BC Centre for Disease Control
PROVINCIAL HEALTH SERVICES AUTHORITY

TB

Annual Report
2018

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2018

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Summary of Trends

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.

Active TB

- In 2018, the rate of active TB in BC was 6.0/100,000 population (300 cases), down from 6.2/100,000 population (307 cases) in 2017.
- As in previous years, males had a higher active TB rate (6.6/100,000 population, 162 cases) than females (5.5/100,000 population, 138 cases) in 2018.
- TB rates among males and females were generally greater in older age groups, similar to previous years.
- In 2018, 86.3% (259 cases) of active TB cases were among individuals born outside of Canada. Among these individuals, the active TB rate was 17.9/100,000 population.
- In 2018, 84.7% (254 cases) 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 86.6% (266 cases) in 2017. Of those with known HIV status, 2.4% (6 cases) had HIV infection, up from 1.5% (4 cases) in 2017.
- Drug resistant active TB is a concern world-wide, and while rates of isoniazid-resistant TB were generally increasing in BC since 2009, they began to decrease in 2015. In 2018, 6.0% (18 cases) of all cases had isoniazid resistance, up from 5.2% (16 cases) in 2017. One case of multi-drug resistant TB (i.e. resistance to both isoniazid and rifampin) was seen in 2018 (0.3%), down slightly from 2 (0.7%) in 2017.

Latent TB Treatment

- A total of 687 clients were started on latent TB infection (LTBI) treatment in 2017, a slight increase from 2016 (676 clients).
- Of the 687 clients that started LTBI treatment, 71.0% (488 clients) successfully completed treatment within 12 months and 1.5% (10 clients) took longer than 12 months to complete treatment. Of those starting treatment, 27.5% (189 clients) were documented with incomplete treatment in 2017.
- Most LTBI treatment starts were among clients born outside of Canada (71.0%, 488 clients) in 2017.

Contact Tracing

- In 2018, an average of 10.4 contacts (median= 4.0) were documented per respiratory TB case, similar to 2017 (mean=10.2, median=5.0).
- Of respiratory cases aged 5 years and older diagnosed in 2017, there were 2446 contacts identified, among whom 89.3% (2185 contacts) completed an initial assessment, 18.2% (444 contacts) had a positive screen, and 0.6% (15 contacts) were identified as secondary cases. Of the

444 contacts who had a positive screen, 25.5% (113 contacts) started and completed latent TB treatment.

- Nearly 90% of contacts of respiratory active TB cases aged 5 years and older diagnosed in 2017 completed an initial assessment for TB within 26 weeks.

Active TB

Active TB Historical Trends

TB incidence in BC slightly decreased to 6.0/100,000 population (300 cases) in 2018, down from 6.2/100,000 population (307 cases) in 2017 (Table 2; Figure 3). Overall, the rate of TB in BC has been generally decreasing for more than a decade with the lowest recorded value observed in 2016. In Canada, active TB incidence has remained generally stable over the past decade. Similar to BC, the Canadian rate also decreased slightly from 5.0 to 4.8 per 100,000 population.[1] Compared to the Canadian rate, active TB incidence in BC has remained consistently higher. While there has been some decrease in provincial and national active TB rates, this has generally been minimal. This underscores the need for ongoing public health strategies to reduce the burden of TB, and that support the provincial[2] and global[3] milestones for the reduction of morbidity and mortality related to TB.

Active TB by Health Authority of Residence

In 2018, TB incidence was highest in Fraser Heath Authority (FHA; 8.8/100,000 population, 164 cases), followed by Vancouver Coastal Health Authority (VCHA; 7.9/100,000 population, 96 cases), Northern Health Authority (NHA; 2.7/100,000 population, 8 cases), Interior Health Authority (IHA; 2.3/100,000 population, 18 cases), and Vancouver Island Health Authority (VIHA; 1.7/100,000 population, 14 cases). Incidence in VCHA and VIHA decreased in 2018 compared to 2017, while FHA, IHA, and NHA all showed increases in TB incidence (Table 4; 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 (Table 22; Figure 24), with variation in TB rates also seen within Health Service Delivery Areas (Figure 7).

Active TB by Age and Gender

TB incidence has been historically higher in males than in females. In 2018, the rate in males was 6.6/100,000 population (162 cases) compared to 5.5/100,000 population (138 cases) in females (Table 9; Figure 10). Relative to 2017, these rates slightly decreased among males and females in 2018. Active disease in those <5 years of age indicates recent transmission because of the low probability of historic exposure and reactivation. There were two cases of active TB diagnosed in those <5 years of age in 2018 (Table 11).

Active TB by Country of Birth

In BC in 2018, 86.3% (259 cases) of provincial cases occurred in those born outside of Canada, an increase from 83.7% (257 cases) in 2017 (Table 17; Figure 18). This corresponds to a rate of 17.9/100,000 population in 2018, down from 18.1/100,000 population in 2017 (Table 19; Figure 20). Of the cases born outside of Canada in 2018, 42.1% (109 cases) were 60 years of age or older, 30.9% (80 cases) were 20-39 years of age, and 23.2% (60 cases) were 40-59 years of age (Table 29; Figure 30). Of all active TB cases, 10.3% (31 cases) were Canadian born in 2018, a decrease from 14.3% (44 cases) in 2017. In 2018 the rate of active TB among Canadian born cases was 1.0/100,000 population, down from 1.4/100,000 population in 2017. See Technical Appendix for more information on how 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.[4] Active TB among individuals born outside of Canada appears to result largely from reactivation of latent TB infection, and local transmission is generally low.[5] 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 currently undergo routine screening mandated by IRCC.

HIV Screening and Co-infection

In 2018, 84.7% (254 cases) 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 86.6% (266 cases) in 2017. Over the preceding decade, less than 5% of active TB cases with known HIV status were co-infected with HIV (Table 32, Figure 33). Of those with known HIV status, 2.4% (6 cases) were co-infected with HIV in 2018, up from 1.5% (4 cases) in 2017.

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 others 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, or that were tested outside of 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. 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 disease is generally more transmissible than non-respiratory disease. Of the TB reported in BC in 2018, 76.7% were respiratory cases, which is within historic trends (Table 35; Figure 36).

Treatment of Active Cases

Treatment outcomes are reported for cases diagnosed in 2017 owing to the long duration of active TB treatment, and exclude post-mortem diagnoses (4 cases). Of those diagnosed in 2017 and excluding post-mortem diagnoses (303 cases), 290 (95.7%) were documented to have started treatment (Table 37). Of the thirteen cases (4.3%) with no treatment documented in 2017, twelve died before treatment was initiated and one was lost to follow-up. Compared to previous years presented in this report, in 2017 there was the highest proportion of cases with no treatment documented (Table 38) which warrants close monitoring moving forward.

Among diagnosed cases (303 cases), 81.2% (246 cases) successfully completed active TB treatment, with the majority (69.6%, 211 cases) completing within 12 months and 11.6% (35 cases) taking longer than 12

months to complete (Table 38; Figure 39). However, five cases (1.7%) started treatment but left BC during the course of their treatment.

Among cases with incomplete treatment (39 cases), the majority (46.2%, 18 cases) had an unknown reason, 33.3% (13 cases) died during treatment, 17.9% (7 cases) were lost to follow-up, and 2.6% (1 case) were non-adherent (Table 41; Figure 42). Of the 13 cases who died during treatment, the majority (17.9%, 7 cases) were documented with TB contributing to, but not being the underlying cause of death, 7.7% (3 cases) had an underlying cause of death related to their TB disease, 5.1% (2 cases) died for reasons unrelated to their TB disease, and 2.6% (1 case) had an 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.[6] For this reason, provincial surveillance is critical. In 2018, isoniazid (INH) resistance was 6.0% (18 cases), up from 5.2% (16 cases) in 2017. Only 0.3% of cases (1 case) in 2018 had multi-drug resistance (i.e. resistance to both isoniazid and rifampin), a slight decrease from the 0.7% (2 cases) seen in 2017 (Table 44; Figure 46).

Drug resistance data from 2009 to 2015 were not readily accessible for reporting out of Panorama. Thus, case counts and proportions for this period were therefore obtained from historical iPHIS data[7] 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, 2009 to 2018

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BC	314	250	279	299	281	305	288	255	307	300

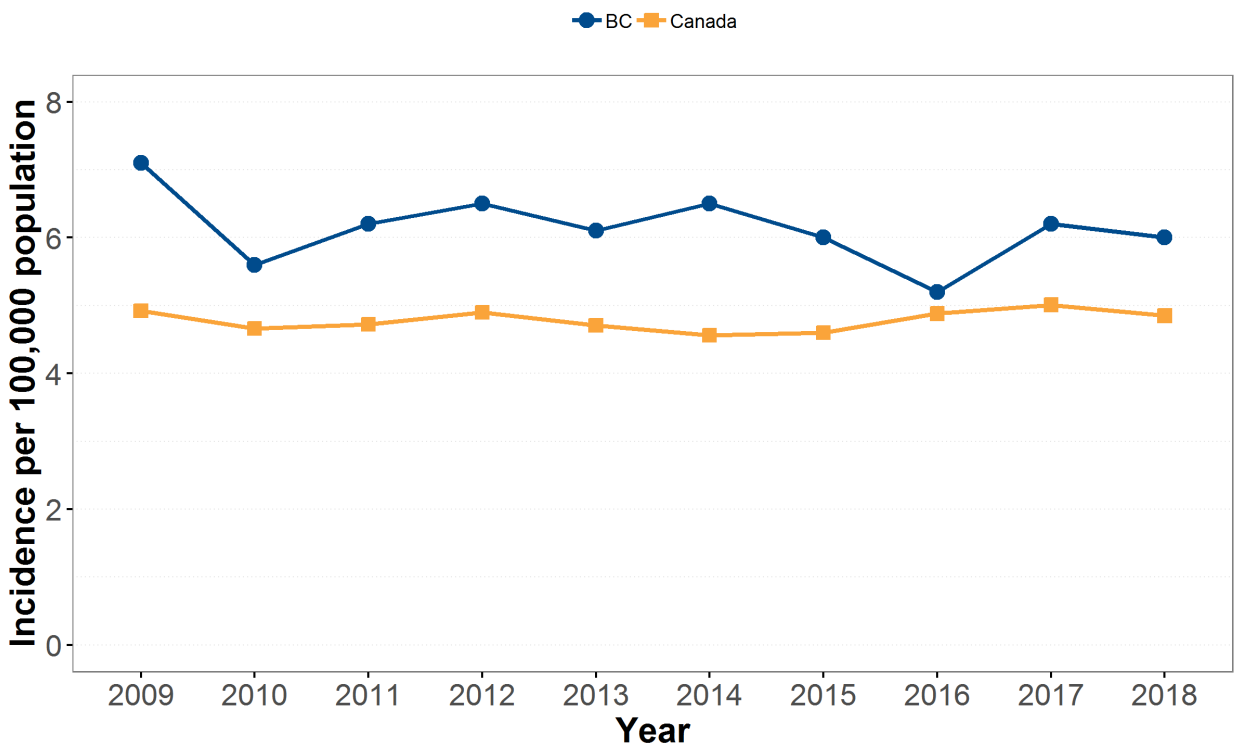
2. Active TB Disease Rates* in BC and Canada, 2009 to 2018

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BC	7.1	5.6	6.2	6.5	6.1	6.5	6.0	5.2	6.2	6.0
Canada**	4.9	4.7	4.7	4.9	4.7	4.6	4.6	4.9	5.0	4.8

*All rates are per 100,000 population

**Canadian rates from the Public Health Agency of Canada[1]

3. Active TB Disease Rates in BC and Canada, 2009 to 2018



Active TB by Health Authority of Residence

4. Active TB Disease Cases by Health Authority in BC, 2009 to 2018

Health Authority*	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fraser (FHA)	125	110	134	122	136	140	123	127	151	164
Interior (IHA)	25	23	13	32	24	15	9	13	13	18
Northern (NHA)	19	14	17	14	12	10	14	10	5	8
Vancouver Coastal (VCHA)	117	88	101	106	95	123	122	93	121	96
Vancouver Island (VIHA)	28	15	14	25	10	12	16	9	17	14

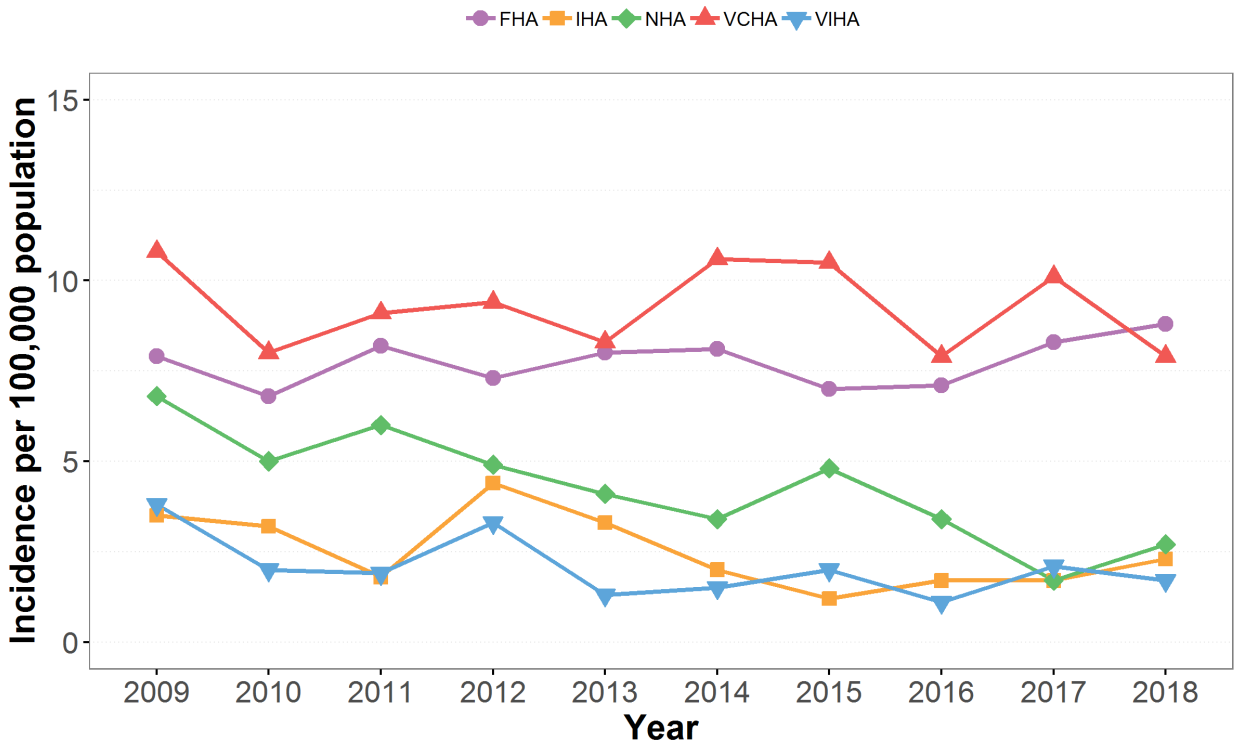
*Residence classified at time of case

5. Active TB Rates by Health Authority in BC, 2009 to 2018

Health Authority*	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fraser (FHA)	7.9	6.8	8.2	7.3	8.0	8.1	7.0	7.1	8.3	8.8
Interior (IHA)	3.5	3.2	1.8	4.4	3.3	2.0	1.2	1.7	1.7	2.3
Northern (NHA)	6.8	5.0	6.0	4.9	4.1	3.4	4.8	3.4	1.7	2.7
Vancouver Coastal (VCHA)	10.8	8.0	9.1	9.4	8.3	10.6	10.5	7.9	10.1	7.9
Vancouver Island (VIHA)	3.8	2.0	1.9	3.3	1.3	1.5	2.0	1.1	2.1	1.7

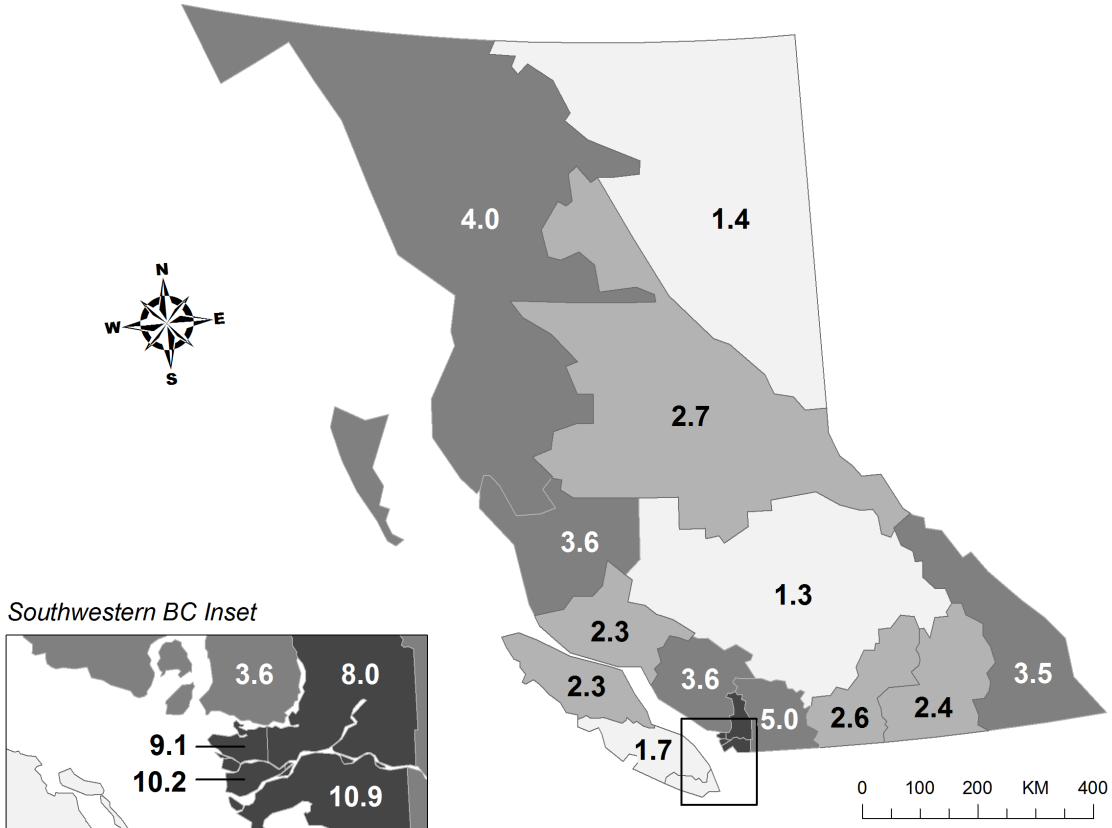
*Residence classified at time of case

6. Active TB Disease Rates by Health Authority in BC, 2009 to 2018



Active TB by Health Service Delivery Area

7. Active TB Disease Rates by Health Service Delivery Area*+ in BC, 2018



Rate per 100,000 population by HSDA

- 1.3 - 1.7
- 2.3 - 2.7
- 3.5 - 5.0
- 8.0 - 10.9

ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	3	3.5
12	Kootenay Boundary	2	2.4
13	Okanagan	10	2.6
14	Thompson Cariboo Shuswap	3	1.3
21	Fraser East	16	5.0
22	Fraser North	55	8.0
23	Fraser South	93	10.9
31	Richmond	22	10.2
32	Vancouver	63	9.1
33	North Shore/Coast Garibaldi	11	3.6
41	South Vancouver Island	6	1.5
42	Central Vancouver Island	5	1.7
43	North Vancouver Island	3	2.3
51	Northwest	3	4.0
52	Northern Interior	4	2.7
53	Northeast	1	1.4

*Health Service Delivery Area determined at time of case
+Population denominators come from 2018 Population Estimates from BC Statistics

Active TB by Age and Gender

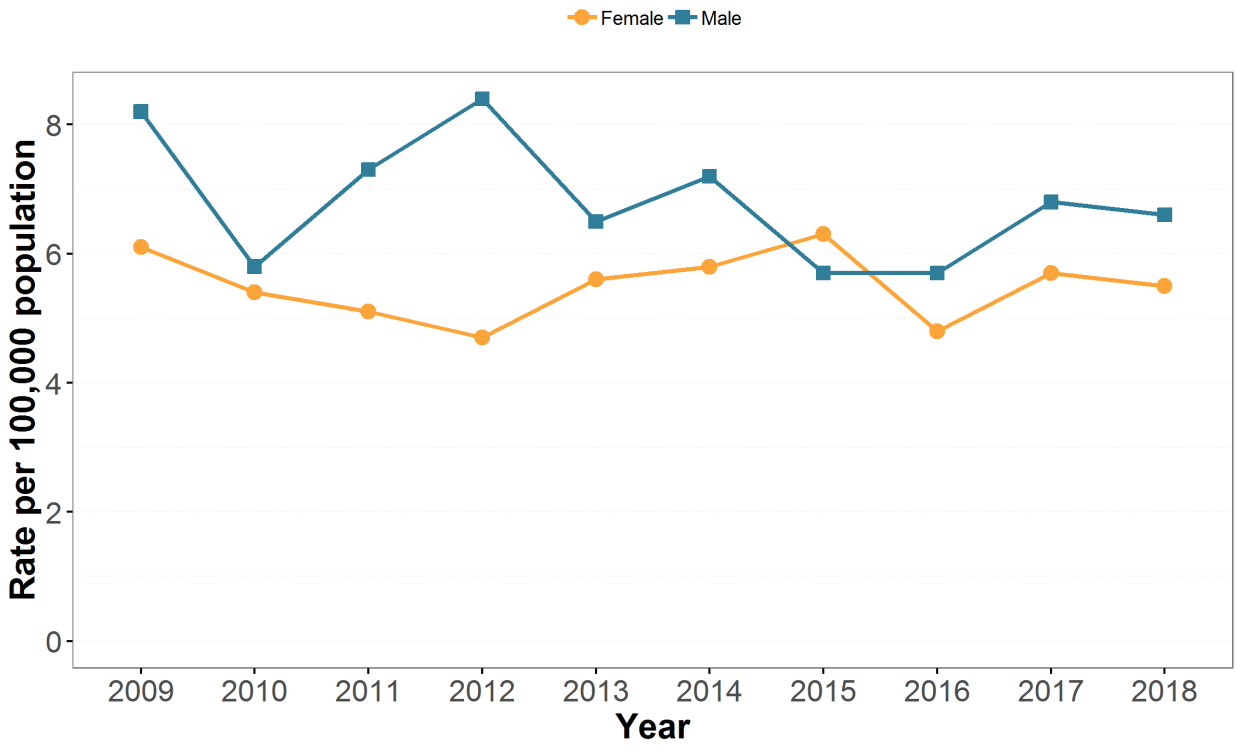
8. Active TB Disease Cases by Gender in BC, 2009 to 2018

Gender	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Female	135	121	115	109	131	138	153	119	142	138
Male	179	129	164	190	150	167	135	136	165	162

9. Active TB Disease Rates by Gender in BC, 2009 to 2018

Gender	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Female	6.1	5.4	5.1	4.7	5.6	5.8	6.3	4.8	5.7	5.5
Male	8.2	5.8	7.3	8.4	6.5	7.2	5.7	5.7	6.8	6.6

10. Active TB Disease Rates by Gender in BC, 2009 to 2018



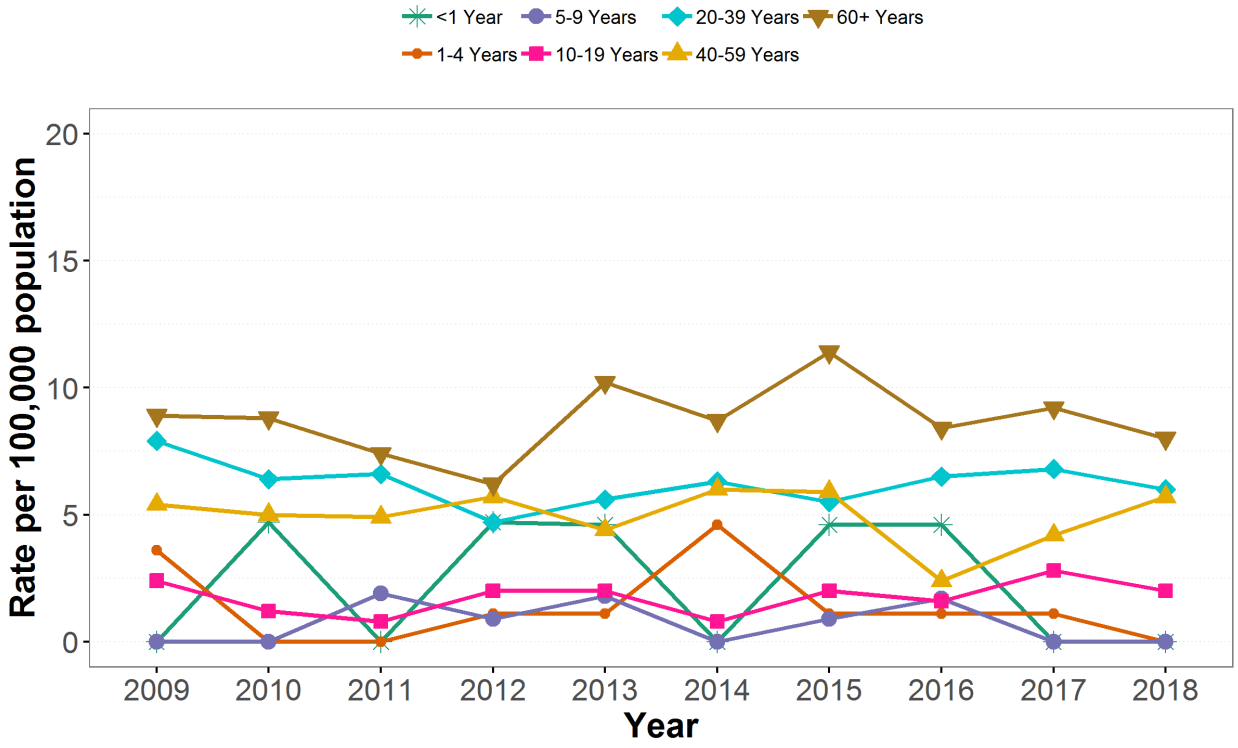
11. Active TB Disease Cases by Gender and Age Group in BC, 2009 to 2018

Gender	Age	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Female	<1 Year	0	1	0	1	1	0	1	1	0	0
	1-4 Years	3	0	0	1	1	4	1	1	1	0
	5-9 Years	0	0	2	1	2	0	1	2	0	0
	10-19 Years	6	3	2	5	5	2	5	4	7	5
	20-39 Years	47	39	40	29	35	40	35	42	45	40
	40-59 Years	36	34	33	39	31	42	42	17	30	40
	60+ Years	43	44	38	33	56	50	68	52	59	53
Male	<1 Year	0	1	0	0	1	0	0	0	1	0
	1-4 Years	2	0	2	1	1	1	1	1	3	2
	5-9 Years	2	1	1	0	2	0	0	0	2	0
	10-19 Years	3	4	4	6	5	8	5	4	8	3
	20-39 Years	47	23	36	32	27	33	23	28	32	50
	40-59 Years	63	41	51	59	44	49	42	44	41	35
	60+ Years	62	59	70	92	70	76	64	59	78	72

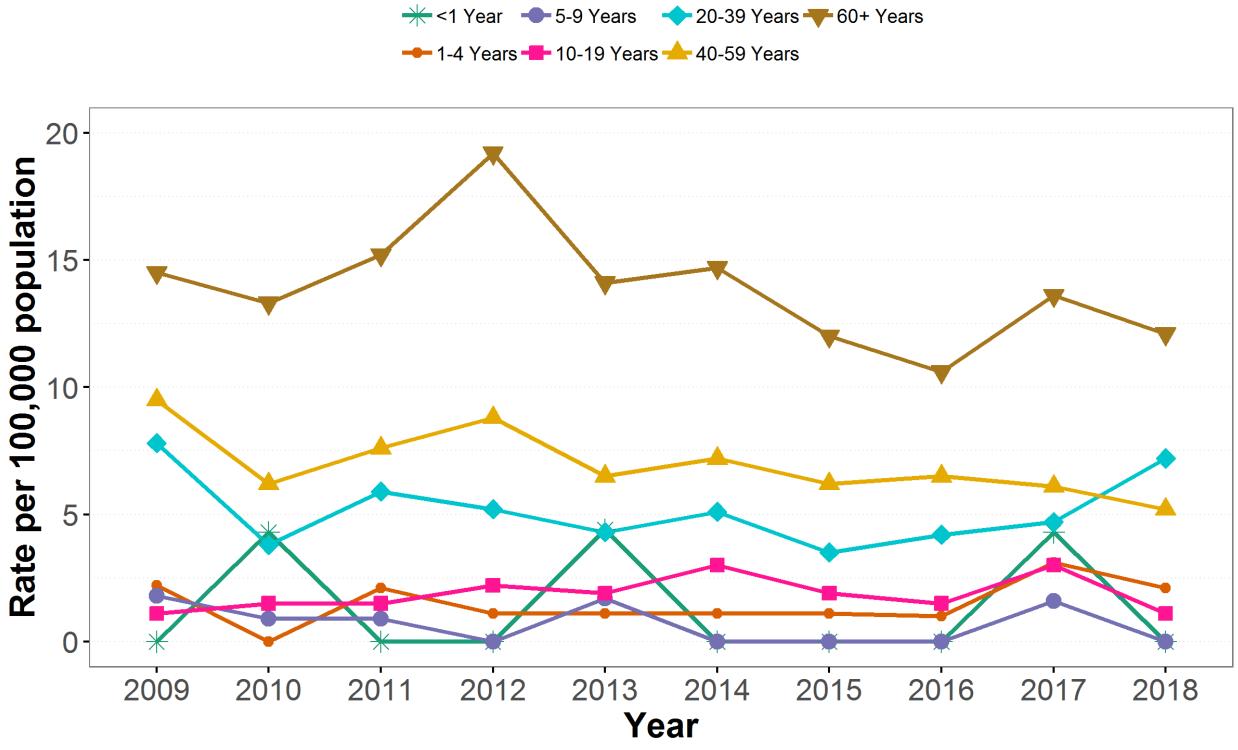
12. Active TB Disease Rates by Gender and Age Group in BC, 2009 to 2018

Gender	Age	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Female	<1 Year	0.0	4.7	0.0	4.7	4.6	0.0	4.6	4.6	0.0	0.0
	1-4 Years	3.6	0.0	0.0	1.1	1.1	4.6	1.1	1.1	1.1	0.0
	5-9 Years	0.0	0.0	1.9	0.9	1.8	0.0	0.9	1.7	0.0	0.0
	10-19 Years	2.4	1.2	0.8	2.0	2.0	0.8	2.0	1.6	2.8	2.0
	20-39 Years	7.9	6.4	6.6	4.7	5.6	6.3	5.5	6.5	6.8	6.0
	40-59 Years	5.4	5.0	4.9	5.7	4.4	6.0	5.9	2.4	4.2	5.7
	60+ Years	8.9	8.8	7.4	6.2	10.2	8.7	11.4	8.4	9.2	8.0
Male	<1 Year	0.0	4.3	0.0	0.0	4.4	0.0	0.0	0.0	4.3	0.0
	1-4 Years	2.2	0.0	2.1	1.1	1.1	1.1	1.1	1.0	3.1	2.1
	5-9 Years	1.8	0.9	0.9	0.0	1.7	0.0	0.0	0.0	1.6	0.0
	10-19 Years	1.1	1.5	1.5	2.2	1.9	3.0	1.9	1.5	3.0	1.1
	20-39 Years	7.8	3.8	5.9	5.2	4.3	5.1	3.5	4.2	4.7	7.2
	40-59 Years	9.5	6.2	7.6	8.8	6.5	7.2	6.2	6.5	6.1	5.2
	60+ Years	14.5	13.3	15.2	19.2	14.1	14.7	12.0	10.6	13.6	12.1

13. Active TB Disease Rates Among Females by Age Group in BC, 2009 to 2018



14. Active TB Disease Rates Among Males by Age Group in BC, 2009 to 2018



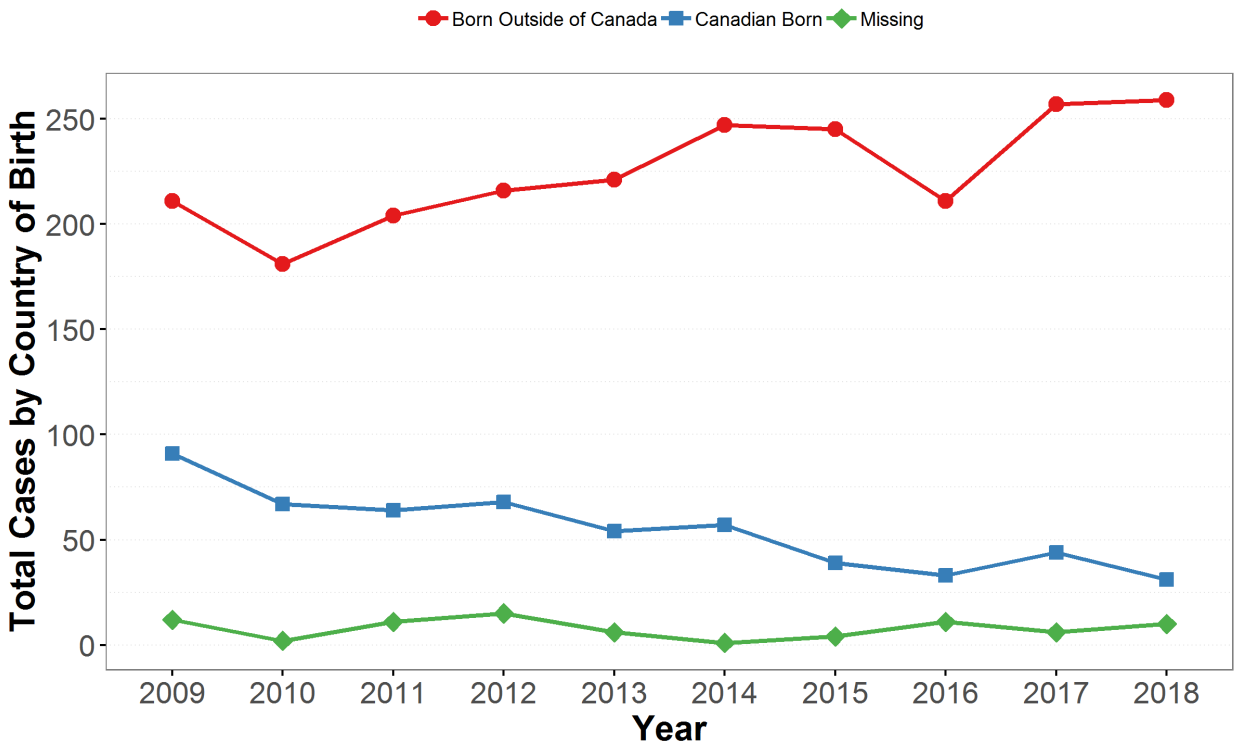
Active TB by Country of Birth

15. Active TB Disease Cases by Country of Birth in BC, 2009 to 2018

Country of Birth	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Born Outside of Canada	211	181	204	216	221	247	245	211	257	259
Canadian Born	91	67	64	68	54	57	39	33	44	31
Missing*	12	2	11	15	6	1	4	11	6	10

*Unknown or undocumented country of birth

16. Active TB Disease Cases by Country of Birth in BC, 2009 to 2018

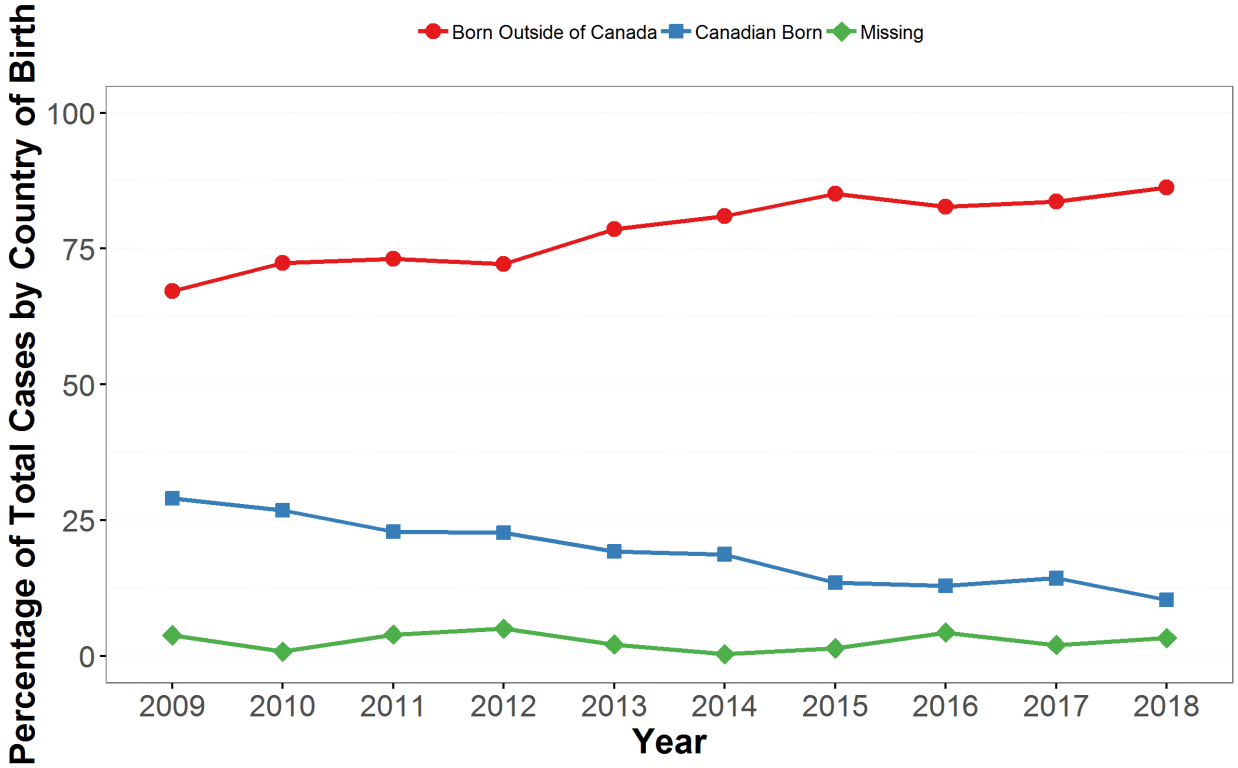


17. Percentage of Total Active TB Cases by Country of Birth in BC, 2009 to 2018

Country of Birth	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Born Outside of Canada	67.2	72.4	73.1	72.2	78.6	81.0	85.1	82.7	83.7	86.3
Canadian Born	29.0	26.8	22.9	22.7	19.2	18.7	13.5	12.9	14.3	10.3
Missing*	3.8	0.8	3.9	5.0	2.1	0.3	1.4	4.3	2.0	3.3

*Unknown or undocumented country of birth

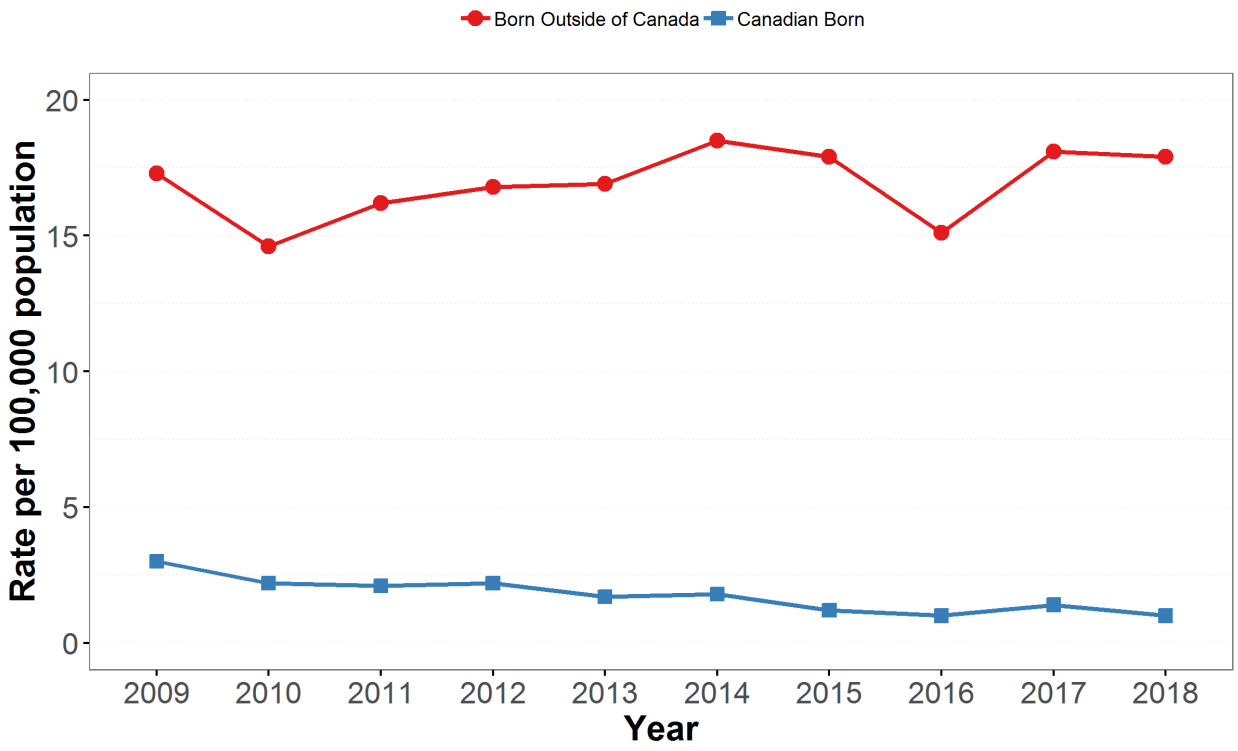
18. Percentage of Total Active TB Cases by Country of Birth in BC, 2009 to 2018



19. Active TB Disease Rates by Country of Birth in BC, 2009 to 2018

Country of Birth	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Born Outside of Canada	17.3	14.6	16.2	16.8	16.9	18.5	17.9	15.1	18.1	17.9
Canadian Born	3.0	2.2	2.1	2.2	1.7	1.8	1.2	1.0	1.4	1.0

20. Active TB Disease Rates by Country of Birth in BC, 2009 to 2018



Active TB by Country of Birth and Health Authority

21. Active TB Disease Cases by Country of Birth and Health Authority in BC, 2009 to 2018

Health Authority*	Country of Birth	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fraser (FHA)	Born Outside of Canada	102	91	109	103	115	123	111	115	132	146
	Canadian Born	21	18	20	14	18	17	10	7	18	18
Interior (IHA)	Born Outside of Canada	9	8	6	6	14	7	8	10	12	12
	Canadian Born	13	15	7	23	8	8	1	2	1	5
Northern (NHA)	Born Outside of Canada	3	0	1	4	4	4	4	2	0	2
	Canadian Born	16	13	15	10	8	5	9	7	5	3
Vancouver Coastal (VCHA)	Born Outside of Canada	82	76	82	93	79	101	108	76	105	92
	Canadian Born	29	12	15	6	15	22	13	13	13	4
Vancouver Island (VIHA)	Born Outside of Canada	15	6	6	10	5	8	10	6	8	7
	Canadian Born	12	9	7	15	5	4	6	3	7	1

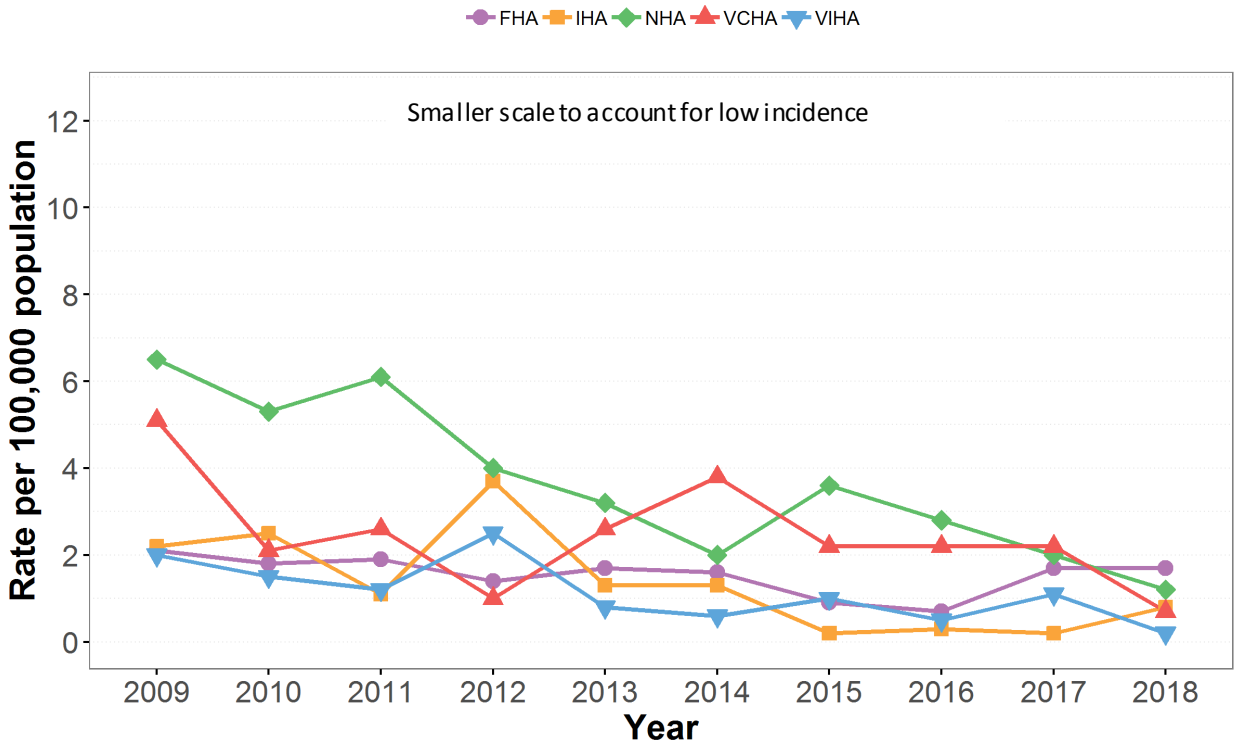
*Residence classified at time of case

22. Active TB Disease Rates by Country of Birth and Health Authority in BC, 2009 to 2018

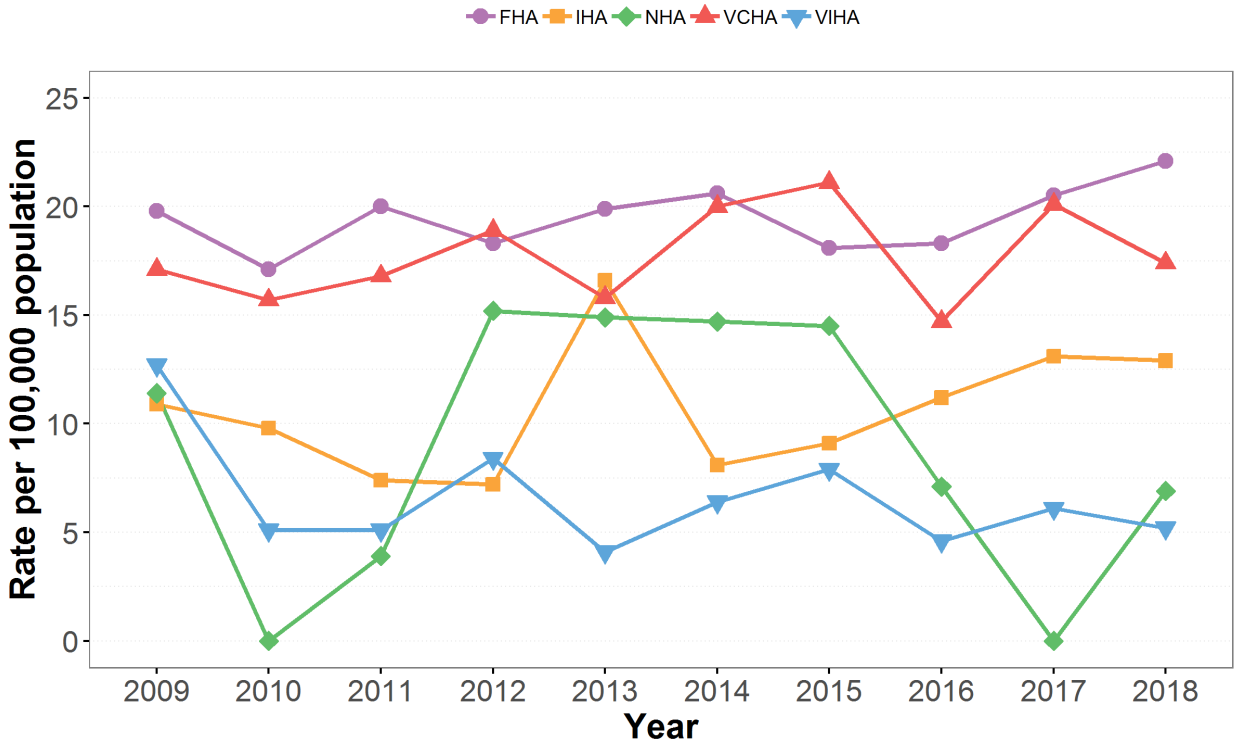
Health Authority*	Country of Birth	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fraser (FHA)	Born Outside of Canada	19.8	17.1	20.0	18.3	19.9	20.6	18.1	18.3	20.5	22.1
	Canadian Born	2.1	1.8	1.9	1.4	1.7	1.6	0.9	0.7	1.7	1.7
Interior (IHA)	Born Outside of Canada	10.9	9.8	7.4	7.2	16.6	8.1	9.1	11.2	13.1	12.9
	Canadian Born	2.2	2.5	1.1	3.7	1.3	1.3	0.2	0.3	0.2	0.8
Northern (NHA)	Born Outside of Canada	11.4	0.0	3.9	15.2	14.9	14.7	14.5	7.1	0.0	6.9
	Canadian Born	6.5	5.3	6.1	4.0	3.2	2.0	3.6	2.8	2.0	1.2
Vancouver Coastal (VCHA)	Born Outside of Canada	17.1	15.7	16.8	18.9	15.8	20.0	21.1	14.7	20.1	17.4
	Canadian Born	5.1	2.1	2.6	1.0	2.6	3.8	2.2	2.2	2.2	0.7
Vancouver Island (VIHA)	Born Outside of Canada	12.7	5.1	5.1	8.4	4.1	6.4	7.9	4.6	6.1	5.2
	Canadian Born	2.0	1.5	1.2	2.5	0.8	0.6	1.0	0.5	1.1	0.2

*Residence classified at time of case

23. Active TB Disease Rates Among Canadian Born Populations by Health Authority in BC, 2009 to 2018



24. Active TB Disease Rates Among Populations Born Outside of Canada by Health Authority in BC, 2009 to 2018



Active TB Among Canadian Born Populations by Age Group

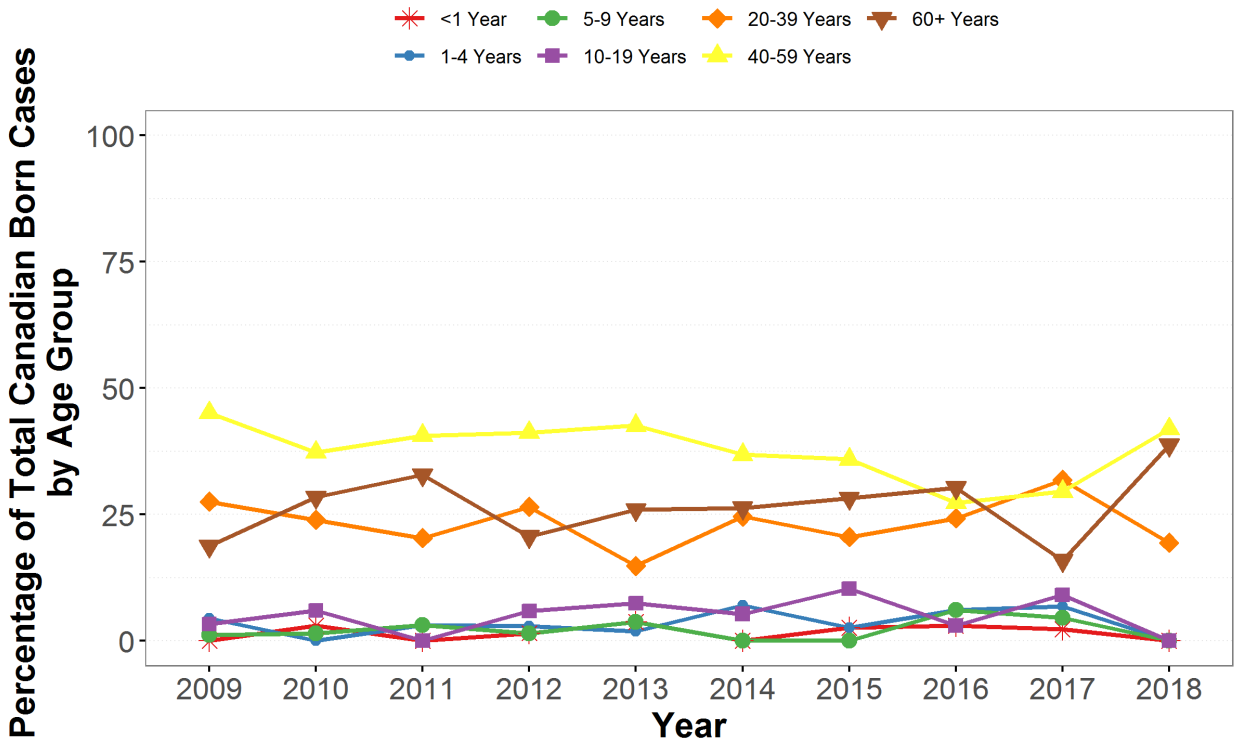
25. Active TB Disease Cases Among Canadian Born Populations by Age Group, 2009 to 2018

Age Group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
<1 Year	0	2	0	1	2	0	1	1	1	0
1-4 Years	4	0	2	2	1	4	1	2	3	0
5-9 Years	1	1	2	1	2	0	0	2	2	0
10-19 Years	3	4	0	4	4	3	4	1	4	0
20-39 Years	25	16	13	18	8	14	8	8	14	6
40-59 Years	41	25	26	28	23	21	14	9	13	13
60+ Years	17	19	21	14	14	15	11	10	7	12

26. Percentage of Active TB Disease in Canadian Born Populations by Age Group, 2009 to 2018

Age Group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
<1 Year	0.0	3.0	0.0	1.5	3.7	0.0	2.6	3.0	2.3	0.0
1-4 Years	4.4	0.0	3.1	2.9	1.9	7.0	2.6	6.1	6.8	0.0
5-9 Years	1.1	1.5	3.1	1.5	3.7	0.0	0.0	6.1	4.5	0.0
10-19 Years	3.3	6.0	0.0	5.9	7.4	5.3	10.3	3.0	9.1	0.0
20-39 Years	27.5	23.9	20.3	26.5	14.8	24.6	20.5	24.2	31.8	19.4
40-59 Years	45.1	37.3	40.6	41.2	42.6	36.8	35.9	27.3	29.5	41.9
60+ Years	18.7	28.4	32.8	20.6	25.9	26.3	28.2	30.3	15.9	38.7

27. Percentage of Active TB Disease in Canadian Born Populations by Age Group, 2009 to 2018



Active TB Among Populations Born Outside of Canada by Age Group

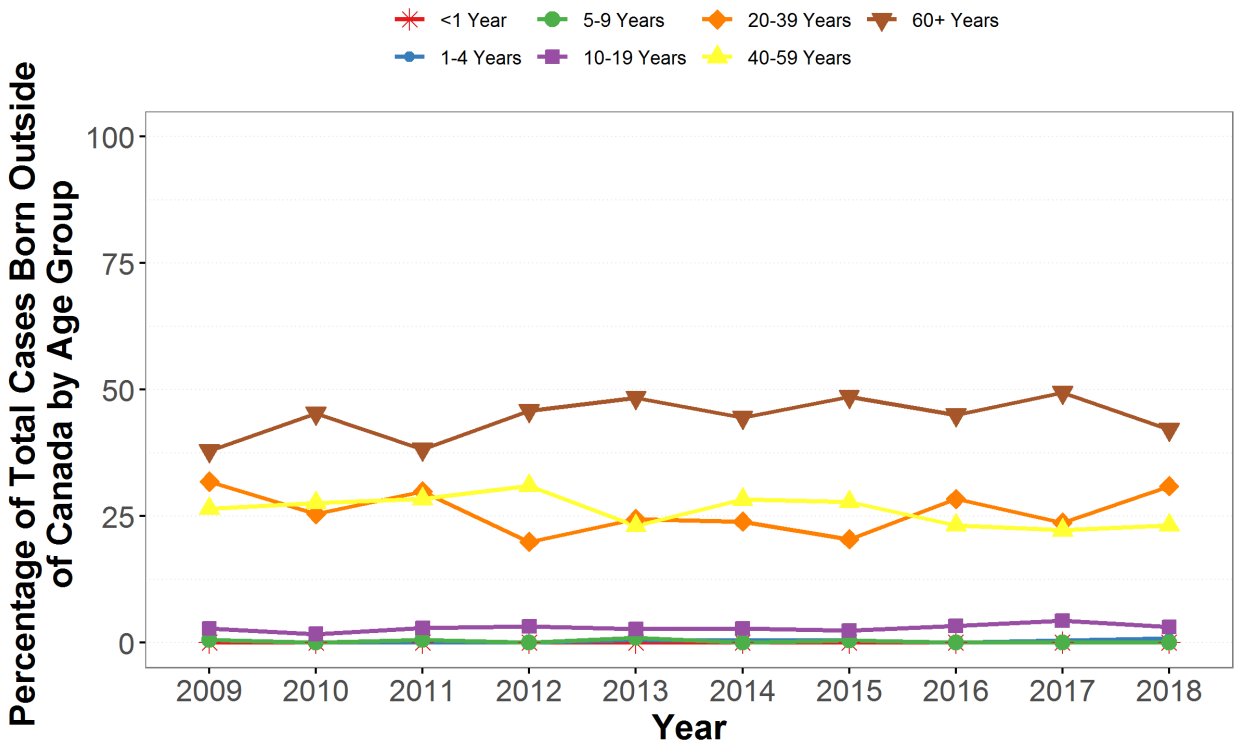
28. Active TB Disease Cases Among Populations Born Outside of Canada by Age Group, 2009 to 2018

Age Group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
<1 Year	0	0	0	0	0	0	0	0	0	0
1-4 Years	1	0	0	0	1	1	1	0	1	2
5-9 Years	1	0	1	0	2	0	1	0	0	0
10-19 Years	6	3	6	7	6	7	6	7	11	8
20-39 Years	67	46	61	43	54	59	50	60	61	80
40-59 Years	56	50	58	67	51	70	68	49	57	60
60+ Years	80	82	78	99	107	110	119	95	127	109

29. Percentage of Active TB Disease in Populations Born Outside of Canada by Age Group, 2009 to 2018

Age Group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
<1 Year	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1-4 Years	0.5	0.0	0.0	0.0	0.5	0.4	0.4	0.0	0.4	0.8
5-9 Years	0.5	0.0	0.5	0.0	0.9	0.0	0.4	0.0	0.0	0.0
10-19 Years	2.8	1.7	2.9	3.2	2.7	2.8	2.4	3.3	4.3	3.1
20-39 Years	31.8	25.4	29.9	19.9	24.4	23.9	20.4	28.4	23.7	30.9
40-59 Years	26.5	27.6	28.4	31.0	23.1	28.3	27.8	23.2	22.2	23.2
60+ Years	37.9	45.3	38.2	45.8	48.4	44.5	48.6	45.0	49.4	42.1

30. Percentage of Active TB Disease in Populations Born Outside of Canada by Age Group, 2009 to 2018



Active TB by HIV Status

31. Active TB Cases by Known HIV Status, 2009 to 2018

HIV Status	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
HIV Positive	5	3	8	7	9	7	11	7	4	6
Known HIV Status*	202	173	198	221	222	251	240	225	266	254

*Known status is obtained from new HIV/AIDS diagnoses and HIV testing history in BC

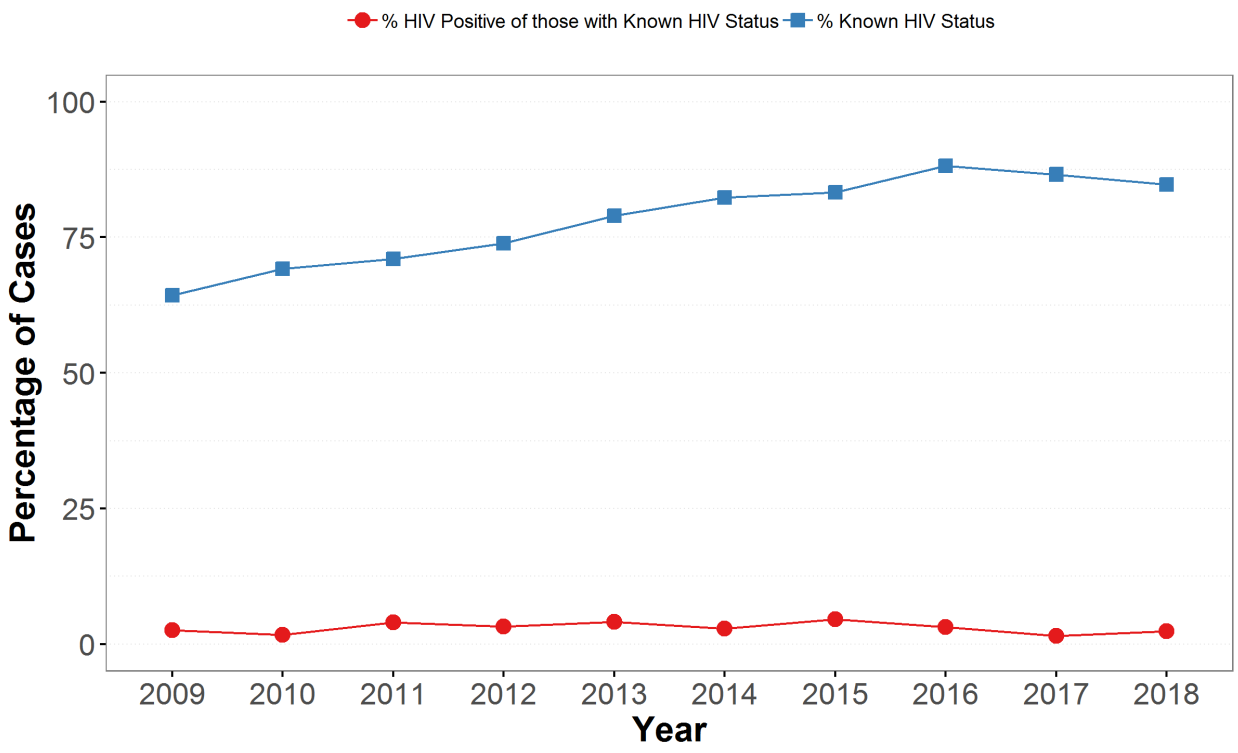
32. Percentage of Active TB Cases by Known HIV Status, 2009 to 2018

HIV Status	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
% HIV Positive*	2.5	1.7	4.0	3.2	4.1	2.8	4.6	3.1	1.5	2.4
% Known HIV Status**	64.3	69.2	71.0	73.9	79.0	82.3	83.3	88.2	86.6	84.7

*% HIV positive of those with known HIV status

**Known status is obtained from new HIV/AIDS diagnoses and HIV testing history in BC

33. Percentage of Active TB Cases by Known HIV Status, 2009 to 2018



Active TB by Site of Disease

34. Active TB Disease Case Totals by Site of Disease, 2009 to 2018

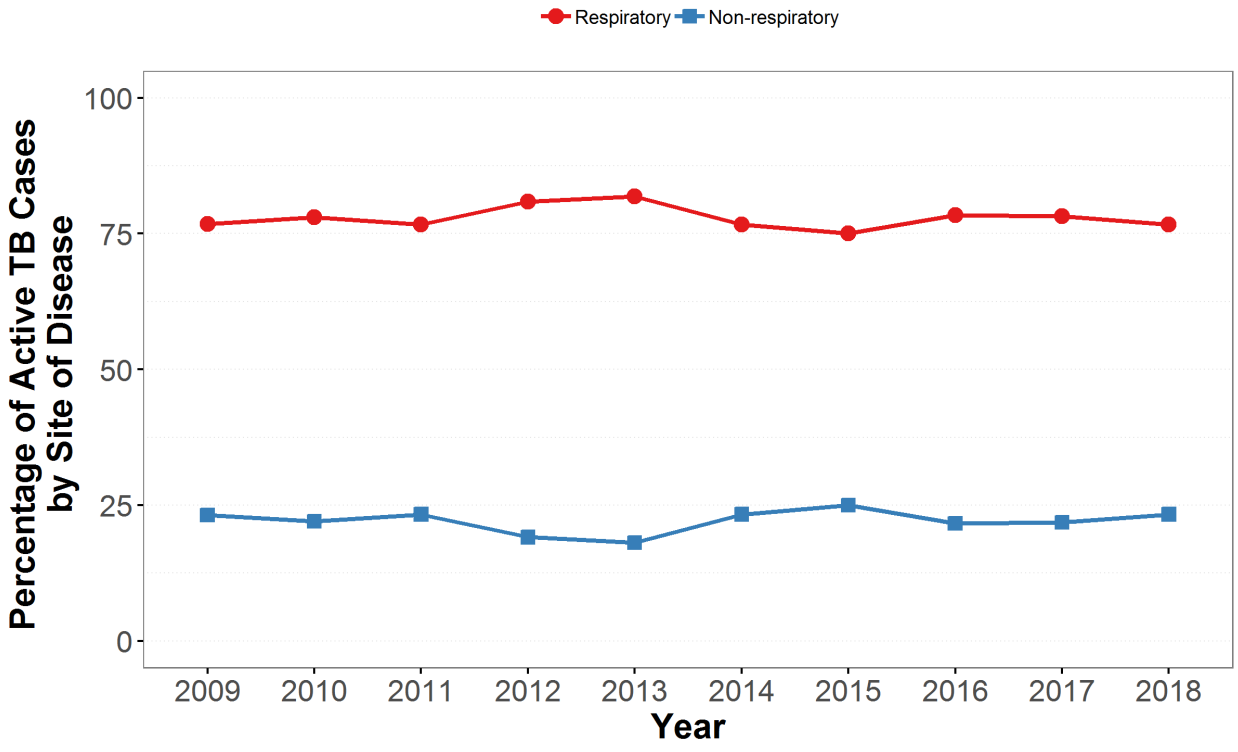
Site of Disease	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Respiratory*	241	195	214	242	230	234	216	200	240	230
Non-respiratory only	73	55	65	57	51	71	72	55	67	70

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

35. Percentage of Active TB Cases by Site of Disease, 2009 to 2018

Site of Disease	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Respiratory	76.8	78.0	76.7	80.9	81.9	76.7	75.0	78.4	78.2	76.7
Non-respiratory only	23.2	22.0	23.3	19.1	18.1	23.3	25.0	21.6	21.8	23.3

36. Percentage of Active TB Cases by Site of Disease, 2009 to 2018



Treatment Completion of Active Cases

37. Active TB Disease by Treatment Completion, 2009 to 2017

Treatment Summary*	2009	2010	2011	2012	2013	2014	2015	2016	2017
Treatment Completed	**265**	**204**	**224**	**243**	**242**	**252**	**234**	**197**	**246**
- Within 12 Months	203	172	181	207	211	212	187	161	211
- Greater Than 12 Months	62	32	43	36	31	40	47	36	35
Incomplete Treatment	**35**	**36**	**31**	**38**	**20**	**31**	**36**	**35**	**39**
Left Province During Treatment	**5**	**8**	**12**	**6**	**4**	**14**	**9**	**18**	**5**
No Treatment Documented	**3**	**0**	**9**	**6**	**4**	**0**	**8**	**2**	**13**

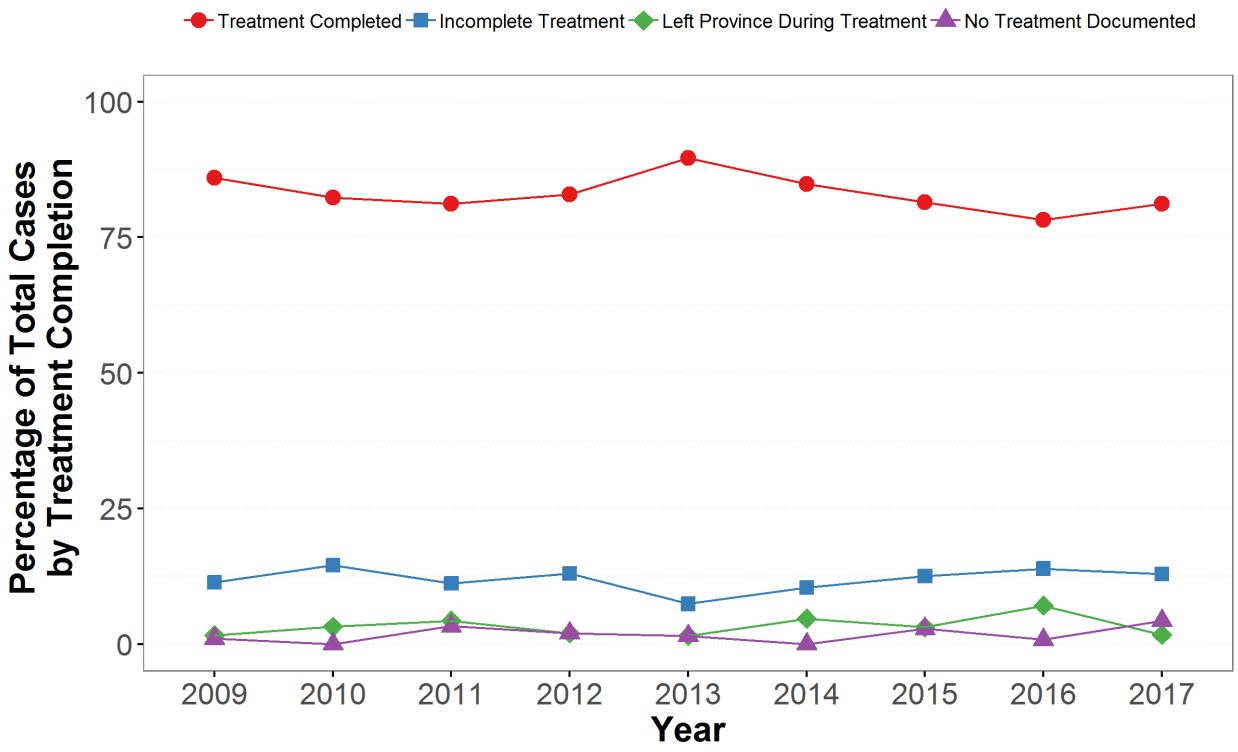
*Excluding those diagnosed post-mortem

38. Percentage of Active TB Disease by Treatment Completion, 2009 to 2017

Treatment Summary*	2009	2010	2011	2012	2013	2014	2015	2016	2017
Treatment Completed	**86.0**	**82.3**	**81.2**	**82.9**	**89.6**	**84.9**	**81.6**	**78.2**	**81.2**
- Within 12 Months	65.9	69.4	65.6	70.6	78.1	71.4	65.2	63.9	69.6
- Greater Than 12 Months	20.1	12.9	15.6	12.3	11.5	13.5	16.4	14.3	11.6
Incomplete Treatment	**11.4**	**14.5**	**11.2**	**13.0**	**7.4**	**10.4**	**12.5**	**13.9**	**12.9**
Left Province During Treatment	**1.6**	**3.2**	**4.3**	**2.0**	**1.5**	**4.7**	**3.1**	**7.1**	**1.7**
No Treatment Documented	**1.0**	**0.0**	**3.3**	**2.0**	**1.5**	**0.0**	**2.8**	**0.8**	**4.3**

*Excluding those diagnosed post-mortem

39. Active TB Disease Treatment, 2009 to 2017



Incomplete Treatment of Active Cases

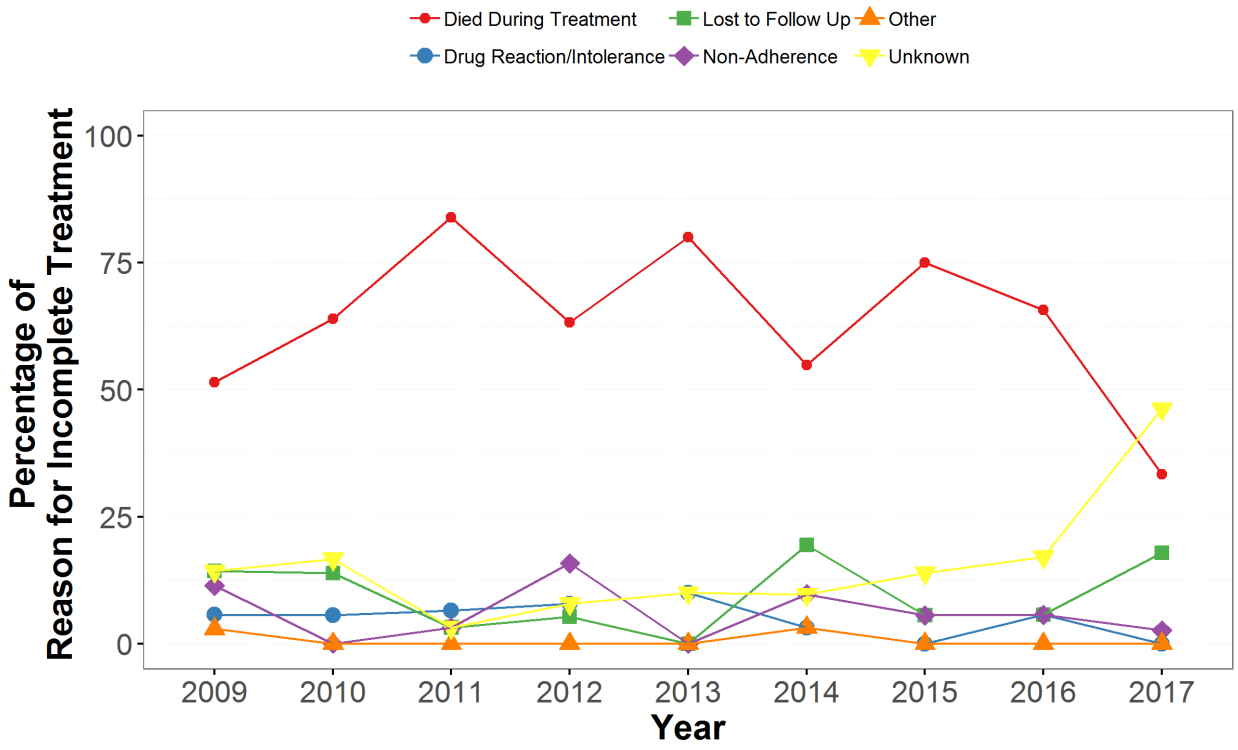
40. Documented Reason for Incomplete Treatment, 2009 to 2017

Reason	2009	2010	2011	2012	2013	2014	2015	2016	2017
Died During Treatment	**18**	**23**	**26**	**24**	**16**	**17**	**27**	**23**	**13**
- TB Underlying Cause	1	9	6	4	1	3	3	5	3
- TB Contributed, Not Underlying Cause	13	6	10	7	7	9	18	7	7
- TB Unrelated to Death	4	8	9	13	7	3	4	8	2
- Unknown	0	0	1	0	1	2	2	3	1
Drug Reaction/Intolerance	**2**	**2**	**2**	**3**	**2**	**1**	**0**	**2**	**0**
Lost to Follow Up	**5**	**5**	**1**	**2**	**0**	**6**	**2**	**2**	**7**
Non-Adherence	**4**	**0**	**1**	**6**	**0**	**3**	**2**	**2**	**1**
Other	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**
Unknown	**5**	**6**	**1**	**3**	**2**	**3**	**5**	**6**	**18**

41. Percentage of Documented Reason for Incomplete Treatment, 2009 to 2017

Reason	2009	2010	2011	2012	2013	2014	2015	2016	2017
Died During Treatment	**51.4**	**63.9**	**83.9**	**63.2**	**80.0**	**54.8**	**75.0**	**65.7**	**33.3**
- TB Underlying Cause	2.9	25.0	19.4	10.5	5.0	9.7	8.3	14.3	7.7
- TB Contributed, Not Underlying Cause	37.1	16.7	32.3	18.4	35.0	29.0	50.0	20.0	17.9
- TB Unrelated to Death	11.4	22.2	29.0	34.2	35.0	9.7	11.1	22.9	5.1
- Unknown	0.0	0.0	3.2	0.0	5.0	6.5	5.6	8.6	2.6
Drug Reaction/Intolerance	**5.7**	**5.6**	**6.5**	**7.9**	**10.0**	**3.2**	**0.0**	**5.7**	**0.0**
Lost to Follow Up	**14.3**	**13.9**	**3.2**	**5.3**	**0.0**	**19.4**	**5.6**	**5.7**	**17.9**
Non-Adherence	**11.4**	**0.0**	**3.2**	**15.8**	**0.0**	**9.7**	**5.6**	**5.7**	**2.6**
Other	**2.9**	**0.0**	**0.0**	**0.0**	**0.0**	**3.2**	**0.0**	**0.0**	**0.0**
Unknown	**14.3**	**16.7**	**3.2**	**7.9**	**10.0**	**9.7**	**13.9**	**17.1**	**46.2**

42. Documented Reason for Incomplete Treatment, 2009 to 2017



Drug Resistant TB

43. Number of Cases with Drug Resistant TB, 2009 to 2018*

Resistance	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
No Resistance	292	232	252	279	254	259	233	233	289	279
Isoniazid Only	21	18	23	18	19	25	27	19	16	18
Rifampin Only	2	0	1	0	0	2	0	0	0	2
Multi-Drug**	0	1	1	2	0	7	1	3	2	1

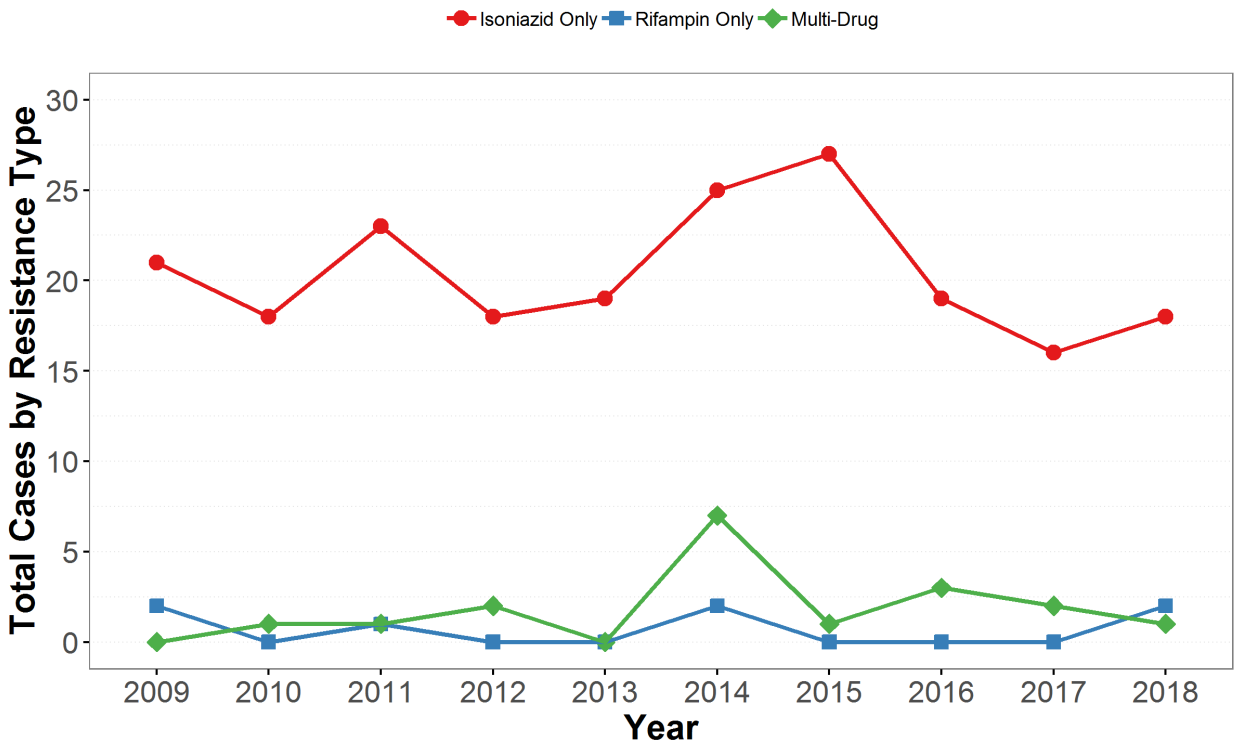
*Data from 2009-2015 are from iPHIS.[7] Historical case counts have changed slightly over time.
**Multi-drug resistance is defined as resistance to both isoniazid and rifampin

44. Percentage of Cases with Drug Resistant TB, 2009 to 2018*

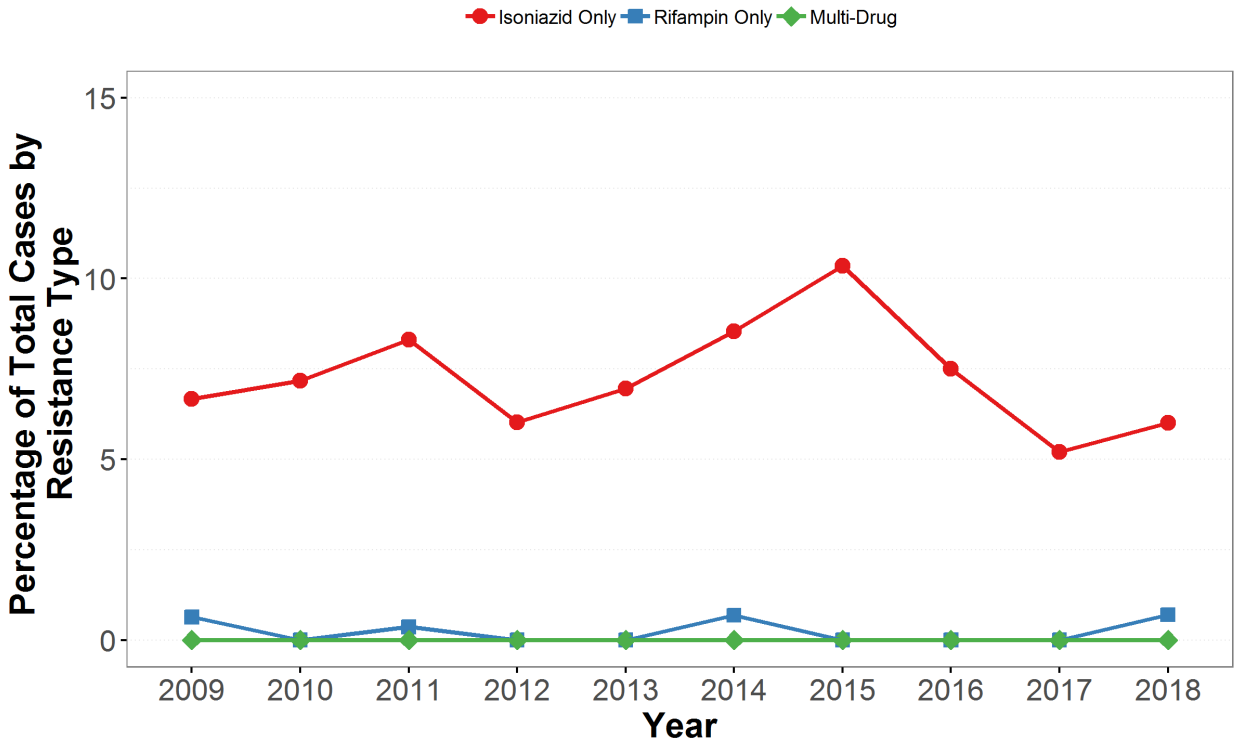
Resistance	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
No Resistance	92.7	92.4	91.0	93.3	93.0	88.4	89.3	91.4	94.1	93.0
Isoniazid Only	6.7	7.2	8.3	6.0	7.0	8.5	10.3	7.5	5.2	6.0
Rifampin Only	0.6	0.0	0.4	0.0	0.0	0.7	0.0	0.0	0.0	0.7
Multi-Drug**	0.0	0.4	0.4	0.7	0.0	2.4	0.4	1.2	0.7	0.3

*Data from 2009-2015 are from iPHIS.[7] Historical case counts have changed slightly over time.
**Multi-drug resistance is defined as resistance to both isoniazid and rifampin

45. Number of Cases with Drug Resistant TB, 2009 to 2018



46. Percentage of Cases with Drug Resistant TB, 2009 to 2018



Latent TB Treatment

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 2017 due to the extended duration of LTBI treatment and corresponding delay in reporting. Since the provincial TB data system transitioned to Panorama, there has been underreporting of LTBI treatment in the new system, affecting counts from 2016 and 2017. This may reflect the challenges of adapting to a new clinical and surveillance system, including limitations on clinical capacity. Therefore, these trends should be interpreted with a high level of caution. Note that clients receiving primary prophylaxis are not reported here.

In 2017, 687 clients started LTBI treatment compared with 676 clients in 2016. A total of 72.5% (498 clients) of those starting treatment in 2017 successfully completed treatment, with 71.0% (488 clients) completing treatment within 12 months and only 1.5% (10 clients) taking more than 12 months to complete treatment (Table 48, Figure 49). Of those starting treatment in 2017, 71.0% (488 clients) were born outside of Canada, 22.1% (152 clients) were Canadian born, and 6.8% (47 clients) had an unknown country of birth or had missing data (Table 51, Figure 52). In 2017, 39.4% (271 clients) were 40-59 years of age, 28.7% (197 clients) were 60 years of age or older, and 27.1% (186 clients) were 20-39 years of age (Table 54).

LTBI Treatment

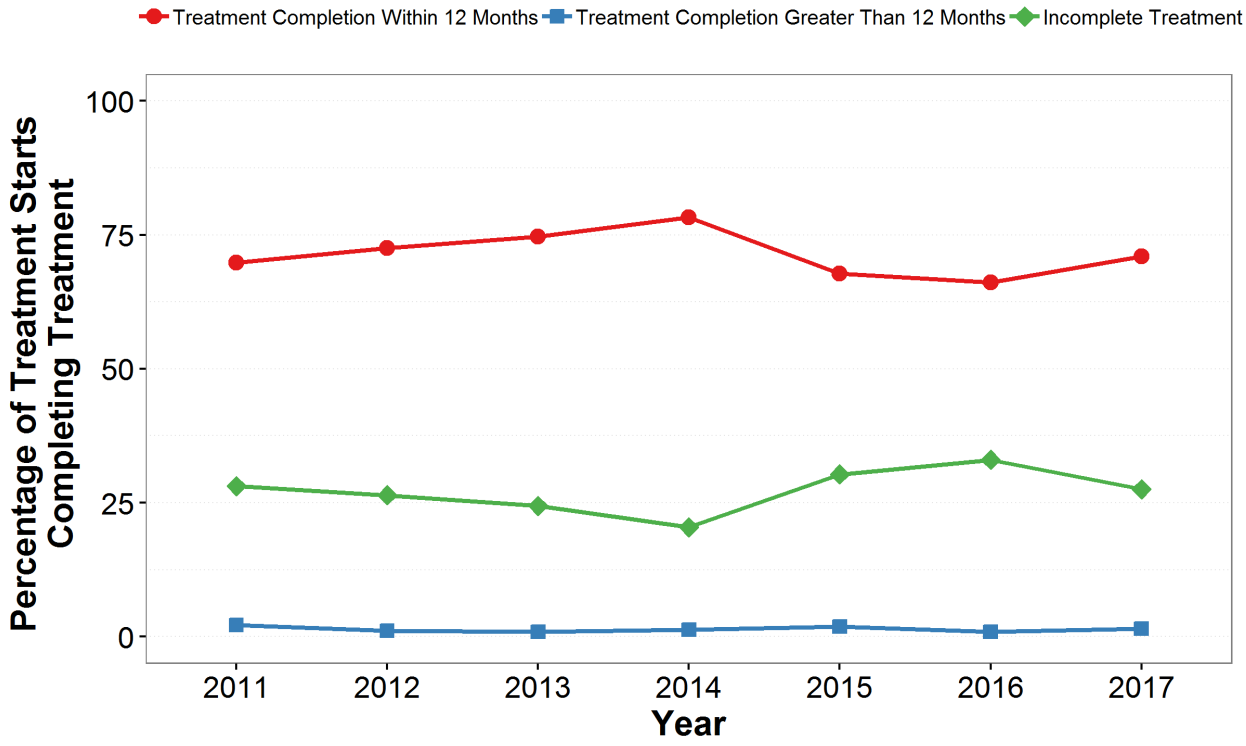
47. Total Clients Started on LTBI Therapy by Treatment Success, 2011 to 2017

Treatment Summary	2011	2012	2013	2014	2015	2016	2017
Treatment Completion Within 12 Months	542	601	600	626	583	447	488
Treatment Completion Greater Than 12 Months	17	9	7	10	16	6	10
Incomplete Treatment	218	219	196	163	261	223	189

48. Percentage of Clients Started on LTBI Therapy by Treatment Success, 2011 to 2017

Treatment Summary	2011	2012	2013	2014	2015	2016	2017
Treatment Completion Within 12 Months	69.8	72.5	74.7	78.3	67.8	66.1	71.0
Treatment Completion Greater Than 12 Months	2.2	1.1	0.9	1.3	1.9	0.9	1.5
Incomplete Treatment	28.1	26.4	24.4	20.4	30.3	33.0	27.5

49. Percentage of Clients Started on LTBI Therapy by Treatment Success, 2011 to 2017



LTBI Treatment by Country of Birth

50. LTBI Treatment Initiation by Country of Birth, 2011 to 2017

Country of Birth	2011	2012	2013	2014	2015	2016	2017
Born Outside of Canada	496	577	572	597	647	506	488
Canadian Born	248	230	212	189	196	149	152
Missing*	33	22	19	13	17	21	47

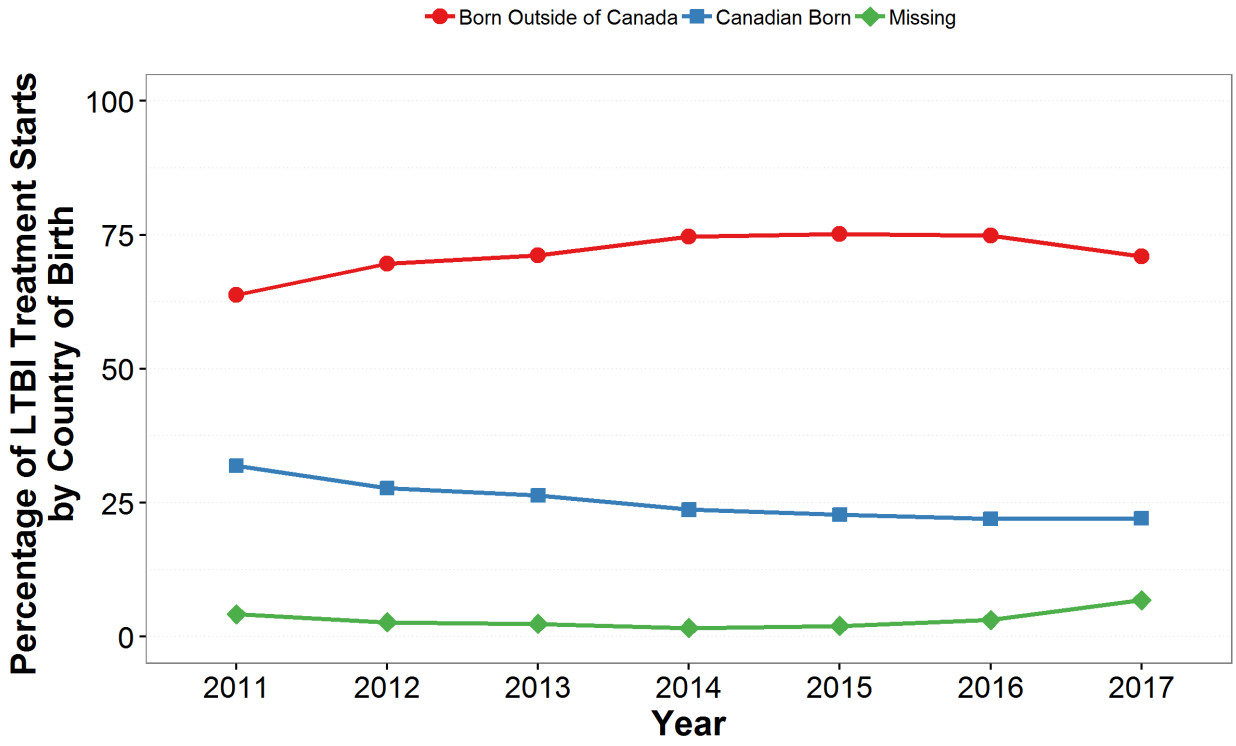
*Unknown or undocumented country of birth

51. Percentage of LTBI Treatment Initiation by Country of Birth, 2011 to 2017

Country of Birth	2011	2012	2013	2014	2015	2016	2017
Born Outside of Canada	63.8	69.6	71.2	74.7	75.2	74.9	71.0
Canadian Born	31.9	27.7	26.4	23.7	22.8	22.0	22.1
Missing*	4.2	2.7	2.4	1.6	2.0	3.1	6.8

*Unknown or undocumented country of birth

52. Percentage of LTBI Treatment Initiation by Country of Birth, 2011 to 2017



LTBI Treatment by Age Group

53. LTBI Treatment Initiation by Age Group in BC, 2011 to 2017

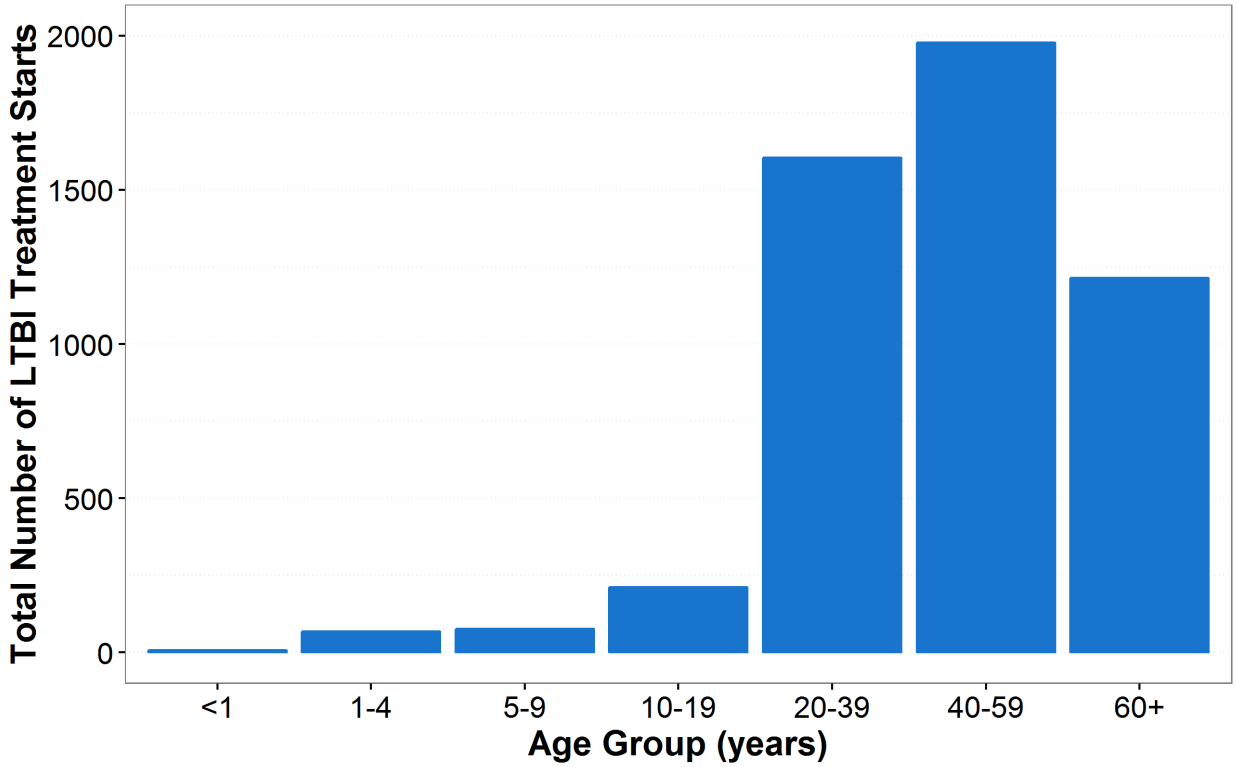
Age Group	2011	2012	2013	2014	2015	2016	2017
<1 Year	1	1	0	1	1	3	1
1-4 Years	13	3	13	10	12	8	9
5-9 Years	13	9	16	11	13	4	10
10-19 Years	29	32	41	43	36	17	13
20-39 Years	271	245	227	233	243	200	186
40-59 Years	313	384	343	334	342	262	271
60+ Years	137	155	163	167	213	182	197

54. Percentage of LTBI Treatment Initiation by Age Group in BC, 2011 to 2017

Age Group	2011	2012	2013	2014	2015	2016	2017
<1 Year	0.1	0.1	0.0	0.1	0.1	0.4	0.1
1-4 Years	1.7	0.4	1.6	1.3	1.4	1.2	1.3
5-9 Years	1.7	1.1	2.0	1.4	1.5	0.6	1.5
10-19 Years	3.7	3.9	5.1	5.4	4.2	2.5	1.9
20-39 Years	34.9	29.6	28.3	29.2	28.3	29.6	27.1
40-59 Years	40.3	46.3	42.7	41.8	39.8	38.8	39.4
60+ Years	17.6	18.7	20.3	20.9	24.8	26.9	28.7

LTBI Treatment by Age Group

55. Total Number of LTBI Treatment Initiation by Age Group in BC, 2011 to 2017



TB Contact Tracing

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 Panorama and iPHIS 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) and residing in BC at time of investigation.

Trends in the number of contacts are affected by the circumstances of each case and also differences in the collection, entry and reporting of contact data. Provincial workflows for contact tracing and contact data entry changed in 2013, and again in 2016 with the implementation of Panorama, and should be considered when interpreting the provincial surveillance data presented here. Contact data from 2010 to 2015 were not readily accessible for reporting out of Panorama. Thus, counts and proportions for this period were therefore obtained from historical iPHIS data[7] to enable assessment of trends. Historic counts and proportions should be interpreted with caution.

Among the 230 respiratory TB cases in 2018, 32 cases had no contacts listed. The mean number of contacts per respiratory TB case (primary, pulmonary, miliary, and other respiratory) in 2018 was 10.4 (median=4.0), similar to the mean of 10.2 (median = 5.0) observed in 2017 (Table 56). The maximum number of contacts associated with a single respiratory case in 2018 was 98, and ranged from 92 to 421 contacts from 2010 to 2017. Of those contacts reported in 2018, 37.3% (896 contacts) occurred in those 20-39 years of age, 33.4% (802 contacts) occurred in those 40-59 years of age, and 14.6% (351 contacts) occurred in those 60 years of age or older (Table 58, Figure 59). In 2018, 48.7% (1169 contacts) of contacts were born outside of Canada, 39.6% (951 contacts) were Canadian born, and 11.6% (279 contacts) had no country of birth documented (Table 61, Figure 62).

Contacts per Case

56. Mean, Median, Max, and Total Number of Contacts* Reported per Respiratory Case in BC, 2010 to 2018**

Measure	2010	2011	2012	2013	2014	2015	2016	2017	2018
Mean	16.8	21.4	22.4	19.9	10.3	10.3	9.5	10.2	10.4
Median	8.0	9.5	13.0	11.0	5.0	6.0	6.0	5.0	4.0
Max	295	421	236	182	97	99	92	234	98
Total	2852	3928	5138	4184	1963	1864	1891	2456	2399

*Excludes anonymous contacts

**Data before 2016 are from iPHIS[7]

Contacts by Age

57. Contacts of Respiratory Cases in BC by Age Group, 2010 to 2018*

Age Group**	2010	2011	2012	2013	2014	2015	2016	2017	2018
<1 Year	14	9	16	29	6	20	31	21	26
1-4 Years	62	71	114	98	69	104	116	155	91
5-9 Years	70	142	164	150	57	66	86	67	76
10-19 Years	203	241	359	337	151	84	111	132	157
20-39 Years	1028	1257	1599	1172	624	537	581	750	896
40-59 Years	943	1402	1883	1538	712	665	573	811	802
60+ Years	510	758	975	828	318	366	389	520	351
Unknown	22	48	28	32	26	22	4	0	0

*Data before 2016 are from iPHIS[7]

**Age at time of source case diagnosis

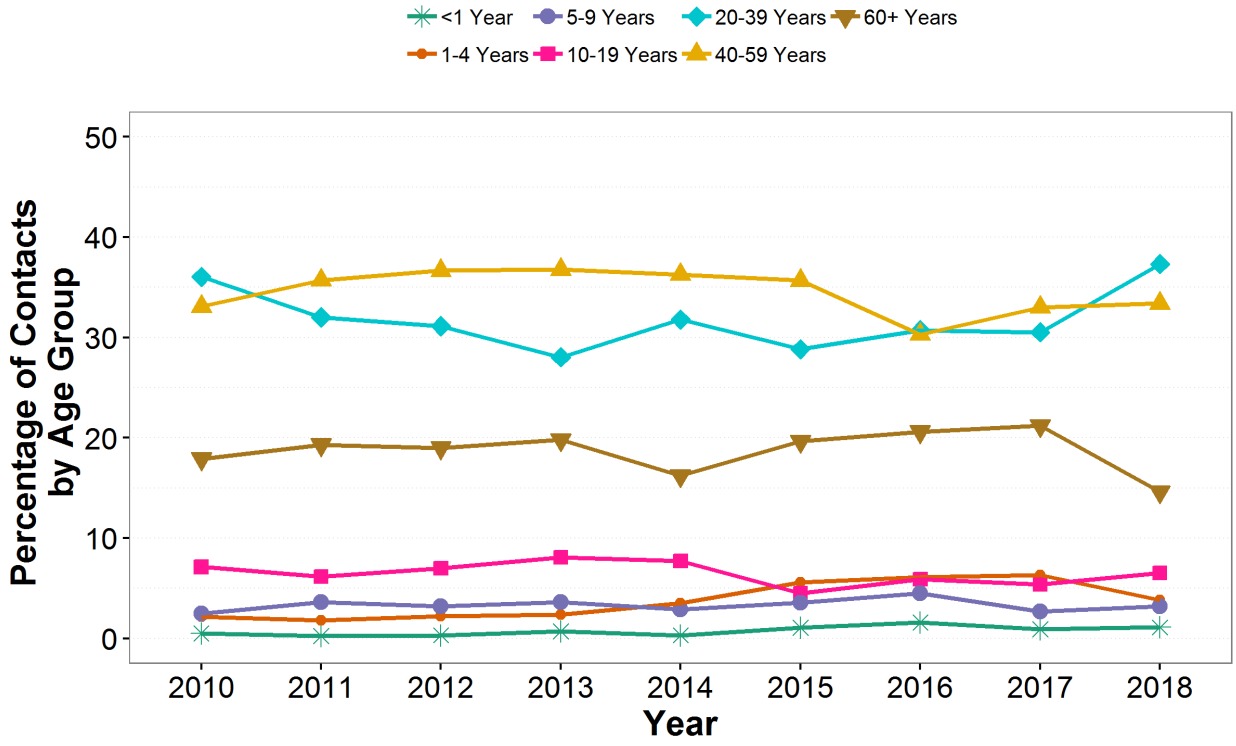
58. Percentage of Contacts of Respiratory Cases in BC by Age Group, 2010 to 2018*

Age Group**	2010	2011	2012	2013	2014	2015	2016	2017	2018
<1 Year	0.5	0.2	0.3	0.7	0.3	1.1	1.6	0.9	1.1
1-4 Years	2.2	1.8	2.2	2.3	3.5	5.6	6.1	6.3	3.8
5-9 Years	2.5	3.6	3.2	3.6	2.9	3.5	4.5	2.7	3.2
10-19 Years	7.1	6.1	7.0	8.1	7.7	4.5	5.9	5.4	6.5
20-39 Years	36.0	32.0	31.1	28.0	31.8	28.8	30.7	30.5	37.3
40-59 Years	33.1	35.7	36.6	36.8	36.3	35.7	30.3	33.0	33.4
60+ Years	17.9	19.3	19.0	19.8	16.2	19.6	20.6	21.2	14.6
Unknown	0.8	1.2	0.5	0.8	1.3	1.2	0.2	0.0	0.0

*Data before 2016 are from iPHIS[7]

**Age at time of source case diagnosis

59. Percentage of Contacts of Respiratory Cases in BC by Age Group, 2010 to 2018



Contacts by Country of Birth

60. Contacts of Respiratory Cases in BC by Country of Birth, 2010 to 2018*

Country of Birth	2010	2011	2012	2013	2014	2015	2016	2017	2018
Born Outside of Canada	1062	1143	1525	1604	888	906	767	955	1169
Canadian Born	1231	1722	2635	1701	778	769	790	975	951
Missing**	559	1063	978	879	297	189	334	526	279

*Data before 2016 are from iPHIS[7]

**Unknown or undocumented country of birth

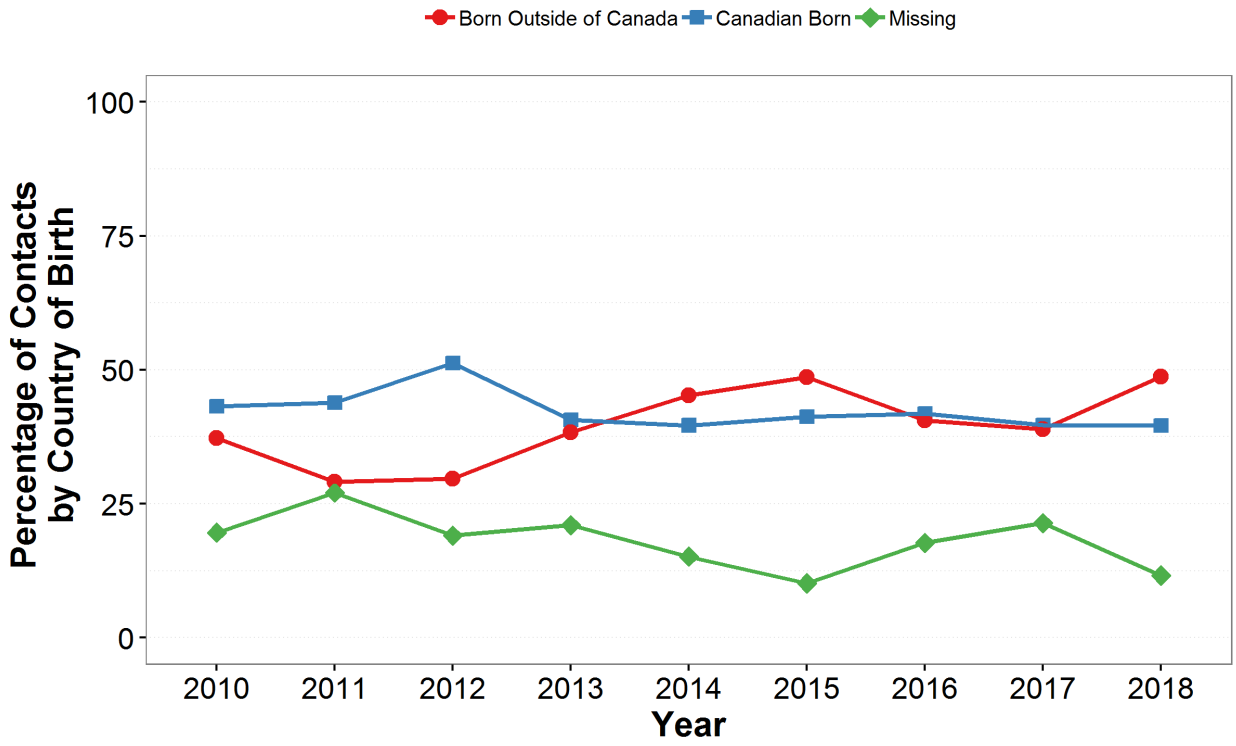
61. Percentage of Contacts of Respiratory Cases in BC by Country of Birth, 2010 to 2018*

Country of Birth	2010	2011	2012	2013	2014	2015	2016	2017	2018
Born Outside of Canada	37.2	29.1	29.7	38.3	45.2	48.6	40.6	38.9	48.7
Canadian Born	43.2	43.8	51.3	40.7	39.6	41.3	41.8	39.7	39.6
Missing**	19.6	27.1	19.0	21.0	15.1	10.1	17.7	21.4	11.6

*Data before 2016 are from iPHIS[7]

**Unknown or undocumented country of birth

62. Percentage of Contacts of Respiratory Cases in BC by Country of Birth, 2010 to 2018



Contact Tracing Cascade of Care

The contact tracing cascade of care provides insights on activities aimed to end the cycle of transmission through prompt screening and treatment of contacts. It enables better understanding of where losses are occurring among the follow-up activities and may inform areas where public health interventions can be strengthened. See Case Definitions section for indicator definitions.

This report presents data on the cascade of care for contacts of respiratory cases in BC aged 5 years and older reported in 2016 and 2017, due to the extended duration of treatment and corresponding delay in reporting. Only contacts of source cases reported since Panorama implementation (i.e., since March 12, 2016) are included in the cascade due to data quality challenges in the iPHIS-converted contacts data. Those less than 5 years of age were excluded as they typically represent recent transmission and thus the approach is to identify the source case rather than to contact trace (e.g., reverse contact investigation).

Of respiratory cases aged 5 years and older diagnosed in 2017, there were 2446 contacts identified, among whom 89.3% (2185 contacts) completed an initial assessment, 18.2% (444 contacts) had a positive IGRA or TST screen (a proxy for LTBI infection), and only 0.6% (15 contacts) were identified as secondary cases (Table 66). Of the 444 contacts who had a positive screen, 25.5% (113 contacts) started and completed latent TB treatment. A high proportion of contacts (89.3%, 2185 contacts) in 2017 completed their initial assessment (Table 66), with the vast majority (86.6%, 2119 contacts) having completed it within 26 weeks of the source case being diagnosed (Table 64). In 2016 and 2017, treatment initiation and completion were steps where the greatest drops in the cascade were observed. Additionally, the data illustrated that it can take 52 weeks or more post source case diagnosis to get contacts through treatment (Table 65; Table 66; Figure 67). Note that contacts and screenings may be underreported in Panorama and these data should be interpreted with caution.

63. Contact Tracing Indicators Among Contacts of Respiratory Cases* in BC Aged 5 Years and Older by Completion at 12 Weeks After Source Case Diagnosis, 2016 to 2017

	Count		Percentage^	
Indicator	**2016***	**2017**	**2016***	**2017**
Number of contacts	**1583**	**2446**	**100.0**	**100.0**
Started initial assessment	**1327**	**1802**	**83.8**	**73.7**
Completed initial assessment	**1288**	**1760**	**81.4**	**72.0**
- IGRA	230	389	14.5	15.9
- TST	972	1255	61.4	51.3
- XRay	86	116	5.4	4.7
Secondary cases	**7**	**7**	**0.4**	**0.3**
Positive screen**	**223**	**298**	**14.1**	**12.2**
- IGRA	29	23	1.8	0.9
- TST	194	275	12.3	11.2
Started treatment	**29**	**27**	**1.8**	**1.1**
Completed treatment	**0**	**0**	**0.0**	**0.0**

*Only includes source cases reported since Panorama implementation (i.e., since March 12, 2016)
**For contacts with both IGRA and TST positive results, the IGRA date and result was used
^Percentage of total contacts reported

64. Contact Tracing Indicators Among Contacts of Respiratory Cases* in BC Aged 5 Years and Older by Completion at 26 Weeks After Source Case Diagnosis, 2016 to 2017

	Count		Percentage^	
Indicator	**2016***	**2017**	**2016***	**2017**
Number of contacts	**1583**	**2446**	**100.0**	**100.0**
Started initial assessment	**1469**	**2196**	**92.8**	**89.8**
Completed initial assessment	**1449**	**2119**	**91.5**	**86.6**
- IGRA	273	460	17.2	18.8
- TST	1077	1517	68.0	62.0
- XRay	99	142	6.3	5.8
Secondary cases	**8**	**10**	**0.5**	**0.4**
Positive screen**	**299**	**397**	**18.9**	**16.2**
- IGRA	71	78	4.5	3.2
- TST	228	319	14.4	13.0
Started treatment	**70**	**80**	**4.4**	**3.3**
Completed treatment	**0**	**4**	**0.0**	**0.2**

*Only includes source cases reported since Panorama implementation (i.e., since March 12, 2016)
**For contacts with both IGRA and TST positive results, the IGRA date and result was used
^Percentage of total contacts reported

65. Contact Tracing Indicators Among Contacts of Respiratory Cases* in BC Aged 5 Years and Older by Completion at 52 weeks After Source Case Diagnosis, 2016 to 2017

	Count		Percentage^	
Indicator	**2016***	**2017**	**2016***	**2017**
Number of contacts	**1583**	**2446**	**100.0**	**100.0**
Started initial assessment	**1489**	**2241**	**94.1**	**91.6**
Completed initial assessment	**1470**	**2165**	**92.9**	**88.5**
- IGRA	279	470	17.6	19.2
- TST	1088	1548	68.7	63.3
- XRay	103	147	6.5	6.0
Secondary cases	**8**	**13**	**0.5**	**0.5**
Positive screen**	**317**	**433**	**20.0**	**17.7**
- IGRA	89	103	5.6	4.2
- TST	228	330	14.4	13.5
Started treatment	**91**	**141**	**5.7**	**5.8**
Completed treatment	**34**	**56**	**2.1**	**2.3**

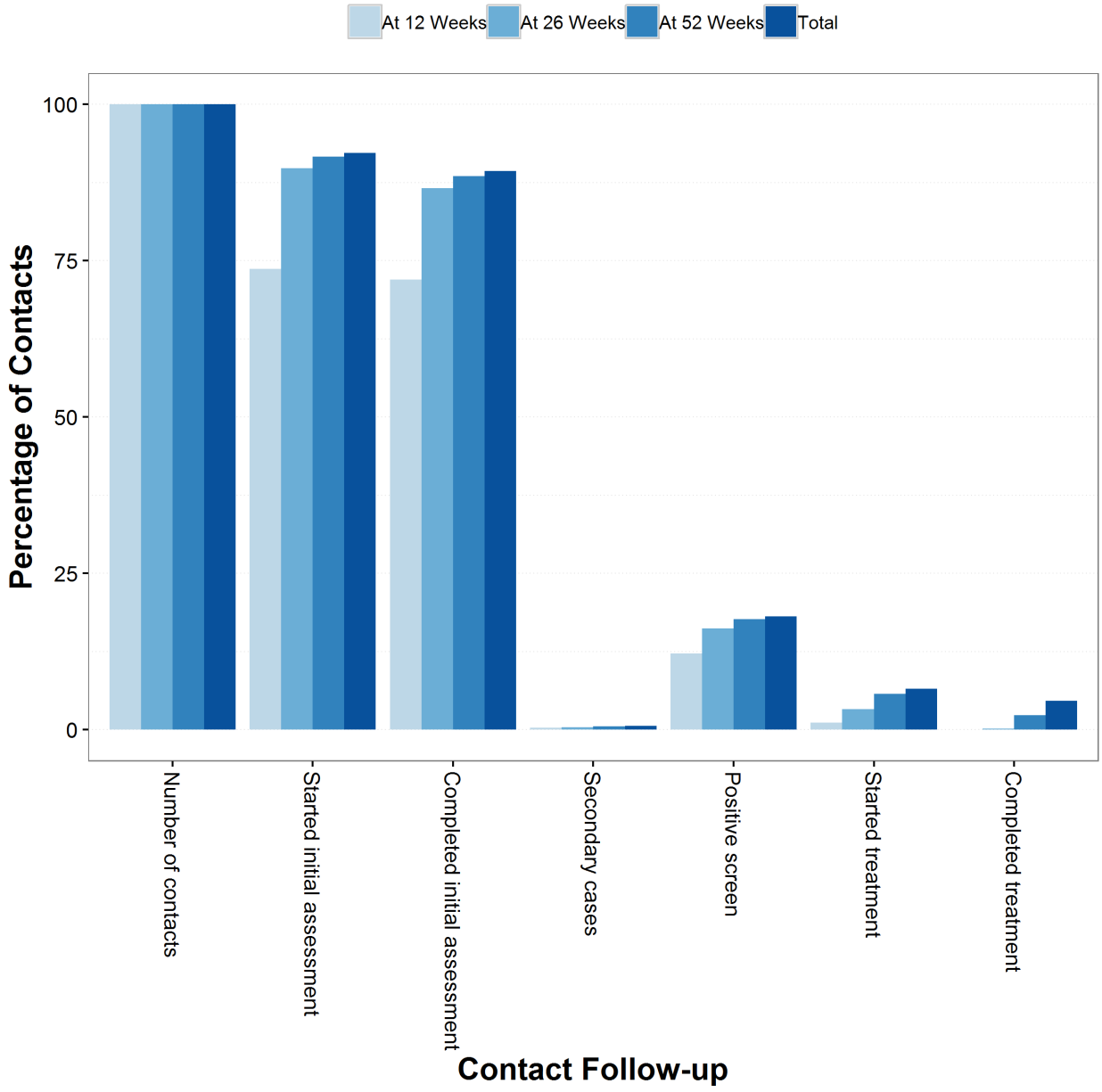
*Only includes source cases reported since Panorama implementation (i.e., since March 12, 2016)
**For contacts with both IGRA and TST positive results, the IGRA date and result was used
^Percentage of total contacts reported

66. Contact Tracing Indicators Among Contacts of Respiratory Cases* in BC Aged 5 Years and Older by Completion (Total) After Source Case Diagnosis, 2016 to 2017

	Count		Percentage^	
Indicator	**2016***	**2017**	**2016***	**2017**
Number of contacts	**1583**	**2446**	**100.0**	**100.0**
Started initial assessment	**1498**	**2256**	**94.6**	**92.2**
Completed initial assessment	**1479**	**2185**	**93.4**	**89.3**
- IGRA	282	473	17.8	19.3
- TST	1091	1560	68.9	63.8
- XRay	106	152	6.7	6.2
Secondary cases	**12**	**15**	**0.8**	**0.6**
Positive screen**	**330**	**444**	**20.8**	**18.2**
- IGRA	100	108	6.3	4.4
- TST	230	336	14.5	13.7
Started treatment	**107**	**160**	**6.8**	**6.5**
Completed treatment	**75**	**113**	**4.7**	**4.6**

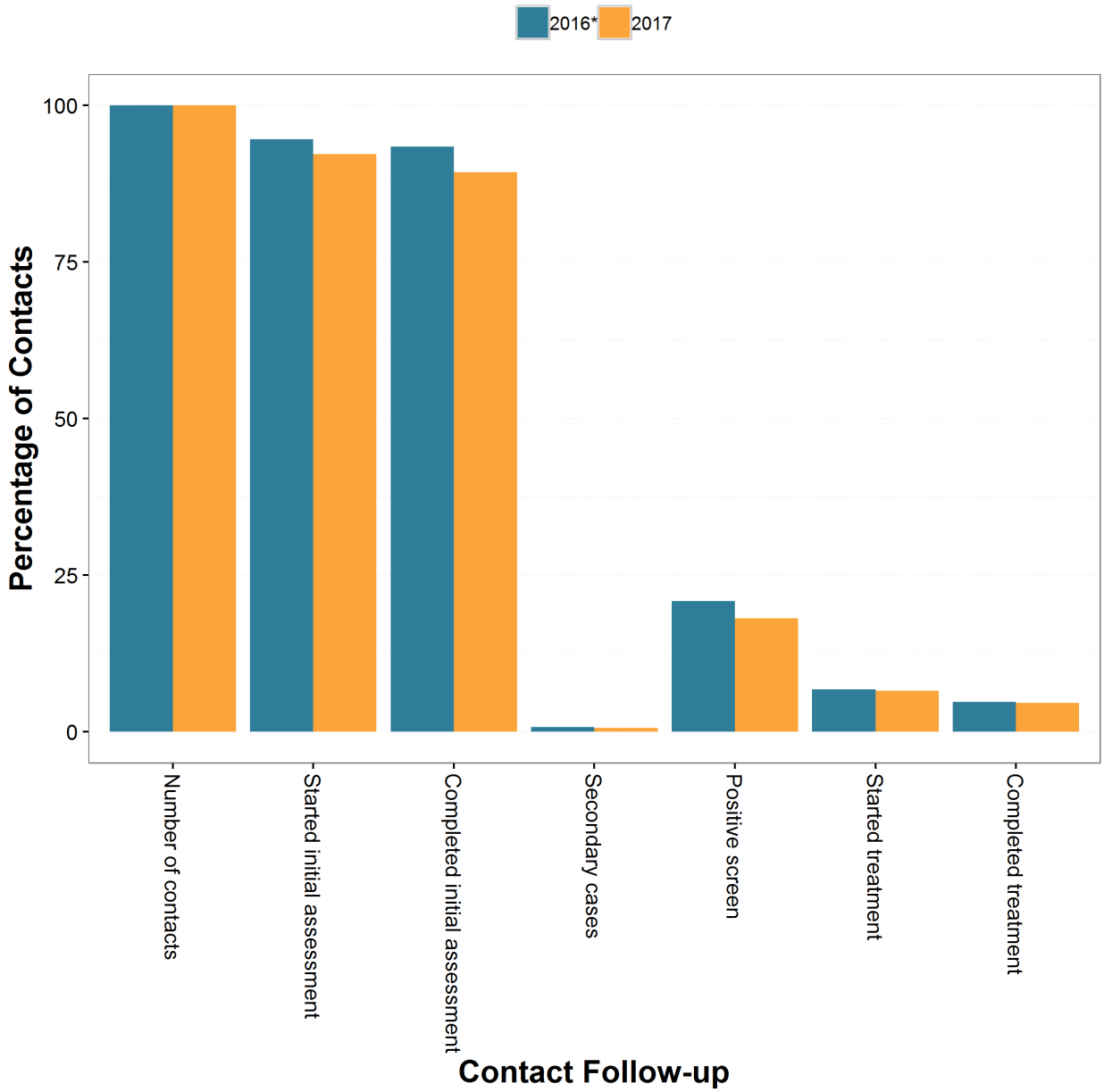
*Only includes source cases reported since Panorama implementation (i.e., since March 12, 2016)
**For contacts with both IGRA and TST positive results, the IGRA date and result was used
^Percentage of total contacts reported

67. Contact Tracing Indicators Among Contacts of Respiratory Cases in BC Aged 5 Years and Older by Completion After Source Case Diagnosis, 2017*



*Percentage of total contacts reported

68. Contact Tracing Indicators Among Contacts* of Respiratory Cases in BC Aged 5 Years and Older by Completion (Total) After Source Case Diagnosis, 2016 to 2017**



*Only includes source cases reported since Panorama implementation (i.e., since March 12, 2016)
**Percentage of total contacts reported

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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.
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- 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 Leslie Chiang, Camille Herpin, and Claire Swanston for assisting with case reporting.
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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, laboratory data, LTBI data, and contact data were extracted from Panorama on November 27, 2019. HIV screening and co-infection data was extracted November 11, 2019 from 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 or testing with a pseudonym, particularly those with a negative test result, would not be represented in this report.
- The contact information presented in this report includes only contacts of source cases identified in BC, residing in BC at time of investigation, and linked to a source case in Panorama. The data does not include contacts identified as part of federal airplane screening, contacts of sources cases not located in BC, or anonymous contacts. Regions may have separate databases for contact investigation and for the investigation of clusters/outbreaks, that may not be reported in Panorama. As a result, the data presented does not reflect the full workload of contact tracing teams.

- The contact evaluation cascade of care indicators are based on contact screening conducted after the source case was diagnosed, and does not capture contact screening initiated before the source case was diagnosed.

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 non-respiratory 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 re-treatment within 6 months).

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 date;
- Active TB cases with a negative HIV test result within a 90 day period before or after the TB diagnosis date.

Drug Resistance

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

B. Site of Disease

Since Panorama's implementation, 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 eosophogeal tuberculosis)
- cavitation of lung tuberculosis
- intrathoracic lymph node tuberculosis
- nose or sinus tuberculosis

Non-respiratory sites

- meningeal tuberculosis
- central nervous systemt 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. Latent Tuberculosis Infection (LTBI)

The clinical definition for LTBI is based on a complex mix of demographic characteristics and the presence of co-morbidities. As a surrogate, we report on clients who have started LTBI treatment in the TB annual report, which is likely an underestimate of the actual number of LTBI cases.

D. Treatment Completion

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

Treatment Completed: A Treatment Start Date and 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 with no Treatment End Date, or the 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.

E. TB Contact Tracing Cascade of Care Indicators

Denominator - Number of contacts: Number of unique contacts linked to respiratory TB cases 5 years of age and older in Panorama (i.e., since March 12, 2016), excluding contacts residing outside of BC at time of investigation. For contacts who were exposed to more than one source case in the reporting year, the earliest exposure for the contact (i.e., based on source case surveillance date) was used.

Indicator 1 - Started initial assessment: Number of contacts who started any of the following after the source case surveillance date (i.e., diagnosis date): Tuberculin Skin Test (TST) planted, Interferon-Gamma Release Assay (IGRA) test, or X-Ray. For contacts who received more than one type of screen, the earliest screen date was used.

Indicator 2 - Completed initial assessment: Number of contacts who completed any of the following after the source case surveillance date: TST read with valid result, IGRA test with valid result, or X-Ray. For contacts who received more than one type of screen, the earliest screen date was used.

Indicator 3 - Secondary cases: Number of total contacts with disease classification of confirmed or clinical active TB diagnosed after the source case surveillance date.

Indicator 4 - Positive screen: Number of contacts who are not secondary cases and with any of the following after the source case surveillance date: a reactive IGRA, or a positive TST (without a subsequent non-reactive IGRA). For contacts who received more than one TST in contact follow-up, any positive result would be considered. For contacts with both IGRA and TST positive results, the IGRA date and result was used. This is proxy measure for clients with LTBI.

Indicator 5 - Started treatment: Number of contacts with a positive screen and a LTBI treatment start date after the source case surveillance date.

Indicator 6 - Completed treatment: Number of contacts with a LTBI treatment start date and treatment status reported as completed satisfactorily after the source case surveillance date.

Indicators are reported based on the year the source case was diagnosed.

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, contact follow-up), 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 regional 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.[8] 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.

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