mitigation Strategy
The Agency’s TB activities do not have a dedicated logic model or a performance measurement strategy.	No overall program logic model articulating short, medium and long term outcomes.	<p>More upfront evaluation time and effort was allocated to clarifying the underlying theory that guides the Agency’s TB activities. Each component activity was assessed separately to allow for a more robust assessment of performance. The components were then examined together to determine patterns and common challenges.</p> <p>In addition, a thorough review of corporate documents as well as key informant interviews helped clarify the underlying theory that guides TB activities in the Agency as well as some of the intended impacts these activities seek to have.</p>

Limitation	Impact	Mitigation Strategy
There were limited baseline measures or guidelines in place against which to assess progress.	Difficulty in assessing progress against a baseline for activities other than overall TB rates.	Expert interviews and document reviews were used to assess progress over time.
Key informant interviews are retrospective in nature.	As interviews are retrospective in nature, this may lead to the provision of recent perspectives on past events. This can impact the validity of assessing activities or results relating to improvements in the program area.	Triangulation of other lines of evidence to substantiate or provide further information on data received in interviews. Document review provided corporate knowledge.
The Agency’s TB activities are funded through communicable disease prevention and control A-based allocation/budget. No planned budget was available and the financial data structure was not linked to outputs or outcomes.	Limited ability to quantitatively assess efficiency and economy, no assessment of variance between planned and actual spending.	Used other lines of evidence, including key informant interviews, previous assessments of cost effectiveness and file review, to assess efficiency and economy.

4.0 Findings

4.1 Relevance: Issue #1 – Continued Need for the Program

SUMMARY: Canada has one of the lowest incidence rates of TB in the world.⁵ Within Canada, TB disproportionately affects foreign-born individuals and Canadian-born Aboriginal people. As a result of higher than average incidence rates of TB in these specific communities compared to the rate for Canadian-born, non-Aboriginal people, and in order to continue to reduce the national incidence rate of TB, there continues to be a need for the prevention and control of TB in Canada.

TB is a bacterial infection spread primarily through the air. TB usually infects the lungs, although other parts of the body can also be involved. Once inhaled, *Mycobacterium TB* bacteria are either eradicated by the body’s innate immune response, or are able to replicate and establish TB infection.

Most individuals (95%) who become infected with TB carry the bacterium without symptoms; they have latent TB infection (also referred to as LTBI), which is dormant and does not make the person symptomatic or infectious. Without treatment, a small proportion of individuals infected with latent TB will develop active TB disease in their lifetime. In Canada, 5% of latent TB cases will progress to active TB disease, also known as TB reactivation.⁶ The characteristics of a host’s immune system determine whether an individual exposed to TB will acquire latent TB and develop active TB.⁷ Most of the TB cases in Canada are cases of TB reactivation, which generally occurs as a result of a weakened immune system or the existence of other health conditions. Active TB disease is contagious and requires treatment with antibiotics.

Despite being preventable and treatable, TB remains a serious global public health concern, infecting up to one third of the world's population. The areas with the highest TB burden include countries in Asia and sub-Saharan Africa, where TB prevalence rates can reach up to 50%.^{8, 9, 10} Canada plays a role in reducing the global burden of TB as a participant in international health efforts and by addressing TB among Canada's foreign-born population.¹¹

TB incidence in Canada

Canada's incidence rate of active TB is among the lowest in the world at 4.7 cases per 100,000 people (as of 2013, the most recent year for which data is available).¹² Despite no longer being common in the general Canadian population, cases of TB in Canada disproportionately occur in Canadian-born Aboriginal and foreign-born individuals.¹³

Although the total number of reported cases among the foreign-born reported annually has remained relatively unchanged at approximately 1,000 cases per year since 1970, the proportion of active TB cases in foreign-born individuals has increased, reflecting the decline of TB cases in the Canadian-born non-Aboriginal population. Today, over 70% of all reported active TB cases in Canada occur in foreign-born individuals.¹⁴ To illustrate:

- In 2013, the foreign-born population in Canada, which represented approximately 22% of the total Canadian population, accounted for 71% of all reported TB cases of known origin, with an incidence rate of 14.8 per 100,000 population.¹⁵
- Today's migrants to Canada are mainly from regions where prevalence rates of TB are higher than in Canada. As a result, as many as 50% of recent immigrants and refugees in Canada have been found to be infected with latent TB and are at risk of developing active TB.^{16, 17}
- Rates of TB in immigrant and refugee populations are highest within the first five years after arrival in a low-incidence region such as Canada, but decrease dramatically after the first year of arrival.^{18, 19}

The rate of TB in Canadian-born Aboriginal populations has decreased by 60% since 1970.²⁰ However, rates of TB in the Canadian-born Aboriginal population have remained substantially higher than in the Canadian-born non-Aboriginal population. To illustrate:

- In 2013, Canadian-born Aboriginal people made up 4% of the total Canadian population, but accounted for 19% of reported cases of known origin, with an incidence rate of 19.9 per 100,000 population. Among these cases, 65% of cases were First Nations, almost a third were Inuit (29%), and 6% were Métis.²¹
- With the exception of 2003, from 2002 to 2012, the annual TB incidence rates for the Inuit were the highest of any origin group in Canada.
- Historical context, health conditions, environmental conditions and challenges related to the health system are believed to affect TB rates in Aboriginal communities.²²

TB transmission and reactivation: social and environmental determinants

Social and environmental factors, both upstream and proximate, have been shown to be associated with TB transmission and the activation of latent TB.²³ To illustrate:

- Upstream determinants of TB include factors associated with unhealthy situations (poverty, low socioeconomic status, low education levels), and factors associated with a weak health system (poor access to the health care).
- Proximate risk factors for TB include those that contribute to a high level of contact with infectious droplets (active TB cases in the community, crowding, poor ventilation), and those that lead to an impaired host defence (tobacco smoke, air pollution, HIV, malnutrition, lung diseases, diabetes, alcoholism, as well as age, sex and genetic factors).²⁴
- Other known risk factors for TB include experiencing homelessness and being a resident in a long-term care or correctional facility.²⁵

Antimicrobial resistance

There is a growing worldwide concern that drug-resistant strains of TB pose a serious threat to TB prevention and control efforts.²⁶ Although drug-resistant TB has not yet been identified as a major problem in Canada, the potential for it to become an issue is high because of the frequency with which Canadians travel abroad.²⁷ In 2011, one in five (19%) confirmed TB cases reported globally to the WHO were cases of multi-drug resistant TB (MDR-TB).²⁸ In Canada, reported drug resistance through the Canadian TB Laboratory Surveillance System, has remained relatively stable and is consistently below international levels.²⁹ In 2013, 8.1% of the total number of isolates reported for susceptibility testing in Canada demonstrated drug resistance.³⁰ Antimicrobial resistance is a global concern because it challenges traditional TB treatment options; alternate treatment options are more costly and limited; and, may develop more side effects and be less effective.^{i,31,32}

Global targets

In line with the WHO *Global Plan to Stop TB: 2006-2015*, which aimed to halve the 2015 prevalence of TB reported in 1990, the Agency set a target for a Canadian TB incidence rate of 3.6 per 100,000 for 2015.³³ Although the overall rate of TB in Canada has declined since 1990 to 4.7 per 100,000, this 2015 target had not been met as of this writing. The WHO has updated their plan however. On July 3, 2014, the WHO, in collaboration with the European Respiratory Society, released a new framework for the elimination of TB in 33 low-incidence countries, including Canada, by 2050. The eight-point framework was adapted from the post-2015 Global TB Strategy, which the World Health Assembly approved in May 2014³⁴.

i Provincial and territorial representatives spoke to the difficulties in obtaining new TB drugs. They felt that the small number of Canadian TB cases may impact the availability of new drugs due to barriers related to drug distribution in a small market.

4.2 Relevance: Issue #2 – Alignment with Government Priorities

SUMMARY: TB activities are a priority of the Government of Canada and the Public Health Agency of Canada as reflected in a variety of planning and corporate documents.

TB activities are aligned with Government of Canada priorities to ensure the health and security of Canadians and their communities. Highlighted in the Response of the Government of Canada to the Standing Committee on Health Report, “*The Way Forward: Addressing the Elevated Rates of TB Infection in on-reserve First Nations and Inuit Communities*”³⁵ (2010), the Government of Canada acknowledged the need for a coordinated effort by multiple partners to reduce the burden of this disease, stating, in particular, that despite significant reductions in TB rates among First Nations over the past 30 years, more work needs to be done. For its part, Federal Budget 2014 proposed measures to improve the health and safety of Aboriginal communities, as well as reducing the incidence of TB among vulnerable populations.³⁶ Likewise, in 2013, the Government made a new commitment of \$650 million over three years to the Global Fund to Fight AIDS, TB and Malaria.

In March 2014, ahead of World TB Day, the Minister of Health, the Honourable Rona Ambrose, released the government’s *TB Prevention and Control in Canada: A Federal Framework for Action*. The Framework captures the federal government’s commitment to address TB in the two populations with the highest incidence rates of active TB disease in Canada, those being Canadian-born Aboriginal peoples and foreign-born individuals from countries with a high incidence of TB as well as addressing the underlying risk factors for TB. The Framework also sought to reduce the national incidence of reported TB in Canada to 3.6 per 100,000 or less by 2015.

The activities align well with the Agency’s priorities. Over the last five years, through various corporate planning and reporting documents, the Agency has acknowledged the significant public health risk posed by infectious diseases. For example, the Report on Plans and Priorities 2014-15 sets out to achieve a 3.6 per 100,000 rate (TB) by March 2015 as well as to work with federal partners to address the underlying factors for TB and developing culturally appropriate communications tools related to TB.³⁷ TB activities also align with four of the Agency’s key priorities listed in the Agency’s “Strategic Horizons 2013-18”.³⁸

The Agency’s Corporate Risk Analysis highlights the continued risk posed by infectious diseases such as TB and how, in response, “within a multi-jurisdictional context, the Agency will continue to contribute to enhancing surveillance systems, maintain laboratory capacity and support research, in collaboration with national and international partners.”³⁹ The Profile recognizes that “domestic and international jurisdictions face a continued risk that infectious diseases, such as influenza, TB and food-borne illness, will create the potential for outbreaks, epidemics and pandemics.”⁴⁰

4.3 Relevance: Issue #3 – Alignment with Federal Roles and Responsibilities

SUMMARY: The Agency’s TB-related activities align broadly with the Agency’s mandate. There is an appropriate role for the Agency in surveillance, provision of public health guidance, programming and policy (including supporting community-led initiatives). There are no clearly defined authorities for some activities, including TB and Air Travel, Public Health Travel Restriction, and International Notification for continuity of care.

Alignment with Acts and Mandate

The Public Health Agency of Canada addresses the federal government’s broad role in disease prevention and control outlined in foundational legislations. *The Department of Health Act* gives the Minister of Health powers, duties and functions relating to “the promotion and preservation of the physical, mental and social well-being of the people of Canada”. Included in the Minister’s powers and duties are the following:

- the protection of the people of Canada against risks to health and the spreading of diseases;
- investigation and research into public health, including the monitoring of diseases;
- the collection, analysis, interpretation, publication and distribution of information relating to public health; and
- cooperation with provincial authorities with a view to the coordination of efforts made or proposed for preserving and improving public health.

The *Public Health Agency of Canada Act* is linked to the *Department of Health Act*, as it states that the Agency was established for the purpose of assisting the Minister in exercising or performing the Minister’s duties. It specifies the Agency’s role in health protection, surveillance, and disease prevention.

No TB Program

The Agency’s TB activities are not organized in a program; rather, they are a series of activities coordinated around the disease. The Agency has various levels of cabinet authorities for these activities. It has broad authorities for disease prevention and control activities. These authorities are rooted in broad legacy cabinet documents covering infectious diseases, which include TB. The broad cabinet authorities establish that the Agency has a role in areas such as the provision of guidance for public health professionals, policy and program development, community capacity building, public and professional education, and intersectoral collaboration to prevent and control various diseases. The Agency’s TB activities align with the authorities.

The Agency was given authorities for three functions related specifically to TB which clearly establish the Agency’s role for conducting TB surveillance, TB research, and TB emergency preparedness and response. The Agency has specific authorities that enhanced the Agency’s capacity to conduct surveillance of TB among foreign-born individuals and Canadian-born Aboriginal people.

There are some activities for which policy authorities are not clearly defined. These include: TB and Air Travel (TBAT), Public Health Travel Restrictions, and International Notification for continuity of care. These travel-related TB activities involve Agency risk assessment and follow-up activities (related to the travel of an individual with TB or the potential travel of an individual with TB) upon notification from provincial or territorial jurisdictions.

Federal Framework

Many stakeholders are involved in addressing TB, which requires careful coordination of the activities of those involved to avoid duplication of efforts. Two public documents stipulate the roles of partners in TB prevention and control. These documents are: *Guidance for TB Prevention and Control Programs in Canada* (the Guidance) by the Pan-Canadian Public Health Network and *TB Prevention and Control in Canada: A Federal Framework for Actions* (the Framework) by Health Canada and the Public Health Agency of Canada.

In addition, the documents clearly delineate the roles and responsibilities of the jurisdictions involved in TB management. The Agency is responsible for TB prevention and control for the overall population in Canada, while other federal government departments focus on specific populations (including the key populations of foreign-born individuals and Aboriginal Canadians). For instance, Citizenship and Immigration Canada is responsible for screening immigrants to Canada for TB (including latent TB infection and drug resistance), First Nations and Inuit Health Branch is responsible for TB prevention and control for on-reserve communities, and Correctional Service Canada is responsible for TB prevention and control for inmates in federal correctional institutions. Provincial, territorial, and local level governments are responsible for surveillance and TB case management and control within their jurisdictions.

Both the Guidance and the Framework set out that the Agency is responsible for:

- undertaking TB surveillance;
- providing support for TB outbreak management and laboratory support;
- enforcing measures under the *Quarantine Act*;
- providing guidance to health care professionals and public health authorities regarding best practices in prevention, lab diagnosis and treatment;
- providing laboratory reference services;
- supporting the TAIMA TB project;
- engaging with other federal departments and agencies to address socio-economic factors that contribute to TB; and,
- working collaboratively with domestic and international partners to improve TB prevention and control activities.

While these roles and responsibilities align well with the broad cabinet authorities the Agency has been given with respect to its efforts to control and prevent diseases, there are certain areas, such as those involved in TB response, which may need clarification.

4.4 Performance: Issue #4 – Achievement of Expected Outcomes (Effectiveness)

4.4.1 To what extent are the Agency’s surveillance activities and reports effective?

SUMMARY: The Agency’s national surveillance reports on TB cases and drug resistance are used by multiple audiences, and used in different ways. For example: jurisdictions can identify where they stand relative to others in reducing the burden of TB; and, can apply reported data to make informed decisions in developing TB policies, programs, teaching material, and research questions.

Overview of the Agency’s TB surveillance activities and systems

The effectiveness of the Agency’s TB surveillance reports depends on the performance of five key activities at the national level: data gathering, integration, analysis, interpretation and dissemination.

The Agency’s data gathering activities are supported by effective partnerships

The Agency’s data gathering activities are supported by effective partnerships that are based on a long-standing tradition of voluntary collaboration. From a historical perspective, the production of TB statistics at a national level in Canada has remained a continuously-supported activity since 1924. In contemporary times, public health officials continue to recognize TB as a threat to monitor with vigilance – both globally and domestically.⁴¹ Accordingly, the need to effectively maintain TB as a nationally notifiable disease in Canada was last reaffirmed in 2009 by consensus among federal, provincial and territorial officials using agreed upon criteria that are reviewed periodically.⁴²

All provinces and territories, as well as participating laboratories in the Canadian TB Laboratory Technical Network, submit data to the Agency on a regular and voluntary basis, so that a national perspective can be formulated.^{43,44} Standardized national reporting forms (available in both paper and electronic formats) are used to manage all data submissions. The majority of data elements gathered on the Agency’s forms are complete, and in the case of clinical and demographic data, over 95% of the data elements are submitted complete.⁴⁵

Overall, the WHO estimates that Canada’s case detection rate for TB is between 87% and 100%, so the working assumption is that Canada’s national surveillance systems for TB are both mature and high performing.⁴⁶ Although the Agency must always consider the possibility of diagnosed cases being underreported, or people with active TB being undiagnosed, the presence of collaborative partnerships and a commonly shared purpose for standardized information is often recognized in the literature as a key condition for advancing effective surveillance systems.⁴⁷ Research shows that TB notifications made under mandatory relationships are not necessarily more effective in yielding full participation or case detection, as observed by incomplete reports amongst some European parties operating under formal arrangements.⁴⁸

The Agency’s analysis activities are supported by effective data gathering approaches

The Agency’s data analysis activities, and ultimately the reports it produces, are supported by effective data gathering approaches that promote standardization and apply international best practices in TB surveillance. As one example, the Agency uses a case-based surveillance system to purposefully gather selected data on people diagnosed with active TB. Although case-based surveillance systems are technically more labour intensive to administer, the WHO acknowledges case-based surveillance systems as the ideal approach for producing reliable information and a proxy of TB incidence rates.⁴⁹ Case-based surveillance systems, such as the CTBRS, are considered the ideal because they contain records for which an episode of TB and its associated treatment information is the unit of analysis, so more detailed analyses and accuracy checks are possible than if the system had only featured aggregate data.⁵⁰ As one interviewee summarized, “we use the data from the CTBRS [...] it’s gold standard data which we love and we’re able to extract on.” The WHO further recommends that the collection and analysis of case data contain a minimum set of variables, which the Agency also fulfills.⁵¹ Although this evaluation did not assess whether the Agency’s TB surveillance systems would pass the WHO’s certification standards, or the Agency’s internal Data Quality Assessment framework,⁵² the presence of standardized case definitions and national level reporting forms allows each province and territory to effectively relay information to the Agency in a consistent and comparable manner – a necessary condition for data validity and assessing trends over time.

The Agency’s TB Reports are used and useful

The Agency’s TB reports are used by multiple audiences in different ways. Interviews with public health officials from across the country affirm that the Agency’s reports are both informative and necessary for helping jurisdictions identify where they stand relative to others in reducing the burden of TB. Survey responses further highlight that the Agency’s reports are used and useful:

- for teaching purposes (27%);
- to inform the development of policies and decisions (21%);
- to improve the quality of services (21%);
- to develop programs and health services (15%);
- to inform the development of research questions and studies (10%); and,
- to develop advocacy programs (6%).

Reports have been used by the Agency and other federal partners:

- to identify the focus of community interventions, such as TAIMA TB;
- to respond to media questions seeking reliable data on TB incidence rates;
- to support the Minister of Health by framing the context for Canada’s first federal framework for action on TB; and,
- to inform program and policy development. For example, Correctional Services Canada uses the Agency’s reports as a baseline to guide their TB risk assessments by comparing the incidence of TB rates in federal penitentiaries with what is being observed in the general public.

From time-to-time, the Agency's reports are referenced in federal, provincial and territorial legislatures by elected and non-elected officials to support advocacy positions, generate awareness, or rationalize a course of action.^{53,54,55} On March 24th of every year – World TB Day – the Agency's reports are extensively referenced by multiple organizations and mass media to advocate for more attention and resources in eliminating domestic and global TB rates.⁵⁶ As one measure to maximize effectiveness, the Agency also tends to release its TB-related materials on or before World TB day.^{57,58}

World TB Day also provides the Agency with an annual opportunity to promote TB awareness through social media, a Ministerial message, and the promotion of annual Agency reports through public webinars. The most recent webinar on Agency TB surveillance reports attracted approximately 290 participants, predominantly from the public health sector and individual clinicians.

The Agency's reports are referenced in all provincial and territorial documents related to TB prevention and control. Some recent publications include:

- the Manitoba TB Protocol (2014);⁵⁹
- the Yukon Communicable Disease Control – TB Control Manual (2014);⁶⁰
- the NWT TB Manual: Stop TB (2014);⁶¹
- the Saskatchewan Provincial TB Strategy, 2013-2018 (2013);⁶²
- the BC Strategic Plan for TB, Prevention, Treatment and Control (2012);⁶³ and,
- the TB Prevention and Control Guidelines for Alberta (2010).⁶⁴

In addition to helping users frame the national context and provide baselines for comparison, all provincial and territorial documents were found to emphasise at least two specific populations in their reports – Canadian-born Aboriginals and foreign-born people – that national surveillance reports consistently show are disproportionately burdened by TB.

The Agency's reports are viewed by a clear majority of survey respondents to be well produced (e.g., accurate and timely) and well received (e.g., used and useful). However, a closer look at the data collected does reveal some minor variances amongst different information users. For example, a greater majority of health care professionals, as well as provincial and territorial officials, view the Agency's reports to be accurate versus federal officials. Conversely, while a greater majority of federal officials consider the Agency's reports to be timely, health care professionals, as well as provincial and territorial officials, are more likely to disagree that the Agency's reports are timely enough for their needs.

Table 3: Survey Results on the Effectiveness of the Agency’s Reports, by Key Users

Reports	TB in Canada			TB: Drug Resistance in Canada		
	Information is Accurate					
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
Federal officials	71%	29%	0%	57%	43%	0%
Provincial/Territorial officials	83%	11%	1%	94%	6%	0%
Health care professionals	88%	12%	0%	86%	14%	0%
Information is Timely						
Federal officials	71%	29%	0%	57%	43%	0%
Provincial/Territorial officials	44%	33%	22%	69%	25%	6%
Health care professionals	59%	25%	15%	77%	16%	7%
Information has Influenced Work						
Federal officials	86%	14%	0%	43%	57%	0%
Provincial/Territorial officials	72%	28%	0%	63%	25%	13%
Health care professionals	69%	29%	2%	68%	32%	0%

Yet, when compared with other G8 nations, as well as Australia and New Zealand, Canada’s reporting schedule generally aligns with the slight majority – annual reporting with a two-year time lag in data (although the Agency does distribute supplementary tables annually). However, as discovered during key informant interviews, evaluating the question of whether reports are timely enough depends on the information needs of users, and the stated objectives of the Agency’s surveillance reports.

Table 4: International Comparison of Data Time Lag in National TB Reports

Data Time Lag Found in National TB Reports Published in 2014			
Countries	1-year time lag (2013 data published in 2014)	2-year time lag (2012 data published in 2014)	4-year time lag (2010 data published in 2014)
	Germany ⁶⁵ Japan ⁶⁶ United Kingdom ⁶⁷ United States ⁶⁸	Canada ⁶⁹ France ⁷⁰ Italy ⁷¹ New Zealand ⁷² Russia ⁷³	Australia ⁷⁴

4.4.2 To what extent are the Agency’s Laboratory References and Diagnostic services Effective?

SUMMARY: The National Microbiology Laboratory within the Agency provides specialized reference and diagnostic services in the area of TB mycobacteriology that are needed, used, timely, accurate, and standardized. Laboratory procedures are accredited by the International Organization for Standardization, and the Agency’s work has been evaluated as high performing by other third parties.

The Agency’s laboratory services are accredited as competent and effective.

The Agency performs, on request, unique reference and diagnostic tests on TB samples that are not offered by all provincial and territorial laboratories. The laboratory procedures used at the Agency are endorsed by the International Organization for Standardization (ISO), and fall under the accreditation of ISO 17025. This Standards Council of Canada accreditation means the Agency’s technical competence and laboratory methods in performing TB tests, calibrations, and sampling activities and reporting are recognized as accurate, reproducible, valid, reliable and effective (with high sensitivity and specificity).⁷⁵

The Agency’s laboratory services are used and useful

The unique services available at the Agency are used by provincial and territorial laboratories, and year-over-year performance data indicates that use has increased between fiscal 2011-12 and 2012-13. For example, the Agency received 17% more provincial and territorial TB samples for testing in fiscal 2012-13 than it did in 2011-12, and conducted 66% more tests in fiscal 2012-13 than it did in 2011-12. Altogether, the Agency received 1,866 TB samples from the provinces and territories, and performed 67,465 TB tests during the 2012-13 fiscal year.

Table 5: Summary of laboratory usage

P/T use of the Agency’s laboratory services	2011-2012	2012-2013	Year-over-Year Difference (%)
# of TB samples sent to the Agency by all provinces	1,593	1,866	17% increase
# of unique TB tests performed by the Agency	40,723	67,465	66% increase

In addition to generating reports, laboratory results are used to assist epidemiologists with outbreak investigations and contact tracing. Recent examples include Agency assistance in:

- Kelowna and Port Alberni, British Columbia;
- Nunavik, Quebec;
- the territory of Nunavut;
- a federal correctional facility in Manitoba;
- four interprovincial border cases; and
- an international border case between Manitoba and North Dakota, United States.⁷⁶

To help strengthen the efficacy and capacity of laboratory services in Canada, the Agency also provides, on request, technical assistance and training to clinical microbiologists and infectious disease physicians. Recent examples include requests for technical assistance on interpreting TB results and validating the proficiency of laboratory procedures.⁷⁷

The Agency’s effectiveness is periodically reviewed for proficiency and quality assurance by a third party – the Reference Centre Advisory Subcommittee (RCA SC) of the Canadian Public Health Laboratory Network (CPHLN). In the CPHLN’s most recent report the Agency received an overall assessment of “strong” in the area of TB mycobacteriology – the highest possible rating that means recommendations made to the Centre have been fully addressed, with either minimal or no additional information required.⁷⁸

4.4.3 To what extent have policy activities at the Agency been effective?

SUMMARY: TB prevention and control efforts require stakeholder engagement and management. With partners, the Agency developed the *TB Prevention and Control in Canada: A Federal Framework for Action*, which outlines the roles and responsibilities of federal departments/agencies, as well as developing partnership priorities for action to address TB.

There are a number of different policy actions that could take place to advance the prevention and control of TB in Canada. The Agency chose to focus its policy activities on priority setting and the development of a federal framework. This is in addition to the other policy work that took place to develop community mobilization projects or support for World TB Day that are covered in other areas of this report.

Priority setting

The Agency has worked primarily through the Public Health Network (PHN), which has representatives from the federal, provincial and territorial governments, for priority setting in this area. A time-limited PHN TB Task Group was established, consisting of experts in TB prevention and control. Their mandate was to identify key issues and potential areas for F/P/T collaboration in this area.

The Agency is continuing its work to support collaboration and facilitate a national approach to TB. These include efforts to identify the necessary components of a national framework for action on TB prevention and control in Canada; to develop practical strategies focused on reducing TB infection rates in key populations (Aboriginal Peoples and foreign-born individuals); and to develop pan-Canadian program indicators and targets.

Accordingly, the Agency's projects being developed or pursued are focused on high-risk populations. For example, options are being developed by PHAC to:

- test an innovative approach to addressing latent TB infection in foreign-born populations;
- work with CIC to lead the work of an expert working group to identify approaches to optimize addressing TB in foreign-born Canadians; and,
- pilot projects in a small number of northern Aboriginal communities experiencing high rates of TB in their Aboriginal populations.

Framework development

National efforts to prevent and control TB involve stakeholders at multiple levels of government and non-governmental organizations, which require coordination and stakeholder management. The Agency's primary achievement in this area was the development of the *2014 TB Prevention and Control in Canada: A Federal Framework for Action*, which demonstrated the government's commitment to address TB in affected populations. The Framework was created to outline the roles and responsibilities of federal departments and agencies in their joint efforts to reduce the TB burden in Canada. It was meant to reflect ongoing core activities and to provide direction in addressing TB, rather than to identify future or new concrete actions that the federal government would undertake.

Since the release of TB Framework, some progress has been made in working with key partners to address TB in at-risk populations. Opportunities may exist to review continued or alternative approaches in using the Framework to support continued public health action in order to reduce or eliminate TB in Canada.

Other activities: An example of initiatives focused on high-risk populations

The Agency has engaged provinces and territories to address latent TB infection in northern Aboriginal populations through community mobilization projects and works with CIC and experts to provide advice on optimizing TB prevention and control for migrant populations.

The Canadian Institutes of Health Research (CIHR) is spearheading a "*Pathways to Health Equity for Aboriginal Peoples*" initiative aimed at going from knowledge of what works to understanding with whom, under what contextual circumstances, and at what cost. Announced in June 2012, this \$25 million long-term Aboriginal health research initiative focuses on four themes or health inequities affecting First Nations, Inuit and Métis (Aboriginal) peoples – namely suicide, **TB**, obesity and oral health. It serves as a platform for health portfolio organizations (PHAC, HC-FNIHB and CIHR) to work collaboratively. According to key informants, the Agency has been involved in providing advice and recommendations to foster the success of this initiative. It has served, informally, as an opportunity for senior management to discuss key issues such as ways to address the high levels of latent TB in the North.

Challenges

Many of the key informants interviewed and a very small proportion of those surveyed (approximately three percent) expressed a desire for a clear plan and a forum to share knowledge and ideas (i.e., managing complex cases, policy options, and lessons learned) as important components in their efforts to reduce TB burden. Informants also stated that it would be an appropriate public health role for the federal government to coordinate such a forum. A few key informants tied the issue to the change in membership in discussions, which were instituted after the PHN restructuring, when the Canadian TB Committee was disbanded (which, among other activities, allowed for best practices to be shared). Regardless, no concerns were raised with the stakeholders' interactions with the Agency and the vast majority of those interviewed and surveyed expressed satisfaction with the Agency's activities during the evaluation period.

4.4.4 To what extent have public health practice activities at the Agency been effective in supporting public health actions and decisions?

SUMMARY: The Agency provides guidance to health care professionals and public health authorities on best practices in prevention, diagnosis and treatment by producing the TB Standards, the Guidance, and educational modules. Numerous lines of evidence show that the Agency's public health practice activities are perceived as essential, effective, and timely.

The Agency contributes to the production of resources to support TB prevention and control. These include the *Canadian TB Standards*; the *Guidelines for TB Prevention and Control Programs in Canada*; and educational modules.

The Canadian TB Standards

The Agency, in partnership with the Canadian Thoracic Society, released the 7th edition of the *Canadian TB Standards* in 2013 (the Standards). The Standards contains clinical best practice information for TB diagnostics and treatment based on the most recent studies. It is written by experts in the field with a wide audience in mind, including: medical professionals, public health officials, academics/researchers, and policymakers.

Both survey respondents and key informants interviewed indicated that they find the Standards useful, timely, and appropriate. Many also valued its focus on the unique Canadian context. Survey results suggest that the Standards are used by medical professionals and provincial policymakers to teach, to help them in their policy decision-making, and to improve service quality. Approximately 69 percent of survey respondents indicated that they were both aware of and use the Standards, and an overwhelming majority of this group (95 percent) agreed that Standards were useful. Eighty-seven percent of those who used the Standards agreed that they were timely; and 93 percent agreed that the Standards have influenced their work. Some of the comments on the Standards included:

- “Great resource and would be happy to help with future updates”;
- “I love having it and I use it all the time”;
- “I like that it is the Canadian Standards ... We need to keep it country wide”;
- “I treat the Standards as the bible”;
- “Overall a very good piece of work that has the potential of improving TB care in Canada”;
- and
- “The Standards were started by the Canadian Lung Association, with later generous support of the federal government. Without them, we would have a heterogeneous and chaotic system of TB prevention and control practice. They are absolutely essential”.

External key informants, in their interviews, also expressed that the *TB Standards* were useful in their efforts to prevent and control TB. When asked about the Standards' usefulness, timeliness and impact, they noted that the Standards were crucial resources that enabled them to conduct their work more efficiently and effectively. The Standards were used in diagnosis and treatment of complex cases of TB; as a basis on which more tools (concise and more focused guidelines) were developed for the work of other departments and other levels of governments; and as a guide based on which policies were developed and programs were delivered. An internet search revealed that 12 of 13 provinces and territories used the Standards to develop their own TB manual.

Other federal government departments involved in TB control and prevention efforts also used the Standards to develop their tools, such as Citizenship and Immigration Canada's Immigration Medical Examination guide for screening TB. The only significant concern raised both by a small number of key informants and survey respondents was the format of the Standards. They found that the 7th edition of the Standards (where the larger edition was available only in an electronic format) was not as user-friendly as the previous edition (printed book with tables).

Guidance for TB Prevention and Control Programs in Canada

Guidance for TB Prevention and Control Programs in Canada (2012, the Guidance) was produced via the Pan-Canadian Public Health Network. The Guidance outlined roles and responsibilities and suggested best practices for various stakeholders, which included epidemiological practices, contact tracing, and drug treatments. Approximately 38 percent of the survey respondents indicated that they were both aware of and use the Guidance, of which 89 percent agreed that they found the Guidance useful; 75 percent agreed that they are timely; and 80 percent agreed that they have influenced their work.

Educational modules to disseminate products

There are other activities developed by the Agency to disseminate knowledge about TB prevention and control. In addition to TB Fact Sheets on the Agency's website, the Agency developed a number of educational modules via webinars which provided advice for healthcare professionals. For example:

- Online training modules were posted on MD Briefcase to assist physicians and nurses working with First Nations on reserve and with Inuit populations. The objective of the modules was to assist health practitioners with the identification of active TB disease and the diagnosis and management of latent TB infections. A total of 1,567 health care providers, including physicians, nurses, and pharmacists completed the course. The program's survey results for MD Briefcase indicate that a majority of the participants found the course useful (participants intended to apply the information they had acquired in their practices such as better screening practices for potential TB patients).
- The Agency also hosted webinars to introduce the 7th edition of the Canadian TB Standards. An estimated 723 participants attended the webinars for the TB Standards. The participants were stakeholders from federal departments and agencies (CIC, CSC, HC's FNIHB), provincial and territorial ministries of health, nurses, physicians, and NGOs. The webinars

presented the 7th edition of the *Canadian TB Standards* and highlighted important updates to best practices in TB prevention and control to relevant/ key stakeholders. Survey feedback from webinar participants notes that the majority of the survey respondents found the information provided to be useful for their work.

In addition, the Agency provided advice and guidance for healthcare professionals (such as doctors and dental office workers), care givers, employers, regulatory bodies and other members of the community to support them in their efforts to prevent and control TB. Over the course of the evaluation, the Agency responded to approximately 40 requests for information about TB. Requests came in the form of calls or webmails seeking information. While the Agency did not provide personalised medical advice, representatives did refer individuals to appropriate resources (e.g., P/T guidelines, TB standards, PHAC website, local public health unit) and invited them to contact a health professional.

4.4.5 To what extent have TB response activities at the Agency been effective in supporting public health actions and decisions to reduce the prevalence of TB among most at-risk populations?

SUMMARY: The Agency worked collaboratively with provincial, territorial, and international jurisdictions to prevent and control the transmission of TB through travel-related TB response activities, and through outbreak management support activities (including remote and field epidemiological support to communities with TB outbreaks).

Travel-related TB response

The Agency works in partnership with other federal partners (including CBSA, CIC) and stakeholders (industry, provincial and territorial authorities) to ensure that travel restrictions are imposed when there is a risk of an already identified individual diagnosed with active TB disease of travelling on a commercial airline. As well for flights or other conveyances on which a case of active TB disease had been identified. Agency staff will work to ensure that contact notifications are conducted as necessary. Key informant interviews indicated that despite some jurisdictional differences (in criteria for notification (see below), and privacy standards), the Agency collaborates effectively with its partners and stakeholders to take appropriate action to limit the spread of TB as a result of travel.

The Agency receives notifications from provincial, territorial and international jurisdictions related to TB. Notifications are sent to the Agency from provincial or territorial TB programs or from TB programs in the country in which the case was diagnosed. Upon notification, the Agency conducts a public health risk assessment and facilitates/conducts further follow-up actions as necessary.

There are three different public health activities undertaken by the Agency in this area:

- The Agency's **TB and air travel (TBAT)** and close-contact activities aim to assess TB related health risk associated with travel on commercial conveyances (including airplanes, buses and trains) by identifying the passenger contacts of individuals with active or suspected active respiratory TB who have travelled on a conveyance.
- The Agency's **public health travel restriction activities (PHTR)** aim to prevent the introduction and spread of TB in Canada, and the exportation of TB from Canada to the global community, by identifying individuals with suspected or confirmed active TB, and preventing them from traveling against public health advice.
- **Continuity of care activities** aim to maintain the continuity of treatment and care during travel and/or prolonged stay by individuals with active TB who are deemed non-infectious.

The volume of notifications received by the Agency and the volume of follow-up activities conducted by the Agency have increased since 2009. To illustrate:

- The volume of TBAT contact notifications received by the Agency from all jurisdictions increased by 40% from 2009 to 2014.
- In 2014, almost half (48%) of these notifications required further Agency action beyond a risk assessment (i.e., they met the criteria for follow-up), compared to 29% in 2009.
- Travel restriction notifications submitted to the Agency have increased nearly six-fold since 2009.
- Continuity of care requests and case detail requests, both of which required follow-up action in all cases, increased from a combined total of 36 notifications continuity of care and case detail notifications in 2009 to 50 continuity of care notifications in 2014.

The increase in notifications received from stakeholder jurisdictions may also be due to an increase in travel since 2009. Travel and migration are increasing both globally and in Canada, and are predicted to continue to rise. To illustrate:

- Air passenger traffic at Canadian airports increased 2.7% in 2013. This was the fourth consecutive annual increase since 2009, when passenger traffic had declined.⁷⁹
- In 2012, the number of global travellers exceeded 1 billion⁸⁰ and global travel is projected to grow by 5.4% per annum over the next 10 years.⁸¹
- In 2011, an estimated 20.6% of the Canadian population was foreign-born. The proportion of foreign-born persons is predicted to reach between 25% and 28% by 2031, with the foreign-born population increasing four times more rapidly than the rest of the Canadian population.⁸²

In the case of TB and air travel activities (TBAT), the increase in TBAT notifications may reflect heightened stakeholder awareness of the Agency's *Canadian TB and Air Travel Guidelines Version 2.0 (2009)*. In a survey of key stakeholders who report TB-related data to the Agency, all respondents who indicated that they report data to the Agency for TB response purposes indicated that they are aware of and use the *Guidelines*. A majority of respondents who use the *Guidelines* (73%) indicated that the information in the *Guidelines* has influenced their work.

The increase in travel-related TB notifications from stakeholder jurisdictions may also be a result of increased awareness in stakeholders such as public health authorities of the Agency's TB response mechanisms, and a better understanding of the processes required to notify the Agency.

With respect to their criteria for reporting cases to federal public health authorities, the Agency's *Canadian TB and Air Travel Guidelines Version 2.0* are more stringent than both the CDC and the WHO's guidelines for reporting. The Agency's *Guidelines* indicate that contact notification should be implemented for any cases of TB and travel, regardless of flight date or of time from flight to notification of Agency, while CDC and WHO guidelines indicate that notification should be implemented within 3 months of flight only. The Agency's *Guidelines* also differ from the CDC and WHO guidelines regarding their criteria for notification related to flight duration, drug sensitive isolates and laryngeal TB. This difference in criteria for notification has been reflected in a higher volume of TBAT notifications received by PHAC than by CDC.

There is little available scientific evidence regarding the outcomes of contact notifications related to TB and air travel. Overall, the evidence suggesting that TB transmission occurs on commercial aircraft remains variable: some studies have reported TB skin test (TST) conversion among passengers with no other known risk factors (TST conversions are considered presumptive evidence for acquired latent TB infection). Other studies have reported positive TST results, but among passengers who had received BCG vaccination (which can cross-react with a TST test, possibly leading to a false positive) or had other known risk factors for TB, making it difficult to conclude whether TB transmission had in fact occurred on the aircraft. Several other studies have found no evidence of TB transmission in passengers or crew.⁸³ A limited number of publications have described the results of air travel-related contact investigations.

There is therefore a need for a strengthened evidence base related to the transmission of TB on aircraft, and for a systematic analysis of the Agency's TB and air travel and close contact notification activities, in order to determine the effectiveness of contact notification activities at contributing to the control of TB, and to determine whether the Agency's *Guidelines* could be reviewed to match the CDC and WHO recommendations for contact notification in the case of air travel.

Provincial/Territorial Challenges

While it falls outside of the mandate of the Agency, a limiting factor related to travel and highlighted by provincial and territorial representatives, especially those from provinces with the highest rates of TB, is related to difficulties in TB medical surveillance for foreign-born individuals new to Canada. Once an individual lands in Canada as an immigrant, tracking and following-up with individuals with TB becomes difficult. As of now, the system is passive: the

onus remains with the individual to present themselves to the health care system. Provincial and territorial representatives noted that, although formal citizenship applications do require proof that applicants have followed up with a medical practitioner in Canada after arrival, landed immigrant status does not. This passive surveillance system only captures those individuals that present themselves to the health care system for treatment.

Outbreak management support

The Agency has provided laboratory, in-field and remote support to communities in which TB outbreaks have occurred. For example, at the request of a province or territory, the Agency has deployed subject-matter experts and field epidemiologists to Nunavut in 2010 and 2011, and Nunavik in 2012 and 2013. Subject-matter experts provided advice, expertise and contributed to outbreak investigations by gathering and analyzing epidemiological data.

The Agency's outbreak response activities have contributed to capacity building in the area of TB outbreak control and preventative activities. For example, in 2010, the Agency conducted a pilot study in Nunavut to develop and implement new standardized surveillance forms in order to contribute to improving the territory's TB surveillance system. NML has also provided support for Nunavik's TB lab by evaluating the lab's capacity and making suggestions for its improvement. The lab has contributed genotyping tools to support other tools used in Nunavik and Nunavut, which have contributed to community capacity to provide a rapid response to outbreaks.

The Agency has also provided outbreak management support via remote support from Ottawa, and has developed collaborative relationships with stakeholders (including the Nunavik Regional Health Authority) that have enabled the Agency to contribute support and expertise appropriately in the case of outbreaks of TB.

In the case of the outbreak of TB in Nunavik in 2012, the potential for Agency support to the outbreak response was brought to the CCDIC's attention as a result of a close working relationship with representatives, which ultimately led to the deployment of senior epidemiologists from CCDIC and the Canadian Field Epi Program.

Canadian Field epidemiologists and CCDIC epidemiologists have, upon request, provided remote advice in the form of recommendations to local health authority outbreak reports, and have provided short and long-term recommendations for the Nunavut surveillance system, including the 2010 pilot study noted above.

4.4.6 To what extent have community engagement activities at the Agency been effective in supporting public health actions and decisions to reduce the prevalence of TB among most at-risk populations?

In 2006, the Agency along with a group of stakeholders developed a National Lung Health Framework⁸⁴ (launched in 2008) as a strategic action plan to improve the lung health of Canadians.⁸⁵ The Framework identified a number of challenges, including unstable funding/lack

of long-term funding for research, programs and services. At the time, many stakeholders involved in the development of that Framework expressed concern that issues such as crowded housing/living conditions and a lack of systematic detection of latent TB would enable the rate among Aboriginal Peoples to remain high. In response, the Government of Canada (through the Agency’s Centre for Chronic Disease Prevention) committed \$10 million, over three years (2009-2012), for initiatives to improve Canadians’ awareness of prevention, early detection, and management of lung diseases.

Two of such projects focused specifically on TB in one of the two most affected communities: Northern Aboriginal populations. Table 6 below offers a brief description of these two projects.

Table 6: Lung Health Program TB-Related Projects

Project title	Lead	Description
<p>TAIMA TB</p> <p>Funding: \$805,579 (F/Y 2010-11: \$207,006; F/Y 2011-12: \$598,573)</p>	<p>Ottawa Hospital Research Institute/ Government of Nunavut</p>	<p>TAIMA TB (means “Stop” TB, in Inuktitut) consisted of an awareness and prevention campaign carried out in Iqaluit, Nunavut, in three phases:</p> <ul style="list-style-type: none"> • Phase 1 (January to May, 2011) focused on increasing TB awareness and knowledge by engaging the community at large. • Phase 2 (June to November 2011) door-to-door awareness, screening and testing campaign in residential areas that had shown historically high incidence of TB in Iqaluit. • Phase 3 (December 2011 to February 2013) participants were offered treatment for latent TB.
<p>TB Education for Aboriginal and non-Aboriginal Youth</p> <p>- <i>Baseline Needs Assessment:</i> \$50,000 (F/Y 2009-10: \$29,400; F/Y 2010-11: \$20,600)</p> <p>- <i>TB Public Health Promotional Curriculum</i> \$350,000 (F/Y 2010-11: \$75,083; F/Y 2011-12: \$274,917)</p>	<p>TB Program Evaluation and Research Unit, Department of Medicine, University of Alberta</p>	<p>This project consisted of two phases:</p> <ul style="list-style-type: none"> • Phase 1 consisted of a Baseline Needs Assessment for TB education in First Nations youth which resulted in recommendations for the development of a culturally relevant TB curriculum for high school students in three communities in Saskatchewan and Manitoba. Grade 9 and 10 students in 3 schools were surveyed to determine their level of knowledge about TB. • Phase 2 resulted in a culturally relevant TB curriculum aimed at Canadian Aboriginal youth. The curriculum aimed at reducing transmission and stigma by teaching about TB, its symptoms, ways in which is contracted, and how to manage the disease.

TAIMA TB

According to project reports and Agency’s internal documents, as a result of this initiative:

- The number of people who presented to public health to get tested for TB increased, doubling from an average of 26 per month over the previous four years to an average of 50 people per month during the four months of TAIMA TB’s general awareness campaign).⁸⁶
- 444 individuals within 162 dwellings were provided TB awareness in their home.
- 300 people from those dwellings agreed to be actively screened for LTBI.
- One third of those screened resulted in positive tests for latent TB and were recommended for treatment.
- Eight cases of active TB disease were found.⁸⁷

- The project contributed to an increase of 33% in the total number of patients who completed treatment within the community.⁸⁸
- Given the positive results of the TAIMA TB project, the project team received two grants from the Canadian Institutes of Health Research (CIHR) to continue TB-related work in Nunavut.

TB Education for Aboriginal and non-Aboriginal Youth

According to project reports and Agency's internal documents, the baseline needs assessment – conducted with the participation of principals, senior staff and teachers – informed the development of a culturally relevant TB curriculum aimed at high school students. Stakeholders showed keen interest and willingness to support the development of TB resources to complement and support their existing Health Curriculum. According to post-intervention surveys:

- General knowledge increased post-intervention and more than 80% of respondents to the survey indicated a desire to learn more about TB.
- A Resource Guide was developed, which was intended to become a living document that would adapt to the changing demands of schools across the Prairies and hopefully in the North where TB is endemic.
- Interest was also expressed by FNIHB-AB region nurses to use the Guide as a resource for Community Health Workers.⁸⁹
- Through the delivery of the curriculum to predominantly Aboriginal high schools, the project contributed to filling the gaps in knowledge in this population, and increasing awareness regarding maladaptive attitudes and practices that facilitate transmission of TB. It also helped teachers focus their lessons on TB-specific knowledge.

Common underlying factors

According to program documents, a number of common underlying factors contributed to the success of both these projects:

- Community involvement and engagement at all levels including the introduction, design, implementation and delivery of the program.
- Educational TB messaging developed and tailored to the target population and context.
- Focused efforts in high risk TB geographical areas.
- Leadership through a steering committee including project staff and community leaders.
- Plan for the dissemination of project findings to the community, the media and organizations that may have an interest in the results of the projects.

Challenges

Some general challenges were identified in the performance reporting associated with these projects:

- TAIMA TB had adequate resources to carry out its activities, but minimal resources to sustain it long term; i.e., project results were not sustained after the project ended. For example, the increase in the number of walk-ins for passive latent TB screening during the four-month awareness campaign, which had doubled, went back to pre-intervention numbers once the project ended.
- Additional staff for the six-month door-to-door campaign, which targeted high risk TB zones in Iqaluit, and time to reach the target numbers, would have been beneficial.
- Obtaining ethics approval from two boards (Public Health Agency of Canada Ethics Board and the Ottawa Hospital Research Ethics Board) was time consuming.
- Initiatives like TAIMA TB are costly. Reasons for this are the fact that target populations are disperse and located in remote areas which add to transportation costs. They also require dedicated and sustained human resources which existing infrastructures may not be able to fully address.
- Similarly, in the case of the TB education project, key informants closely involved with this project were not able to confirm whether project results have been sustained and/or expanded to other schools after the conclusion of the project, as initially hoped.
- Both projects reported constraints with timelines affecting the implementation of the projects. “In the future, more flexible time lines would help make the best use of funding – especially for projects that are guided by community input, and thus beholden to timelines that are to some degree out of their control.”⁹⁰

The road ahead

There is indication that as the Agency plans to pilot a small number of innovative public health interventions aimed at reducing the impact of TB in at-risk Aboriginal northern communities over two years, the lessons from previous efforts are being considered. In fact, at the time of this report, an announcement has been launched and a number of applications for funding have been received (preliminary funding amounts: 2015-2016, \$400K; 2016-2017, \$400K). However, there have been delays and some applicants have reported unsatisfactory response time from Agency staff regarding their application. Further collaboration and leveraging of partnerships with other federal, provincial and territorial partners may enhance the reach of these efforts.

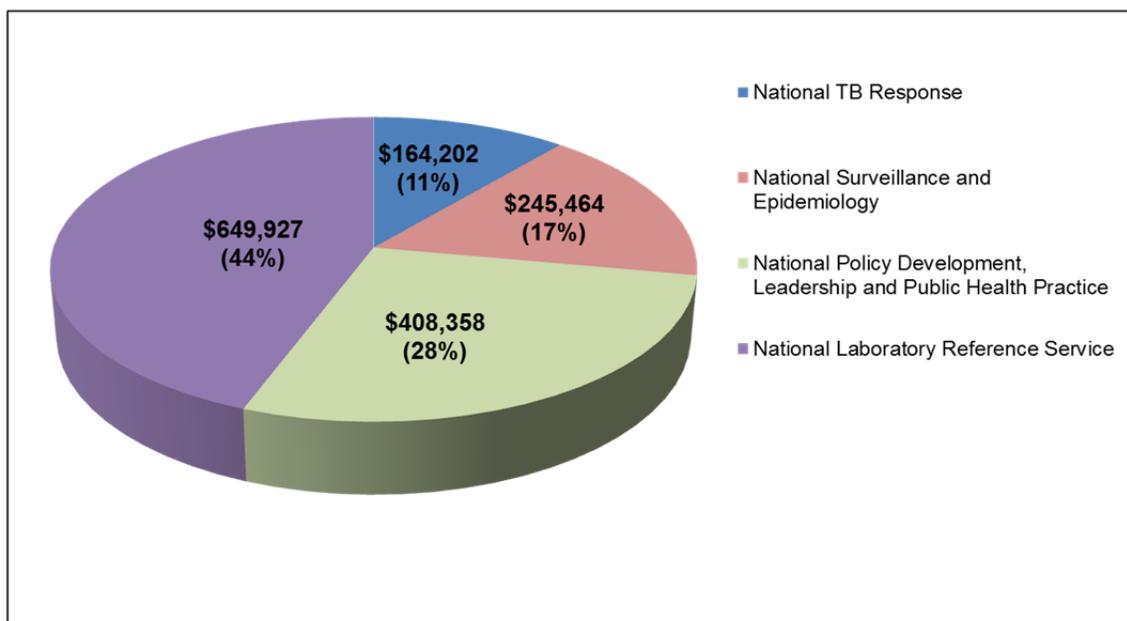
4.5 Performance: Issue #5 – Demonstration of Economy and Efficiency

The Treasury Board of Canada’s *Policy on Evaluation* (2009) and guidance document, *Assessing Program Resource Utilization When Evaluating Federal Programs* (2013), defines the demonstration of economy and efficiency as an assessment of resource utilization in relation to the production of outputs and progress toward expected outcomes. This assessment is based on the assumption that departments have standardized performance measurement systems and that financial systems link information about program costs to specific inputs, activities, outputs and expected results.

The data structure of the detailed financial information provided for the program did not facilitate the assessment of whether program outputs were produced efficiently, or whether expected outcomes were produced economically. Specifically, the primary difficulty in addressing this evaluation requirement was the lack of planning or budgetary information for TB activities, which are funded through the existing Agency budget.

Expenditure information based on functional responsibilities was available for a three-year period. This information demonstrates the level of effort (salary dollars) dedicated by the Agency for TB-related functions. The Agency focusses its level of effort in technical functions (72%) primarily in the area of national diagnostic and reference services (44%), national surveillance and epidemiology (17%) and national TB response (11%). Just over a quarter of the Agency’s level of effort is dedicated to policy and program development (28%), although this excludes operational expenses and the funds for Lung Health projects.

Figure 1: The Agency's Actual Average Annual Salary Expenditure by TB Activity (Fiscal 2010/11 to 2013/14)



Findings below provide additional observations on the adequacy and use of performance measurement information to support economical and efficient program delivery and evaluation.

Observations on Economy

SUMMARY: The cost to society to treat TB for a relatively small number of cases is substantial. Some of these costs may be offset by community mobilization projects if the benefits outweigh the costs of delivery, although the success of broadening community mobilization projects is unknown at this time.

Through the development of the 2014 TB framework, the Agency outlined the cost of preventing active cases of TB. Using a study conducted with 2004 data, the authors were able to adequately demonstrate that there are substantial savings when treating active TB. In 2004, total TB-related expenditures in Canada were estimated at \$74 million, with the average cost of treating a case of active TB being approximately \$47,000. Treatment for latent TB infection, on the other hand, was estimated to be less than \$1,000 per patient.⁹¹

An update of these figures was attempted for the evaluation based on the Economic Burden of Illness in Canada database. This analysis yielded similar results, however, several data points were missing, such as costs associated with diagnosis, public health activities, and staffing outside hospitals (technicians, clerical). The research and the data sources used in the previous 2004 analysis also captured more and different sources. Regardless, both analyses demonstrated the cost savings for treating latent TB, which would then avoid the more substantial costs of treating active TB.

Theoretically then, some of these costs may be offset by community mobilization projects similar to TAIMA TB, where its general awareness campaign resulted in an increase in walk-ins for latent TB screening (from an average of 25 to an average of 50 people per month). However, a few external key informants cautioned about the initial start-up costs for this type of community mobilisation project. The costs of such mobilisation programs would therefore need to be assessed on its effectiveness to determine whether benefits outweigh the costs of delivery. In addition, there was no evidence on the success of replicating or broadening this project, given its specific and time-limited focus.

Observations on Efficiency

SUMMARY: There are efficiencies in the Agency's TB activities. For example, as Canada has a low incidence rate of new TB cases per year, it is more efficient for one lab to maintain expertise and technology to help support those provinces and territories with very few cases per year.

In the spirit of efficiency, the *Canadian TB Standards* recommend that laboratories not performing a minimum of 15 Acid-fast bacillus smears per week should refer TB specimens to another laboratory or reference laboratory.⁹² According to the most recently available statistics, in 2013 four provinces and two territories reported having fewer than 15 TB cases.⁹³ As Canada has a relatively low incidence rate of new TB cases per year (approximately 1,600 cases across the country), it is therefore viewed to be more efficient for one lab to maintain expertise and technology than it would be for many provincial laboratories dealing with only a few cases per year.

Table 7: Canadian Jurisdictions with Low TB Incidence Rates

Jurisdiction	Number of TB Cases in 2013
Prince Edward Island	0
Yukon	2
New Brunswick	3
Northwest Territories	4
Nova Scotia	8
Newfoundland	13

The *Canadian TB Standards* also prioritize the timely detection and treatment of active TB. Overall, the Agency is meeting all of its stated turn-around service time standards (although with no additional resources), and has demonstrated year-over-year operational improvement, as shown in Table 8.

Table 8: The Agency is performing within All Turn-Around Service Time Standards

Agency Testing Categories	The Agency’s Testing Turn-Around Targets	Year-over-Year Performance Efficiency Average Turn-Around Time (Days)		
		2011-12	2012-13	Year-over-Year Variance
TB first line susceptibility testing	30-days - (calendar)	20	17	Within target, and 3-days faster
TB second line susceptibility testing	30-days - (calendar)	27	25	Within target, and 2-days faster
Rapid grower susceptibility testing	14-days - (calendar)	12	9	Within target, and 3-days faster
Slow grower susceptibility testing	30-days - (calendar)	14	12	Within target, and 2-days faster
Sequence based identification	10-days - (working)	6	6	Within target, and similar
MIRU-VNTR genotyping	30-days - (working)	23	14	Within target, and 9-days faster
Drug Targets (INH, rpoB, embB, pncA)	6-days - (working)	5	5	Within target, and similar
AMTD/NAA Testing	2-days - (working)	1	1	Within target, and similar

There were no indications of duplicative efforts by having two different surveillance systems (the CTBRS and the CTBLSS). Both systems had unique data requirements and unique stakeholders (or those who were supplying the data). There was no indication through survey responses that there was perceived duplication in providing data for the two systems and it does appear that the combined data from the two systems provides a comprehensive overview of active TB cases in Canada.

Observations on the Adequacy and Use of Performance Measurement Data

As previously noted, the Agency's TB activities have not been established as a 'program' based on the foundation of cabinet authorities. Therefore, a logic model and performance measurement strategy were not developed. However, the evaluation found lines of evidence to retrospectively assess the use and impact of the Agency's TB activities. Stakeholder lists were relatively up-to-date, there were several stakeholder feedback surveys available and performance measurement-like information was provided to help assess specific TB-related activities.

Nevertheless, a lack of a logic model and performance measurement strategy can hinder the Agency's ability to clearly articulate its goals to prevent and control TB within its federal public health mandate, as well as the activities, resources and processes needed to obtain these goals.

5.0 Conclusions

The Agency's TB activities since 2009 are perceived to be useful for the vast majority of internal and external stakeholders. Products and services are used for a variety of purposes, from the development of public health practice and policies to teaching and research. The Agency's ability to prevent and control TB could be enhanced by reviewing activities in airline contact notification of TB cases and improving stakeholder management.

5.1 Relevance Conclusions

5.1.1 Continued Need

TB remains a major global public health issue and there is a continued need to prevent and control TB both in Canada and globally. Overall, Canada's TB rate, at 4.7 cases per 100,000 population, is low by global standards. However, foreign-born individuals from countries with high incidence of TB and Canadian-born Aboriginals are at higher risk for active TB, and have higher than national average incidence rates of TB. TB is a health and social issue; the social determinants of health (e.g., housing, health care access, education and income) have been associated with TB transmission and the progression of latent TB infection to active TB disease. Finally, while rates of drug resistance in Canada are well below international levels, drug resistance is one of the most challenging aspects of global TB control: drug-resistant TB strains are more difficult and costly to treat and have greater associated morbidity and mortality, highlighting the importance of adequate and continuous monitoring of TB cases.

5.1.2 Alignment with Government Priorities

TB prevention and control is a priority of the Government of Canada and the Public Health Agency of Canada, as reflected in a variety of planning and corporate documents.

5.1.3 Alignment with Federal Roles and Responsibilities

As the prevention and control of TB is a shared responsibility, the Agency is one among many players within the federal government, and provinces and territories with activities in this area. The Agency's TB activities align broadly with its mandate. There is an appropriate role for the Agency in surveillance, provision of public health guidance, outbreak response, public awareness, program and policy development (including community interventions, mobilization and awareness) although there are no cabinet authorities which group all TB activities into one program.

5.2 Performance Conclusions

5.2.1 Achievement of Expected Outcomes (Effectiveness)

The Agency's activities appear to be effective in supporting public health actions, planning and decision making in the prevention and control of TB. The Agency continues to work with provincial/territorial partners, as well as other government departments, to identify specific areas of action related to departmental or organizational mandates. Part of this work culminated in the development of the 2014 Tuberculosis Prevention and Control in Canada: A Federal Framework for Action. Since the release of the federal TB Framework, some progress has been made in working with key partners and stakeholders to address TB in at-risk populations. Opportunities may exist to review continued or alternative approaches in using the Framework to support continued public health action.

Many of the products and services developed by the Agency (alone or in partnership) are considered useful, timely and appropriate by stakeholders. This includes the Agency's laboratory and diagnostic services, as well as the development/revision of products such as the *Canadian TB Standards* (and educational modules produced to support dissemination of the Standards) and the Guidance for TB Prevention and Control Programs in Canada. Similarly, national surveillance reports on TB cases and outcomes are used by multiple audiences and for many different purposes.

There is recognition that the rates of TB have remained largely unchanged, and there are pockets where latent TB remains a concern. Some of the Agency's related activities may provide some guidance with respect to addressing these concerns, such as the TAIMA TB project (funded through the Lung Health Program), which demonstrated considerable success in preventing and controlling TB, although the focus was on one key population (Aboriginals) in one community. Therefore, lessons can be learned for future community engagement in preventing and controlling TB: factors such as community involvement, culturally appropriate messaging and infrastructure appeared to be critical for success.

5.2.2 Demonstration of Economy and Efficiency

The Agency's TB activities have not been established as a program. While the evaluation found lines of evidence to retrospectively assess the use and impact of the Agency's TB activities, a logic model and performance measurement strategy have not been developed to articulate the Agency's approach and goals to prevent and control TB, within a federal public health mandate.

However, efficiencies were demonstrated in the Agency's activities. For example, as Canada has a low number of new TB cases per year (approximately 1,600), it is more efficient for one lab to maintain expertise and technology to help support those provinces with very few cases per year.

More broadly, it appears more efficient to enhance efforts to identify and treat latent TB with a goal to prevent active cases of the disease. In 2004, total TB-related expenditures in Canada were estimated at \$74 million, with the average cost of treating a case of active TB being approximately \$47,000. Treatment for latent TB infection, on the other hand, is estimated to be less than \$1000 per patient. The higher costs associated with treating active TB cases may, however, be offset by community mobilization projects similar to TAIMA TB, as the project's general awareness campaign resulted in an increase in walk-ins for TB testing (from an average of 25 to an average of 50 people per month). No evidence has been provided at this time on the success of replicating, adapting or broadening a project such as TAIMA TB.

6.0 Recommendations

Recommendation 1

Review the way forward for the Agency to advance its activities for the prevention and control of TB, with consideration of the Agency's mandate and the roles and responsibilities of others

There is evidence that the Agency's current products and services are timely and used. There is also recognition, however, that the rate of TB amongst Canada's foreign-born population is disproportionately high and has remained relatively stable at approximately 70% of all reported TB cases over the past decade. In low-incidence countries like Canada, the elimination of TB becomes more difficult as rates decline and level off, and global concerns about antimicrobial resistance necessitates a context for continued vigilance.

The Agency is one of many players involved in preventing and controlling TB and the recently released 2014 federal TB Framework outlines the Agency's national leadership role related to the public health aspects of the disease. There is evidence that priorities have been established with partners (both federal and provincial/territorial) for future activities, but there is no established plan focussing on how the Agency's activities are working together to advance this issue. With no logic model outlining the strategic goals of the Agency in this area, it is difficult to see how the Agency will work towards decreasing the overall rate of TB in Canada, as committed to by the Government of Canada in line with the post 2015 World Health Organization End TB Strategy.

Recommendation 2

Review activities related to the public health response to active TB

The volume of TB response activities has increased since 2009. The quantity of airline contact notification cases submitted to the Agency for action has also increased and the volume of cases submitted to the Agency on a yearly basis is greater than the number of cases submitted to the CDC. This may likely be due to the greater stringency of Canadian guidelines for initiation of an airline contact investigation. As the risk of TB transmission during travel on commercial aircraft remains uncertain, there is a need for a strengthened evidence base in the case of TB and air travel and for a review of Canadian guidelines for TB and air travel contact notifications. As an added benefit, this review could also lead to cost savings.

Recommendation 3

Engage stakeholders more effectively.

As noted previously, the Canadian TB Standards were considered useful, timely and appropriate by stakeholders participating in data collection for this evaluation. Updating these standards requires work from external experts and partners when new information becomes available. For this type of public health guidance and other related TB activities, there is no current forum to discuss best practices across the broader continuum of TB prevention and control, and a few external key informants noted a need to exchange information to ensure public health practice, program and policy improvement on an ongoing basis. Providing this mechanism will be important as the scientific landscape for TB advances (such as updated medications, laboratory and public health practices).

Appendix 1 – Evaluation Description

Evaluation Scope

The scope of the evaluation covered the period from 2009-10 to 2014-15, and included TB diagnostics, prevention and control activities performed by:

- the Centre for Communicable Disease and Infection Control; and,
- the National Microbiology Laboratory.
- TB Projects funded through the Lung Health Program of the Centre for Chronic Disease Prevention.

Other non-TB related projects funded through the Lung Health Program of the Centre for Disease Prevention and Control are out of scope because these activities are currently being assessed through the evaluation of chronic disease prevention and mitigation. Also excluded are projects recently initiated in support of the *TB Prevention and Control in Canada: A Federal Framework for Action* (2014). An important point to note is that TB activities are not framed by a defined program, so the approach of this evaluation was designed to evaluate a cluster of activities that are directed to TB diagnostics, prevention and control by the Agency.

Evaluation Issues

The specific evaluation questions used in this evaluation were based on the five core issues prescribed in the Treasury Board of Canada’s *Policy on Evaluation* (2009). These are noted in the table below. Corresponding to each of the core issues, evaluation questions were tailored to the program and guided the evaluation process.

Table 1: Core Evaluation Issues and Questions

Core Issues		Evaluation Questions
Relevance		
Issue #1:	Continued Need for Program	Assessment of the extent to which the program continues to address a demonstrable need and is responsive to the needs of Canadians <ul style="list-style-type: none"> • What are the rates and trends of TB in Canada, as well as their localized area of burden? • What actions has IDPC (CCDIC & NML) taken to address the incidence of TB in Canada (April 2009-March 2014)?
Issue #2:	Alignment with Government Priorities	Assessment of the linkages between program objectives and (i) federal government priorities and (ii) departmental strategic outcomes <ul style="list-style-type: none"> • Are the TB activities performed by IDPC (CCDIC & NML) aligned with federal government priorities and PHAC’s strategic outcomes?
Issue #3:	Alignment with Federal Roles and Responsibilities	Assessment of the role and responsibilities for the federal government in delivering the program <ul style="list-style-type: none"> • Are the TB activities performed by IDPC (CCDIC & NML) aligned with federal roles and responsibilities?

Performance (effectiveness, economy and efficiency)		
Issue #4:	Achievement of Expected Outcomes (Effectiveness)	<p>Assessment of progress toward expected outcomes (including immediate, intermediate and ultimate outcomes) with reference to performance targets and program reach, program design, including the linkage and contribution of outputs to outcomes</p> <ul style="list-style-type: none"> • Has the incidence of TB decreased in Canada, both generally and within targeted populations and geographic regions (April 2009-March 2014)? • Is the Agency’s undertaking of: a) surveillance, b) public health guidance, and c) outbreak & contact tracing activities effective in supporting public health actions, planning and decision making (April 2009-March 2014)? • Is the Agency getting to where it needs to be? If not, why not?
Issue #5:	Demonstration of Economy and Efficiency	<p>Assessment of resource utilization in relation to the production of outputs and progress toward expected outcomes</p> <ul style="list-style-type: none"> • Has the Agency’s TB activities been undertaken in the most efficient and economical manner? Are there overlaps and duplications; alternate ways to achieve similar results at a lower cost? • Does the Agency’s surveillance activities meet basic needs, and have these activities been undertaken in the most efficient and economical manner? Compared with other jurisdictions, is the Agency’s surveillance approach optimal? • What is the Agency’s cost-effectiveness of performing Surveillance activities and Community Mobilization projects (i.e., such as TAIMA TB)?

Data Collection and Analysis Methods

Evaluators collected and analyzed data from multiple sources. Sources of information used in this evaluation included:

- **Document and file review** – 603 documents pertinent to TB related activities dealing with TB diagnostics, prevention and/or control were reviewed for information regarding the relevance (priorities, roles and responsibilities) of the activities. The main purpose of conducting a document review is to obtain a comprehensive understanding of the underlying theory of TB activities within the Agency, delivery of the activities, and results over the five year period covered by the evaluation. The document and file review supports and corroborates findings from other methodological approaches (triangulation), increases the accuracy of findings, and acts as a validity measure.
- **Financial data review** – A review of financial data from 2009-2010 to 2014-2015, which focussed on actual expenditures. An analysis of financial data helps respond to questions of effectiveness, efficiency and economy.
- **Key informant interviews** – interviews were conducted with 32 stakeholders (Public Health Agency of Canada (n=9); other federal government departments or agencies (n=8); provincial/territorial government representatives (n=8); external experts (n=7). Interview questionnaires were developed and slightly modified and tailored for each specific stakeholder group. Guides were based on the evaluation issues and questions identified in the Evaluation Matrix. They were developed using a semi-structured format, including probes where helpful. These semi-structured interviews based on several key questions help to define the areas to be explored, and also allow the interviewer or key informant to diverge in order to pursue an idea or response in more detail. The flexibility of this approach, particularly when compared to structured interviews or focus groups, also allows for the discovery or elaboration of information that is important to participants but may not have been previously thought of as pertinent by the evaluation team. Interviews were conducted in person (when possible) or by telephone. They were recorded, with participant’s consent, and transcribed as necessary. Data was coded and analysed with the aid of NVIVO software.

- **International analysis** – a review of published TB incidence rates and reporting schedules amongst the G8 countries, as well as Australia and New Zealand, was conducted by scanning the countries’ public health websites. The G8 countries include: Canada; France; Germany; Italy; Japan; Russia; United Kingdom; and the United States.
- **Literature review** – a search for Canadian and international literature from the past ten years using search terms of “tubercul*” and “canad*”. After examining documents to ensure relevance, 60 articles were reviewed. The literature review supports and corroborates findings from other methodological approaches (triangulation), increases the accuracy of findings, and acts as a validity measure.
- **Performance data review** – a review of data on performance of the two TB-related community mobilization projects funded through the national Lung Health Program of the Centre for Chronic Disease Prevention (2009-2012). Also analyzed were (stakeholder satisfaction survey, knowledge uptake survey, project-level performance and evaluation reports).
- **Stakeholder web survey** – an online survey was conducted by the Office of Evaluation. The web survey was targeted to key stakeholders who are involved in TB-related surveillance, public health guidance and response activities. It provided these stakeholders an opportunity to share their knowledge of and views on the use and impact of the Agency’s products and services related to TB. The feedback collected, specifically on the Agency’s products and services, helped assess the relevance and performance of these, along with other lines of evidence (e.g., key informant interviews, document and file review). The survey was in the field between February 3 and February 20, 2015; it was sent to 1949 contacts provided by the Centre for Disease Prevention and Control. There were 221 fully completed surveys for a response rate of 11.71%.

Data were analyzed by triangulating information gathered from the different sources and methods listed above. This included: systematic compilation, review and summarization of data to illustrate key findings; statistical analysis of quantitative data from databases; thematic analysis of qualitative data; and comparative analysis of data from disparate sources to validate summary findings.

Appendix 2 – Summary of Findings

Rating of Findings

Ratings have been provided to indicate the degree to which each evaluation issue and question have been addressed.

Relevance Rating Symbols and Significance:

A summary of Relevance ratings is presented in Table 1 below. A description of the Relevance Ratings Symbols and Significance can be found in the Legend.

Table 1: Relevance Rating Symbols and Significance

Issues	Indicators	Overall Rating	Summary
1. Continued Need for the Program			
What are the rates and trends of TB in Canada, as well as their localized areas of burden?	<ul style="list-style-type: none"> Evidence of a problem to solve; magnitude (i.e., active, latent, re-treatment, & drug resistant TB). 	High	TB remains a major global public health issue and an evolving disease. Although Canada's national rates of TB are low, two sub- Canadian populations are disproportionately impacted. Foreign-born Canadians and Aboriginal Canadians are at higher risk for active TB, and have significantly higher than average incidence rates of TB.
2. Alignment with Government Priorities			
Are the TB activities performed by IDPC (CCDIC & NML) aligned with federal government priorities and PHAC's strategic outcomes?	<ul style="list-style-type: none"> Evidence that activities and objectives align with, and contribute towards, government priorities. 	High	TB activities are a priority of the Government of Canada and the Public Health Agency of Canada as reflected in a variety of planning and corporate documents.
3. Alignment with Federal Roles and Responsibilities			
Are the TB activities performed by IDPC (CCDIC & NML) aligned with federal roles and responsibilities?	<ul style="list-style-type: none"> Evidence that roles and responsibilities are: defined, known, and implemented. 	High	The TB activities align broadly with the Agency's mandate. There is an appropriate role for the Agency in surveillance, provision of public health guidance, community mobilization, and policy.

Legend - Relevance Rating Symbols and Significance:

- High** There is a demonstrable need for program activities; there is a demonstrated link between program objectives and (i) federal government priorities and (ii) departmental strategic outcomes; role and responsibilities for the federal government in delivering the program are clear.
- Partial** There is a partial need for program activities; there is some direct or indirect link between program objectives and (i) federal government priorities and (ii) departmental strategic outcomes; role and responsibilities for the federal government in delivering the program are partially clear.
- Low** There is no demonstrable need for program activities; there is no clear link between program objectives and (i) federal government priorities and (ii) departmental strategic outcomes; role and responsibilities for the federal government in delivering the program have not clearly been articulated.

Performance Rating Symbols and Significance:

A summary of Performance Ratings is presented in Table 2 below. A description of the Performance Ratings Symbols and Significance can be found in the Legend.

Table 2: Performance Rating Symbols and Significance

Issues	Indicators	Overall Rating	Summary
4. Achievement of Expected Outcomes (Effectiveness)			
Program/policy development & Leadership/Stewardship	<ul style="list-style-type: none"> Evidence of: utility; applicability; information quality; timeliness; cultural appropriateness; and, ease of use. 	Progress Made; Further Work Warranted	TB prevention and control efforts require stakeholder engagement and management. The <i>TB Prevention and Control in Canada: A Federal Framework for Action</i> outlines federal departments/agencies' roles and responsibilities, however, there is no evidence of a concrete implementation/action plan to advance this framework.
Public Health Practice	<ul style="list-style-type: none"> Evidence of: utility; applicability; information quality; timeliness; cultural appropriateness; and, ease of use. 	Achieved	The <i>TB Standards</i> , the <i>Guidance</i> , and educational modules produced are considered useful, timely and appropriate by the stakeholders.
Surveillance	<ul style="list-style-type: none"> Evidence of: utility; applicability; information quality; timeliness; cultural appropriateness; and, ease of use. 	Achieved	The Agency's nationalized surveillance data on TB cases and outcomes is used by multiple audiences, and used in different ways. The most expressed impact noted from the availability of surveillance data is twofold: 1) jurisdictions can identify where they stand relative to others in reducing the burden of TB; and, 2) can apply data to make informed decisions in developing TB policies, programs, teaching material, and research questions.
TB Response	<ul style="list-style-type: none"> Evidence of: utility; applicability; information quality; timeliness; cultural appropriateness; and, ease of use. 	Priority for Attention	CCDIC has provided outbreak management support by deploying subject matter experts (epidemiologists) to the field to assist with TB outbreak investigations. CCDIC has contributed to the Canadian public health capacity to respond to TB by conducting TB response activities (which include actions to prevent or mitigate the risks of travel by individuals infected with TB). There is a need for a strengthened evidence base regarding the risk of transmission of TB during air travel, and for a review of Canadian guidelines for TB and air travel contact notifications.
Laboratory References Services	<ul style="list-style-type: none"> Evidence of: utility; applicability; information quality; timeliness; cultural appropriateness; and, ease of use. 	Achieved	The Agency's laboratory reference services in the area of TB are timely, standardized, and have been assessed as high performing by other third parties. The services provided are specialized, and not offered by P/T Laboratories.
Community Mobilization	<ul style="list-style-type: none"> Evidence of: utility; applicability; information quality; timeliness; cultural appropriateness; and, ease of use. 	Achieved	The experience and lessons of community mobilization projects (mainly TAIMA TB) have shown considerable success in preventing and controlling TB. Factors such as community involvement, culturally appropriate messaging and infrastructure appear to be critical for success.

Legend - Performance Rating Symbols and Significance:

- Achieved The intended outcomes or goals have been achieved or met.
- Progress Made; Further Work Warranted Considerable progress has been made to meet the intended outcomes or goals, but attention is still needed.
- Little Progress; Priority for Attention Little progress has been made to meet the intended outcomes or goals and attention is needed on a priority basis.

Issues	Indicators	Overall Rating	Summary
5. Demonstration of Economy and Efficiency			
Has the Agency's TB activities been undertaken in the most efficient and economical manner? Are there overlaps and duplications; alternate ways to achieve similar results at a lower cost?	<ul style="list-style-type: none"> Evidence of value, merit and harmonization. 	<p>Progress Made; Further Work Warranted</p>	The cost to society to treat TB for a relatively small number of cases is substantial (\$74M). Some of these costs may be offset by community mobilization projects, although the success of broadening projects such as TAIMA-TB is unknown at this time.

Legend - Performance Rating Symbols and Significance:

- | | |
|---|---|
| Achieved | The intended outcomes or goals have been achieved or met. |
| Progress Made; Further Work Warranted | Considerable progress has been made to meet the intended outcomes or goals, but attention is still needed. |
| Little Progress; Priority for Attention | Little progress has been made to meet the intended outcomes or goals and attention is needed on a priority basis. |

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