



BC Centre for Disease Control
AN AGENCY OF THE PROVINCIAL HEALTH SERVICES AUTHORITY

TB

Annual Report
2015

Contact Information

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Summary of Trends

Tuberculosis (TB)

Active TB

- In 2015, the rate of active TB in BC was 5.6 per 100,000 population (261 cases), down from 6.3/100,000 population (293 cases) in 2014.
- For the first time in the last decade, males had a lower active TB rate (males=5.2/100,000 population) than in females (5.9/100,000 population).
- TB rates in males and females were greater in older age groups.
- In 2015, 84.3% of cases were among foreign born individuals.
- Individuals born in the Western Pacific Region, South East Asia regions comprised 56.4% and 29.5% of foreign born cases, respectively, in 2015.
- In 2015, 82.4% of active TB cases had known HIV status (including self-reported), down from 89.4% in 2014. Of those with known HIV status, 4.7% (n=10) had HIV infection as indicated by self report or lab report, up from 3.1% (n=8) in 2014.
- Drug resistant active TB is a concern world-wide, and rates of Isoniazid-resistant TB have generally increased in BC over the past decade. In 2015, 10.3% of all cases had Isoniazid resistance, up from 8.5% in 2014. Only 1 case of multi-drug resistant TB (both Isoniazid and Rifampin) was seen in 2015 (0.4%), down from 7 in 2014.

Latent TB

- A total of 796 individuals were started on latent TB infection (LTBI) therapy in 2014, of which 78.6% successfully completing treatment in under 12 months and 1.3% took longer than 1 year to complete treatment. Of the 796 individuals who started treatment, 20.1% were documented with incomplete treatment.
- In 2014, 41.8% of LTBI treatment starts occurred in those 40-59 years of age, 28.9% in those 20-39 years of age, and 21.1% in those 60 years of age or older.

Contact Tracing

- In 2015, an average of 10.3 contacts (median=6.0) were documented per respiratory TB case. Of the contacts documented in the Integrated Public Health Information System (iPHIS) in 2015, 47.1% were Type 1, 18.5% were Type 2, and 21.5% were Type 3*.

* See page 26 for description of contact types.

Active TB Historical Trends

TB incidence in BC continued a decade long decrease in 2015, reaching the lowest value on record at 5.6/100,000 population (Table 2; Figure 3). This trend of decreasing incidence mirrors that seen for Canada as a whole, however, active TB incidence in BC remains higher than the Canadian rate. The large number of foreign born individuals entering the province from high-incidence countries may be a contributing factor.

Active TB Rates by Health Authority of Residence

In 2015, disease incidence was highest in Vancouver Coastal Health Authority (VCHA; 9.5/100,000 population), followed by Fraser Health Authority (FHA; 6.5/100,000 population), Northern Health Authority (NHA; 4.3/100,000 population), Vancouver Island Health Authority (VIHA; 2.1/100,000 population) and Interior Health Authority (IHA 1.2/100,000 population). Incidence in FHA, IHA, and VCHA decreased in 2015 compared to 2014, while VIHA and NHA both showed slight increases in TB incidence (Table 4, Figure 5). The higher TB incidence in FHA and VCHA likely results from the large number of foreign born people settling in these urban regions.

Active TB by Age and Gender

TB incidence has historically been higher in males than in females. However, the rate in females in 2015 was 5.9/100,000 population compared to 5.2/100,000 in males (Table 7; Figure 8). The TB rate in males has generally decreased since 2012 while increasing in females over the same period. Active disease in those <5 years of age indicates recent transmission because of the reduced probability of historic exposure and reactivation. There was one case of active TB diagnosed in those <5 years of age in 2015 (Table 9; Figure 10).

Active TB by Origin

In BC in 2015, 84.3% of provincial cases occurred in those born outside of Canada, the highest percentage on record in BC (Table 13; Figure 14). Half of the foreign born cases in 2015 were ≥60 years of age, in comparison to 27.3% in 40-59 age group, and 19.1% in those 20-39 years of age (Table 17; Figure 18). Many of BC's recent immigrants come from regions with high rates of active TB such as the South East Asia and Western Pacific regions as defined by the Public Health Agency of Canada (PHAC). Immigration, Refugees and Citizenship Canada (IRCC) currently screens immigrants applying for permanent residency for active TB, as well as all students, visitors or workers staying for more than 6 months. Visitors, students or workers staying less than 6 months do not undergo screening. Of the foreign born cases in 2015, 56.4% were from the Western Pacific Region with 29.5% from the South East Asia region (Table 19; Figure 20).

HIV Screening and Co-infection

Only data collected 2007 or later is evaluated in relation to HIV infection status because HIV data was previously not routinely collected for all TB cases. In 2015, 82.4% of active TB cases had known HIV status (including self-reported), down from 89.4% in 2014. Of those with known HIV status, 4.7% (n=10) had HIV infection as indicated by self report or lab report, up from 3.1% (n=8) in 2014. (Table 22; Figure 23). The percentage of known HIV status in TB cases is believed to be an underestimate due to incomplete ascertainment of all testing data from non-iPHIS systems.

Site of Disease

The site of active TB describes the clinical location of TB disease. Respiratory infection is more transmissible than non-respiratory infection. Of the TB seen in BC in 2015, 78.2% were respiratory cases, well within historic trends (Table 25; Figure 26).

Treatment of Active Cases

Retreatment refers to clients diagnosed with active disease who have documented evidence of previous active disease in BC or elsewhere. Of all cases, 95.4% (n=249) were identified as new infection, with only 4.6% (n=12) retreatment cases, down from 8.5% (n=23) in 2014 (Table 27; Figure 28).

Treatment for active TB was completed in all but 7 cases in 2014 (post-mortem diagnoses excluded, n=8) (Table 29, Figure 31). Here treatment outcomes are reported for those who started treatment in 2014 owing to the duration of active TB treatment. Of those who started treatment in 2014, 85.9% completed active TB treatment within 12 months, with 11.6% taking more than 1 year to complete treatment. Only 2.5% of cases failed to complete TB treatment for active disease (Table 30).

Drug Resistance

Drug resistant TB is an important public health issue globally, and has an increasing impact here in BC. In 2015, 10.3% of TB cases had Isoniazid (INH) resistance. Only 0.4% of cases in 2015 have multi-drug resistance (both Isoniazid and Rifampin), a decrease from the 2.4% seen in 2014 (Table 33).

Mortality

In those clients who died during the course of TB treatment, 68.2% (n=15) were documented with TB contributing to, but not being the underlying cause of death. Of those who died during treatment, 13.6% (n=3) had underlying cause of death related to TB infection and 13.6% (n=3) died for reasons unrelated to their TB infection (Table 35; Figure 36).

Active TB Historical Trends

1: Active TB Disease Cases in BC, 2006 to 2015

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
BC	336	292	313	315	251	277	299	273	293	261

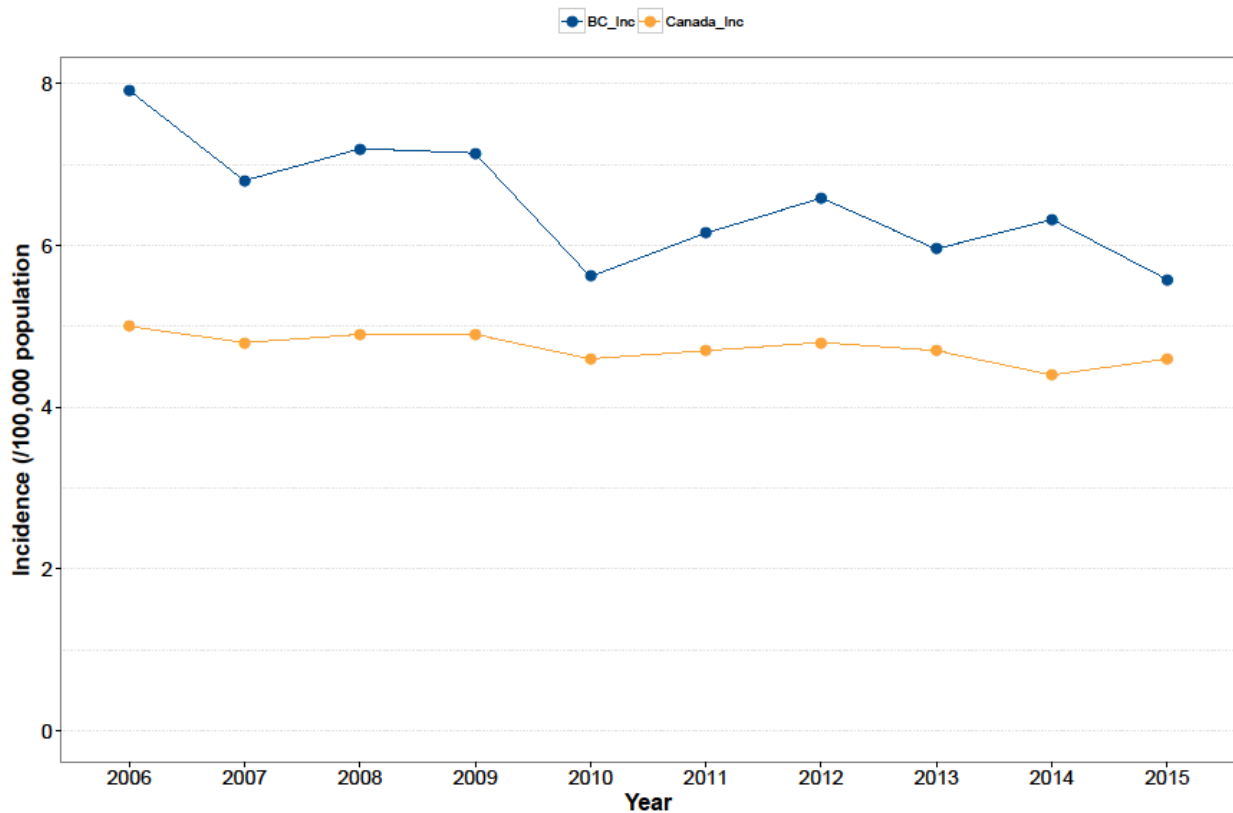
2: Active TB Disease Rates in BC and Canada, 2006 to 2015

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
BC	7.9	6.8	7.2	7.1	5.6	6.2	6.6	6.0	6.3	5.6
Canada*	5.0	4.8	4.9	4.9	4.6	4.7	4.8	4.7	4.4	4.6

*Canadian rates come from the Public Health Agency of Canada

**2015 data for Canada was not available at time of publication

3: Active TB Disease Rates in BC and Canada, 2006 to 2015



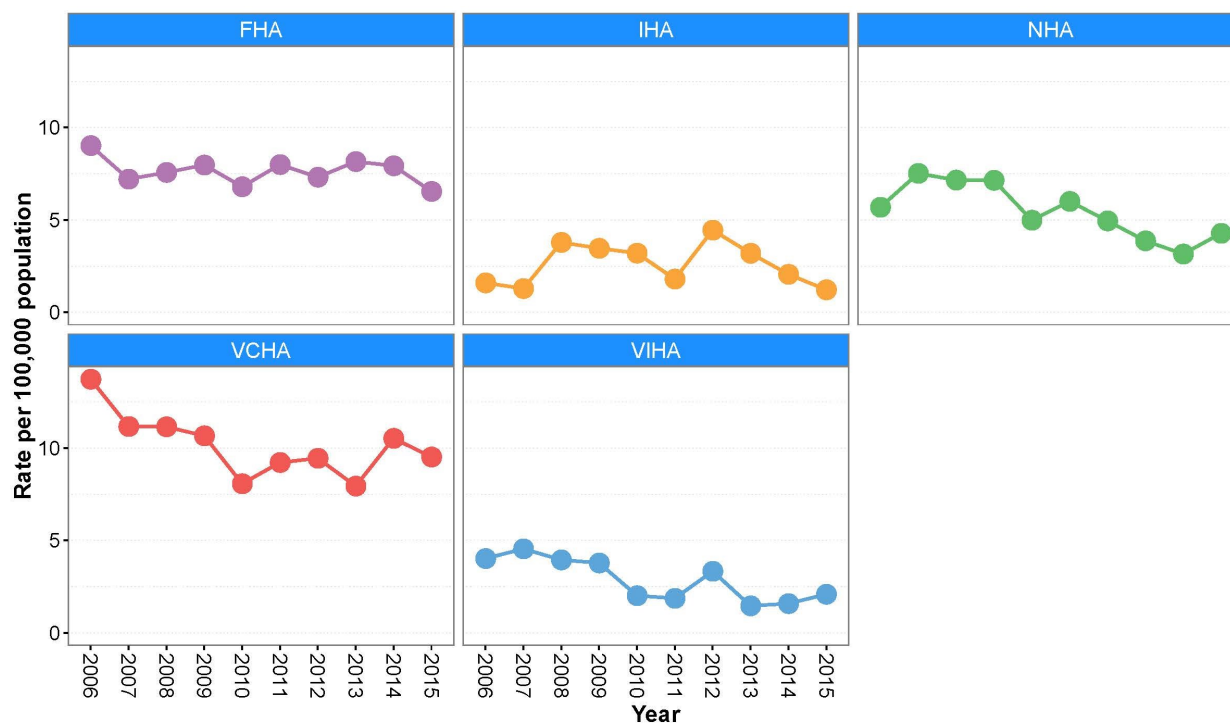
Active TB Rates by Health Authority of Residence

4. Active TB Disease Rates by Health Authority in BC, 2006 to 2015

Health Authority*	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fraser (FHA)	9.0	7.2	7.6	8.0	6.8	8.0	7.3	8.2	7.9	6.5
Interior (IHA)	1.6	1.3	3.8	3.5	3.2	1.8	4.4	3.2	2.1	1.2
Northern (NHA)	5.7	7.5	7.2	7.1	5.0	6.0	4.9	3.9	3.2	4.3
Vancouver Coastal (VCHA)	13.7	11.2	11.1	10.7	8.1	9.2	9.4	7.9	10.5	9.5
Vancouver Island (VIHA)	4.0	4.5	3.9	3.8	2.0	1.9	3.3	1.5	1.6	2.1

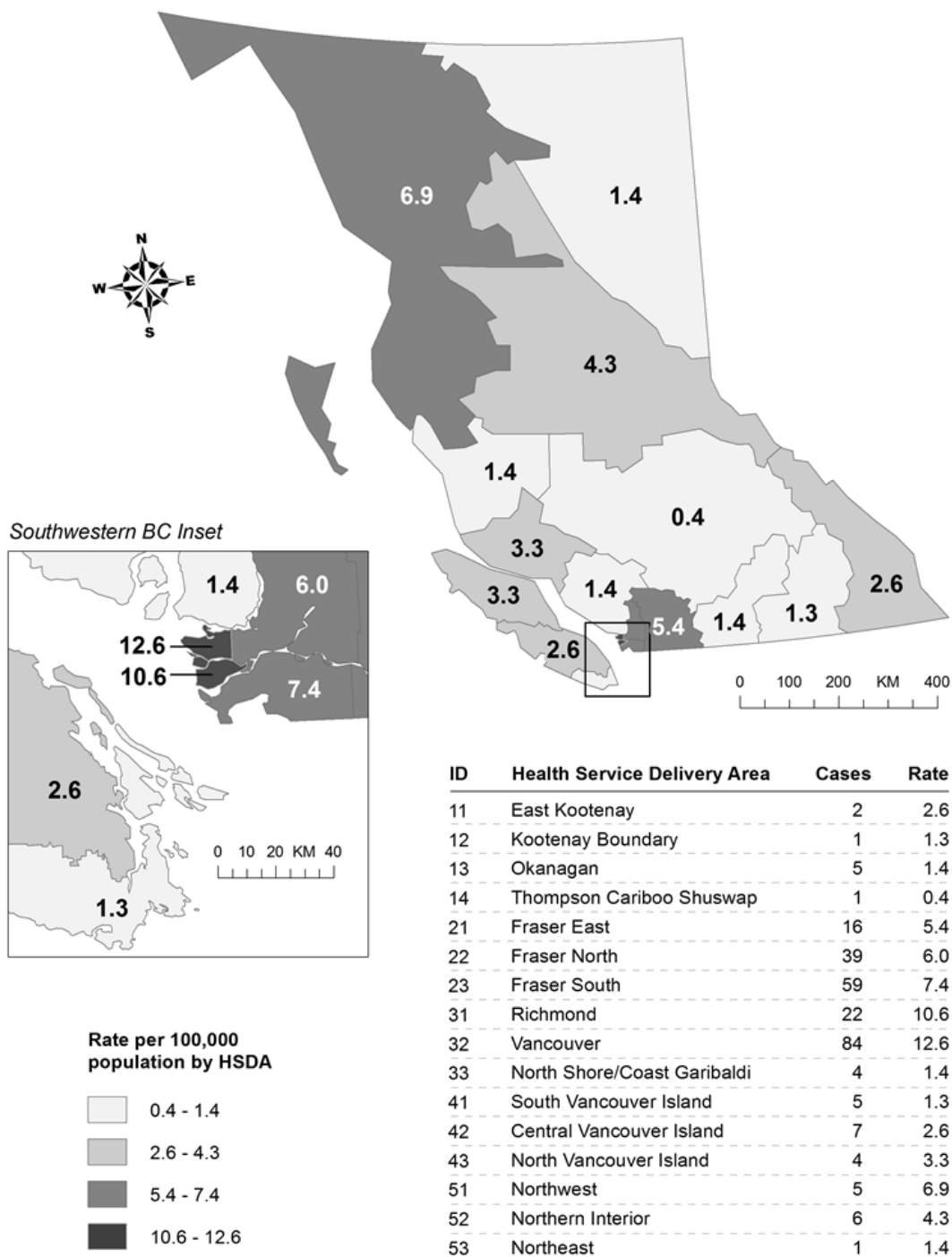
*Residence classified at time of case

5. Active TB Disease Rates by Health Authority in BC, 2006 to 2015



Active TB Rates by Health Service Delivery Area

6. Active TB Disease Rates by Health Service Delivery Area*+ in BC, 2015



* Health Service Delivery Area determined at time of case

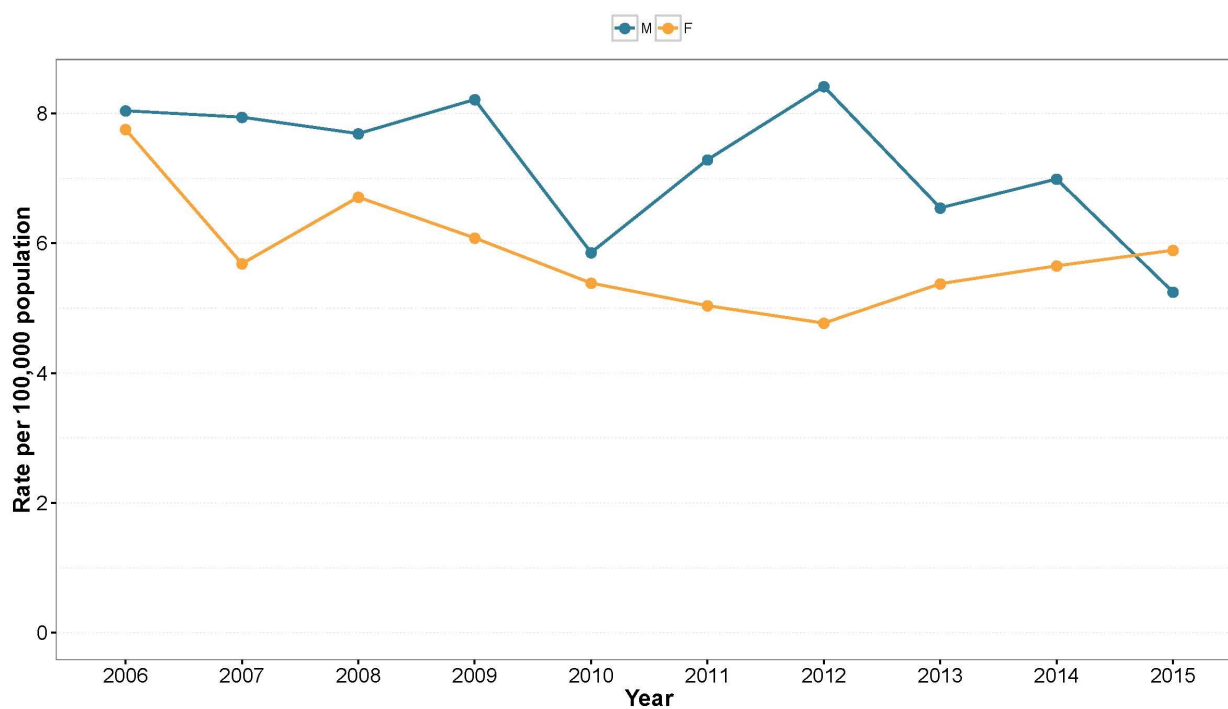
+ Population denominators come from 2015 Population Estimates from BC Statistics.

Active TB by Age and Gender

7. Active TB Disease Rates by Gender in BC, 2006 to 2015

Gender	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Female	7.8	5.7	6.7	6.1	5.4	5.0	4.8	5.4	5.7	5.9
Male	8.0	7.9	7.7	8.2	5.9	7.3	8.4	6.5	7.0	5.2

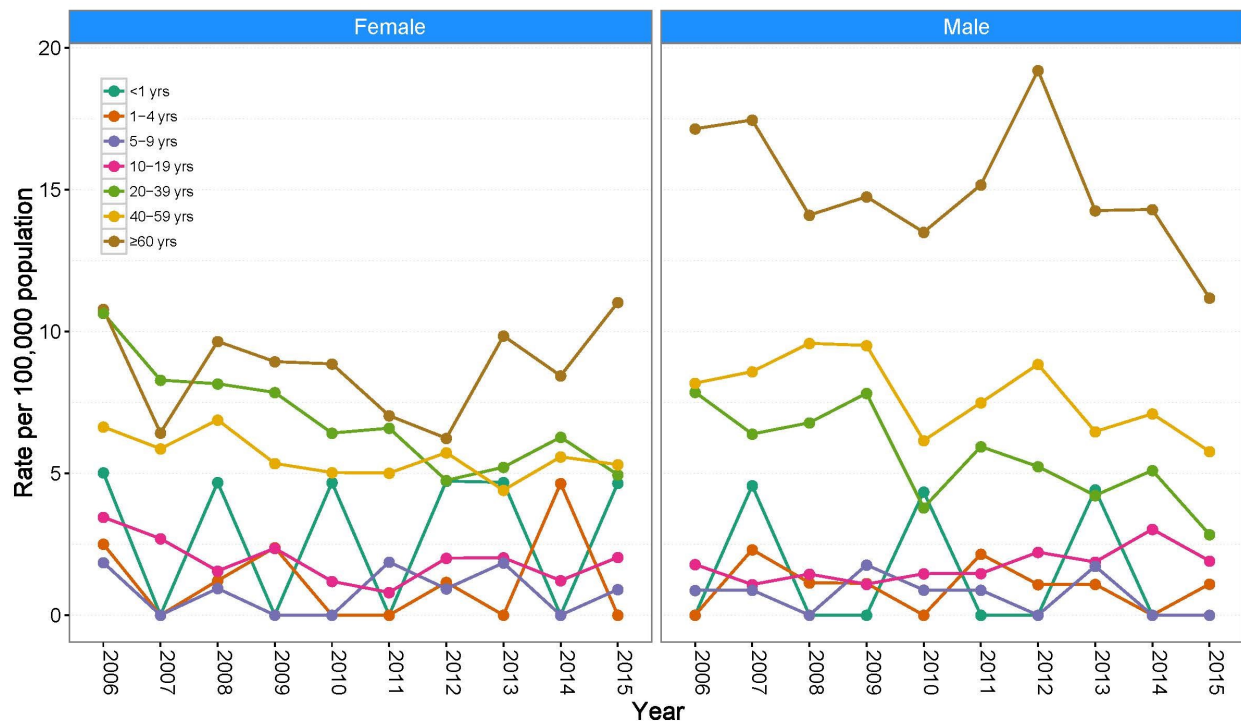
8. Active TB Disease rates by Gender in BC, 2006 to 2015



9. Active TB Disease Rates by Gender and Age Group in BC, 2006 to 2015

Gender	Age	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Female	<1 yrs	5.0	0.0	4.7	0.0	4.7	0.0	4.7	4.7	0.0	4.7
	1-4 yrs	2.5	0.0	1.2	2.4	0.0	0.0	1.2	0.0	4.6	0.0
	5-9 yrs	1.9	0.0	0.9	0.0	0.0	1.9	0.9	1.8	0.0	0.9
	10-19 yrs	3.5	2.7	1.6	2.4	1.2	0.8	2.0	2.0	1.2	2.0
	20-39 yrs	10.6	8.3	8.2	7.9	6.4	6.6	4.7	5.2	6.3	4.9
	40-59 yrs	6.6	5.9	6.9	5.3	5.0	5.0	5.7	4.4	5.6	5.3
	≥60 yrs	10.8	6.4	9.7	8.9	8.9	7.0	6.2	9.8	8.4	11.0
Male	<1 yrs	0.0	4.6	0.0	0.0	4.3	0.0	0.0	4.4	0.0	0.0
	1-4 yrs	0.0	2.3	1.1	1.1	0.0	2.1	1.1	1.1	0.0	1.1
	5-9 yrs	0.9	0.9	0.0	1.8	0.9	0.9	0.0	1.7	0.0	0.0
	10-19 yrs	1.8	1.1	1.4	1.1	1.5	1.5	2.2	1.9	3.0	1.9
	20-39 yrs	7.9	6.4	6.8	7.8	3.8	5.9	5.2	4.2	5.1	2.8
	40-59 yrs	8.2	8.6	9.6	9.5	6.2	7.5	8.8	6.5	7.1	5.8
	≥60 yrs	17.1	17.5	14.1	14.8	13.5	15.2	19.2	14.3	14.3	11.2

10. Active TB Disease Rates by Gender and Age Group in BC, 2006 to 2015



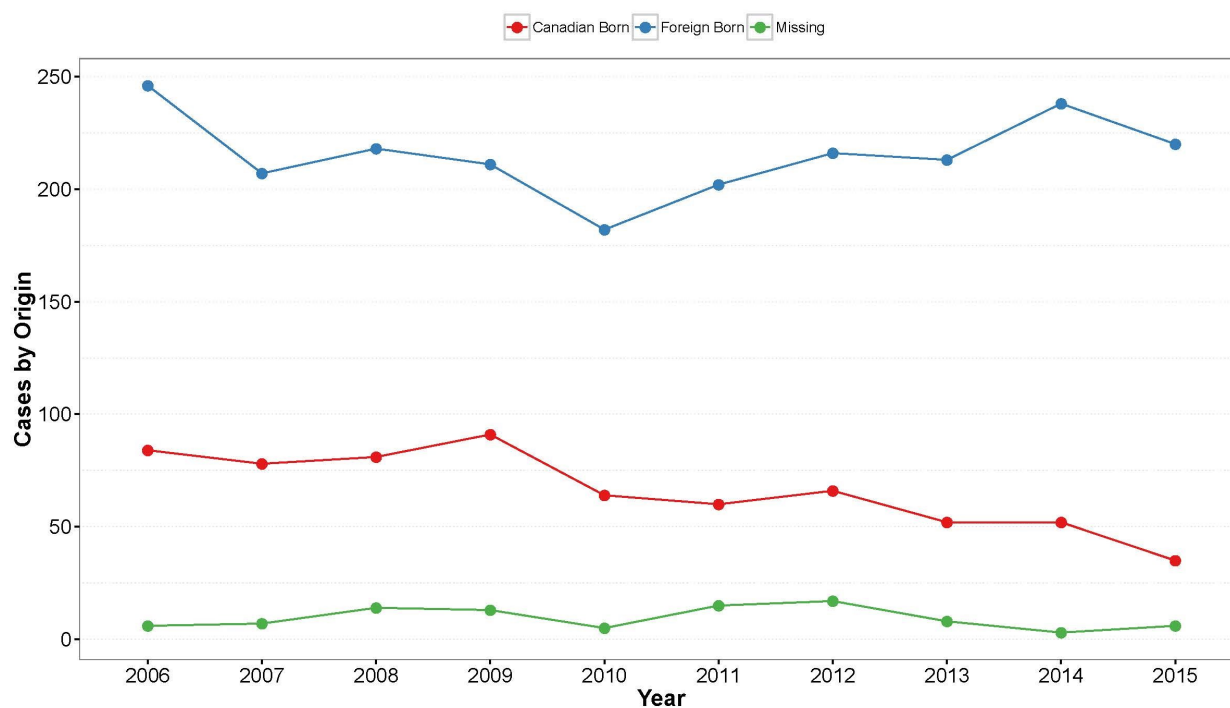
Active TB by Origin - Case Totals

11. Active TB Disease Cases by Origin in BC, 2006 to 2015

Origin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Canadian Born	84	78	85	94	67	66	68	55	55	37
Foreign Born	246	207	218	211	182	202	216	213	238	220
Missing*	6	7	10	10	2	9	15	5	0	4

*Unknown or undocumented origin

12. Active TB Disease Cases by Origin in BC, 2006 to 2015



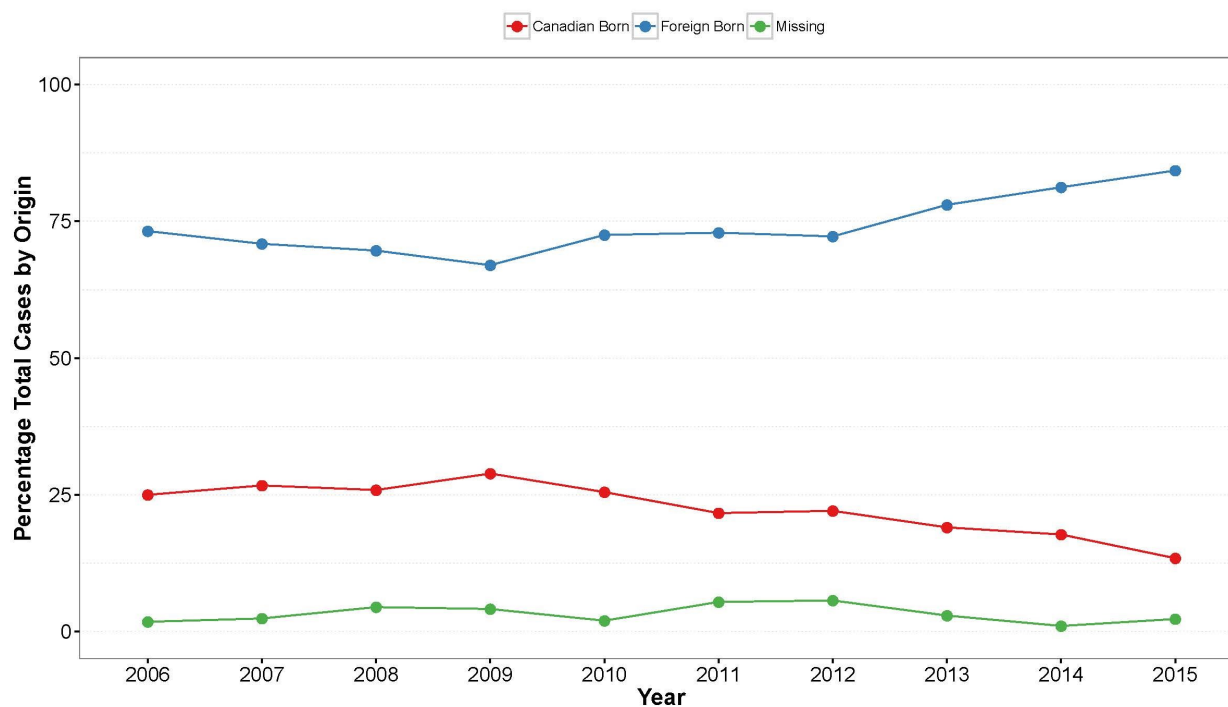
Active TB by Origin - Percentage Total Cases

13. Percentage of Total Active TB Cases by Origin in BC, 2006 to 2015

Origin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Canadian Born	25.0	26.7	27.2	29.8	26.7	23.8	22.7	20.1	18.8	14.2
Foreign Born	73.2	70.9	69.6	67.0	72.5	72.9	72.2	78.0	81.2	84.3
Missing*	1.8	2.4	3.2	3.2	0.8	3.2	5.0	1.8	0.0	1.5

*Unknown or undocumented origin

14. Percentage of Total Active TB Cases by Origin in BC, 2006 to 2015

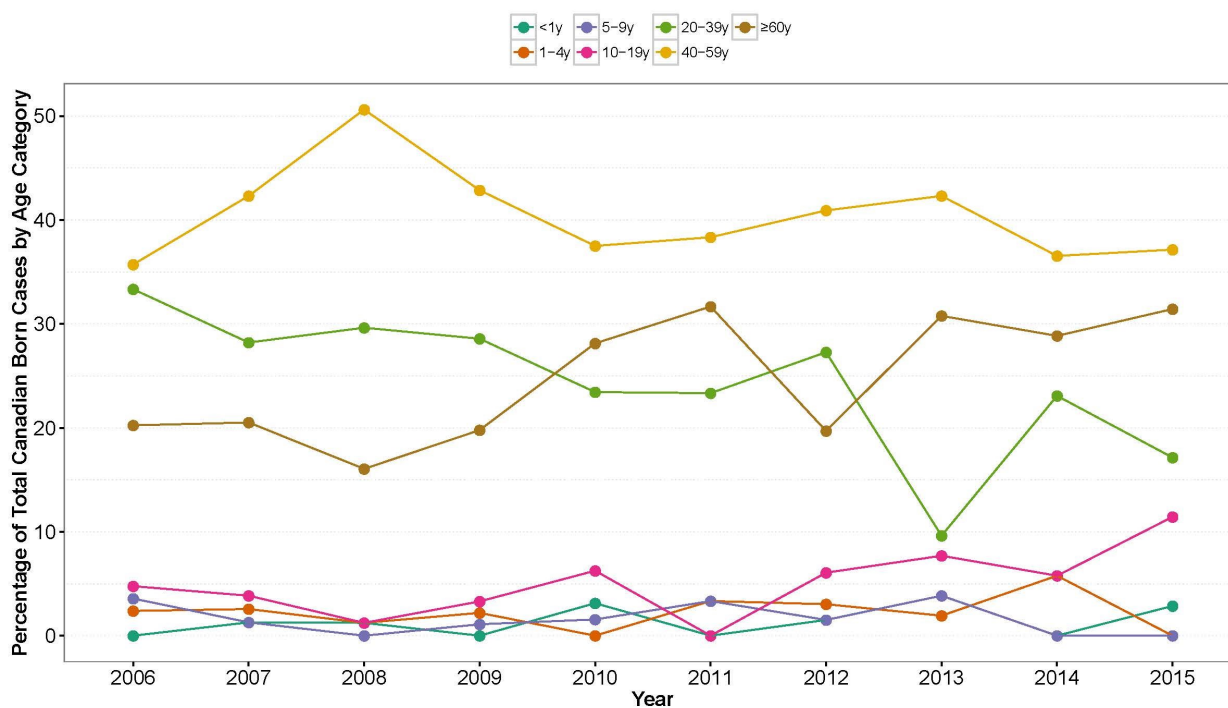


Active TB Among Canadian Born Populations by Age Group

15. Percentage of Active TB Disease in Canadian Born by Age Group, 2006 to 2015

Age	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<1 yrs	0.0	1.3	1.2	0.0	3.0	0.0	1.5	3.6	0.0	2.7
1-4 yrs	2.4	2.6	1.2	2.1	0.0	3.0	2.9	1.8	5.5	0.0
5-9 yrs	3.6	1.3	0.0	1.1	1.5	3.0	1.5	3.6	0.0	0.0
10-19 yrs	4.8	3.8	1.2	3.2	6.0	0.0	5.9	7.3	5.5	10.8
20-39 yrs	33.3	28.2	30.6	28.7	23.9	22.7	26.5	12.7	23.6	18.9
40-59 yrs	35.7	42.3	50.6	43.6	37.3	39.4	41.2	40.0	36.4	35.1
≥60 yrs	20.2	20.5	15.3	19.1	28.4	31.8	20.6	30.9	29.1	32.4

16. Percentage of Active TB Disease in Canadian Born by Age Group, 2006 to 2015

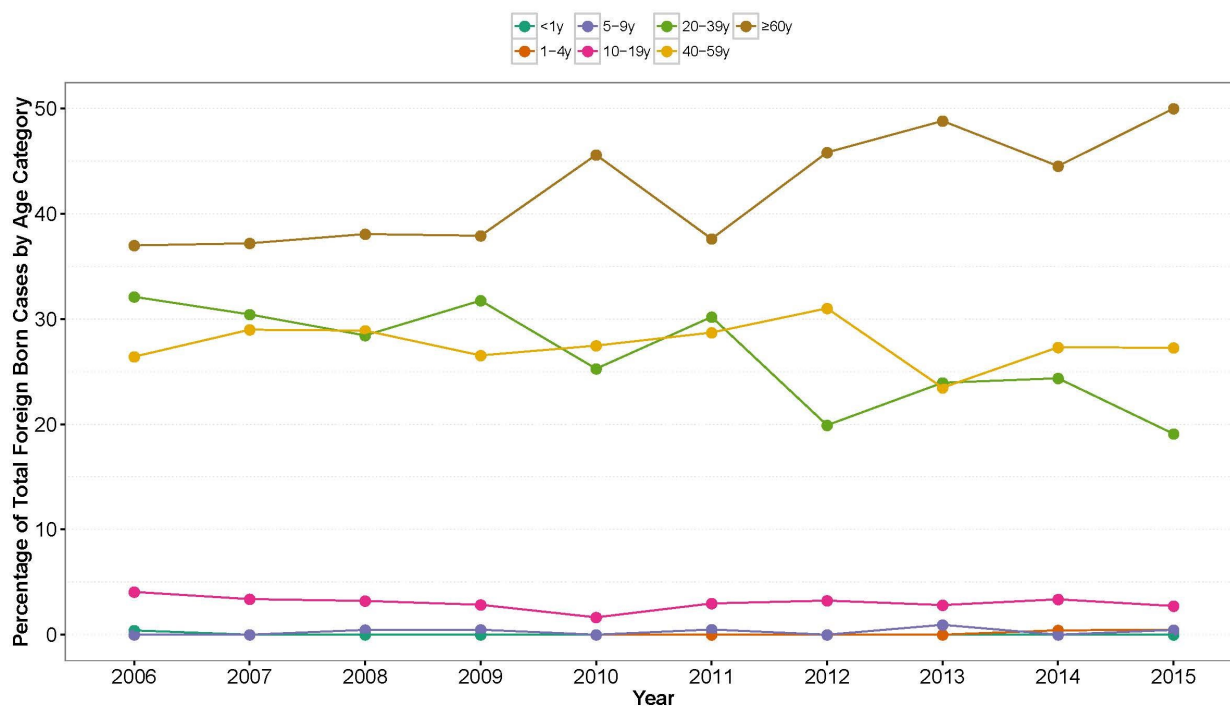


Active TB Among Foreign Born Populations by Age Group

17. Percentage of Active TB Disease in Foreign Born by Age Group, 2006 to 2015

Age	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<1 yrs	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-4 yrs	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.4	0.5
5-9 yrs	0.0	0.0	0.5	0.5	0.0	0.5	0.0	0.9	0.0	0.5
10-19 yrs	4.1	3.4	3.2	2.8	1.6	3.0	3.2	2.8	3.4	2.7
20-39 yrs	32.1	30.4	28.4	31.8	25.3	30.2	19.9	23.9	24.4	19.1
40-59 yrs	26.4	29.0	28.9	26.5	27.5	28.7	31.0	23.5	27.3	27.3
≥60 yrs	37.0	37.2	38.1	37.9	45.6	37.6	45.8	48.8	44.5	50.0

18. Percentage of Active TB Disease in Foreign Born by Age Group, 2006 to 2015

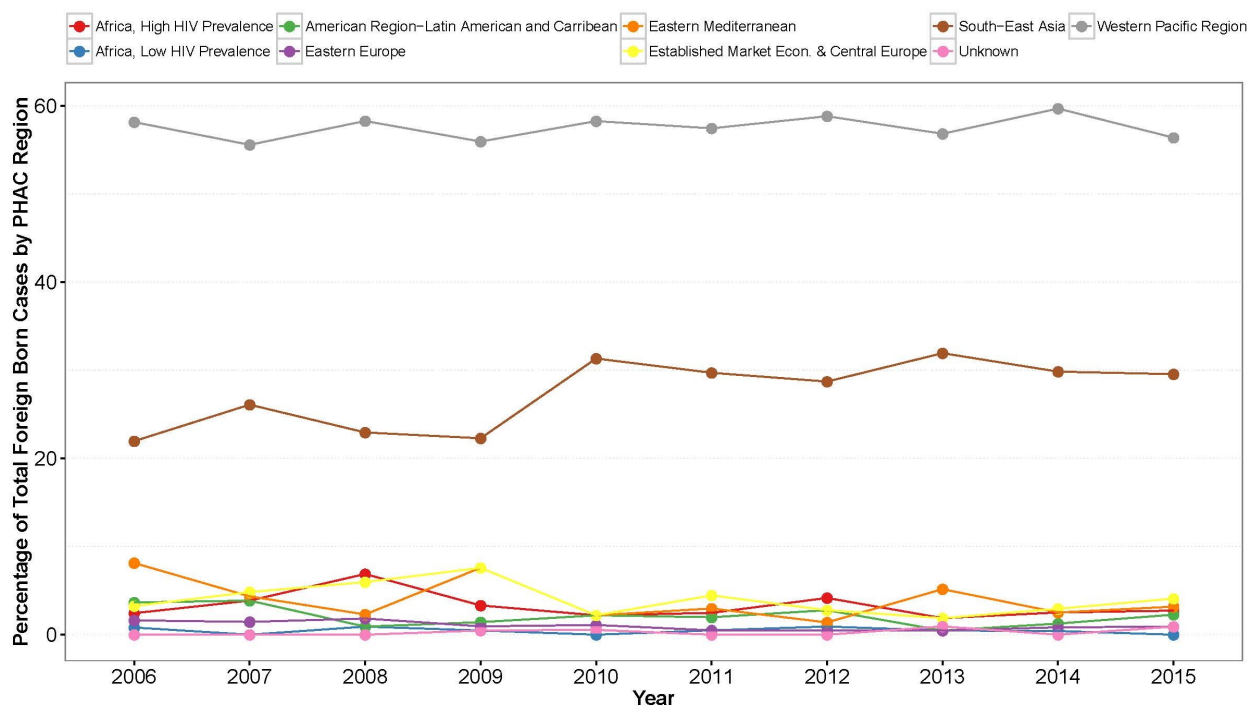


Active TB Among Foreign Born Populations by Regions as Defined by PHAC

19: Percentage of Active TB Case in Foreign Born by Regions (as Defined by the Public Health Agency of Canada (PHAC)).

PHAC Region	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Africa, High HIV Prevalence	2.4	3.9	6.9	3.3	2.2	2.5	4.2	1.9	2.5	2.7
Africa, Low HIV Prevalence	0.8	0.0	0.9	0.5	0.0	0.5	0.9	0.5	0.4	0.0
Eastern Europe	1.6	1.4	1.8	0.9	1.1	0.5	0.5	0.5	0.8	0.9
Eastern Mediterranean	8.1	4.3	2.3	7.6	2.2	3.0	1.4	5.2	2.5	3.2
Established Market Economics & Central Europe	3.3	4.8	6.0	7.6	2.2	4.5	2.8	1.9	2.9	4.1
Latin America & Caribbean	3.7	3.9	0.9	1.4	2.2	2.0	2.8	0.5	1.3	2.3
South-East Asia	22.0	26.1	22.9	22.3	31.3	29.7	28.7	31.9	29.8	29.5
Unknown	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.9	0.0	0.9
Western Pacific Region	58.1	55.6	58.3	55.9	58.2	57.4	58.8	56.8	59.7	56.4

20. Percentage of Active TB Case in Foreign Born by Regions* (as Defined by the Public Health Agency of Canada (PHAC)).



*Canadian Tuberculosis Reporting System: <http://www.phac-aspc.gc.ca/tbpc-latb/pdf/guidelinesform-eng.pdf>

Active TB By HIV Status

21. Active TB Cases by known HIV Status, 2007 to 2015

HIV Positive	2007	2008	2009	2010	2011	2012	2013	2014	2015
HIV Positive	16	17	8	5	9	8	8	8	10
Known HIV Status*	233	281	277	219	210	224	220	262	215

*Either positive or negative on self reported form

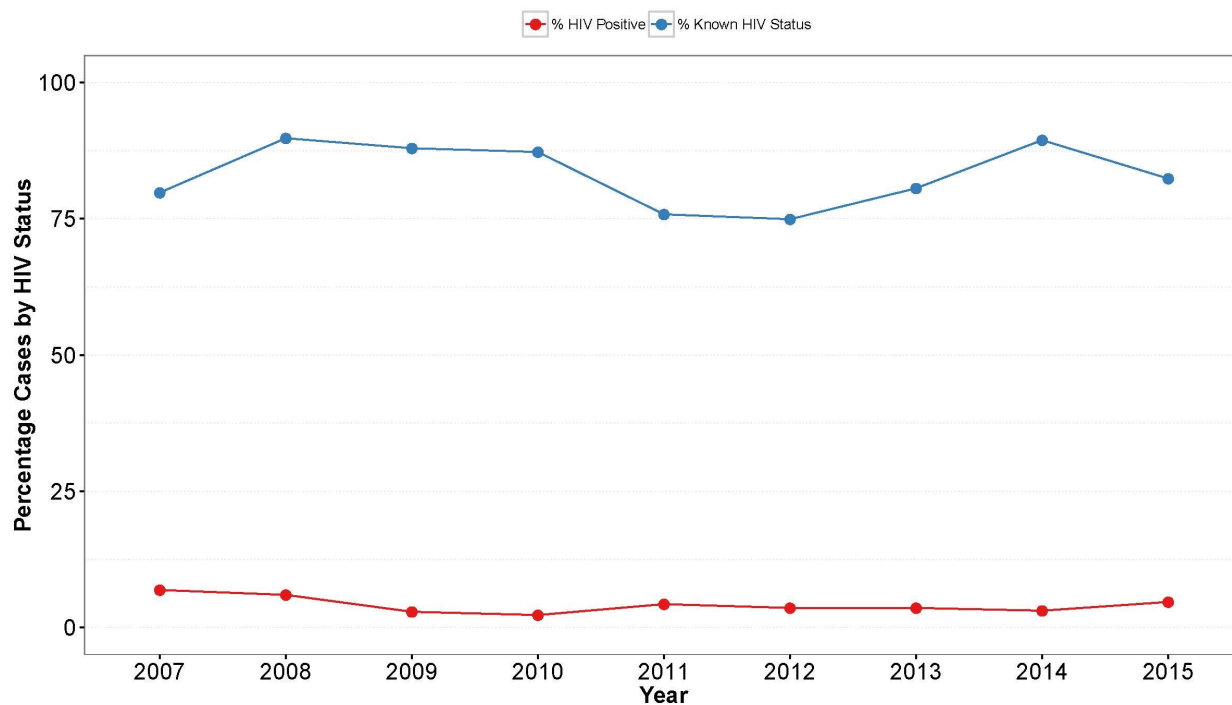
22. Percentage of Active TB Cases by Known HIV Status, 2007 to 2015

HIV Status	2007	2008	2009	2010	2011	2012	2013	2014	2015
% HIV Positive*	6.9	6.0	2.9	2.3	4.3	3.6	3.6	3.1	4.7
% Known HIV Status**	79.8	89.8	87.9	87.3	75.8	74.9	80.6	89.4	82.4

*% HIV Positive of those with known HIV status

**Known Status includes results from testing, as well as self-reported status

23. Percentage of Active TB Cases by Known HIV Status, 2007 to 2015



Active TB by Site of Disease

24. Active TB Disease Case Totals by Site of Disease, 2006 to 2015

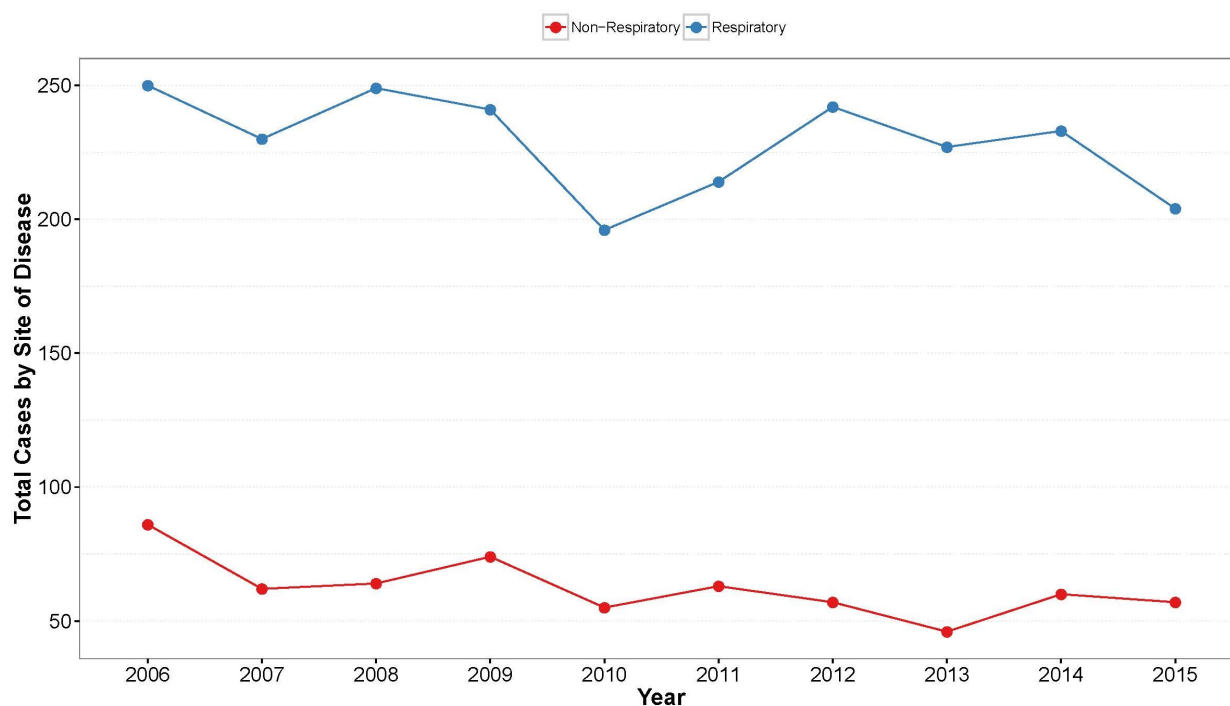
Site of Disease	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Non-Respiratory	86	62	64	74	55	63	57	46	60	57
Respiratory*	250	230	249	241	196	214	242	227	233	204

*Respiratory includes all cases defined as pulmonary, primary, miliary, and other pulmonary (see case definition)

25. Percentage of Active TB Cases by Site of Disease, 2006 to 2015

Site of Disease	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Non-Respiratory	25.6	21.2	20.4	23.5	21.9	22.7	19.1	16.8	20.5	21.8
Respiratory	74.4	78.8	79.6	76.5	78.1	77.3	80.9	83.2	79.5	78.2

26. Active TB Disease Case Totals by Site of Disease, 2006 to 2015

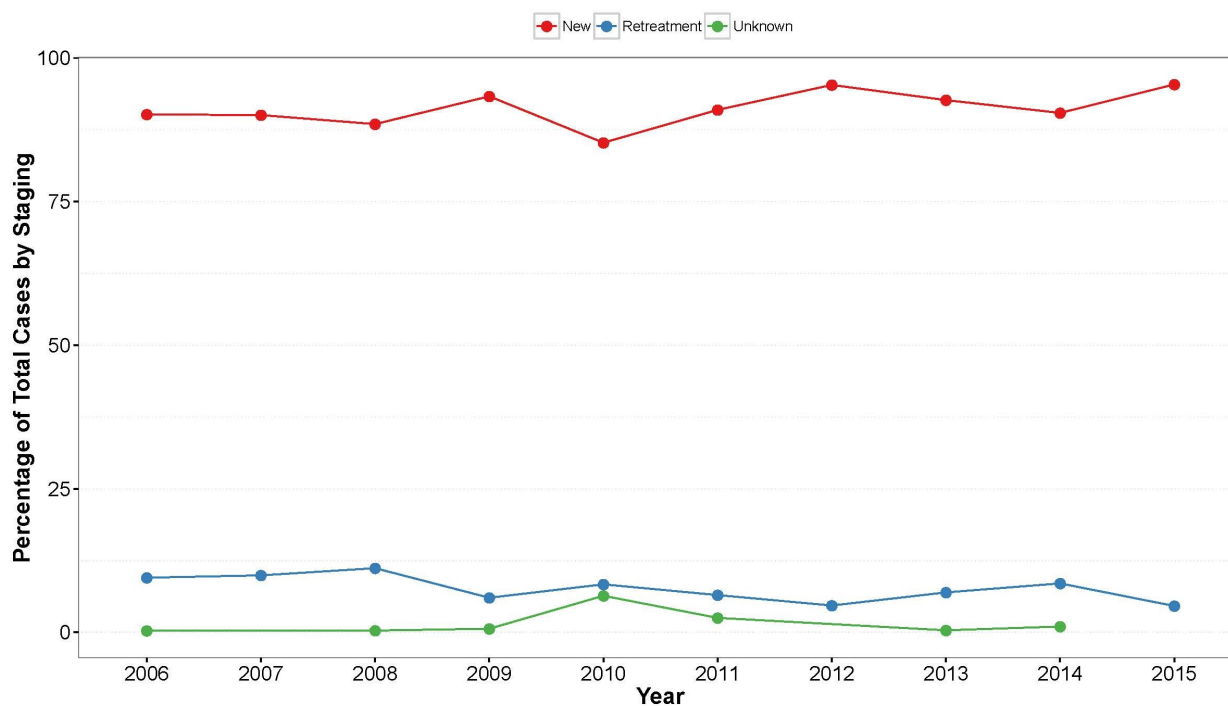


Treatment of Active Cases

27. Percentage of Active TB Cases Diagnosed as Retreatment in BC, 2006 to 2015

Staging	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
New Cases	90.2	90.1	88.5	93.3	85.3	91.0	95.3	92.7	90.4	95.4
Retreatment	9.5	9.9	11.2	6.0	8.4	6.5	4.7	7.0	8.5	4.6
Unknown	0.3	0.0	0.3	0.6	6.4	2.5	0.0	0.4	1.0	0.0

28. Percentage of New and Retreatment Active TB in BC, 2006 to 2015



Treatment Completion of Active Cases

29. Active TB Disease by Treatment Completion, 2006 to 2014

Treatment Summary*	2006	2007	2008	2009	2010	2011	2012	2013	2014
Treatment Completion Within 12 Months	264	237	243	240	212	220	250	228	244
Treatment Completion Greater Than 12 Months	60	40	54	66	37	44	37	30	33
Incomplete Treatment	1	0	0	0	0	0	0	0	7
No Treatment	4	6	6	3	0	9	6	4	0

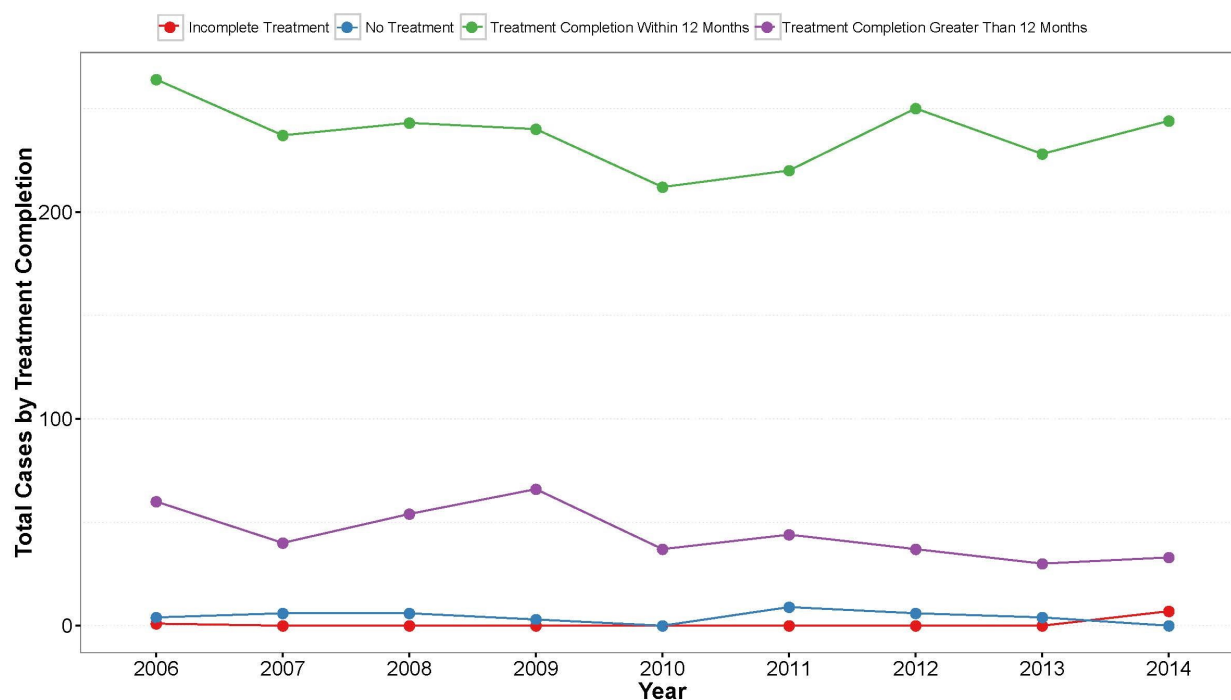
*Excluding those diagnosed post-mortem

30. Percentage Active TB Disease by Treatment Completion, 2006 to 2014

Treatment Summary*	2006	2007	2008	2009	2010	2011	2012	2013	2014
Treatment Completion Within 12 Months	80.2	83.7	80.2	77.7	85.1	80.6	85.3	87.0	85.9
Treatment Completion Greater Than 12 Months	18.2	14.1	17.8	21.4	14.9	16.1	12.6	11.5	11.6
Incomplete Treatment	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
No Treatment	1.2	2.1	2.0	1.0	0.0	3.3	2.0	1.5	0.0

*Excluding those diagnosed post-mortem

31. Active TB Disease Treatment, 2006 to 2014



Drug Resistant TB

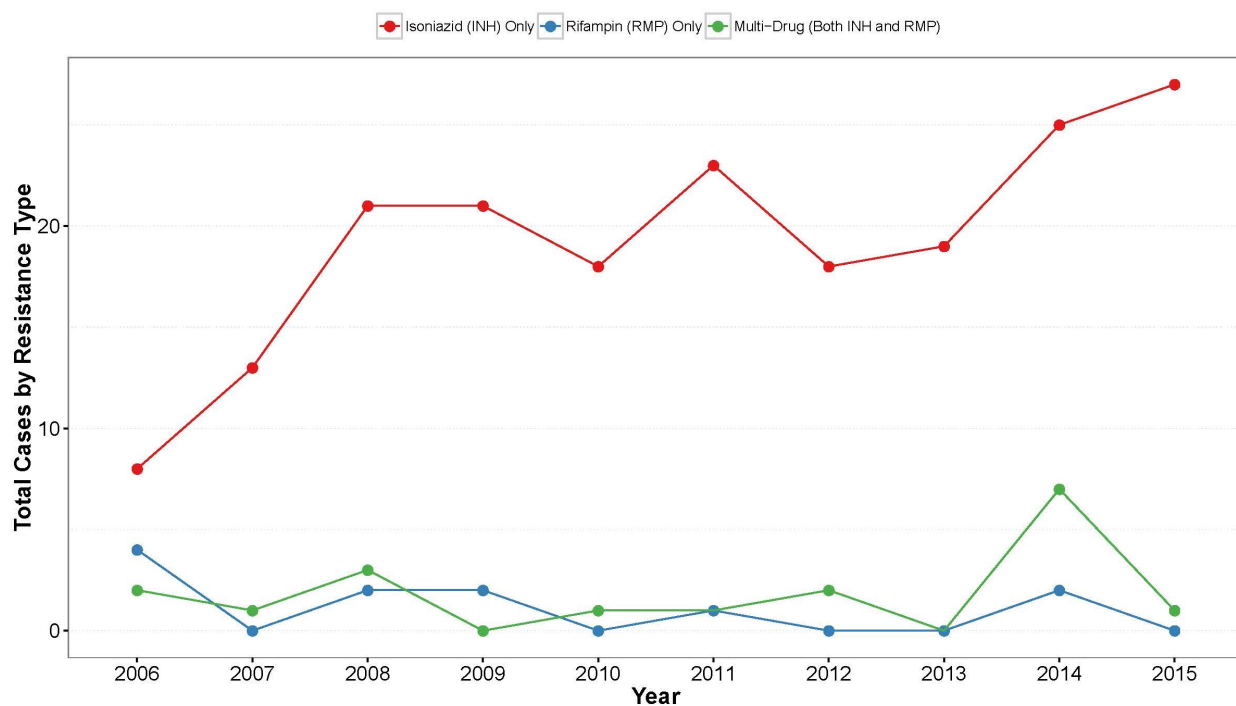
32. Number of Cases with Drug Resistant TB, 2006 to 2015

Resistance	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
No Resistance	322	278	287	292	232	252	279	254	259	233
Isoniazid (INH) Only	8	13	21	21	18	23	18	19	25	27
Rifampin (RMP) Only	4	0	2	2	0	1	0	0	2	0
Multi-Drug Resistance (both INH and RMP)	2	1	3	0	1	1	2	0	7	1

33. Percentage of Cases with Drug Resistant TB, 2006 to 2015

Resistance	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
No Resistance	95.8	95.2	91.7	92.7	92.4	91.0	93.3	93.0	88.4	89.3
Isoniazid (INH) Only	2.4	4.5	6.7	6.7	7.2	8.3	6.0	7.0	8.5	10.3
Rifampin (RMP) Only	1.2	0.0	0.6	0.6	0.0	0.4	0.0	0.0	0.7	0.0
Multi-Drug Resistance (both INH and RMP)	0.6	0.3	1.0	0.0	0.4	0.4	0.7	0.0	2.4	0.4

34. Number of Cases with Drug Resistant TB, 2006 to 2015

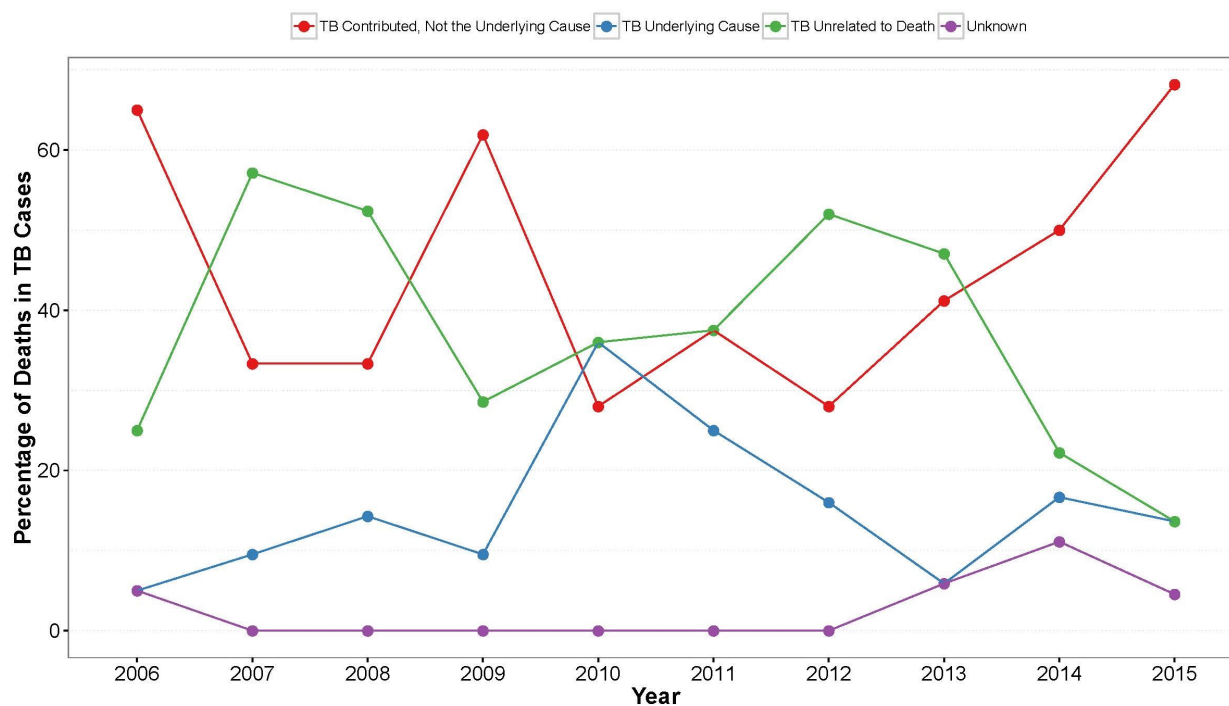


Mortality in Active TB Cases

35. Percent of Total Mortality by Cause in BC, 2006 to 2015

Cause of Death	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
TB Contributed, Not The Underlying Cause of Death	65.0	33.3	33.3	61.9	28.0	37.5	28.0	41.2	50.0	68.2
TB Underlying Cause	5.0	9.5	14.3	9.5	36.0	25.0	16.0	5.9	16.7	13.6
TB Unrelated to Death	25.0	57.1	52.4	28.6	36.0	37.5	52.0	47.1	22.2	13.6
Unknown	5.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	11.1	4.5

36. Percent of Total Mortality by Cause in BC, 2006 to 2015



Latent TB

Latent TB Therapy

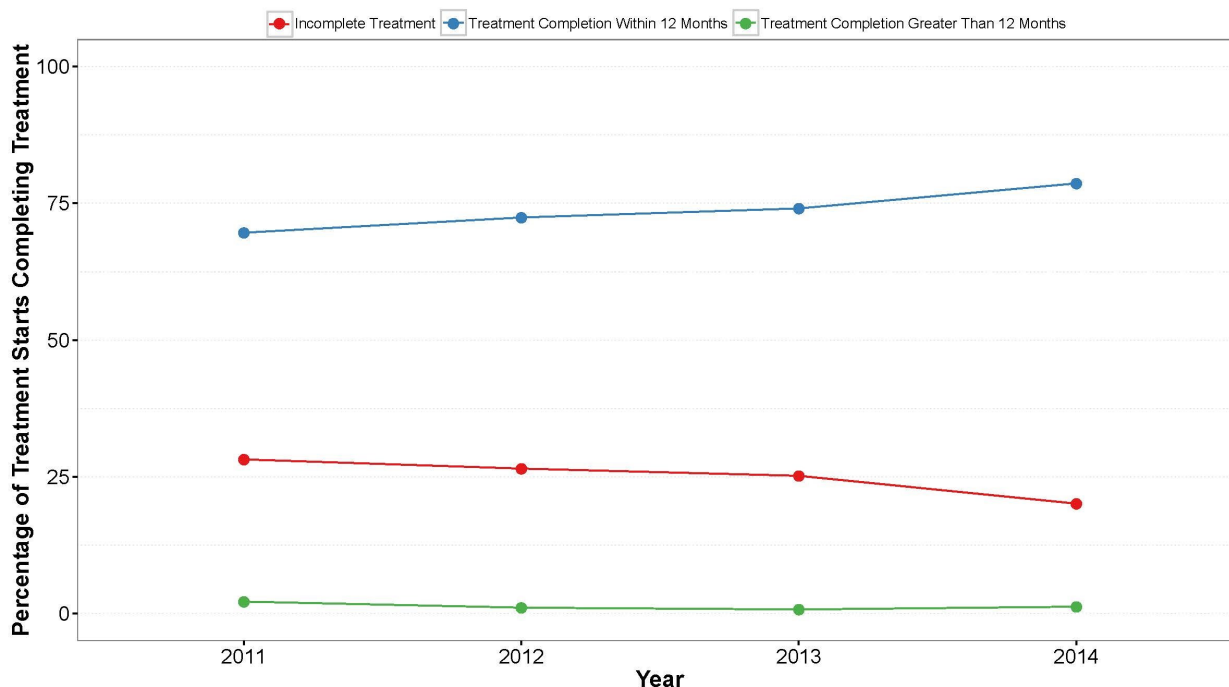
Latent Tuberculosis Infection (LTBI) is a clinical diagnosis in which an individual is suspected to have the non-infectious or dormant phase of TB. The recommendation to treat LTBI is based on a clinical assessment of the patient balancing the risks for progression to active TB against the risks associated with treatment. Not everyone with LTBI is offered or needs treatment.

Here we report on LTBI treatment outcomes for treatment started in 2014 due to the extended duration of LTBI treatment and corresponding delay in reporting. In 2014, 796 clients started LTBI therapy. A total of 78.6% of those starting treatment completed treatment satisfactorily in 2014 (Table 37; Figure 38). Of those starting treatment in 2014, 74.5% of those starting LTBI treatment were among foreign born, 24.2% were Canadian born and 1.3% were of unknown origin or had missing data (Table 39; Figure 40). In 2014, 41.8% were aged 40-59, 28.9% were 20-39 years of age, and 21.1% were 60 years of age or older (Table 41; Figure 42).

37. Percentage of Clients Started on LTBI Therapy by Treatment Success, 2011 to 2014

Treatment Summary	2011	2012	2013	2014
Treatment Completion Within 12 Months	69.6	72.4	74.1	78.6
Treatment Completion Greater Than 12 Months	2.2	1.1	0.7	1.3
Incomplete Treatment	28.2	26.5	25.2	20.1

38. Percentage of Clients Started on LTBI Therapy by Treatment Success, 2011 to 2014



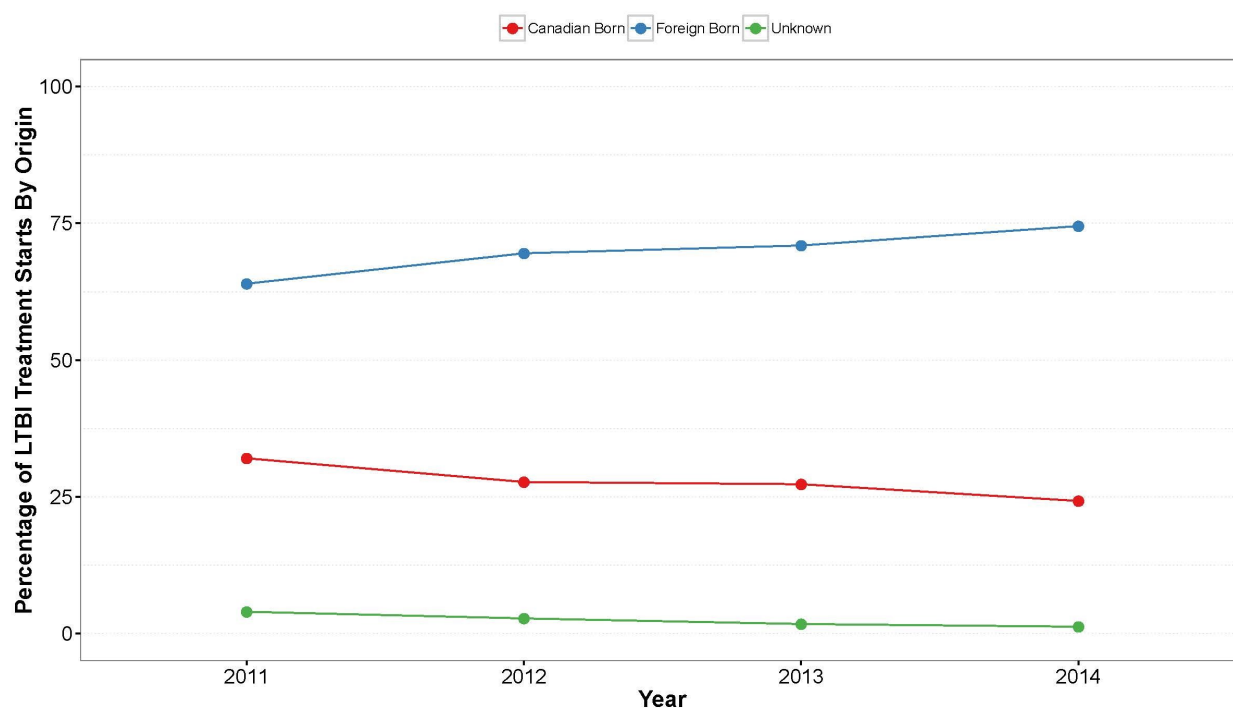
LTBI Treatment by Origin

39. Percentage of LTBI Treatment Initiation by Origin, 2011 to 2014

Origin	2011	2012	2013	2014
Canadian Born	32.0	27.7	27.3	24.2
Foreign Born	64.0	69.5	70.9	74.5
Unknown*	4.0	2.8	1.7	1.3

*Unknown or undocumented origin

40. Percentage of LTBI Treatment Initiation by Origin, 2011 to 2014

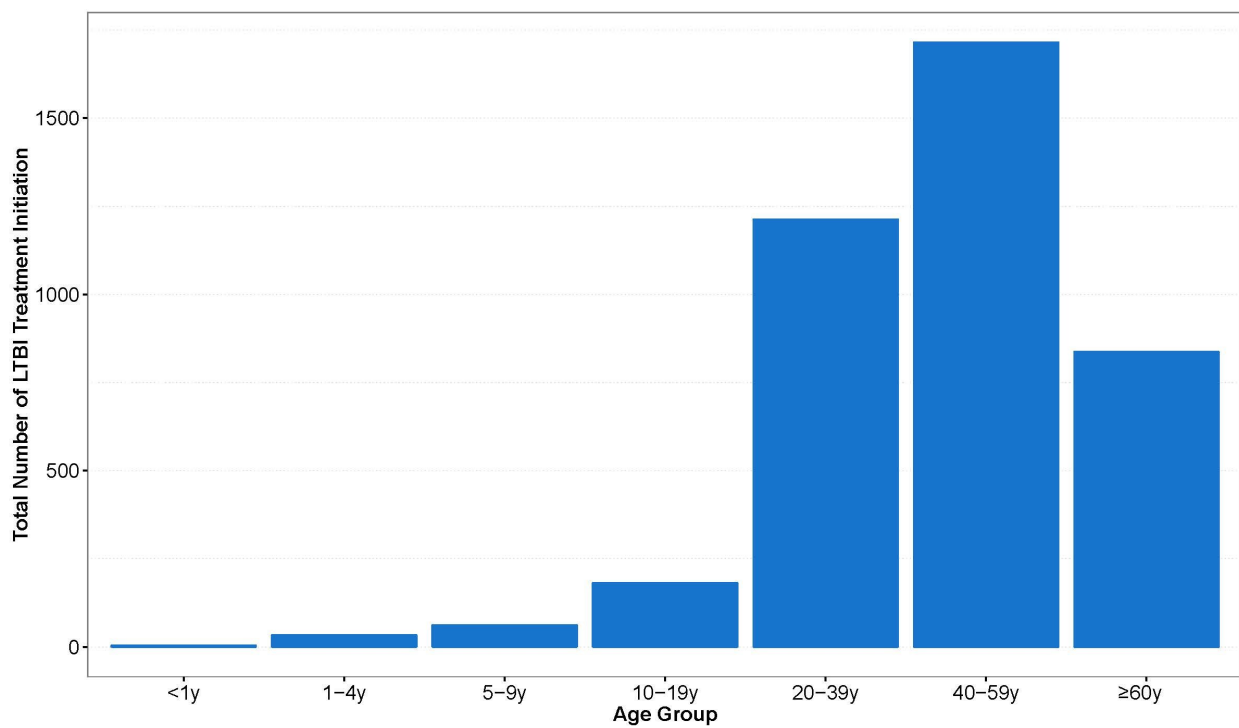


LTBI Treatment By Age Group

41. Percentage of LTBI Treatment Initiation by Age Group in BC, 2011 to 2014

Age Group	2011	2012	2013	2014
<1 yrs	0.1	0.1	0	0.1
1-4 yrs	1	0.2	0.9	0.9
5-9 yrs	1.7	1.1	2	1.4
10-19 yrs	3.7	3.9	5.1	5.4
20-39 yrs	34.9	29.5	28.4	28.9
40-59 yrs	40.3	46.3	42.6	41.8
≥60 yrs	17.6	18.8	20.2	21.1

42. Total Number of LTBI Treatment Initiation by Age Group in BC, 2011 to 2014



TB Contact Tracing

Interpretation of Contact Data

Contact tracing is an important public health intervention that involves identifying individuals who may be at risk of having TB infection or active TB disease as a result of having shared air space with an active TB case. Not all person-to-person contact is equivalent; contacts are classified and prioritized based on the type of TB (in some cases), duration of contact, and contact risk factors. The data presented in this report is from the Integrated Public Health Information System (iPHIS) only and may be incomplete as regions may have separate databases for contact investigation and for the investigation of clusters/outbreaks. This section of the report provides data on contacts of known source cases diagnosed in BC (i.e., contacts identified as part of federally managed airplane screening or contacts of non-resident cases are not included).

Finally, patterns in the number of contacts are affected by the circumstances of each case and differences in the collection, entry and reporting of contact data. Provincial workflows for contact tracing and contact data entry changed in 2013, and should be considered when interpreting the provincial surveillance data presented here.

In 2015, 24 respiratory cases had 0 contacts listed. The mean number of contacts per respiratory TB case (primary, pulmonary, miliary, and other respiratory) in 2015 was 10.3 (median = 6.0), similar to the 10.3 (median = 5.0) observed in 2014. The maximum number of contacts associated with a single respiratory case in 2015 was 99, similar to the max of 97 observed in 2014 (Table 43). Of those contacts identified in 2015, 35.7% occurred in those 40-59 years of age, 28.8% occurred in those 20-39 years of age, and 19.6% occurred in those ≥ 60 years of age (Table 44; Figure 45). In 2015, 48.6% of contacts were foreign born, 41.3% were Canadian born, and 10.1% had an unknown or undocumented origin (Table 46; Figure 47).

Contacts are grouped according to the intensity of the exposure; Type 1 are household contacts or those sharing airspace for 4 hours per week, Type 2 contacts are non-household contacts or those sharing air space for 2-4 hours per week, and type 3 are casual contacts or those sharing airspace for less than 2 hrs per week. Of those contacts identified in 2015, 47.1% were identified as Type 1, up from 42.7% in 2014 (Table 48; Figure 49).

43. Mean, Median, and Max Number of Contacts Reported per Respiratory Case, 2006 to 2015

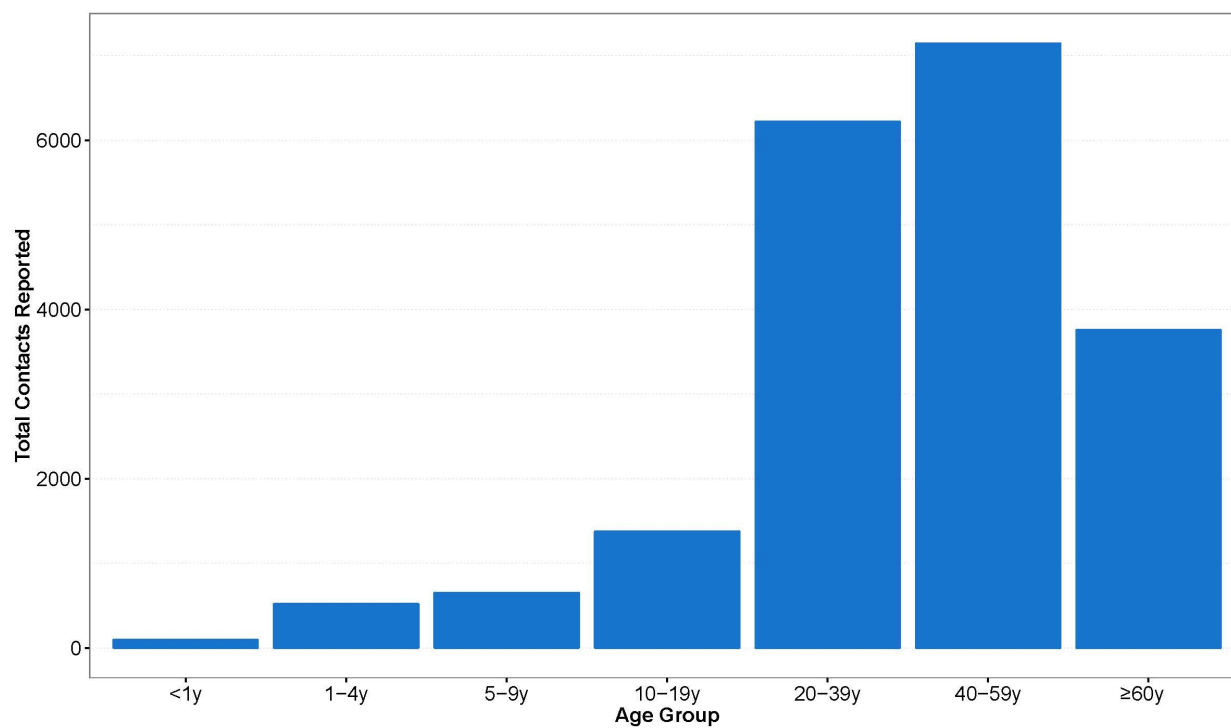
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Max	126	207	269	268	295	421	236	182	97	99
Mean	17.1	15.5	16.8	20.8	16.8	21.4	22.4	19.9	10.3	10.3
Median	7.0	6.0	6.0	8.0	8.0	9.5	13.0	11.0	5.0	6.0

Contacts By Age Group

44. Percentage of Total Contacts Reported by Age Group, 2010 to 2015

Age Group	2010	2011	2012	2013	2014	2015
<1 yrs	0.5	0.2	0.3	0.7	0.3	1.1
1-4 yrs	2.2	1.8	2.2	2.3	3.5	5.6
5-9 yrs	2.5	3.6	3.2	3.6	2.9	3.5
10-19 yrs	7.1	6.1	7	8.1	7.7	4.5
20-39 yrs	36	32	31.1	28	31.8	28.8
40-59 yrs	33.1	35.7	36.6	36.8	36.3	35.7
≥60 yrs	17.9	19.3	19	19.8	16.2	19.6

45. Cumulative Number of Contacts Reported by Age Group in BC, From 2010 to 2015



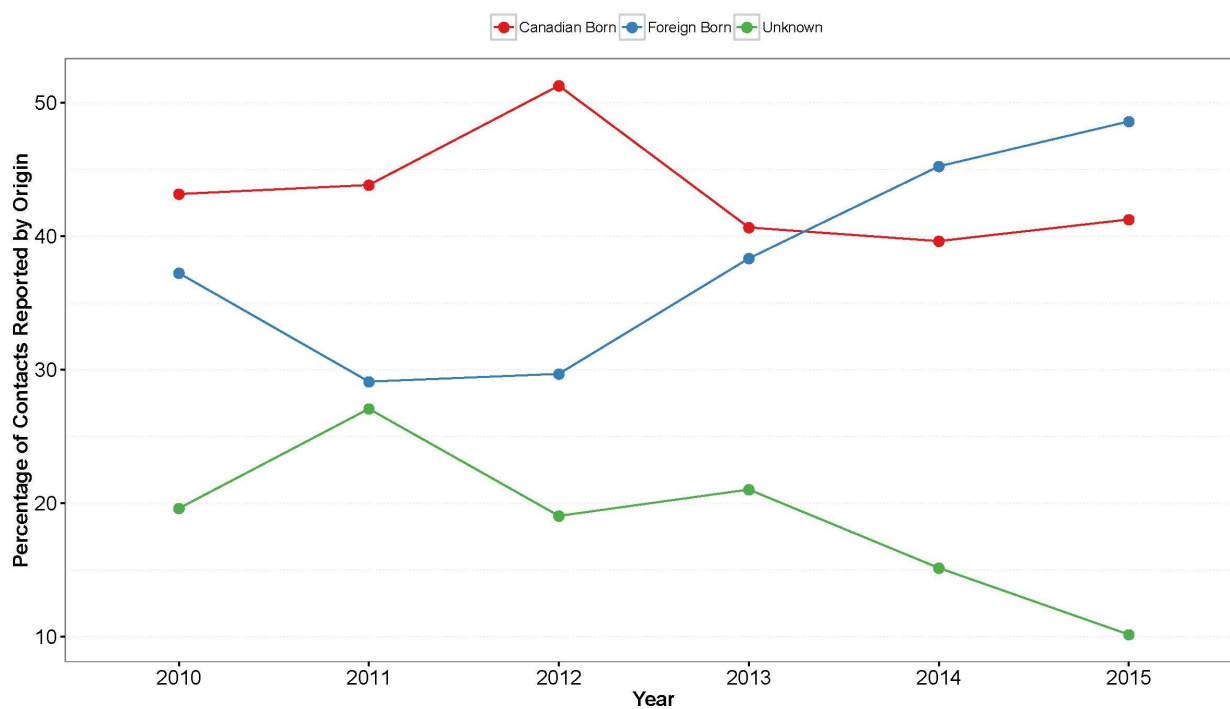
Contacts by Origin

46. Percentage of Contacts Reported by Origin, 2010 to 2015

Origin	2010	2011	2012	2013	2014	2015
Canadian Born	43.2	43.8	51.3	40.7	39.6	41.3
Foreign Born	37.2	29.1	29.7	38.3	45.2	48.6
Unknown*	19.6	27.1	19.0	21.0	15.1	10.1

*Unknown or undocumented origin

47. Percentage of Contacts Reported by Origin, 2010 to 2015



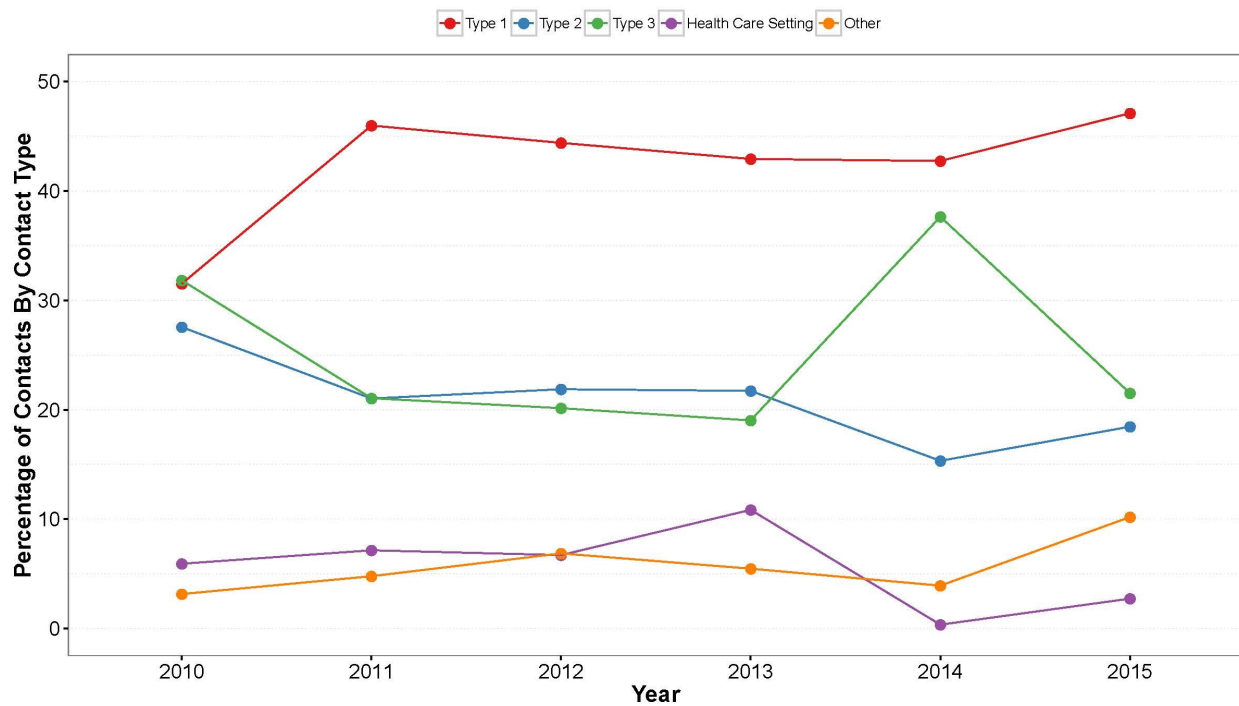
Contacts by Type

48. Percentage of Contacts by Contact Type, 2010 to 2015

Contact Type	2010	2011	2012	2013	2014	2015
Type 1	31.5	46.0	44.4	42.9	42.7	47.1
Type 2	27.6	21.0	21.9	21.7	15.3	18.5
Type 3	31.8	21.1	20.1	19.0	37.6	21.5
Health Care Setting	5.9	7.2	6.7	10.9	0.4	2.7
Other*	3.2	4.8	6.9	5.5	3.9	10.2

*Other includes: Non-Household; School/University/College; Factory/Office; Other Care Facility; Casual

49. Percentage of Contacts by Contact Type, 2010 to 2015



*The results presented here are heavily affected by provincial and regional contact management practices.

Contributors

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- Designated public health nurses in the Health Service Delivery Areas for data collection as part of follow-up to persons testing positive for TB.
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- TB Services staff for time spent entering provincial data. Specifically, we would like to thank Gloria Mui and Aileen Chu for their help with case reporting.
- Surveillance and Epidemiology Division, Centre for Communicable Diseases and Infection Control, Public Health Agency of Canada (PHAC) for providing the national TB rates.

Technical Appendix

- All TB surveillance data comes from the Integrated Public Health Information System (iPHIS). This system was implemented in 2003. No data was extracted from Panorama for the creation of this report. Minor differences in the aggregate counts may be seen if comparing annual report data to that found in Panorama due to iPHIS->Panorama data conversion.
- All geographic breakdowns reflect place of residence at time of diagnosis or time of treatment. Subsequent movement is not reflected in this report.
- Active TB case data, LTBI data and contact data was extracted from iPHIS on November 10th, 2016.
- Active TB is rare in BC. Rates or percentages over time for some indicators may reflect minor differences in small numbers, and not meaningful changes in the underlying disease process.
- Active TB case totals may differ from those reported by PHAC. PHAC excludes cases diagnosed in temporary BC residents (visitors, students, and people granted work permits), while the BCCDC includes these cases in provincial totals.
- Disease rates are not provided for foreign born individuals by PHAC region groupings because we lack accurate denominator data for country groups in BC. See Appendix A of PHAC's Canadian Tuberculosis Reporting System (Version 1.9) for complete list of countries by region: <http://www.phac-aspc.gc.ca/tbpc-latb/pdf/guidelinesform-eng.pdf>.
- The contact information presented here includes only contacts of source cases identified in BC; the data presented does not include contacts identified as part of federal airplane screening, or contacts of sources cases not located in BC. As a result, the data presented does not reflect the full workload of contact tracing teams.
- In iPHIS, contact information was documented in two places: a summary of the total number of contacts is assigned to each active cases, with individual contact information entered elsewhere in the system. However, not all contacts had their individual level information entered in the system. All contact averages were based on the summary measure, while details about specific contact characteristics (e.g. contact type, origin, etc.) were based on the individual level data.

Case Definition

A. Active TB

Detection and confirmation of *Mycobacterium tuberculosis* complex or clinical presentation compatible with tuberculosis.

Laboratory confirmed case

- Cases with *Mycobacterium tuberculosis* complex isolated by culture from a clinical specimen, specifically *M. tuberculosis*, *M. africanum*, *M. canetti*, *M. caprae*, *M. microti*, *M. pinnipedii* or *M. bovis* (excluding *M. bovis* BCG strain).

Clinically confirmed case

- In the absence of culture proof, cases clinically compatible with active tuberculosis. For example:
- chest x-ray changes compatible with active tuberculosis;
- Clinical symptoms and/or signs of nonrespiratory tuberculosis (meningeal, bone, kidney, peripheral lymph nodes etc.);
- Histopathologic or post-mortem evidence of active tuberculosis
- Favorable response to therapeutic trial of antituberculosis drugs.

New active case

Incident case of active TB with no documented evidence or adequate history of previously active tuberculosis.

Reactivation case

The development of active disease after a period of latent tuberculosis infection.

Retreatment case

A re-treatment case of tuberculosis has current active disease and historic documentation of previous active disease. Note that: (1) the client does not currently need to be on treatment, (2) the client did not have to receive previous treatment, and (3) previous treatment did not have to occur in BC.

Drug Resistance

Active cases are classified as resistant to rifampin, isoniazid, or both. Resistance to other TB medication is not reported here.

B. Site of Disease

The main diagnostic site is determined by the following hierarchy: primary, pulmonary, other respiratory and extrapulmonary TB [miliary/disseminated, meninges/central nervous system (CNS), peripheral lymph node and other sites].

Respiratory TB

Primary

This includes primary respiratory tuberculosis and tuberculous pleurisy in primary progressive tuberculosis due to infection within the last 24 months (ICD-9 codes 010.0, 010.1, 010.8, 010.9; ICD-10 codes 015.7, 016.7).

Case Definition

Pulmonary

Includes tuberculosis of the lungs and conducting airways, which includes tuberculous fibrosis of the lung, tuberculous bronchiectasis, tuberculous pneumonia, tuberculous pneumothorax, isolated tracheal or bronchial tuberculosis and tuberculous laryngitis (ICD-9 codes 011-011.9, 012.2, 012.3; ICD-10 codes A15.0-A15.3, A15.5, A15.9, A16.0-A16.4, A16.9).

Other respiratory

Includes tuberculous pleurisy (nonprimary) and TB of intrathoracic lymph nodes (hilar, mediastinal, tracheobronchial), nasopharynx, nose (sputum) and sinus (any nasal) (ICD-9 codes 012.0, 012.1, 012.8; ICD-10 codes 015.4, 015.6, 015.8, 016.3, 016.5, 016.8).

Miliary/disseminated

Includes blood-borne disseminated or generalized tuberculosis whether of a single specified site, multiple sites or unspecified site (ICD-9 codes 018.0- 018.9; ICD-10 codes 019.0- 019.9).

Non-Respiratory TB

Any extrapulmonary site may be involved, but the most common site is peripheral lymph nodes (as defined below).

Meninges/Central Nervous System (CNS)

Includes tuberculosis of meninges (cerebral or spinal), tuberculoma of meninges, tuberculoma or abscess or tuberculosis of brain, CNS unspecified (ICD-9 codes 013.0-013.9, ICD-10 codes 017.0-017.9).

Peripheral Lymph Node

Includes tuberculosis of peripheral lymph nodes but excludes intrathoracic, mesenteric and retroperitoneal lymph nodes (ICD-9 code 017.2; ICD-10 code 018.2).

Other non-respiratory

Includes tuberculosis of all other sites: intestine, peritoneum, mesenteric glands; bones and joints (including vertebral column), genitourinary system; other organs such as skin, eye, ear, thyroid, adrenal gland, spleen, heart, other (ICD-9 all other ICD-9 codes; ICD-10 all other ICD-10 codes).

C. Latent Tuberculosis Infection (LTBI)

The clinical definition for LTBI is based on a complex mix of demographic characteristics and the presence of co-morbidities¹⁰. The clinical definition of LTBI is impractical for surveillance purposes because it cannot be based solely on current surveillance data. As a surrogate, we use a combination of TST and IGRA testing results to provide an estimate of LTBI for the TB annual report. Specifically, LTBI is defined as: 1) Positive TST>9mm with no confirmatory IGRA follow-up, 2) TST>9mm with confirmatory IGRA if subsequent testing was completed, 3) IGRA positive with no documented TST.

Data Sources

Integrated Public Health Information System (iPHIS)

All data presented in this report is extracted from iPHIS. This is the only database used in the creation of this report. This system was implemented in BC in 2003.

Population Data

Population data for 1993-2015 is based on the BC Stats Population Estimates Database:
<http://www.bcstats.gov.bc.ca/StatisticsBySubject/Demography/PopulationEstimates.aspx>.

Additional Notes

Classification of Health Region

Cases are assigned to health regions (i.e., Health Authority or Health Service Delivery Area (HSDA)) by residence. If residence is unknown, the case is assigned to the health region where the individual was diagnosed or screened.