

# Alberta Health

## Tuberculosis in Alberta Surveillance Report 2010 to 2012

Office of the Chief Medical Officer of Health

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*Alberta*  Government

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# TB Surveillance Report 2010–2012

## 1. Introduction

### 1.1. Tuberculosis Control in Alberta

Tuberculosis is a reportable disease caused by the organisms comprising the *Mycobacterium tuberculosis complex*. Tuberculosis of the respiratory tract is communicable through airborne transmission, and therefore poses a risk to public health. Tuberculosis can also affect non-respiratory sites in the body. Some people who are exposed to tuberculosis will become infected with tuberculosis in the latent state, and may be at risk for developing tuberculosis in the future. Others may develop active tuberculosis, and may transmit it to other people if the disease is not detected early.

In Alberta, tuberculosis rates are highest among Canadian-born aboriginal people and foreign-born people from tuberculosis-endemic countries. In the past decade, increasing immigration and changes in the patterns of immigration into Alberta have significantly impacted on the epidemiology of tuberculosis in the province. Screening of this population group is largely directed by Citizenship and Immigration Canada at the time of immigration. Screening and management of tuberculosis for First Nations people's living on reserve is conducted by the Provincial Tuberculosis Program in partnership with First Nations and Inuit Health Branch of Health Canada.

Tuberculosis Control in Alberta consists of a centralized program that works with two tuberculosis clinics in Calgary and Edmonton and a central virtual clinic for patients living outside Calgary and Edmonton. The program works through public health clinics located throughout the province, and with First Nations Inuit Health Branch to diagnose latent and active tuberculosis, prescribe preventive therapy, and administer directly observed therapy for active tuberculosis. A tuberculosis isolation unit is located in the University of Alberta Hospital, which can provide both respiratory isolation and specialized care for tuberculosis.

This document is a detailed report of active tuberculosis in Alberta over 3 years, 2010, 2011 and 2012. This report follows the previous surveillance reports of tuberculosis in Alberta for 2000-2004 and 2005-2009.

### 1.2. Methods

#### Data Sources

##### 1. Tuberculosis Registry Database (iPHIS)

The Interactive Public Health Information System is a database that is accessible by all three tuberculosis clinics in Alberta (Edmonton, Calgary, and Central). This database houses information used for clinical management of cases, contacts, and preventive therapy. All active cases with the date of diagnosis are recorded in the registry. Information collected on each case includes demographic information such as gender, birthdates, population group, health region, country of birth and the year of arrival in Canada if foreign-born. Relevant clinical data such as the site of disease, history of previous active disease, and microbiology results are also recorded. A record of data submitted to Health Canada is also retained in the registry.

## 2. Canadian Tuberculosis Data

Each province and territory in Canada, reports all active cases of tuberculosis to the Centre for Infectious Disease Prevention and Control, Health Canada.

## 3. Interactive Health Data Application (IHDA)

The IHDA is an application maintained by the Surveillance and Assessment Branch of Alberta Health and Wellness. This application is available on-line and includes mid-year population estimates for the province. These estimates are based on the number of people registered in the Alberta Health Care Insurance Plan (AHCIP) as of June 30 according to the AHCIP Quarterly Population Registry Files. This application also uses the Alberta Health Postal Code Translation File (PCTF) to determine population estimates by geographical area (i.e., health zone) according to the registrant's postal code. Data elements include age and gender. The IHDA provided the denominator figures necessary for deriving case rates.

## 4. Aboriginal Affairs and Northern Development Canada

Population estimates of the number of people living in Alberta with an aboriginal identity were obtained from the AANDC 2011 household survey. This included registered Indian, non-treaty status, Metis and Inuit populations plus total aboriginal identity population in Alberta.

## 5. Statistics Canada National Household Survey Data

Between May and August 2011, Statistics Canada conducted the National Household Survey (NHS) to collect social and economic data about Canadian populations. Estimates of the foreign-born population in Alberta were obtained from this survey.

## 6. Laboratory

All specimens collected for the diagnosis of tuberculosis are submitted to the Provincial Laboratory for Public Health (PLPH) North in Edmonton, or the PLPH South in Calgary. These tests generally include: microscopy for acid fast bacilli; cultures to identify the specific organism; and, in the case of positive cultures, susceptibilities to anti-tuberculous drugs. The PLPH has also been involved with testing for human immunodeficiency virus (HIV) for cases and suspect cases of tuberculosis. Test results are forwarded for entry into the Tuberculosis Registry.

## Calculation of Rates

Mid-year population figures for 2010 to 2012 from the Interactive Health Data Application (IHDA) provided the overall denominator figures for calculating the incidence rates for tuberculosis. The IHDA provided population figures for the province as a whole, and for each of five health zones. The IHDA also includes population figures according to age and gender and for the calculation and comparison of rates and trends between age and gender groups.

The iPHIS database provided the numerator for the country of birth for confirmed tuberculosis cases. The denominator for calculation of rates among the foreign-born was based on population estimates from the Statistics Canada National Household Survey, 2011. Rates over the three-year period 2010–2012 are expressed in “person-years”—where the numerator is the cumulative number of cases over the three years, and the denominator is the cumulative population over the three years (expressed as cases/100,000 person-years).

Aboriginal Affairs and Northern Development Canada 2011 household survey provided the denominator for calculation of tuberculosis rates for Canadian-born people of aboriginal identity. Data on whether a patient is aboriginal identity, First Nations, with or without Treaty Status, Metis or Inuit is recorded in the iPHIS database for all cases of tuberculosis. Calculation of rates for First Nation peoples includes only those who have Treaty status.

### **Limitations**

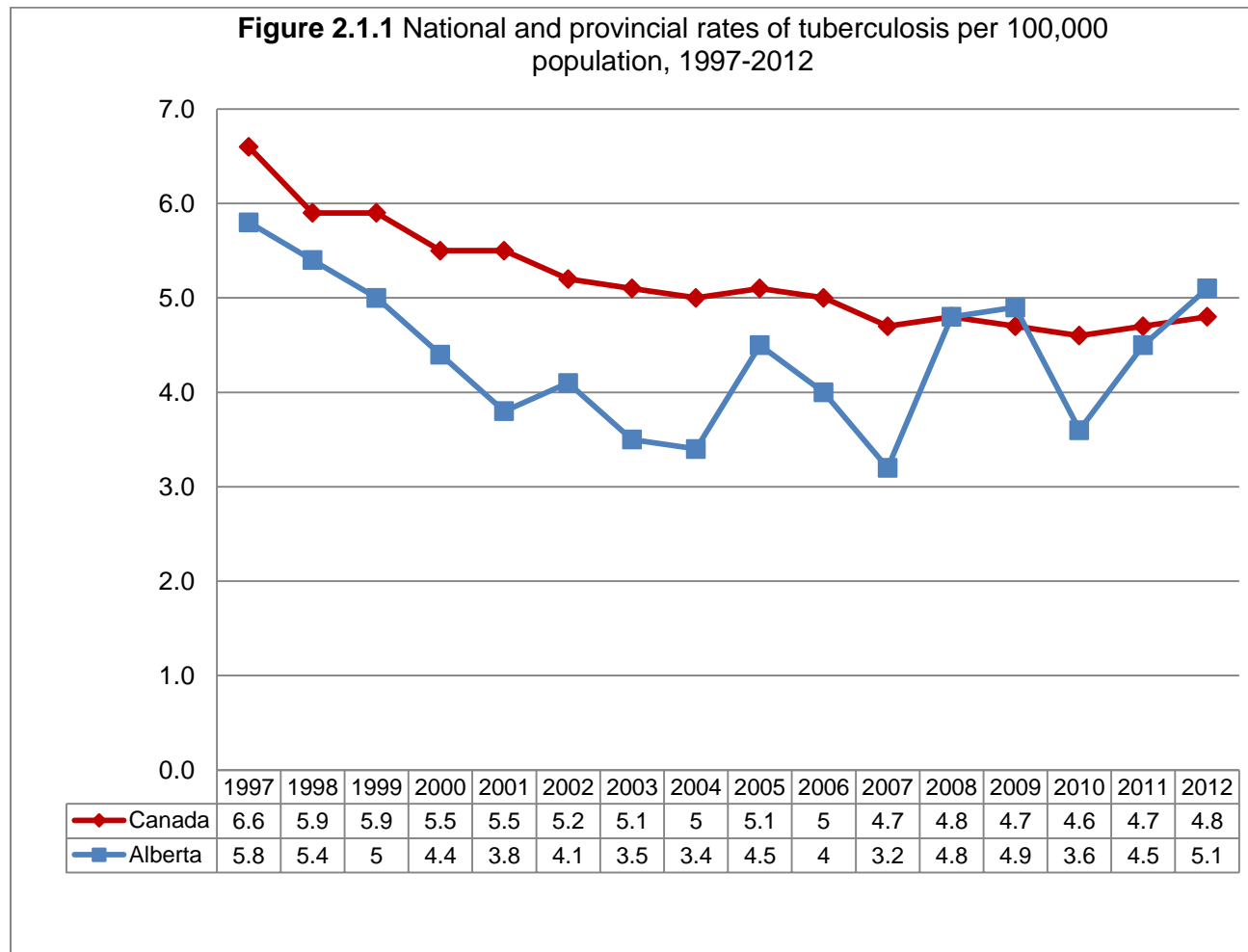
There are limitations to the denominator figures used for calculation of rates. For instance, we were limited to foreign-born population estimates based on Statistics Canada's National Household Survey from 2011. These estimates are limited by sampling error and response rates of the survey. Furthermore, as these figures are based on a 30 per cent sample of private dwellings in Canada in 2011, they do not include institutional residents of facilities such as prisons and long term care facilities. Use of the IHDA to obtain Alberta population estimates similarly excludes certain groups, such as inmates of federal correctional facilities or those who have not registered for Alberta health care insurance. Denominator data provided by Aboriginal Affairs and Northern Development Canada are limited if communities or individuals do not participate in the survey. While on-reserve populations were available for each year, total aboriginal identity population of Alberta and an estimate of off-reserve registered First Nations population was based on AANDC's 2011 data only.

As compared to the previous Alberta tuberculosis surveillance reports, we reported TB cases by health zone as opposed to the former health regions of Alberta.

## 2. Tuberculosis Cases

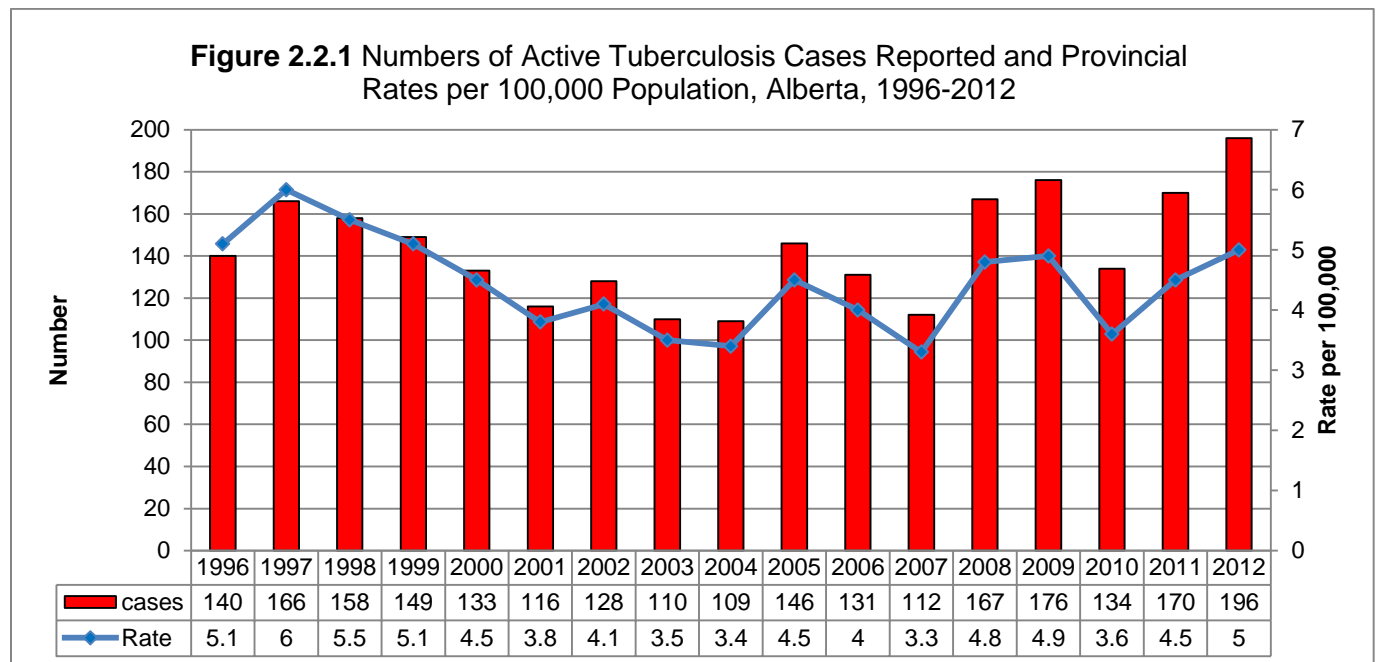
### 2.1. National

Rates of tuberculosis were somewhat lower in Alberta as compared to the national rate until about 2004. However, rates in Alberta have been similar to the national rate in recent years.



## 2.2. Alberta – Cases and Rates

For the years 2010, 2011 and 2012 the number of active TB cases in Alberta were 134, 170 and 196, respectively. The 196 cases reported in 2012 represented the highest number of cases in Alberta since 1996 (Figure 2.2.1). However, with population growth in Alberta the 2012 rate of 5/100 000 was within the range of 3.3-5.5/100 000 observed in Alberta from 1996-2012.





## 2.3. Geographic Distribution

### Health Zones

The Calgary Zone reported 47.8 per cent of all the active tuberculosis cases in Alberta from 2010 to 2012 and Edmonton Zone reported 36.4 per cent of cases. The North Zone contributed the next highest number of cases representing 10 per cent of cases; Southern Zone reported 2 per cent of cases; and Central Zone reported 3 per cent. (Table 2.3.1). Those classified as “other” includes those diagnosed while residing in a correctional facility.

The highest rates were in the largely urban regions of Calgary (5.6) and Edmonton(5.0) where cases were mostly foreign born.

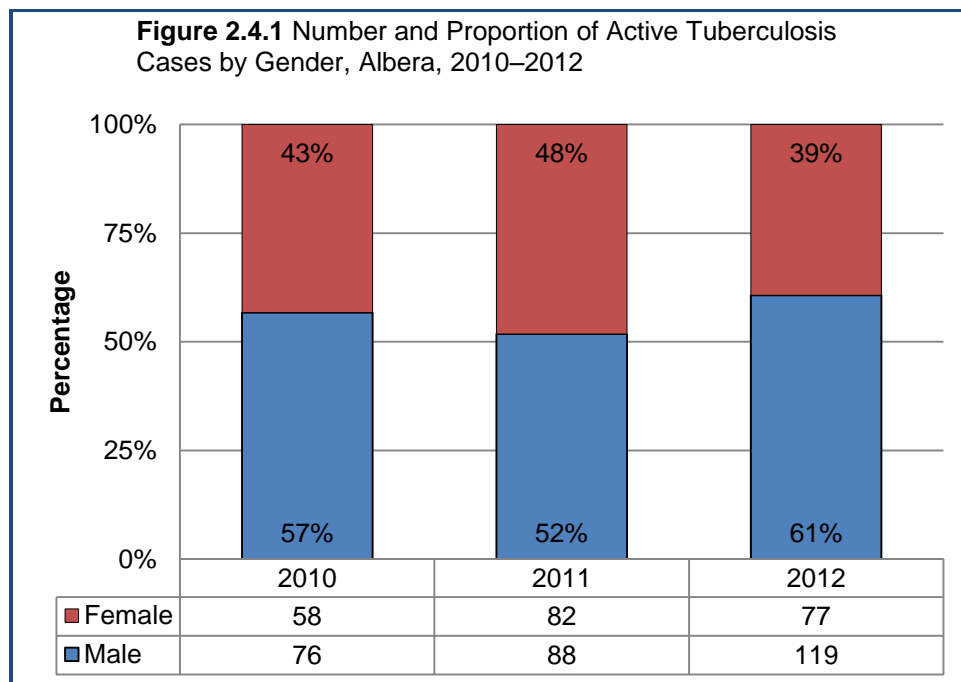
**Table 2.3.1** Active Tuberculosis Cases According to Zones with 3 Year Rates per 100,000 Person Years, 2010–2012, Alberta

Zones	Total Cases	Per cent of Cases	Rate per 100,000
Calgary	236	47.2%	5.6
Edmonton	184	36.8%	5.1
South	9	1.8%	1.2
Central	15	3.0%	1.1
North	52	10.4%	3.8
Other	4	0.8%	-
<b>Total</b>	<b>500</b>	<b>100.0%</b>	<b>4.4</b>

## 2.4. Case Demographics

### Gender

Figure 2.4.1 illustrates the breakdown of cases by year according to gender. While case numbers were very similar for males and females in 2011, overall there is a slight predominance of males among TB cases.



### Age Group

Table 2.4.2 provides a breakdown of all cases from 2010 to 2012 according to age group, and the three-year rates per 100,000 person years. The largest proportion of cases was in the age group 35-64 (40%), while the case rate is highest in the over 65 age group (8.5 per 100,000 person years).

**Table 2.4.2:** Active Tuberculosis Cases by Age Group with 3 year Rates per 100,000 Person Years, 2010–2012, Alberta

Age Group in Years	Cases	per cent	Rate per 100,000 Person Years
0-14	25	5	1.2
15-34	169	33.8	5.0
35-64	200	40	4.3
>65	106	21.2	8.5
<b>Total</b>	<b>500</b>	<b>100</b>	<b>4.4</b>

## Age Group and Gender

Figure 2.4.3 shows the total number of cases from 2010 to 2012 by gender and age group (according to age at diagnosis).

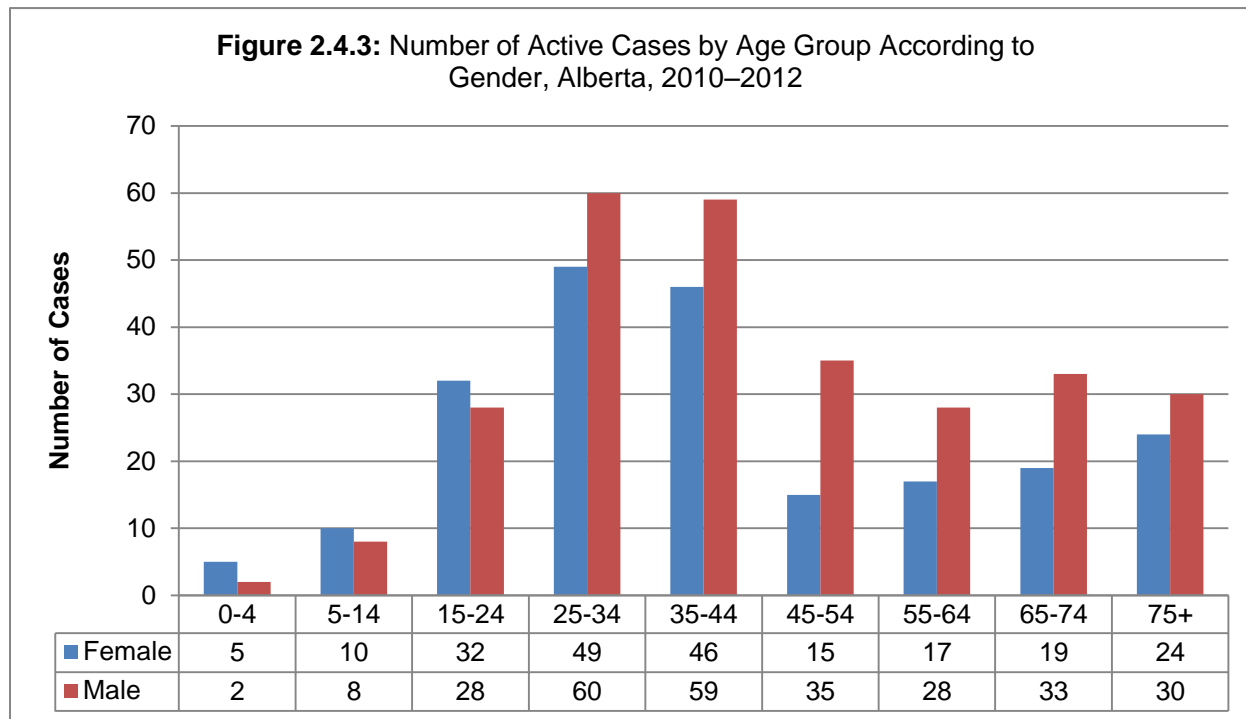


Table 2.4.4 gives the numbers of cases and yearly rates by age group for each of the three years. The table also includes the three year rate per 100,000 person years.

**Table 2.4.4: Active Tuberculosis Cases With Yearly Rates per 100,000 Population by Age Group and 3 Year Rates per 100,000 Person Years for 2010–2012, Alberta**

Age Group	2010		2011		2012		Total	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate*
0-4	1	0.5	2	0.8	4	1.5	7	0.8
5-14	4	0.9	4	0.8	10	2.1	18	1.2
15-24	18	3.5	21	4.1	21	4.0	60	3.9
25-34	26	4.4	38	6.3	45	8.5	109	6.0
35-44	31	5.8	38	7.0	36	6.3	105	6.4
45-54	15	2.6	14	2.4	21	3.6	50	2.9
55-64	12	3.0	15	3.5	18	4.0	45	3.5
65-74	11	5.1	19	8.4	22	9.0	52	7.6
75+	16	8.7	19	10.1	19	9.7	54	9.5
<b>Total</b>	<b>134</b>	<b>3.6</b>	<b>170</b>	<b>4.5</b>	<b>196</b>	<b>5.0</b>	<b>500</b>	<b>4.4</b>

\*Rate for Total Cases = Rate per 100,000 Person Years, 2010–2012

## Population Group

From 2010 to 2012, the majority of active tuberculosis cases (81.5%) were among the foreign-born. Table 2.4.5 gives the cases, the proportion and the rate per 100,000 person years for 2010–2012 for each of three population groups: (i) Canadian-born who are self-identified aboriginal (ii) Canadian-born, other and (iii) foreign-born.

**Table 2.4.5:** Active Tuberculosis Cases and Three Year Rates per 100,000 Person Years for Canadian-born (non-aboriginal), Canadian-born aboriginal, and Foreign-born, 2010–2012, Alberta

<b>Ethnic Group</b>	<b>Cases</b>	<b>Percent of Cases</b>	<b>Rate per 100,000 Person Years</b>
<b>Canadian Born Other</b>	43	8.6	0.54
<b>Canadian Born Aboriginal*</b>	50	10.0	7.6
<b>Foreign-Born†</b>	407	81.4	19.0
<b>Total</b>	<b>500</b>	<b>100.0</b>	<b>4.7</b>

\*Includes registered and non-registered First Nations, Metis, and Inuit peoples, population estimate based on 2011 National Household Survey

†Population estimate based on Statistics Canada 2011 National Household Survey, population of Alberta born outside of Canada

Table 2.4.6 shows cases and proportion of cases by health zone and according to three population groups: Canadian-born Aboriginal (First Nations, Metis and Inuit), Canadian-born non-aboriginal and foreign-born. While North Zone had more cases in the Canadian-born aboriginal group, elsewhere in the province the majority of cases were foreign-born.

**Table 2.4.6: Active Tuberculosis Cases for Three Population Groups According to Zones, 2010–2012, Alberta**

Zone	Ethnic Group	Cases	Percent
<b>Calgary</b>	CB Aboriginal	11	2
	CB Other	13	3
	Foreign-Born	212	42
	<b>Total</b>	<b>236</b>	<b>47</b>
<b>Edmonton</b>	CB Aboriginal	6	1
	CB Other	20	4
	Foreign-Born	158	32
	<b>Total</b>	<b>184</b>	<b>37</b>
<b>South</b>	CB Aboriginal	1	0
	CB Other	0	0
	Foreign-Born	8	2
	<b>Total</b>	<b>9</b>	<b>2</b>
<b>Central</b>	CB Aboriginal	2	0
	CB Other	4	1
	Foreign-Born	9	2
	<b>Total</b>	<b>15</b>	<b>3</b>
<b>North</b>	CB Aboriginal	28	6
	CB Other	4	1
	Foreign-Born	20	4
	<b>Total</b>	<b>52</b>	<b>10</b>
<b>Other</b>	CB Aboriginal	2	0
	CB Other	2	0
	Foreign-Born	0	0
	<b>Total</b>	<b>4</b>	<b>1</b>
<b>Total Cases</b>	CB Aboriginal	50	10
	CB Other	43	9
	<b>Foreign-Born</b>	<b>407</b>	<b>81</b>
	<b>Total</b>	<b>500</b>	<b>100</b>

CB Aboriginal-Canadian-born Aboriginal, includes First Nation, Métis, Inuit

CB Other-Canadian-born, non-Aboriginal

## Population Group and Age Group

There is variation in age distribution of tuberculosis cases between the three main population groups. Figure 2.4.9 shows the number of cases of active tuberculosis by age group for three population groups. Foreign-born cases are highest in the 35–44 year age group. Canadian-born Aboriginal cases were highest in the 65–74 year age group; and, in the Canadian-born non-Aboriginal group, cases were higher in those age 45–64.

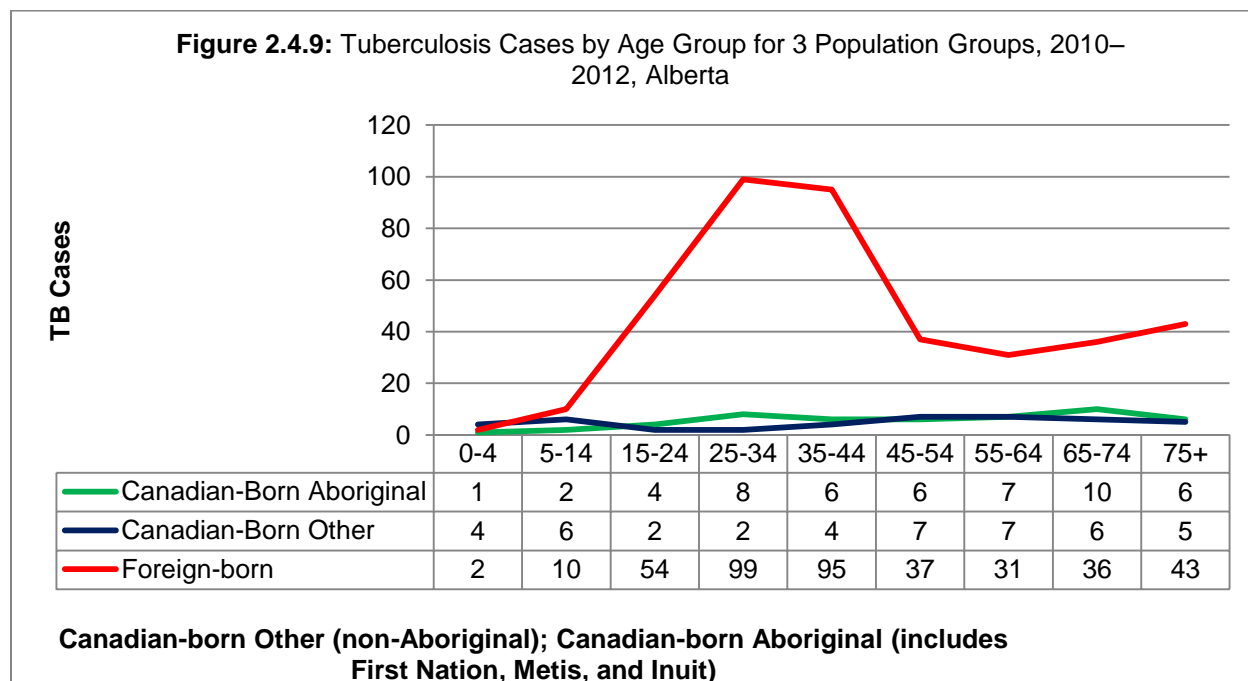


Table 2.4.10 shows the contribution of active tuberculosis cases according to age group and population group with the Canadian-Born Aboriginal category divided further according to “Treaty” (First Nation), “Métis”, and “Inuit” for 2010–2012.

**Table 2.4.10: Tuberculosis Cases by Age Group and Population Group, Alberta, 2010–2012**

Age group	First Nations	Metis	Inuit	Canadian-Born Non-Aboriginal	Foreign-born	Total
0-4	1	0	0	4	2	7
5-14	2	0	0	6	10	18
15-24	4	0	0	2	54	60
25-34	6	2	0	2	99	109
35-44	5	0	1	4	95	105
45-54	3	1	2	7	37	50
55-64	5	2	0	7	31	45
65-74	9	1	0	6	36	52
75+	4	2	0	5	43	54
<b>Total</b>	<b>39</b>	<b>8</b>	<b>3</b>	<b>43</b>	<b>407</b>	<b>500</b>

### First Nations people with Tuberculosis

From 2010 to 2012 there were a total of 35 cases of active tuberculosis among registered First Nations people in Alberta. Twenty-seven of these cases (77%) lived on reserve at the time of diagnosis.

**Table 2.4.7:** Active Tuberculosis Cases and Yearly Rates per 100,000 Population for registered First Nations people living on and off reserve, with 3 Year Rate per 100,000 person-years, 2010–2012, Alberta

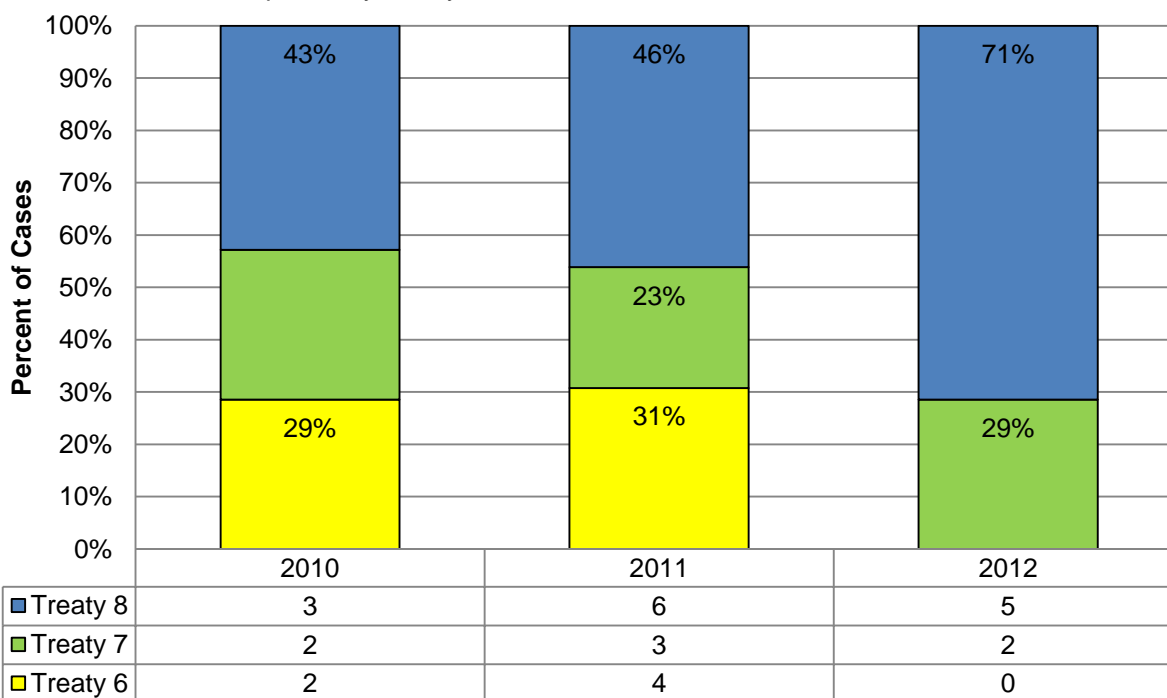
First Nations*	2010		2011		2012		Total Cases	3 year rate (/100,000)
	Cases	Rate	Cases	Rate	Cases	Rate		
On Reserve	7	10.5	13	19.0	7	10.1	27	13.2
Off Reserve†	2	5.1	2	5.3	4	11.0	8	7.1
Both	9	8.5	15	14.2	11	10.4	35	11.1

\*First Nations cases with registered treaty status

†Off reserve population estimates based on AANDC 2011 Survey data

There are three Treaty areas (6, 7 and 8) in Alberta. Treaty 6 stretches across the middle of the province; Treaty 7 covers the south of the province; and Treaty 8 covers the northern regions of Alberta. Figure 2.4.8 shows the proportion of TB cases living on reserve at the time of diagnosis according to treaty area. The northern areas, (Treaty 6 and 8) having the majority of cases. (Appendix C shows a map of the Treaty Areas in Alberta.)

**Figure 2.4.8:** Proportion and Number of Active Tuberculosis Cases living on reserve reported by Treaty Zone, Alberta, 2010–2012\*



\*data restricted to First Nations people with active TB living on reserve at the time of diagnosis

## Foreign-Born – Country of Birth

From 2010 to 2012, there were 407 reported cases of active tuberculosis in the foreign-born. The top 21 countries of origin are listed below. The greatest proportions of these cases were born in Philippines (27.4%), India (15.7%), Ethiopia (10.4%), China (7.7%) and Vietnam (6.5%). Together these five countries of birth accounted for 68 per cent of the foreign-born cases in Alberta. A total of 10 countries accounted for 80% of the foreign-born cases (Table 2.4.11).

**Table 2.4.11: Foreign-Born Tuberculosis Cases According to Country of Birth, 2010–2012, Alberta**

	Country of Birth	Cases	% of Total FB Cases
1	Philippines	110	27.0
2	India	63	15.2
3	Ethiopia	42	10.3
4	China	31	7.6
5	Viet Nam	26	6.4
6	Somalia	13	3.2
7	Eritrea	10	2.5
8	Afghanistan	9	2.2
9	Pakistan	9	2.2
10	Sudan	9	2.2
11	Nigeria	7	1.7
12	Congo	9	2.2
13	Haiti	4	1.0
14	Hong Kong	4	1.0
15	Kenya	4	1.0
16	Nepal	4	1.0
17	Uganda	4	1.0
18	Bangladesh	3	0.7
19	Liberia	3	0.7
20	Netherlands	3	0.7
21	Tanzania	3	0.7
22	Other	37	9.3
	<b>Total</b>	<b>407</b>	<b>100</b>



Variation in tuberculosis rates was noted among the foreign-born depending on the country of origin. From 2010 to 2012, the majority of Alberta’s tuberculosis cases confirmed in the foreign-born were in those born in Asia, including China, Vietnam, India, and Philippines. The second largest foreign-born group with active tuberculosis originated from Sub-Saharan Africa

**Table 2.4.12: Active Tuberculosis Cases with Crude Rate per 100 000 Person Years for Foreign Born According to WHO Regions, 2010–2012, Alberta**

WHO Region	Cases	Crude Rate per 100,000 Person Years	% of Foreign-Born cases
<b>WHO African</b>	86	191	21.1
<b>South-East Asia</b>	73	95.6	17.9
<b>Eastern Mediterranean</b>	42	64.2	10.3
<b>Region of the Americas</b>	12	11.9	3.0
<b>European Region</b>	13	6.6	3.2
<b>Western Pacific</b>	181	86	44.5
<b>Total</b>	<b>407</b>		<b>100.0</b>

## 2.5. Disease Characteristics

### Sites of Tuberculosis Disease

Currently, data captured related to the body site of active TB disease for national TB surveillance uses the ICD-9 and ICD-10 classification systems. These codes can be found in Appendix B of the Reporting Form Completion Guidelines for the Canadian Tuberculosis Reporting System ([http://www.phac-aspc.gc.ca/tbpc-latb/pdf/guidelines\\_report\\_form\\_e.pdf](http://www.phac-aspc.gc.ca/tbpc-latb/pdf/guidelines_report_form_e.pdf)). Tuberculosis infection can be classified as respiratory, which includes infection of the lung and airways, the intrathoracic lymph nodes or pleura, and “primary tuberculosis complex” (most often affecting children). It can also affect sites outside of the respiratory system, such as the urinary tract, lymph nodes or central nervous system. Of 500 tuberculosis cases confirmed from 2010 to 2012, the majority, 344 (69%), were found to have respiratory tuberculosis, while the largest proportion of extra-pulmonary cases were lymph node (16%). (Table 2.5.1)

Table 2.5.1: Active Tuberculosis Cases According to the Primary Site of Disease, Alberta, 2010–2012

Primary Site of Disease	Number of Cases	Percent of Cases
Respiratory	347	69.4
Lymph Node	87	17.4
Miliary	5	1
Central Nervous System	4	0.8
Other*	57	11.4
Total	500	100

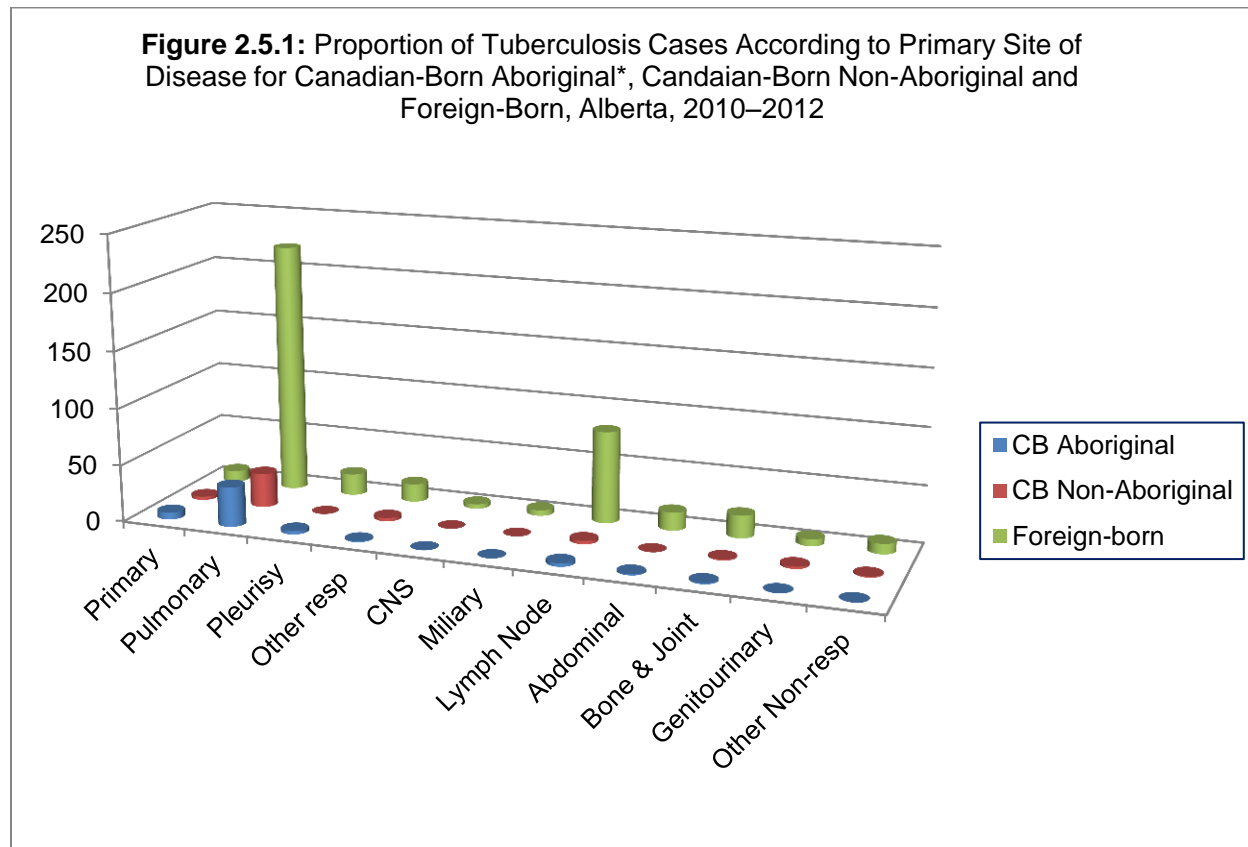
\*Other includes: bone, joint, intestines, genitourinary, skin, eye

Table 2.5.2 provides diagnostic site/ category of tuberculosis by year and percentage of total cases. Primary tuberculosis refers to a clinical syndrome of TB reflecting recent infection with TB that progressed to active disease. Some cases of active TB had more than one site of disease.

Table 2.5.2: Active Tuberculosis Cases According to Primary Site of Disease, by Year, Alberta, 2010–2012

Primary Site	2010		2011		2012	
	#	%	#	%	#	%
<b>Respiratory</b>						
Primary	5	3.7	2	1.2	12	6.1
Pulmonary	74	55.3	97	57.1	115	58.7
Pleurisy	8	6.0	5	2.9	9	4.6
Other	3	2.2	10	5.9	7	3.6
Subtotal Respiratory	90	67.2	114	67.1	143	73.0
<b>Central Nervous System</b>	0	0	3	1.8	1	0.5
<b>Miliary</b>	1	0.8	2	1.2	2	1.0
<b>Lymph Node</b>	26	19.4	27	15.8	34	17.3
<b>Other</b>						
Abdominal	4	3.0	8	4.7	5	2.6
Bone & Joint	5	3.7	9	5.3	8	4.1
Genitourinary	3	2.2	4	2.3	1	0.5
Other	5	3.7	3	1.8	2	1.0
Subtotal Other	17	12.6	24	14.1	16	8.2
<b>Total</b>	134	100.0	170	100.0	196	100.0

Figure 2.5.1 provides the proportion of tuberculosis cases according to primary diagnostic site and population group. Between 2010 and 2012, the majority of active tuberculosis disease in Canadian-born Aboriginal people, Canadian-born, others, and foreign-born was respiratory in nature, but the proportion varied between groups. In general, more extrapulmonary TB was observed among foreign-born people.



## Drug Resistance

From 2010 to 2012, drug susceptibility to first-line drugs was known for all 422 culture-positive cases (84% of the total cases). Of these, 47 cases (11%) were resistant to one or more of the first-line anti-tuberculosis drugs (including isoniazid, rifampin, ethambutol or pyrazinamide). Table 2.5.3 shows drug resistance according to population group. From 2010 to 2012, no drug resistance was observed among tuberculosis cases who were Canadian-born, aboriginal. Of cases with drug resistance, 47 cases involved the foreign-born, and 2 cases were Canadian-born, non-Aboriginal. Table 2.5.4 shows the country of birth of foreign-born patients with drug resistance, and the proportion of cases from that country with drug resistance. From 2010 to 2012, there were a total of ten cases of multidrug resistant tuberculosis (MDRTB) in Alberta (Table 2.5.3). MDRTB is defined as resistance to, at minimum, both isoniazid and rifampin. Two of the ten MDRTB cases had a prior diagnosis of tuberculosis. (Table 2.5.5)

**Table 2.5.3:** Number of Cases Resistant to Anti-tuberculous Drugs According to Population Group for 2010–2012

Population Group	First-Line Drugs	Total Resistant
Canadian-born Non-Aboriginal	INH	2
Canadian-born Aboriginal		0
Foreign-born	INH	26
	PZA	5
	INH, ETH	0
	INH, ETH, PZA	2
	INH, PZA	2
	RIF	0
	INH, RIF*	5
	INH,ETH,RIF*	0
	INH,ETH,RIF,PZA*	3
	INH, RIF, PZA*	2
<b>Total Resistant</b>		<b>47</b>

**Legend:** INH=Isoniazid; PZA=Pyrazinamide; ETH=Ethambutol; RIF= Rifampin

\*Multi-Drug Resistant

Canadian-Born Aboriginal includes: First Nation, Métis, and Inuit

**Table 2.5.4: Drug Resistance in Foreign-born Cases by Country of Birth, Alberta, 2010–2012**

Country of Birth	Total Cases*	Drug Resistant Cases
India	63	7
Ukraine	1	1
Viet Nam	26	5
Nepal	4	1
Philippines	110	14
Ethiopia	42	3
China	31	3
Congo	6	2
Pakistan	9	1
Somalia	13	1
Poland	2	1
Zimbabwe	2	1
Eritrea	10	1
Hungary	1	1
Sudan	9	1
Haiti	4	1
Mexico	2	1
<b>Total</b>	<b>351</b>	<b>45</b>

\*culture-confirmed cases

**Table 2.5.5: MDRTB Cases Diagnosed in Alberta from 2010 to 2012, According to Country of Birth**

Diagnosis Year	Drug Resistance	Country of Birth	New Active vs. Relapse
2010	INH,ETH,RIF,PZA	Ethiopia	New Active
	INH,ETH,RIF,PZA	Viet Nam	New Active
	INH,RIF,PZA	Viet Nam	New Active
2011	INH,RIF	India	New Active
	INH,RIF	Philippines	New Active
	INH,RIF	Philippines	New Active
	INH,RIF	Philippines	Relapse
	INH,RIF,PZA	Philippines	New Active
	INH,ETH,RIF,PZA	Eritrea	Relapse
2012	INH,RIF	India	New Active

**Legend:** INH=Isoniazid; PZA=Pyrazinamide; ETH=Ethambutamol; RIF=Rifampin

## Infectiousness

Cases of tuberculosis are generally considered infectious if they have positive smears and/or cultures of their respiratory secretions (pulmonary TB). From 2010 to 2012, there were a total of 272 cases of laboratory-confirmed pulmonary tuberculosis. Table 2.5.6 includes cases of pulmonary TB according to population group and respiratory tract specimen smear and culture status. Of the three population groups, the greatest proportion of smear positive patients (indicating a higher level of infectiousness) was observed among Canadian-born, aboriginal cases.

**Table 2.5.6: Infectiousness of respiratory TB by population group, 2010–2012, Alberta**

Infectiousness	Population Group							
	Canadian-born, Aboriginal		Canadian-born, Other		Foreign-born		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
<b>Smear-Positive Culture-Positive</b>	24	62.2	9	56.3	100	48.1	133	51.0
<b>Smear-Negative Culture-Positive</b>	13	37.8	7	43.4	108	51.9	128	49.0
<b>Smear-Negative Culture-Negative</b>	0	0.0	0	0.0	0	0.0	0	0.0
<b>Total</b>	37	100.0	16	100.0	208	100.0	261	100.0

## HIV Co-infection

In a statistical analysis of HIV-TB co-infection in Alberta over the years 2003–2008, HIV co infection was significantly greater in middle-aged adults (35–64 years) compared to young adult(15–34 years) TB patients and in Aboriginal and sub-Saharan Africans compared to Canadian-born non-Aboriginal and foreign-born ‘other’ TB patients.<sup>1</sup>

From 2010 to 2012, 22 individuals with TB were found to be co-infected with Human Immunodeficiency Virus (4.4%). Twenty patients did not undergo testing (4%). Eighteen (82%) of those that were found to be HIV positive were foreign-born, and 14% were Canadian-born Aboriginal. One case of HIV-TB coinfection was Canadian-born, non-aboriginal (4%). Of the 29 foreign-born co-infected cases, the majority (20 cases) were born in sub-Saharan Africa. Table 2.5.7 shows TB HIV co-infected cases according to population group.

<sup>1</sup> Long R, Boffa J. High HIV-TB Co-infection Rates in Marginalized Populations: Evidence from Alberta in Support of Screening TB Patients for HIV. Canadian Journal of Public Health 2010; 101 (3):202-4

**Table 2.5.7: HIV Status by Population Group, 2010–2012, Alberta**

Origin	Cases HIV positive	%HIV co-infected cases
<b>Foreign-born</b>	18	81.8
Subsaharan Africa	15	68.2
Other	3	13.6
<b>Canadian-born Non aboriginal</b>	1	4.5
<b>Canadian-born Aboriginal*</b>	3	13.6
<b>Total</b>	<b>22</b>	<b>100</b>

\*Canadian-born Aboriginal includes Registered, Non-Registered First Nations, Métis, and Inuit

### TB Mortality

From 2010 to 2012, there were a total of 28 deaths of patients diagnosed with, or on treatment for active tuberculosis. In three of those deaths, TB was deemed the cause. Not unexpectedly, most TB-related deaths (75%) occurred in people older than 64 years of age. No deaths occurred in children aged <15 years. There was also a higher mortality observed among patients with HIV coinfection, though a number of patients who died did not undergo testing (especially if they were diagnosed post-mortem).

**Table 2.5.8: Mortality and Contribution of TB to Death from 2010 to 2012, Alberta**

	2010	2011	2012
<b>TB was cause of death</b>	0	3	0
<b>TB contributed to death</b>	2	5	8
<b>TB did not contribute to death</b>	3	1	4
<b>Total deaths on TB treatment</b>	<b>5</b>	<b>9</b>	<b>12</b>

**Table 2.5.9: Mortality of TB by Age Group from 2010 to 2012, Alberta**

Age Group	TB was Cause of Death	TB Contributed to Death	TB did not contribute to death	Total Mortalities
<b>0-4</b>	0	0	0	<b>0</b>
<b>5-14</b>	0	0	0	<b>0</b>
<b>15-24</b>	0	0	0	<b>0</b>
<b>25-34</b>	0	0	0	<b>0</b>
<b>35-44</b>	0	1	2	<b>3</b>
<b>45-54</b>	0	2	1	<b>3</b>
<b>55-64</b>	1	1	0	<b>2</b>
<b>65-74</b>	1	4	1	<b>6</b>
<b>75+</b>	1	7	4	<b>13</b>

## 2.6. Summary

From 2010 to 2012, the majority of cases (82%) of tuberculosis in Alberta involved people who were foreign-born and, of these, most were from high TB-incidence countries. Compared to the previous five-year period, numbers of cases among those born in countries of sub-Saharan Africa increased, reflecting immigration patterns to the province. The remainder of cases were split between Canadian-born Aboriginal and non-Aboriginal groups (about 10% and 8%, respectively). Case rates are highest in Alberta's two major urban centres, which together receive most of the new immigrants. This shift in epidemiology of TB in Alberta has influenced the nature of TB managed in the province, including a larger proportion of extrapulmonary disease (cervical lymph node disease is especially common in young to middle-aged Southeast Asian women), and increasing drug resistance (foreign-born cases, are much more likely than Canadian-born cases to be drug-resistant). HIV co-infection was most common amongst the foreign-born from sub-Saharan Africa—a reflection of high HIV infection rates in that region of the world—and, next most common amongst Aboriginal groups.

Alberta has implemented some new screening measures targeted at immigrants from endemic countries to address the growing proportion of cases occurring in this population. These cases arise due to reactivation of infection acquired overseas. There is evidence to indicate a higher reactivation risk in the 2-5 years following immigration, though a higher risk of TB remains thereafter<sup>1</sup>. The provincial program has implemented screening programs for latent tuberculosis infection targeted at children, age 5-15, from endemic countries as well as refugees under the age of 50<sup>2</sup>. Those who are diagnosed with latent tuberculosis infection are offered preventive therapy.

While drug resistance is still not a major problem in Alberta, the incidence of multi-drug resistant and multiple-drug resistant TB is rising. This adds to the cost and complexity of TB management. New technology including methods for rapid detection of MDRTB may improve timely management and prevention of transmission of this serious disease<sup>3</sup>.

In Alberta, the Tuberculosis program works closely with First Nations and Inuit Health Branch to design and implement TB control for First Nations people living on reserve. In 2012, Health Canada released a Strategy Against Tuberculosis For First Nations On Reserve, which aims to reduce the incidence and burden of TB in First Nations living on-reserve and target the populations at highest risk for disease.<sup>4</sup> Alberta's provincial TB program's emphasis remains on early diagnosis of source cases through prompt and thorough contact tracing and, more recently, screening of persons with medical conditions that increase risk of reactivation of tuberculosis. The relatively high proportion of more highly infectious cases observed among Canadian-born,

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<sup>1</sup> Creatore et al, *IJTLD* 2005;9(6):667-672, Cain et al, *AJRCCM* 2007;175(1):75-79

<sup>2</sup> Greenaway C, Sandoe A, Kitai I, et al, Evidence-based clinical guidelines for immigrants and refugees, *CMAJ* 2011, Targeted Tuberculin skin testing and treatment of latent tuberculosis infection in children and adolescents, *Pediatrics*, 2004, 114(supp 4): 1175-1201.

<sup>3</sup> Boehme, CC, Nabeta, P, Hillemann, D., et al., Rapid Molecular Detection of Tuberculosis and Rifampin Resistance, *NEJM* 2010 363(11):1005-1015

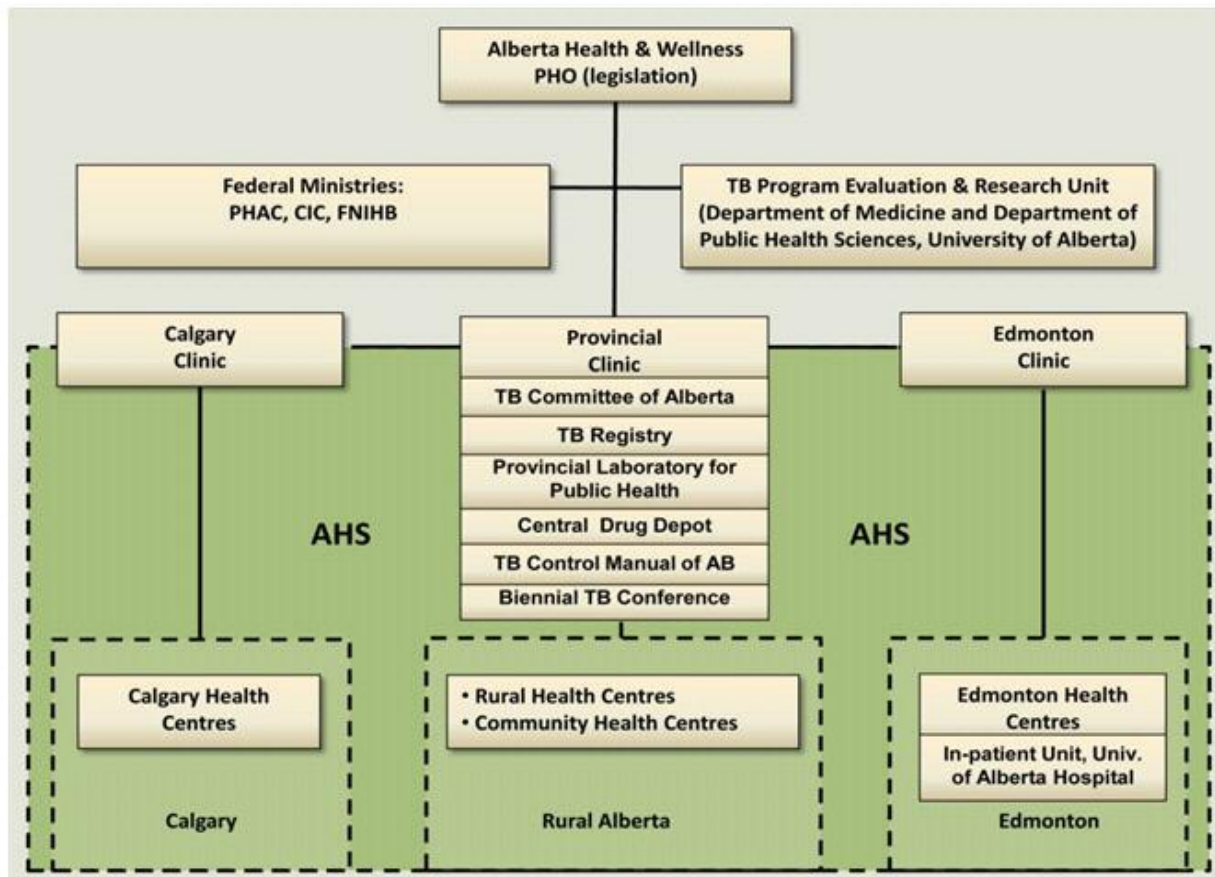
<sup>4</sup> [http://www.hc-sc.gc.ca/fniah-spnia/pubs/diseases-maladies/\\_tuberculos/tuberculos-strateg/fact-fiche-eng.php](http://www.hc-sc.gc.ca/fniah-spnia/pubs/diseases-maladies/_tuberculos/tuberculos-strateg/fact-fiche-eng.php)



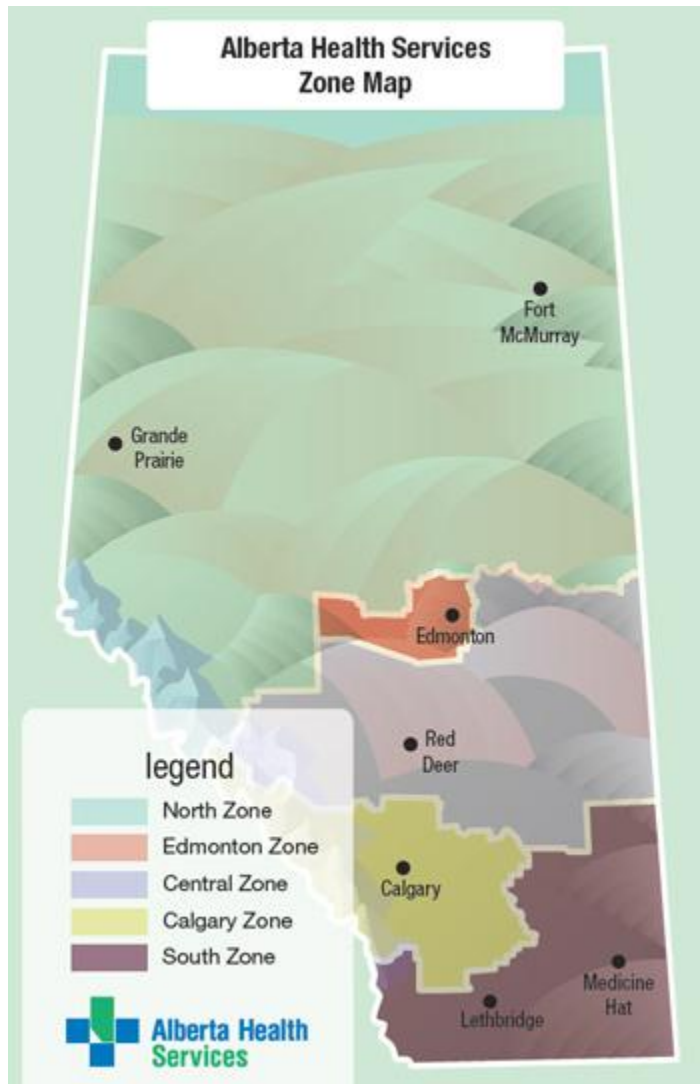
aboriginal cases may highlight ongoing issues with access to care. Some on-reserve and some off-reserve communities in North-Eastern Alberta and North-Western Saskatchewan, respectively, may be influencing each other's tuberculosis case load; population mobility adds to the challenge of tuberculosis control in high-incidence communities.

There are ongoing challenges faced by programs across the country to maintain delivery of health services, including comprehensive screening programs while maintaining adequate surveillance systems. In the future of the provincial TB program, systematic collection of tuberculosis surveillance data will allow us to draw a more comprehensive picture of the disease and the necessary direction of programming. This will influence the capacity of the program to evaluate itself and measure program performance indicators on a regular basis.

## Appendix I: Organization Chart of the Tuberculosis Prevention and Control Program of Alberta



## Appendix II: Map of Alberta's Health Zones



## Appendix III: Map of Alberta's Treaty Zones



## Appendix IV: WHO Regions

### WHO Africa Region

Algeria	Liberia
Angola	Madagascar
Benin	Malawi
Botswana	Mali
Burkina Faso	Mauritania
Burundi	Mauritius
Cameroon	Mozambique
Cape Verde	Namibia
Central African Republic	Niger
Chad	Nigeria
Comoros	Rwanda
Congo	Sao Tome and Principe
Côte d'Ivoire	Senegal
Democratic Republic of the Congo	Seychelles
Equatorial Guinea	Sierra Leone
Eritrea	South Africa
Ethiopia	South Sudan
Gabon	Swaziland
Gambia	Togo
Ghana	Uganda
Guinea	United Republic of Tanzania
Guinea-Bissau	Zambia
Kenya	Zimbabwe
Lesotho	

### WHO Southeast Asia Region

Bangladesh	Myanmar
Bhutan	Nepal
Democratic People's Republic of Korea	Sri Lanka
India	Thailand
Indonesia	Timor-Leste
Maldives	

### WHO Region of the Americas

Antigua and Barbuda	Guyana
Argentina	Haiti
Bahamas	Honduras
Barbados	Jamaica
Belize	Mexico
Bolivia (Plurinational State of)	Nicaragua
Brazil	Panama
Canada	Paraguay
Chile	Peru
Colombia	Saint Kitts and Nevis
Costa Rica	Saint Lucia
Cuba	Saint Vincent and the Grenadines
Dominica	Suriname

Dominican Republic  
Ecuador  
El Salvador  
Grenada  
Guatemala

Trinidad and Tobago  
United States of America  
Uruguay  
Venezuela

**WHO European Region**

Albania  
Andorra  
Armenia  
Austria  
Azerbaijan  
Belarus  
Belgium  
Bosnia and Herzegovina  
Bulgaria  
Croatia  
Cyprus  
Czech Republic  
Denmark  
Estonia  
Finland  
France  
Georgia  
Germany  
Greece  
Hungary  
Iceland  
Ireland  
Israel  
Italy  
Kazakhstan  
Kyrgyzstan

Latvia  
Lithuania  
Luxembourg  
Malta  
Monaco  
Montenegro  
Netherlands  
Norway  
Poland  
Portugal  
Republic of Moldova  
Romania  
Russian Federation  
San Marino  
Serbia  
Slovakia  
Slovenia  
Spain  
Sweden  
Switzerland  
Tajikistan  
The former Yugoslav Republic of Macedonia  
Turkey  
Turkmenistan  
Ukraine  
United Kingdom  
Uzbekistan

**WHO Eastern Mediterranean Region**

Afghanistan  
Bahrain  
Djibouti  
Egypt  
Iran (Islamic Republic of)  
Iraq  
Jordan  
Kuwait  
Lebanon  
Libya  
Morocco

Oman  
Pakistan  
Qatar  
Saudi Arabia  
Somalia  
Sudan  
Syrian Arab Republic  
Tunisia  
United Arab Emirates  
Yemen

**WHO Western Pacific Region**

Australia

New Zealand

Brunei Darussalam	Niue
Cambodia	Palau
China	Papua New Guinea
Cook Islands	Philippines
Fiji	Republic of Korea
Japan	Samoa
Kiribati	Singapore
Lao People's Democratic Republic	Solomon Islands
Malaysia	Taiwan
Marshall Islands	Tonga
Micronesia (Federated States of)	Tuvalu
Mongolia	Vanuatu
Nauru	Viet Nam
Northern Mariana Islands	