



BC Centre for Disease Control  
PROVINCIAL HEALTH SERVICES AUTHORITY



# TB

Annual Report  
2017

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# Summary of Trends

## Tuberculosis (TB)

All TB surveillance data comes from Panorama Public Health Solution for Disease Surveillance and Management, unless otherwise noted. TB Services commenced using Panorama on March 12, 2016, with data conversion from the previous Integrated Public Health Information System (iPHIS). Minor differences in the aggregate counts may be seen if comparing annual report data to that found in iPHIS due to data conversion from iPHIS to Panorama. Numbers in this report are subject to change due to data clean up and possible late reporting as this new system is being adopted.

### Active TB

- In 2017, the rate of active TB in BC was 6.1/100,000 population (295 cases), up from 5.1/100,000 population (245 cases) in 2016.
- Men had a higher active TB rate (6.6/100,000 population) than women (5.6/100,000 population).
- TB rates in men and women were generally greater in older age groups.
- In 2017, 84.1% of cases were among individuals born outside of Canada. Among these individuals, the active TB rate was 17.5/100,000 population.
- In 2017, 86.4% of active TB cases had known HIV status (either reported as a HIV/AIDS case or had a negative HIV test result in BC), a decrease from 88.6% in 2016. Of those with known HIV status, 1.2% (n=3) had HIV infection, down from 2.8% (n=6) in 2016.
- Drug resistant active TB is a concern world-wide, and while rates of isoniazid-resistant TB were generally increasing in BC since 2008, they began to decrease in 2016. In 2017, 5.4% of all cases had isoniazid resistance, down from 7.8% in 2016. Two cases of multi-drug resistant TB (i.e. resistance to both isoniazid and rifampin) were seen in 2017 (0.7%), down from 3 (1.2%) in 2016.

# Active TB

## Active TB Historical Trends

TB incidence in BC increased to 6.1/100,000 population in 2017, up from 5.1/100,000 population in 2016 which was the lowest value on record (Table 2; Figure 3). This is the highest rate of active TB since 2014. However, overall, the rate of active TB in BC has been generally decreasing for more than a decade. In Canada, active TB incidence has remained generally stable over the past decade. Similar to BC, the Canadian rate also increased slightly in 2017. Compared to the Canadian rate, active TB incidence in BC has remained consistently higher.

## Active TB by Health Authority of Residence

In 2017, disease incidence was highest in Vancouver Coastal Health Authority (VCHA; 10.0/100,000 population), followed by Fraser Health Authority (FHA; 7.9/100,000 population), Vancouver Island Health Authority (VIHA; 2.1/100,000 population), Northern Health Authority (NHA; 1.8/100,000 population), and Interior Health Authority (IHA; 1.7/100,000 population). Incidence in NHA decreased in 2017 compared to 2016, while FHA, IHA, VCHA, and VIHA all showed increases in TB incidence (Table 5; Figure 6). The higher TB incidence in FHA and VCHA may be influenced by the larger numbers of people from high-incidence countries settling in these regions.

## Active TB by Age and Gender

TB incidence has historically been higher in men than in women. The rate in men in 2017 was 6.6/100,000 population compared to 5.6/100,000 population in women (Table 9; Figure 10). Compared to 2016, these rates increased among men and women in 2017. Active disease (or a positive Tuberculin Skin Test) in those <5 years of age indicates recent transmission because of the low probability of historic exposure and reactivation. There were five cases of active TB diagnosed in those <5 years of age in 2017 (Table 11).

## Active TB by Country of Birth

In BC in 2017, 84.1% of provincial cases occurred in those born outside of Canada, a slight increase from 83.7% in 2016 (Table 16; Figure 17). This corresponds to a rate of 17.5/100,000 population in 2017, up from 14.7/100,000 population in 2016 (Table 18; Figure 19). A little over half (51.2%) of the cases born outside of Canada in 2017 were 60 years of age or older, 22.2% were 40-59 years of age, and 22.2% were 20-39 years of age (Table 27; Figure 28). See Technical Appendix for more information on how the rates were calculated.

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 World Health Organization. Active TB among individuals born outside of Canada appears to result largely from reactivation of latent TB infection, and local transmission is generally low.<sup>1</sup> 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.

## HIV Screening and Co-infection

In 2017, 86.4% of active TB cases had known HIV status (either reported as a HIV/AIDS case or had a negative HIV test result in BC), a decrease from 88.6% in 2016. HIV co-infection has been generally decreasing over the past decade, reaching the lowest value on record in 2017 (Table 30, Figure 31). Of those with known HIV status, 1.2% (n=3) had HIV infection, down from 2.8% (n=6) in 2016.

Active TB cases co-infected with HIV were identified from the HIV/AIDS Information System (HAISYS) that consists of all HIV and AIDS cases reported in BC. This includes cases identified by confirmatory laboratory testing in BC, as well as those cases reported by other means such as insurance companies and Immigration, Refugees and Citizenship Canada (IRCC). However, active TB cases living with HIV that were not reported as a HIV/AIDS case in the province would not be represented in this data.

HIV screening data consist of those active TB cases identified as being co-infected with HIV and those with a negative HIV test result. These test results were obtained from the Sunquest Laboratory Information System which is the laboratory system of the BCCDC Public Health Laboratory (PHL). BCCDC PHL performs >95% of all HIV screening tests in BC and all confirmatory tests for HIV. For that reason, the percentage of known HIV status among TB cases is believed to be an underestimate due to incomplete ascertainment of screening tests outside of the BCCDC PHL. See Technical Appendix and Case Definitions for more information about HIV screening and co-infection.

## Site of Disease

The site of active TB describes the clinical location of TB disease. Respiratory infection is generally more transmissible than non-respiratory infection. Of the TB seen in BC in 2017, 79.7% were respiratory cases, which is within historic trends (Table 33; Figure 34).

## Treatment of Active Cases

Treatment outcomes are reported for cases diagnosed in 2016 owing to the long duration of active TB treatment, and exclude post-mortem diagnoses (n=2). Of those diagnosed in 2016 (n=243), 241 (99.2%) were documented to have started treatment (Table 35). There were two (0.8%) cases with no treatment documented in 2016 and both died before treatment was initiated.

Among diagnosed cases, 77.8% completed active TB treatment satisfactorily, with the majority (63.4%) completing within 12 months and 14.4% taking longer than 12 months to complete (Table 36; Figure 37).

Among cases with incomplete treatment (n=35), the majority (65.7%) died during treatment, 2.9% had a drug reaction/intolerance, 2.9% were lost to follow-up, 5.7% were non-adherent, and 22.9% had unknown reason (Table 39; Figure 40). Of those who died during treatment, the majority (22.9%, n=8) died for reasons unrelated to their TB disease, 20.0% (n=7) were documented with TB contributing to, but not being the underlying cause of death, 14.3% (n=5) had underlying cause of death related to their TB disease, and 8.6% (n=3) had unknown cause of death.

## Drug Resistance

Drug resistant TB is an important public health issue globally that can lead to lengthier, more complex, and more expensive treatment regimens.<sup>2</sup> For this reason, provincial surveillance is critical. In 2017, isoniazid (INH) resistance was 5.4% (n=16), reaching the lowest value on record in the past decade. Only 0.7% (n=2) of cases in 2017 had multi-drug resistance (i.e. resistance to both isoniazid and rifampin), a decrease from the 1.2% (n=3) seen in 2016 (Table 42; Figure 44).

Drug resistance data from 2008 to 2015 were data converted from iPHIS into a format that was not readily accessible for reporting out of Panorama. Case counts and proportions for this period were therefore obtained from historical iPHIS data<sup>3</sup> to enable assessment of trends. Historic case counts and proportions should be interpreted with caution as case counts have changed slightly over time.

# Active TB Historical Trends

## 1. Active TB Disease Cases in BC, 2008 to 2017

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
BC	312	314	250	276	299	270	292	272	245	295

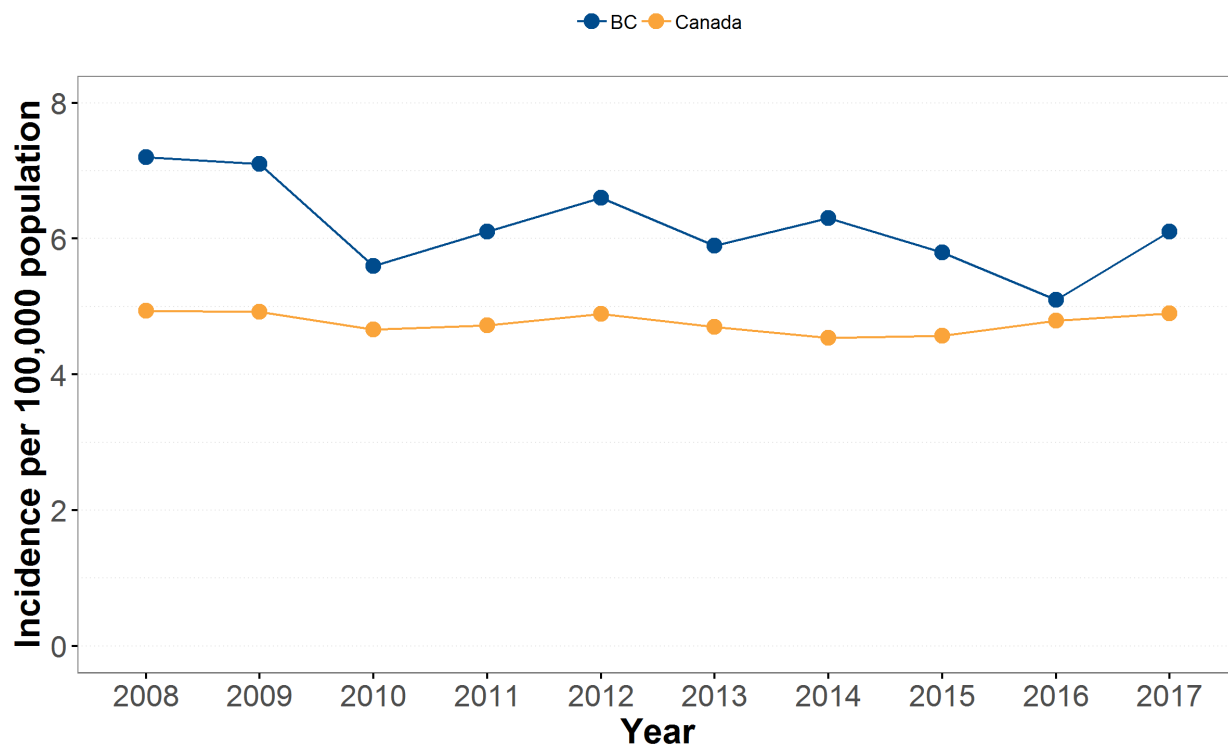
## 2. Active TB Disease Rates\* in BC and Canada, 2008 to 2017

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
BC	7.2	7.1	5.6	6.1	6.6	5.9	6.3	5.8	5.1	6.1
Canada**	4.9	4.9	4.7	4.7	4.9	4.7	4.5	4.6	4.8	4.9

\*All rates are per 100,000 population

\*\*Canadian rates from the Public Health Agency of Canada<sup>4</sup>

## 3. Active TB Disease Rates in BC and Canada, 2008 to 2017





## Active TB by Health Authority of Residence

### 4. Active TB Disease Cases by Health Authority in BC, 2008 to 2017

Health Authority*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fraser (FHA)	116	125	110	130	122	136	135	117	123	142
Interior (IHA)	27	25	23	13	32	23	14	9	11	13
Northern (NHA)	20	19	14	17	14	10	9	14	10	5
Vancouver Coastal (VCHA)	119	117	88	101	106	90	122	116	92	118
Vancouver Island (VIHA)	29	28	15	14	25	11	12	16	9	17

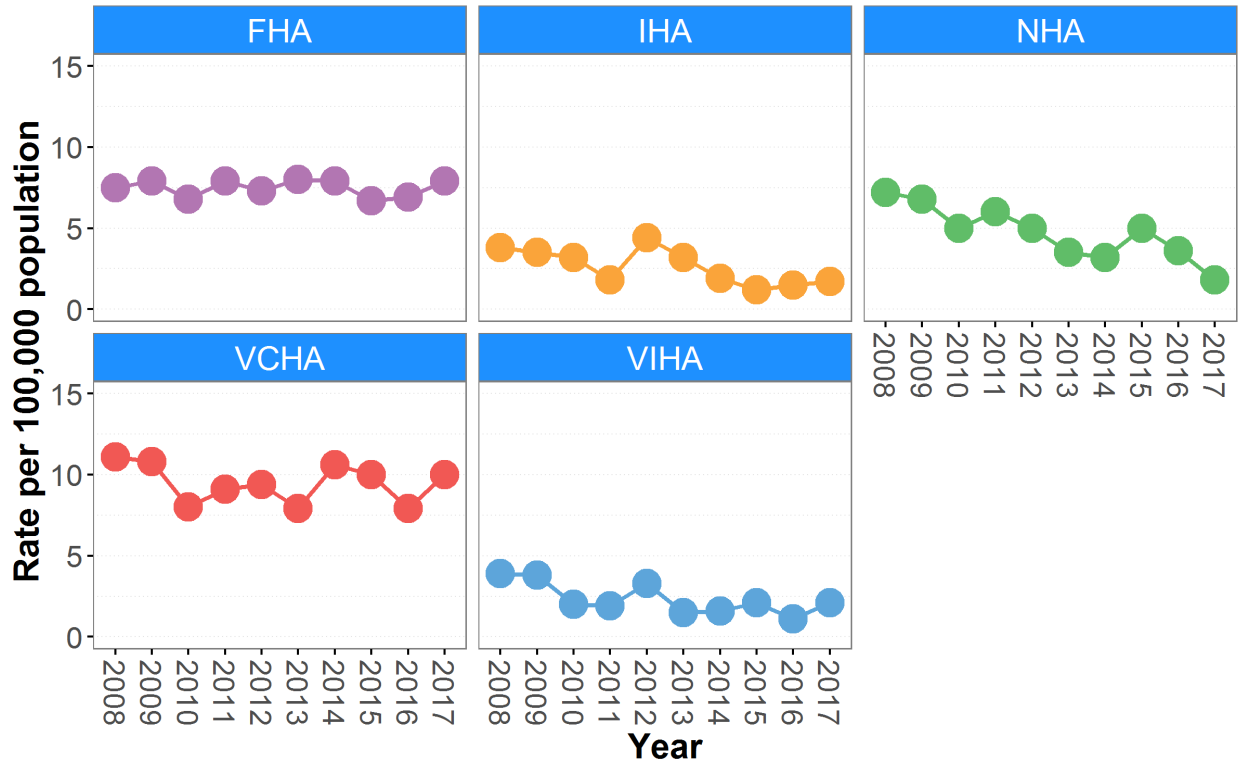
\*Residence classified at time of case

### 5. Active TB Rates by Health Authority in BC, 2008 to 2017

Health Authority*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fraser (FHA)	7.5	7.9	6.8	7.9	7.3	8.0	7.9	6.7	6.9	7.9
Interior (IHA)	3.8	3.5	3.2	1.8	4.4	3.2	1.9	1.2	1.5	1.7
Northern (NHA)	7.2	6.8	5.0	6.0	5.0	3.5	3.2	5.0	3.6	1.8
Vancouver Coastal (VCHA)	11.1	10.8	8.0	9.1	9.4	7.9	10.6	10.0	7.9	10.0
Vancouver Island (VIHA)	3.9	3.8	2.0	1.9	3.3	1.5	1.6	2.1	1.1	2.1

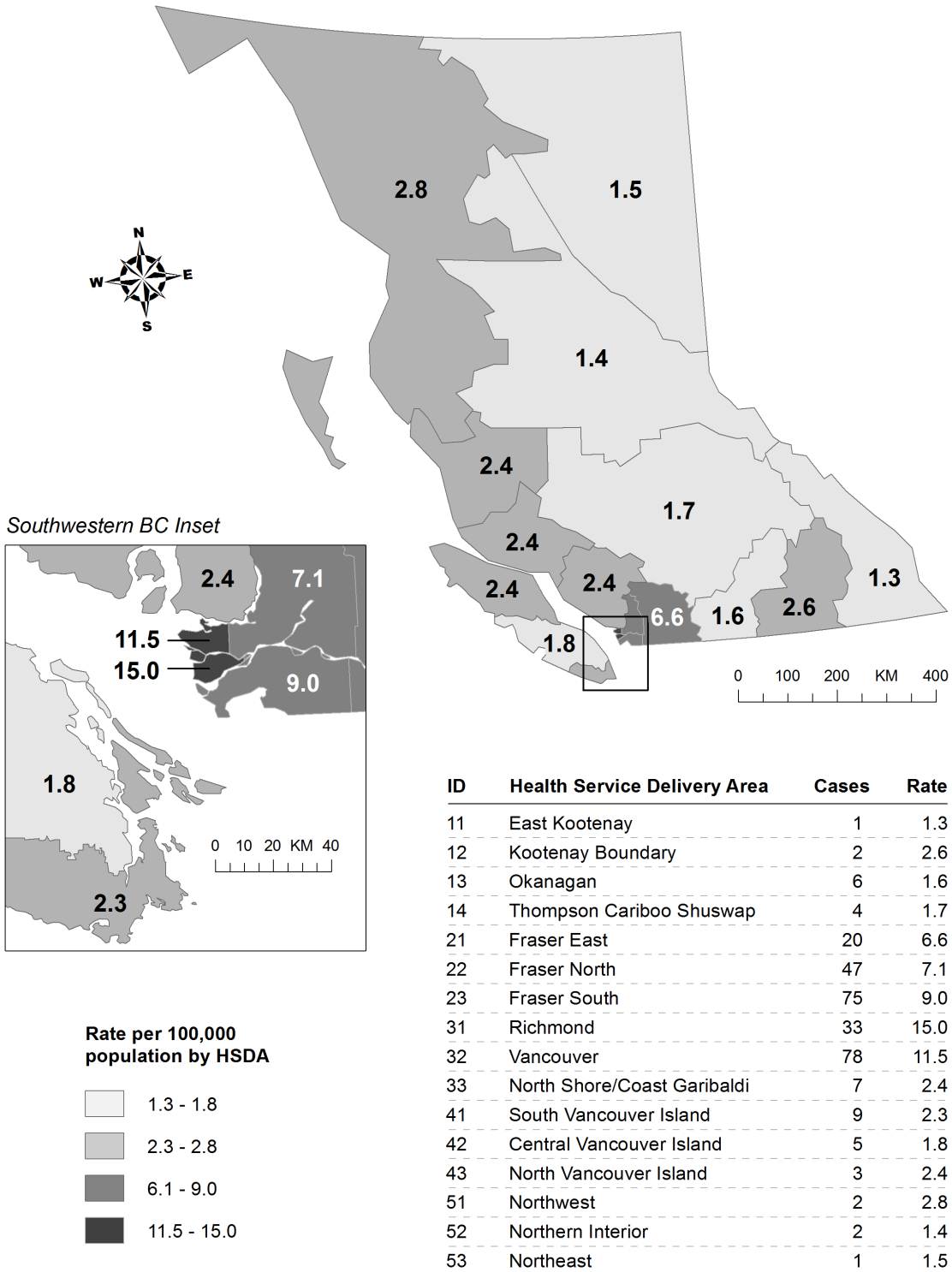
\*Residence classified at time of case

6. Active TB Disease Rates by Health Authority in BC, 2008 to 2017



# Active TB by Health Service Delivery Area

7. Active TB Disease Rates by Health Service Delivery Area\*+ in BC, 2017



\*Health Service Delivery Area determined at time of case

+Population denominators come from 2017 Population Estimates from BC Statistics

## Active TB by Age and Gender

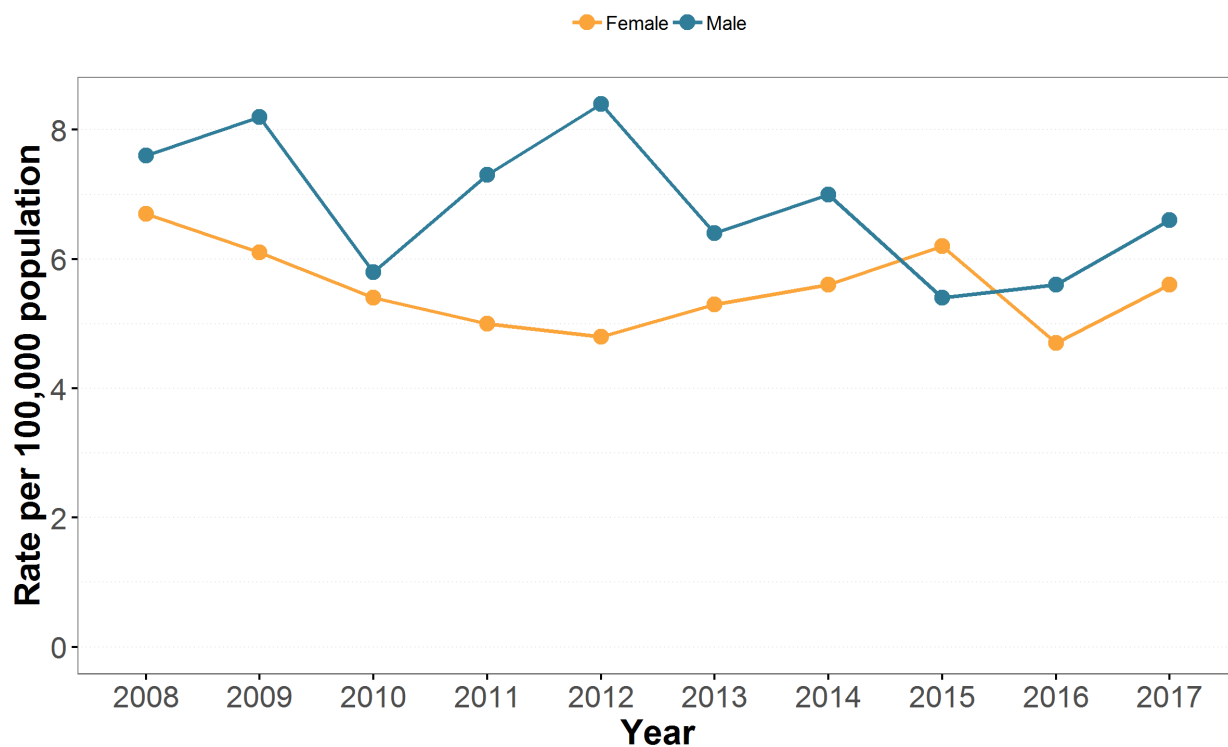
### 8. Active TB Disease Cases by Gender in BC, 2008 to 2017

Gender	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Female	147	135	121	113	109	123	131	147	113	137
Male	165	179	129	163	190	147	161	125	132	158

### 9. Active TB Disease Rates by Gender in BC, 2008 to 2017

Gender	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Female	6.7	6.1	5.4	5.0	4.8	5.3	5.6	6.2	4.7	5.6
Male	7.6	8.2	5.8	7.3	8.4	6.4	7.0	5.4	5.6	6.6

### 10. Active TB Disease Rates by Gender in BC, 2008 to 2017



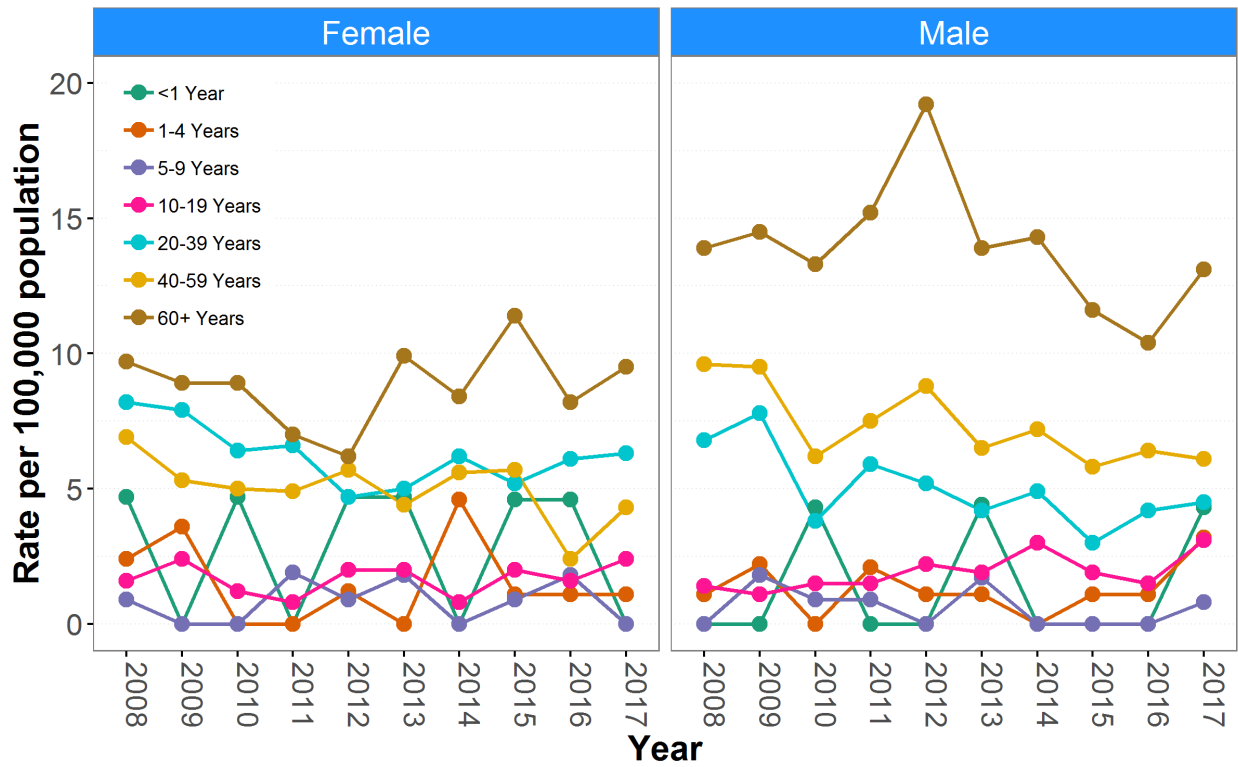
### 11. Active TB Disease Cases by Gender and Age Group in BC, 2008 to 2017

Gender	Age	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Female	<1 Year	1	0	1	0	1	1	0	1	1	0
	1-4 Years	2	3	0	0	1	0	4	1	1	1
	5-9 Years	1	0	0	2	1	2	0	1	2	0
	10-19 Years	4	6	3	2	5	5	2	5	4	6
	20-39 Years	48	47	39	40	29	31	39	33	39	41
	40-59 Years	46	36	34	33	39	30	38	39	16	29
	60+ Years	45	43	44	36	33	54	48	67	50	60
Male	<1 Year	0	0	1	0	0	1	0	0	0	1
	1-4 Years	1	2	0	2	1	1	0	1	1	3
	5-9 Years	0	2	1	1	0	2	0	0	0	1
	10-19 Years	4	3	4	4	6	5	8	5	4	8
	20-39 Years	40	47	23	36	32	26	31	19	27	30
	40-59 Years	63	63	41	50	59	43	48	38	42	40
	60+ Years	57	62	59	70	92	69	74	62	58	75

## 12. Active TB Disease Rates by Gender and Age Group in BC, 2008 to 2017

Gender	Age	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Female	<1 Year	4.7	0.0	4.7	0.0	4.7	4.7	0.0	4.6	4.6	0.0
	1-4 Years	2.4	3.6	0.0	0.0	1.2	0.0	4.6	1.1	1.1	1.1
	5-9 Years	0.9	0.0	0.0	1.9	0.9	1.8	0.0	0.9	1.8	0.0
	10-19 Years	1.6	2.4	1.2	0.8	2.0	2.0	0.8	2.0	1.6	2.4
	20-39 Years	8.2	7.9	6.4	6.6	4.7	5.0	6.2	5.2	6.1	6.3
	40-59 Years	6.9	5.3	5.0	4.9	5.7	4.4	5.6	5.7	2.4	4.3
	60+ Years	9.7	8.9	8.9	7.0	6.2	9.9	8.4	11.4	8.2	9.5
Male	<1 Year	0.0	0.0	4.3	0.0	0.0	4.4	0.0	0.0	0.0	4.3
	1-4 Years	1.1	2.2	0.0	2.1	1.1	1.1	0.0	1.1	1.1	3.2
	5-9 Years	0.0	1.8	0.9	0.9	0.0	1.7	0.0	0.0	0.0	0.8
	10-19 Years	1.4	1.1	1.5	1.5	2.2	1.9	3.0	1.9	1.5	3.1
	20-39 Years	6.8	7.8	3.8	5.9	5.2	4.2	4.9	3.0	4.2	4.5
	40-59 Years	9.6	9.5	6.2	7.5	8.8	6.5	7.2	5.8	6.4	6.1
	60+ Years	13.9	14.5	13.3	15.2	19.2	13.9	14.3	11.6	10.4	13.1

13. Active TB Disease Rates by Gender and Age Group in BC, 2008 to 2017



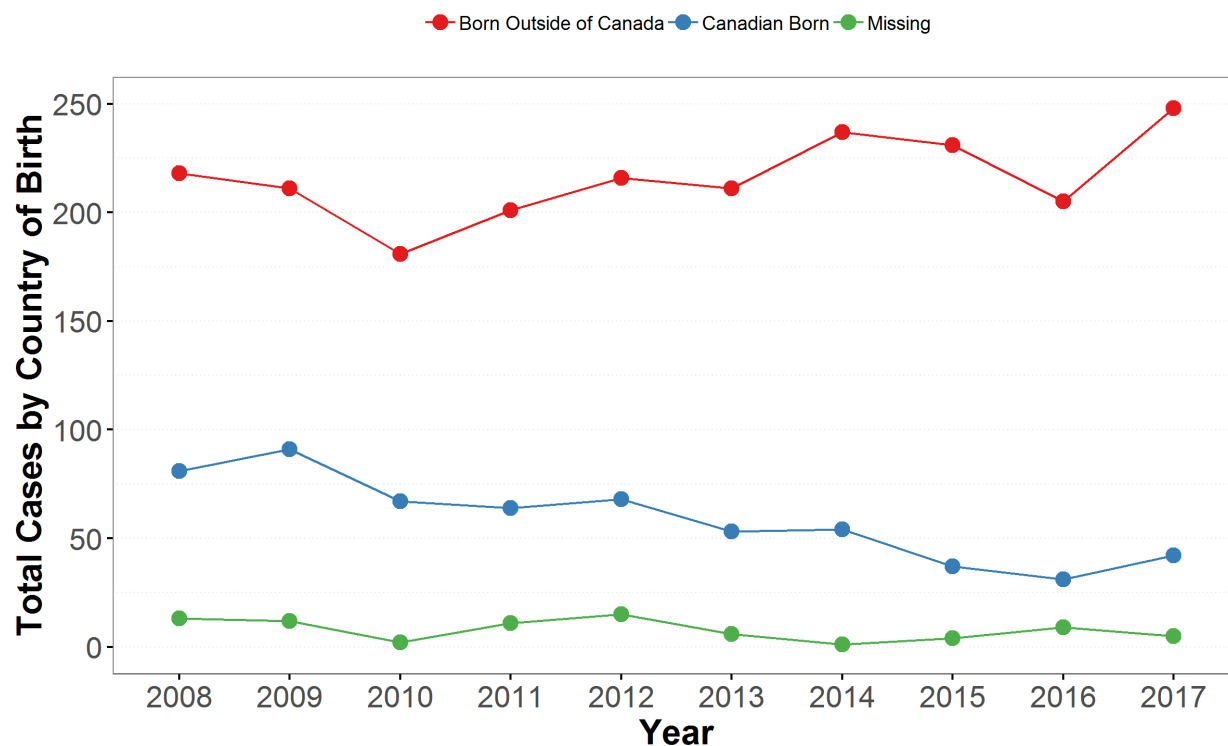
## Active TB by Country of Birth

14. Active TB Disease Cases by Country of Birth in BC, 2008 to 2017

Country of Birth	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Born Outside of Canada	218	211	181	201	216	211	237	231	205	248
Canadian Born	81	91	67	64	68	53	54	37	31	42
Missing*	13	12	2	11	15	6	1	4	9	5

\*Unknown or undocumented country of birth

15. Active TB Disease Cases by Country of Birth in BC, 2008 to 2017



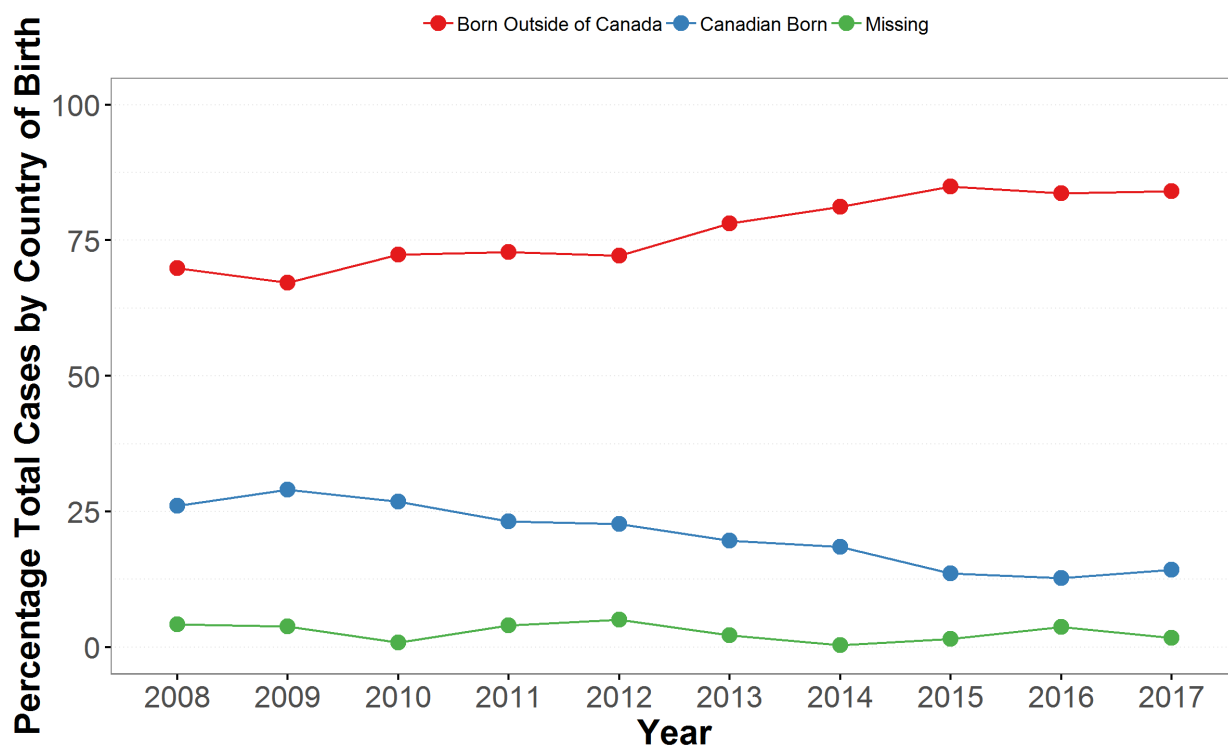


16. Percentage of Total Active TB Cases by Country of Birth in BC, 2008 to 2017

Country of Birth	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Born Outside of Canada	69.9	67.2	72.4	72.8	72.2	78.1	81.2	84.9	83.7	84.1
Canadian Born	26.0	29.0	26.8	23.2	22.7	19.6	18.5	13.6	12.7	14.2
Missing*	4.2	3.8	0.8	4.0	5.0	2.2	0.3	1.5	3.7	1.7

\*Unknown or undocumented country of birth

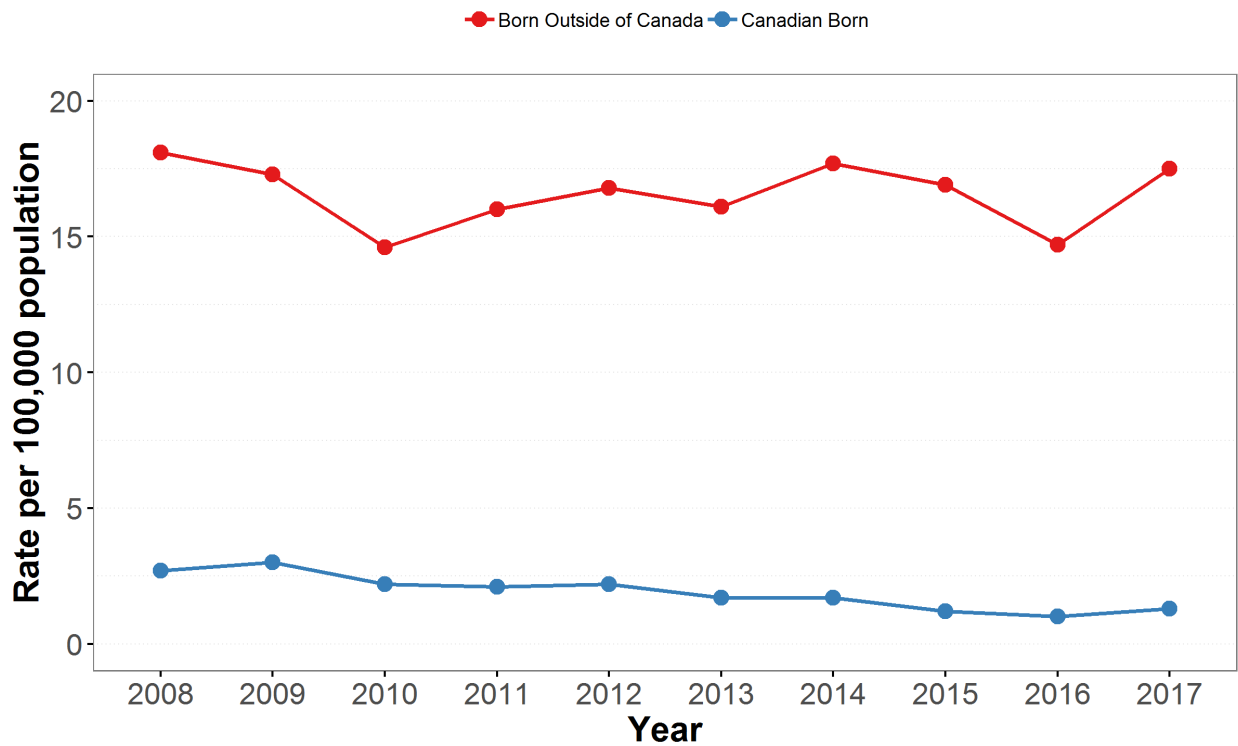
17. Percentage of Total Active TB Cases by Country of Birth in BC, 2008 to 2017



18. Active TB Disease Rates by Country of Birth in BC, 2008 to 2017

Country of Birth	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Born Outside of Canada	18.1	17.3	14.6	16.0	16.8	16.1	17.7	16.9	14.7	17.5
Canadian Born	2.7	3.0	2.2	2.1	2.2	1.7	1.7	1.2	1.0	1.3

19. Active TB Disease Rates by Country of Birth in BC, 2008 to 2017



## Active TB by Country of Birth and Health Authority

20. Active TB Disease Cases by Country of Birth and Health Authority in BC, 2008 to 2017

Health Authority*	Country of Birth	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fraser (FHA)	Born Outside of Canada	96	102	91	106	103	115	118	107	112	125
	Canadian Born	17	21	18	19	14	18	17	8	7	17
Interior (IHA)	Born Outside of Canada	10	9	8	6	6	14	7	8	8	12
	Canadian Born	14	13	15	7	23	7	7	1	2	1
Northern (NHA)	Born Outside of Canada	4	3	0	1	4	2	4	4	2	0
	Canadian Born	15	16	13	15	10	8	4	9	7	5
Vancouver Coastal (VCHA)	Born Outside of Canada	97	82	76	82	93	75	100	102	77	103
	Canadian Born	18	29	12	15	6	14	22	13	12	12
Vancouver Island (VIHA)	Born Outside of Canada	11	15	6	6	10	5	8	10	6	8
	Canadian Born	16	12	9	7	15	6	4	6	3	7

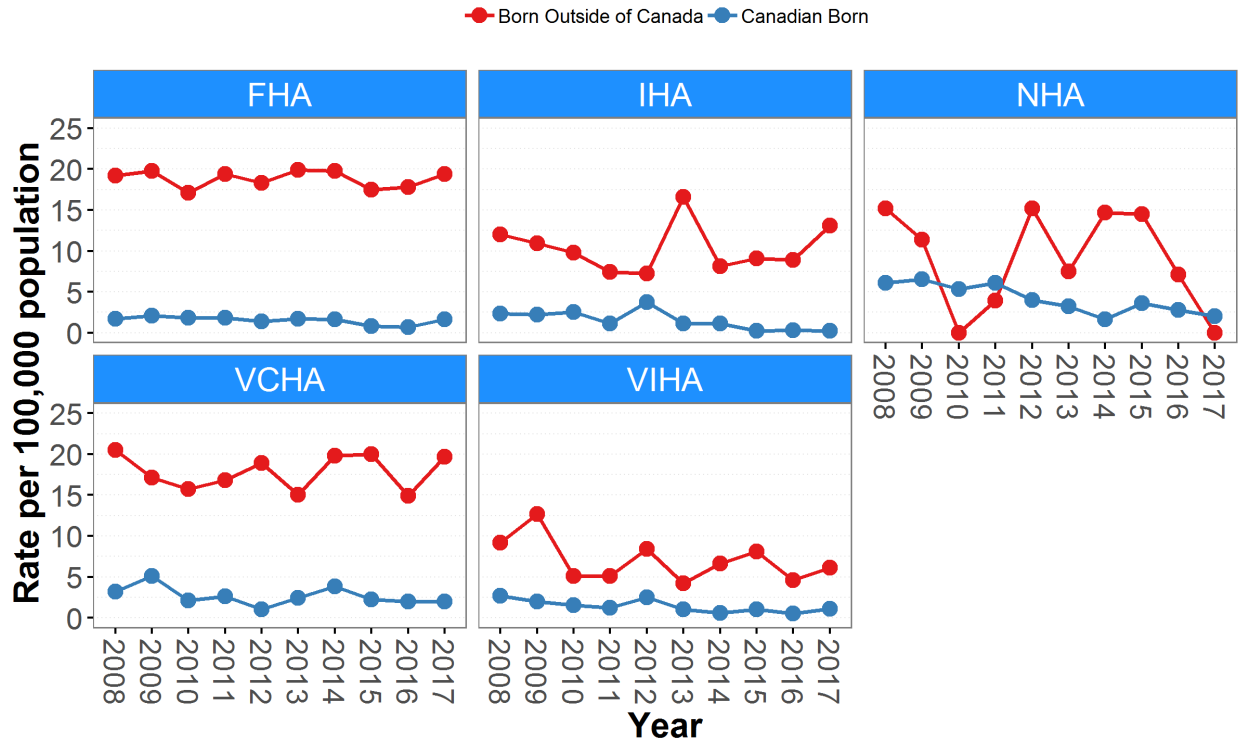
\*Residence classified at time of case

## 21. Active TB Disease Rates by Country of Birth and Health Authority in BC, 2008 to 2017

Health Authority*	Country of Birth	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fraser (FHA)	Born Outside of Canada	19.2	19.8	17.1	19.4	18.3	19.9	19.8	17.5	17.8	19.4
	Canadian Born	1.7	2.1	1.8	1.8	1.4	1.7	1.6	0.8	0.7	1.6
Interior (IHA)	Born Outside of Canada	12.0	10.9	9.8	7.4	7.2	16.6	8.1	9.1	8.9	13.1
	Canadian Born	2.3	2.2	2.5	1.1	3.7	1.1	1.1	0.2	0.3	0.2
Northern (NHA)	Born Outside of Canada	15.2	11.4	0.0	3.9	15.2	7.5	14.7	14.5	7.1	0.0
	Canadian Born	6.1	6.5	5.3	6.1	4.0	3.2	1.6	3.6	2.8	2.0
Vancouver Coastal (VCHA)	Born Outside of Canada	20.5	17.1	15.7	16.8	18.9	15.0	19.8	20.0	14.9	19.7
	Canadian Born	3.2	5.1	2.1	2.6	1.0	2.4	3.8	2.2	2.0	2.0
Vancouver Island (VIHA)	Born Outside of Canada	9.2	12.7	5.1	5.1	8.4	4.2	6.6	8.1	4.6	6.1
	Canadian Born	2.7	2.0	1.5	1.2	2.5	1.0	0.6	1.0	0.5	1.1

\*Residence classified at time of case

22. Active TB Disease Rates by Country of Birth and Health Authority in BC, 2008 to 2017



## Active TB Among Canadian Born Populations by Age Group

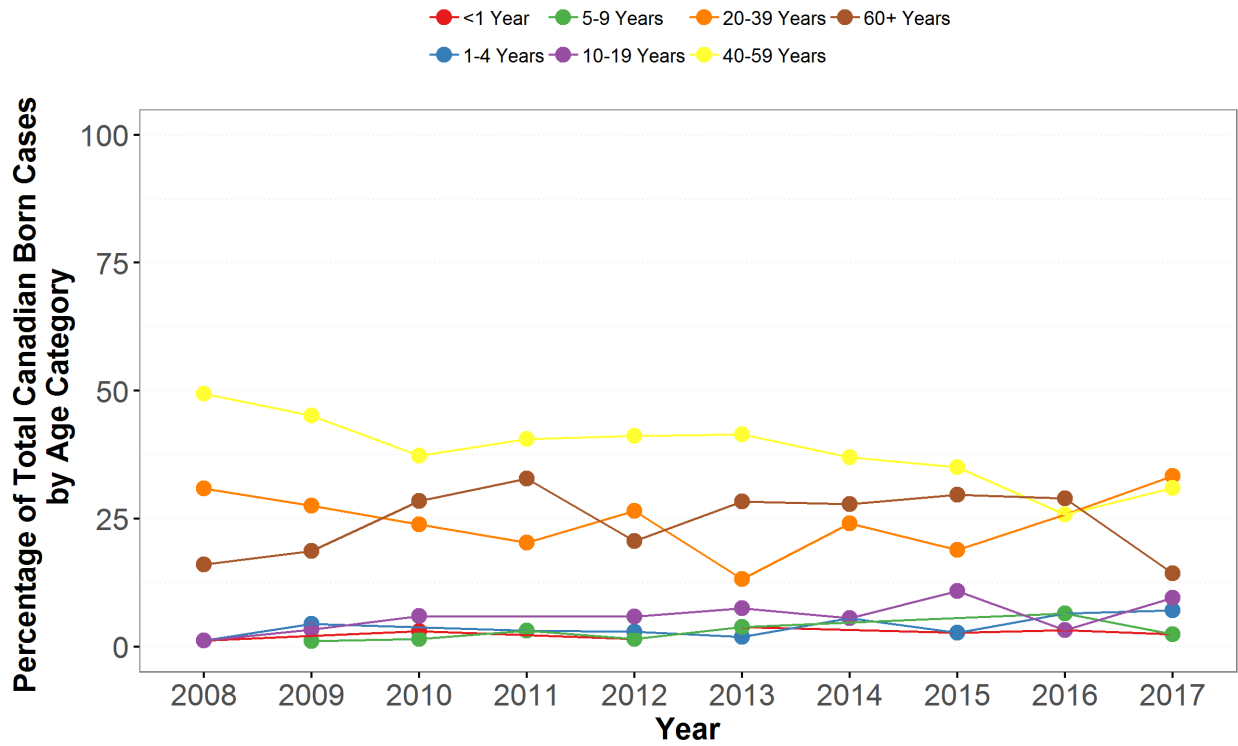
23. Active TB Disease Cases in Canadian Born by Age Group, 2008 to 2017

Age Group	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<1 Year	1	0	2	0	1	2	0	1	1	1
1-4 Years	1	4	0	2	2	1	3	1	2	3
5-9 Years	0	1	1	2	1	2	0	0	2	1
10-19 Years	1	3	4	0	4	4	3	4	1	4
20-39 Years	25	25	16	13	18	7	13	7	8	14
40-59 Years	40	41	25	26	28	22	20	13	8	13
60+ Years	13	17	19	21	14	15	15	11	9	6

24. Percentage of Active TB Disease in Canadian Born by Age Group, 2008 to 2017

Age Group	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<1 Year	1.2	0.0	3.0	0.0	1.5	3.8	0.0	2.7	3.2	2.4
1-4 Years	1.2	4.4	0.0	3.1	2.9	1.9	5.6	2.7	6.5	7.1
5-9 Years	0.0	1.1	1.5	3.1	1.5	3.8	0.0	0.0	6.5	2.4
10-19 Years	1.2	3.3	6.0	0.0	5.9	7.5	5.6	10.8	3.2	9.5
20-39 Years	30.9	27.5	23.9	20.3	26.5	13.2	24.1	18.9	25.8	33.3
40-59 Years	49.4	45.1	37.3	40.6	41.2	41.5	37.0	35.1	25.8	31.0
60+ Years	16.0	18.7	28.4	32.8	20.6	28.3	27.8	29.7	29.0	14.3

25. Percentage of Active TB Disease in Canadian Born by Age Group, 2008 to 2017



## Active TB Among Populations Born Outside of Canada by Age Group

26. Active TB Disease Cases Born Outside of Canada by Age Group, 2008 to 2017

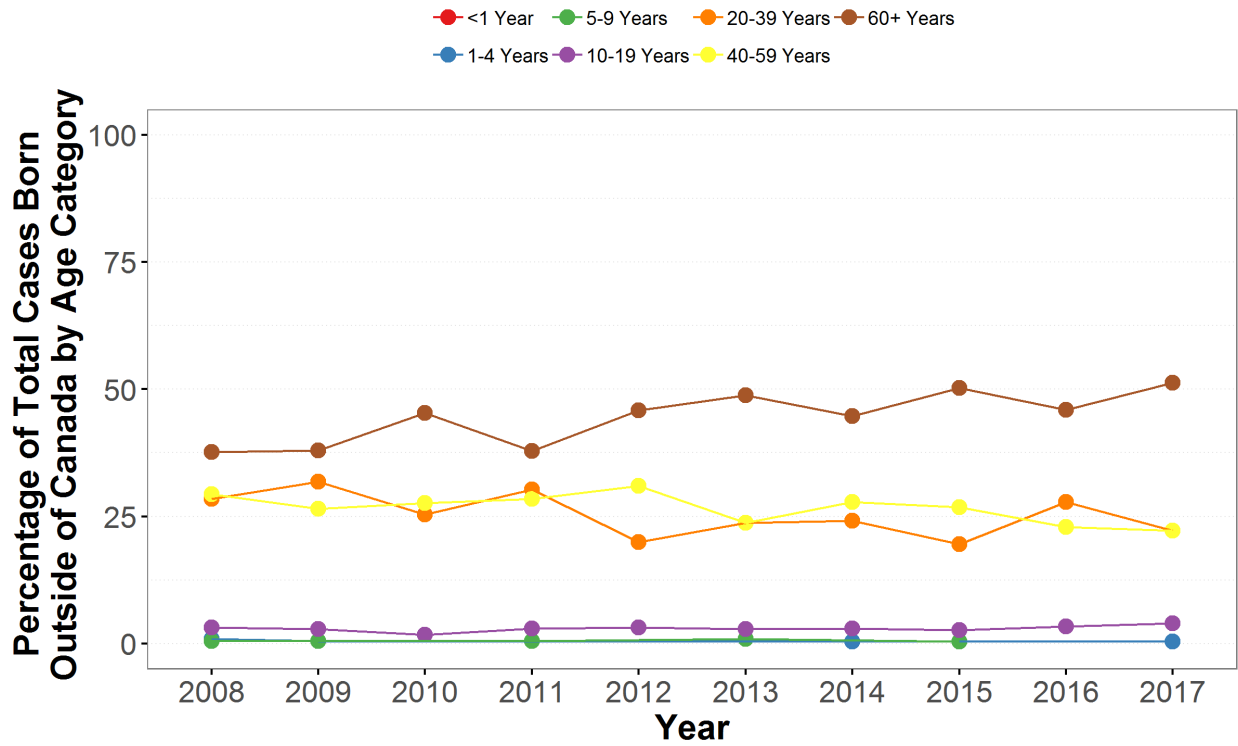
Age Group	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1-4 Years	2	1	0	0	0	0	1	1	0	1
5-9 Years	1	1	0	1	0	2	0	1	0	0
10-19 Years	7	6	3	6	7	6	7	6	7	10
20-39 Years	62	67	46	61	43	50	57	45	57	55
40-59 Years	64	56	50	57	67	50	66	62	47	55
60+ Years	82	80	82	76	99	103	106	116	94	127

27. Percentage of Active TB Disease in Cases Born Outside of Canada by Age Group, 2008 to 2017

Age Group	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1-4 Years	0.9	0.5	0.0	0.0	0.0	0.0	0.4	0.4	0.0	0.4
5-9 Years	0.5	0.5	0.0	0.5	0.0	0.9	0.0	0.4	0.0	0.0
10-19 Years	3.2	2.8	1.7	3.0	3.2	2.8	3.0	2.6	3.4	4.0
20-39 Years	28.4	31.8	25.4	30.3	19.9	23.7	24.1	19.5	27.8	22.2
40-59 Years	29.4	26.5	27.6	28.4	31.0	23.7	27.8	26.8	22.9	22.2
60+ Years	37.6	37.9	45.3	37.8	45.8	48.8	44.7	50.2	45.9	51.2



28. Percentage of Active TB Disease in Cases Born Outside of Canada by Age Group, 2008 to 2017



## Active TB by HIV Status

### 29. Active TB Cases by Known HIV Status, 2008 to 2017

HIV Status	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
HIV Positive	13	5	3	8	7	8	6	11	6	3
Known HIV Status*	187	202	173	196	220	209	242	224	217	255

\*Known status is based on being reported as a HIV/AIDS case or known to have a negative test result in BC

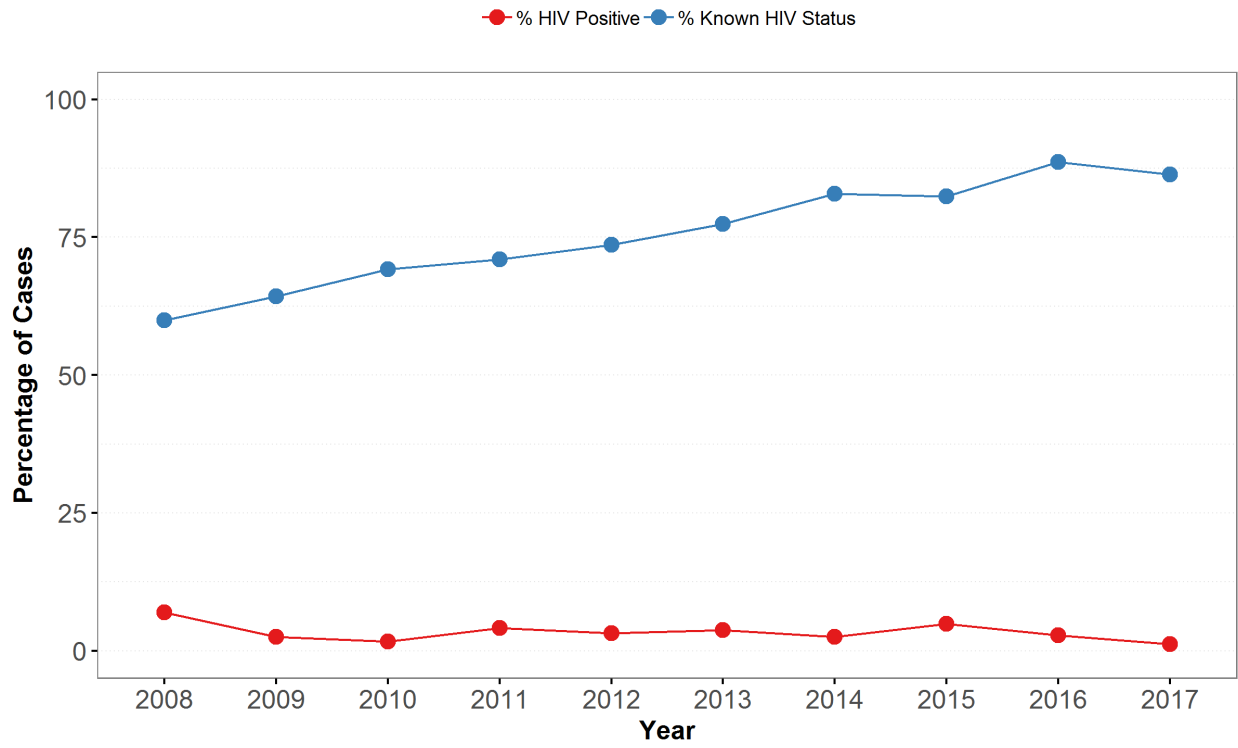
### 30. Percentage of Active TB Cases by Known HIV Status, 2008 to 2017

HIV Status	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
% HIV Positive*	7.0	2.5	1.7	4.1	3.2	3.8	2.5	4.9	2.8	1.2
% Known HIV Status**	59.9	64.3	69.2	71.0	73.6	77.4	82.9	82.4	88.6	86.4

\*% HIV positive of those with known HIV status

\*\*Known status is based on being reported as a HIV/AIDS case or known to have a negative test result in BC

### 31. Percentage of Active TB Cases by Known HIV Status, 2008 to 2017



## Active TB by Site of Disease

32. Active TB Disease Case Totals by Site of Disease, 2008 to 2017

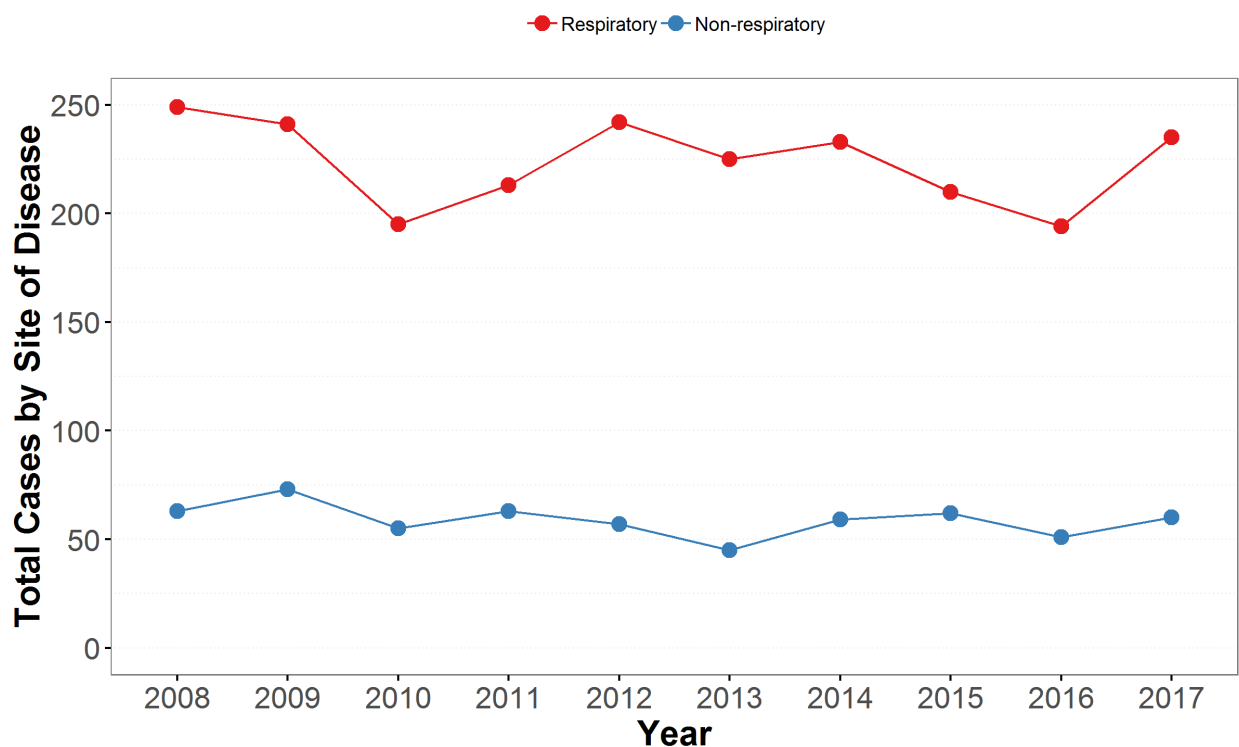
Site of Disease	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Respiratory*	249	241	195	213	242	225	233	210	194	235
Non-respiratory	63	73	55	63	57	45	59	62	51	60

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

33. Percentage of Active TB Cases by Site of Disease, 2008 to 2017

Site of Disease	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Respiratory	79.8	76.8	78.0	77.2	80.9	83.3	79.8	77.2	79.2	79.7
Non-respiratory	20.2	23.2	22.0	22.8	19.1	16.7	20.2	22.8	20.8	20.3

34. Active TB Disease Case Total by Site of Disease, 2008 to 2017



## Treatment Completion of Active Cases

### 35. Active TB Disease by Treatment Completion, 2008 to 2016

Treatment Summary*	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Treatment Completed</b>	<b>247</b>	<b>265</b>	<b>204</b>	<b>222</b>	<b>243</b>	<b>231</b>	<b>243</b>	<b>219</b>	<b>189</b>
- Within 12 Months	198	203	172	180	207	202	205	173	154
- Greater Than 12 Months	49	62	32	42	36	29	38	46	35
<b>Incomplete Treatment</b>	<b>34</b>	<b>35</b>	<b>36</b>	<b>30</b>	<b>38</b>	<b>20</b>	<b>30</b>	<b>35</b>	<b>35</b>
<b>Left Province During Treatment</b>	<b>15</b>	<b>5</b>	<b>8</b>	<b>12</b>	<b>6</b>	<b>4</b>	<b>11</b>	<b>9</b>	<b>17</b>
<b>No Treatment Documented</b>	<b>6</b>	<b>3</b>	<b>0</b>	<b>9</b>	<b>6</b>	<b>4</b>	<b>0</b>	<b>8</b>	<b>2</b>

\*Excluding those diagnosed post-mortem

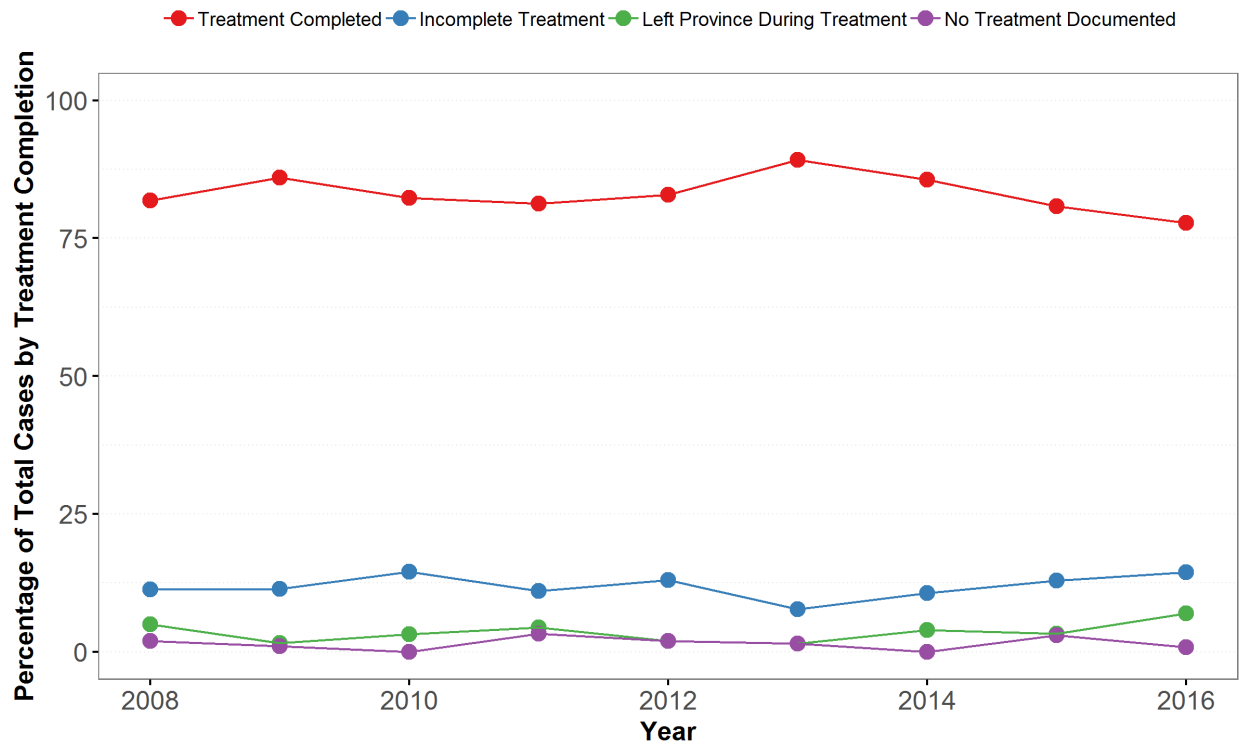
### 36. Percentage of Active TB Disease by Treatment Completion, 2008 to 2016

Treatment Summary*	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Treatment Completed</b>	<b>81.8</b>	<b>86.0</b>	<b>82.3</b>	<b>81.3</b>	<b>82.9</b>	<b>89.2</b>	<b>85.6</b>	<b>80.8</b>	<b>77.8</b>
- Within 12 Months	65.6	65.9	69.4	65.9	70.6	78.0	72.2	63.8	63.4
- Greater Than 12 Months	16.2	20.1	12.9	15.4	12.3	11.2	13.4	17.0	14.4
<b>Incomplete Treatment</b>	<b>11.3</b>	<b>11.4</b>	<b>14.5</b>	<b>11.0</b>	<b>13.0</b>	<b>7.7</b>	<b>10.6</b>	<b>12.9</b>	<b>14.4</b>
<b>Left Province During Treatment</b>	<b>5.0</b>	<b>1.6</b>	<b>3.2</b>	<b>4.4</b>	<b>2.0</b>	<b>1.5</b>	<b>3.9</b>	<b>3.3</b>	<b>7.0</b>
<b>No Treatment Documented</b>	<b>2.0</b>	<b>1.0</b>	<b>0.0</b>	<b>3.3</b>	<b>2.0</b>	<b>1.5</b>	<b>0.0</b>	<b>3.0</b>	<b>0.8</b>

\*Excluding those diagnosed post-mortem

# Treatment Completion of Active Cases

## 37. Active TB Disease Treatment, 2008 to 2016



## Incomplete Treatment of Active Cases

### 38. Documented Reason for Incomplete Treatment, 2008 to 2016

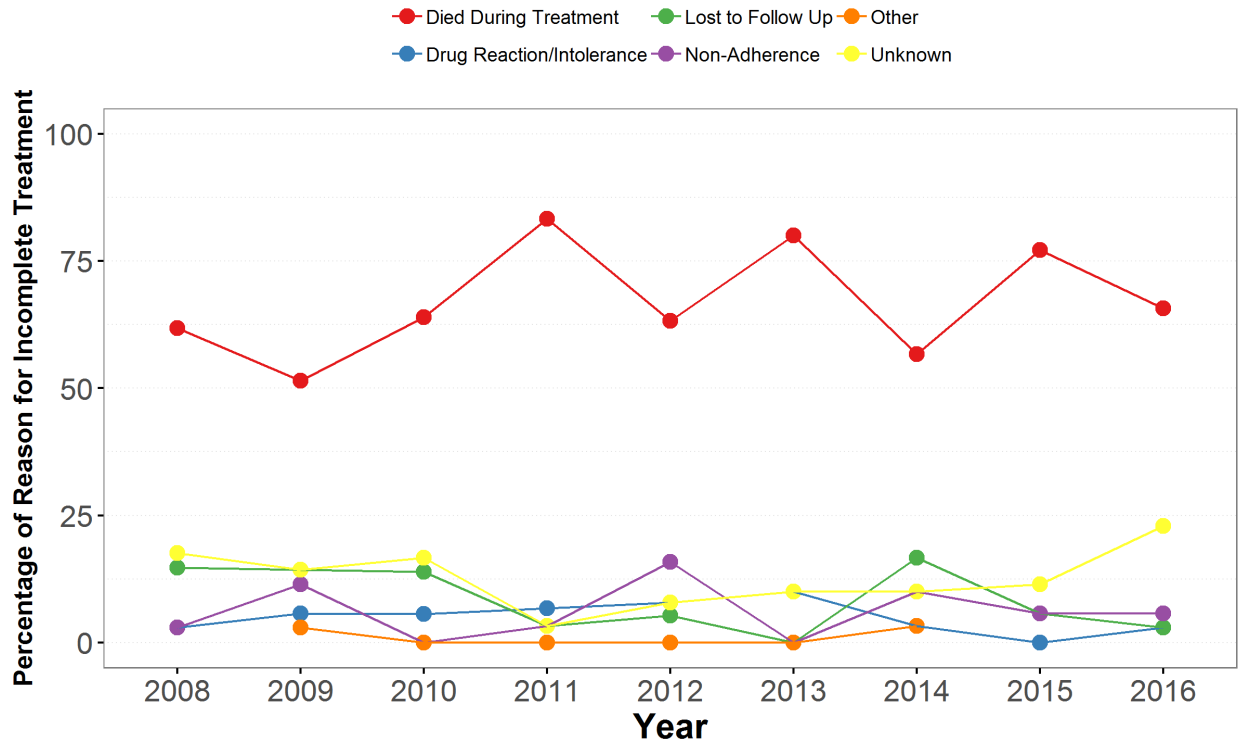
Reason	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Died During Treatment</b>	<b>21</b>	<b>18</b>	<b>23</b>	<b>25</b>	<b>24</b>	<b>16</b>	<b>17</b>	<b>27</b>	<b>23</b>
- TB Underlying Cause	3	1	9	6	4	1	3	3	5
- TB Contributed, Not Underlying Cause	7	13	6	10	7	7	9	18	7
- TB Unrelated to Death	11	4	8	9	13	7	3	4	8
- Unknown	0	0	0	0	0	1	2	2	3
<b>Drug Reaction/Intolerance</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>Lost to Follow Up</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>5</b>	<b>2</b>	<b>1</b>
<b>Non-Adherence</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>Other</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>
<b>Unknown</b>	<b>6</b>	<b>5</b>	<b>6</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>8</b>

### 39. Percentage of Documented Reason for Incomplete Treatment, 2008 to 2016

Reason	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Died During Treatment</b>	<b>61.8</b>	<b>51.4</b>	<b>63.9</b>	<b>83.3</b>	<b>63.2</b>	<b>80.0</b>	<b>56.7</b>	<b>77.1</b>	<b>65.7</b>
- TB Underlying Cause	8.8	2.9	25.0	20.0	10.5	5.0	10.0	8.6	14.3
- TB Contributed, Not Underlying Cause	20.6	37.1	16.7	33.3	18.4	35.0	30.0	51.4	20.0
- TB Unrelated to Death	32.4	11.4	22.2	30.0	34.2	35.0	10.0	11.4	22.9
- Unknown	0.0	0.0	0.0	0.0	0.0	5.0	6.7	5.7	8.6
<b>Drug Reaction/Intolerance</b>	<b>2.9</b>	<b>5.7</b>	<b>5.6</b>	<b>6.7</b>	<b>7.9</b>	<b>10.0</b>	<b>3.3</b>	<b>0.0</b>	<b>2.9</b>
<b>Lost to Follow Up</b>	<b>14.7</b>	<b>14.3</b>	<b>13.9</b>	<b>3.3</b>	<b>5.3</b>	<b>0.0</b>	<b>16.7</b>	<b>5.7</b>	<b>2.9</b>
<b>Non-Adherence</b>	<b>2.9</b>	<b>11.4</b>	<b>0.0</b>	<b>3.3</b>	<b>15.8</b>	<b>0.0</b>	<b>10.0</b>	<b>5.7</b>	<b>5.7</b>
<b>Other</b>	<b>0.0</b>	<b>2.9</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>3.3</b>	<b>0.0</b>	<b>0.0</b>
<b>Unknown</b>	<b>17.6</b>	<b>14.3</b>	<b>16.7</b>	<b>3.3</b>	<b>7.9</b>	<b>10.0</b>	<b>10.0</b>	<b>11.4</b>	<b>22.9</b>

# Incomplete Treatment of Active Cases

## 40. Documented Reason for Incomplete Treatment, 2008 to 2016





## Drug Resistant TB

### 41. Number of Cases with Drug Resistant TB, 2008 to 2017\*

Resistance	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No Resistance	287	292	232	252	279	254	259	233	223	277
Isoniazid Only	21	21	18	23	18	19	25	27	19	16
Rifampin Only	2	2	0	1	0	0	2	0	0	0
Multi-Drug**	3	0	1	1	2	0	7	1	3	2

\*Data from 2008-2015 are from iPHIS. Historical case counts have changed slightly over time.

\*\*Multi-drug resistance is defined as resistance to both isoniazid and rifampin

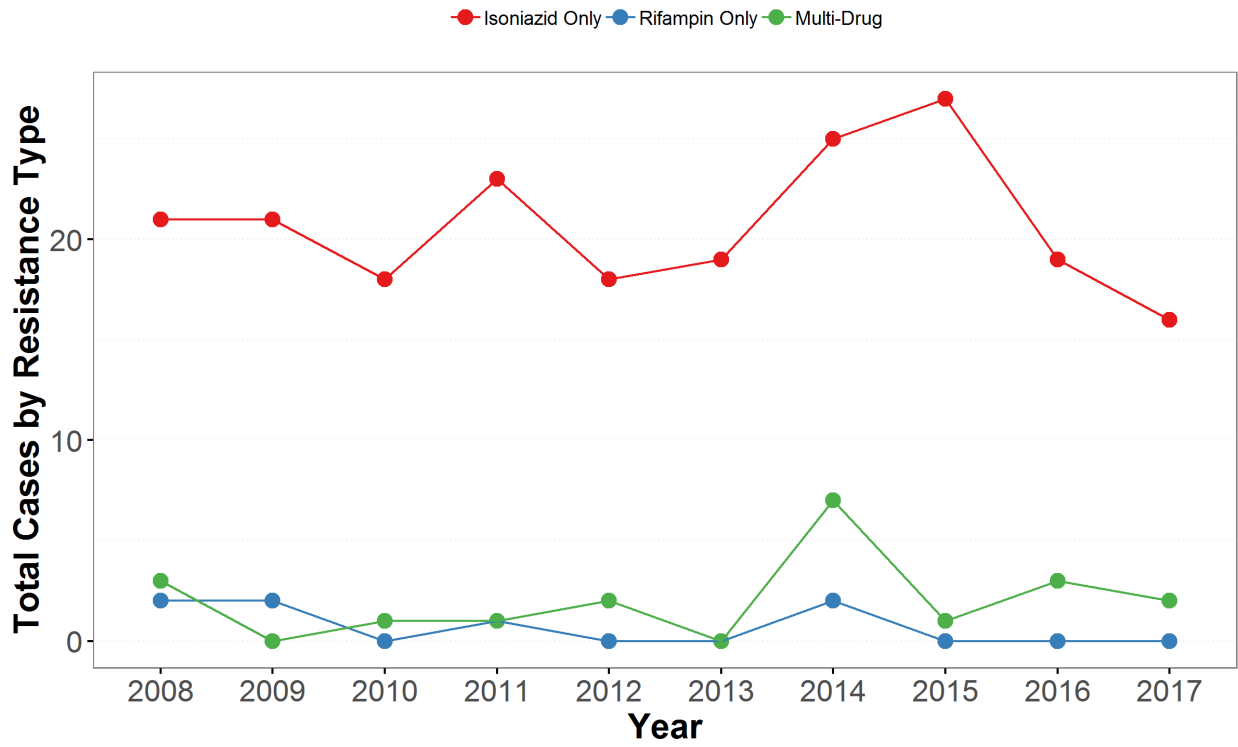
### 42. Percentage of Cases with Drug Resistant TB, 2008 to 2017\*

Resistance	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No Resistance	91.7	92.7	92.4	91.0	93.3	93.0	88.4	89.3	91.0	93.9
Isoniazid Only	6.7	6.7	7.2	8.3	6.0	7.0	8.5	10.3	7.8	5.4
Rifampin Only	0.6	0.6	0.0	0.4	0.0	0.0	0.7	0.0	0.0	0.0
Multi-Drug**	1.0	0.0	0.4	0.4	0.7	0.0	2.4	0.4	1.2	0.7

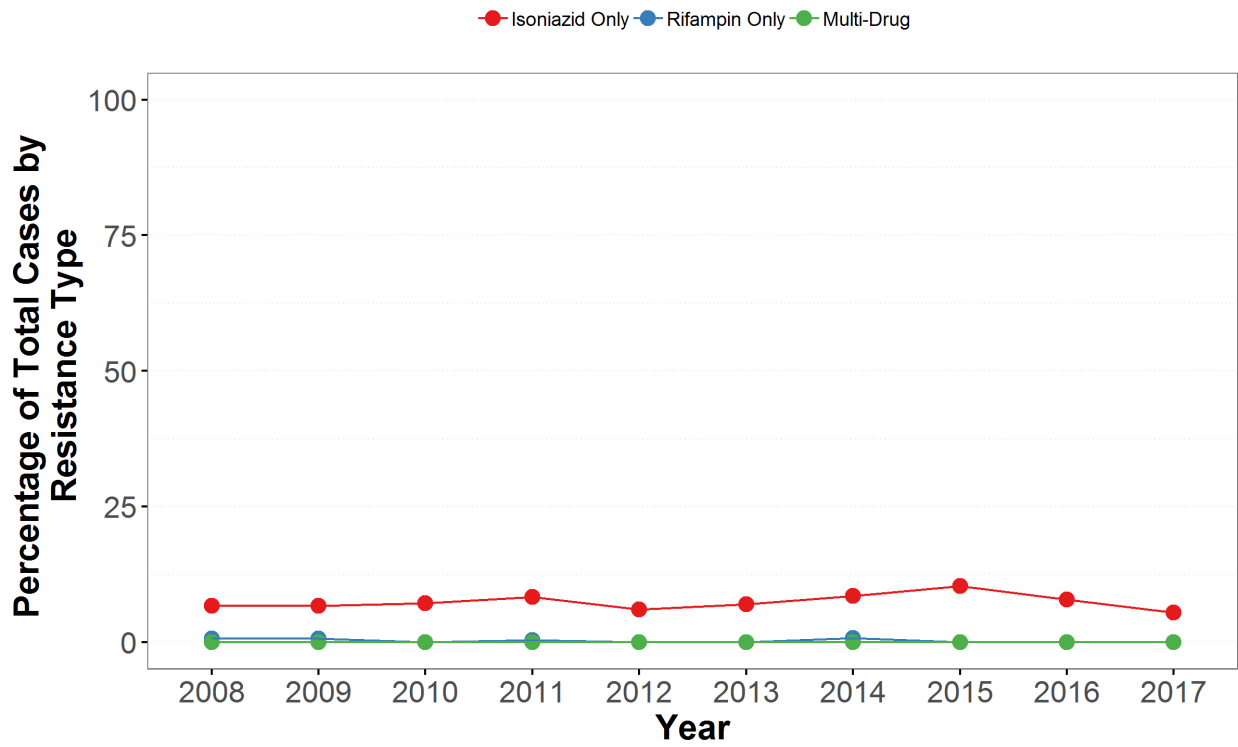
\*Data from 2008-2015 are from iPHIS. Historical case counts have changed slightly over time.

\*\*Multi-drug resistance is defined as resistance to both isoniazid and rifampin

43. Number of Cases with Drug Resistant TB, 2008 to 2017



44. Percentage of Cases with Drug Resistant TB, 2008 to 2017



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# Contributors

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- Staff from the BC Centre for Disease Control Public Health Laboratory for the collecting and compiling of TB and HIV requisition data.
- Designated public health nurses in the Health Service Delivery Areas for data collection as part of follow-up to persons testing positive for TB.
- Physicians, health care providers, and public health staff in BC for taking the time and effort to complete and submit case report forms.
- TB Services staff for time spent entering provincial data. Specifically, we would like to thank Amalia Chang, Gloria Mui, and Sukhman Thind, for their help with case reporting, as well as Sandra Peroff for her help with data remediation.
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- Sunny Mak from the BC Centre for Disease Control for creating the map of active TB rates.
- 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 Panorama Public Health Solution for Disease Surveillance and Management, unless otherwise noted. TB Services commenced using Panorama on March 12, 2016, with data conversion from the previous Integrated Public Health Information System (iPHIS). Minor differences in the aggregate counts may be seen if comparing annual report data to that found in iPHIS due to data conversion from iPHIS to Panorama. Numbers in this report are subject to change due to data clean up and possible late reporting as this new system is being adopted.
- All geographic breakdowns reflect place of residence at time of diagnosis or time of treatment (including temporary residence). Subsequent movement is not reflected in this report.
- Active TB case data and laboratory data were extracted from Panorama on February 21, 2019 and February 25, 2019, respectively. HIV screening and co-infection data was extracted March 11, 2019 from the Sunquest Laboratory Information System and the HIV/AIDS Information System (HAISYS), respectively.
- 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. Among temporary residents (visitors, students, and people granted work permits) and undocumented foreign nationals who are in Canada, PHAC only includes cases that started treatment in BC in provincial totals, while the BCCDC includes all cases who have received treatment in BC in provincial totals, regardless of where their treatment initially began.
- The HIV/AIDS Information System (HAISYS) includes all HIV and AIDS cases that are reported in BC. The system includes cases that were reported based on confirmatory laboratory testing in BC, and also includes those cases reported without laboratory results. This may consist of specific AIDS cases, as well as any cases reported through insurance companies and Immigration, Refugees and Citizenship Canada (IRCC). However, HAISYS reflects only a proportion of the population in BC living with HIV. Active TB cases living with HIV, but not reported as a HIV/AIDS case in BC, would not be represented in this data.
- HIV screening data consist of those active TB cases identified as being co-infected with HIV and those with a negative HIV test result. The BCCDC Public Health Laboratory's (PHL) Sunquest Laboratory Information System contains >95% of HIV screening tests done in BC. Individuals that were not tested for HIV in BC, or that have their testing data outside of the BCCDC PHL (e.g. Island Health Laboratories), will not be represented in this data. Similarly, TB cases that have completed anonymous HIV testing, particularly those with a negative test result, would not be represented in this report.

# Case Definitions

## A. Active TB

Detection and confirmation of *Mycobacterium tuberculosis* complex or clinical presentation compatible with tuberculosis excluding tuberculosis re-treatment within 6 months.

### 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.

Re-treatment exclusion: A re-treatment case of tuberculosis has current active disease and historic documentation of previous active disease. Where re-treatment commences within 6 months after end of previous active disease's treatment, the re-treatment is not counted as another active case (consistent with Public Health Agency of Canada's approach for within 6 months re-treatment).

## HIV Screening and Co-infection

### HIV co-infection

- Active TB cases reported as a HIV/AIDS case on or before the TB diagnosis date, or within a 90 day period after the TB diagnosis date.

### Known HIV status

- Active TB cases reported as a HIV/AIDS case on or before the TB diagnosis date, or within a 90 day period after the TB diagnosis;
- Active TB cases with a negative HIV test result within a 90 day period before or after the TB diagnosis date.

### Drug Resistance

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

## B. Site of Disease

Starting with Panorama, tuberculosis sites of disease were rationalized into a list of body sites used and recognized by tuberculosis clinicians. The new tuberculosis sites are similar to many sites in ICD-9 tuberculosis disease coding.

This report divides tuberculosis into respiratory and non-respiratory based on site of disease. Tuberculosis is respiratory if at least one respiratory site is present. Tuberculosis is non-respiratory if no respiratory site is present but at least one non-respiratory site is present.

#### **Respiratory sites**

- primary tuberculosis
- pulmonary tuberculosis
- pneumonia tuberculosis
- miliary tuberculosis
- pleurisy tuberculosis
- isolated tracheal or bronchial tuberculosis
- laryngitis tuberculosis (excluding eosophageal tuberculosis)
- cavitation of lung tuberculosis
- intrathoracic lymph node tuberculosis
- nose or sinus tuberculosis

#### **Non-respiratory sites**

- meningeal tuberculosis
- central nervous system tuberculosis
- meningeal or central nervous system tuberculosis
- peripheral lymph node tuberculosis
- spinal column tuberculosis
- hip tuberculosis
- knee tuberculosis
- bone tuberculosis
- joint tuberculosis
- kidney tuberculosis
- genitourinary tuberculosis
- skin and subcutaneous tuberculosis
- erythema nodosum tuberculosis
- eye tuberculosis
- ear tuberculosis
- thyroid gland tuberculosis
- adrenal gland tuberculosis
- spleen tuberculosis
- other organ tuberculosis (excluding respiratory)

### **C. Treatment Completion**

For the purposes of this report, treatment completion is defined as the following:

- **Treatment Completed:** A Treatment Start Date and a Treatment End Date is documented, and Treatment Status is reported as “Completed-satisfactory”. Length of treatment is calculated based on the Treatment Start Date and Treatment End Date.



- Incomplete Treatment: A Treatment Start Date is documented and Treatment Status is a value other than “Completed-satisfactory” (i.e., “Completed-unsatisfactory”, “Incomplete”, “Other”, “Unknown”).
- Left Province During Treatment: Includes transfers within Canada and outside of Canada.
- No Treatment Documented: No Treatment Start Date is documented.

# Data Sources

## **Panorama**

Data presented in this report was extracted from Panorama. TB Services commenced using Panorama on March 12, 2016, with data conversion from the previous Integrated Public Health Information System (iPHIS). Some iPHIS-converted data could not be readily extracted for reporting in Panorama (e.g. drug resistance), and these data were obtained from iPHIS using the 2015 TB Annual Report to produce trendlines for this reporting period (this is indicated throughout the report in footnotes). Historic case counts may have changed since the data was reported in 2015 (due to data cleanup and possible late reporting); therefore, these trends should be interpreted with caution.

## **HIV/AIDS Information System**

Co-infection information was extracted from the HIV/AIDS Information System (HAISYS), which contains provincial HIV and AIDS case report data.

## **Sunquest Laboratory Information System**

HIV testing data was extracted from the Sunquest Laboratory Information System. This system contains information about HIV testing conducted by the BCCDC Public Health Lab (PHL), which is estimated to conduct >95% of all screening tests for HIV in the province.

## **Population Data**

Population data and associated rates for the general BC population, age, gender, and health authority were based on the Population Estimates released by BC Stats.

Population data and associated rates for those born outside of Canada and Canadian born individuals were estimated from the 2006, 2011, and 2016 Census Program, conducted by Statistics Canada.<sup>5</sup> Estimates for those born outside of Canada were calculated as the sum of “immigrant” and “non-permanent resident” counts, while Canadian born estimates were obtained from the “non-immigrant” counts. For population estimates for the years between the quinquennial censuses, this method assumes proportional annual changes in the population until the following census.

## **Additional Notes**

### **Classification of Health Region**

Cases are assigned to health regions (i.e., Health Authority of 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.