BC Centre for Disease Control
PROVINCIAL HEALTH SERVICES AUTHORITY

TB

Annual Report 2022

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2022

Summary of Trends

TB Disease

- In 2022, the rate of tuberculosis (TB) disease in BC was 6.2 per 100,000 population (328 cases) similar to what was seen in 2021 (322 cases).
- Regional rates of TB disease in 2022 were greatest in the Fraser Health (8.8/100,000 population; 178 cases) and the Vancouver Coastal Health (7.4/100,000 population; 94 cases) regions.
- Males had a higher rate of TB disease (6.5/100,000 population; 172 cases) than females (5.8/100,000 population; 156 cases) in 2022.
- Rates of TB disease among males and females were generally greater in older age groups.
- In 2022, 85.1% (279 cases) of all cases of TB disease were among individuals born outside of Canada which is similar to historical trends. Among this group, the rate of TB disease was 17.0 per 100,000 population.
- In 2022, 63.7% (209 cases) of TB cases had known HIV status (either through lab report or self-report of HIV diagnosis), a decrease from 75.5% (243 cases) in 2021. Of those with known HIV status, none had a known HIV infection as compared to 1.6% of cases (4 cases) that were co-infected in 2021.
- The majority of TB cases (75.3%, 247 cases) had at least one respiratory site as part of their diagnosis in 2022.
- The majority (75.4%, 242 cases) of TB cases diagnosed in 2021 completed their treatment within 12 months.
- While rates of isoniazid-resistant TB had been increasing in BC since 2017, rates of rifampin and multi-drug resistance have remained low. In 2022, 5.8% (19 cases) of all TB cases had isoniazid resistance, down from 8.7% (28 cases) in 2021. Five cases of multi-drug resistant TB (i.e. resistance to both isoniazid and rifampin) were seen in 2022 (1.5%), up from 0.3% (1 case) in 2021.

TB Infection Treatment

- A total of 664 individuals were started on TB infection (TBI) treatment in 2021, of which 64.5% (428 clients) successfully completed treatment within 6 months and only 1.2% (8 clients) took longer than 12 months to complete treatment.
- Of those that started TBI treatment, 14.6% (97 clients) were documented with incomplete treatment in 2021.
- TBI treatment was more commonly reported among those born outside of Canada and those 40 years of age and older.

Contact Tracing

- In 2022, a total of 986 contacts were reported with a corresponding mean of 4.0 contacts (median= 2.0) per respiratory TB case.
- Among all contacts of respiratory TB cases aged 5 years and older in 2021 (1525 total contacts), 84.4% (1287 contacts) completed an initial assessment, 0.9% (13 contacts) were diagnosed with TB disease (i.e. secondary cases), 12.8% (195 contacts) screened positive, and 6.8% (104 contacts) successfully completed TBI treatment.

TB Disease

TB Disease Historical Trends

In BC, the rate of TB disease was 6.2 per 100,000 population (328 cases) in 2022, similar to 2021 (322 cases) (Table 2; Figure 1). Overall, the rate of TB disease in BC has been stable over the past decade. Despite the emergence of COVID-19 in 2020 – and the associated public health restrictions – BC rates of TB disease did not appear to have been impacted by the pandemic. Similarly, the rate of TB disease in Canada has stayed generally stable over the past decade and in 2022 the national rate was 5.1 per 100,000 population.[1] Stable rates of TB disease highlight the need for ongoing public health approaches to reduce the burden of TB and that support the provincial[2] and national[3] milestones for the reduction of morbidity and mortality related to TB disease. This is of particular consideration as the population in Canada, and BC, is expected to continue growing[4] which would increase the demand for health services and impact our ability to meet elimination goals by 2035 if we do not adapt our current strategies.[5]

TB Disease by Health Authority of Residence

In 2022, the rate of TB disease was highest in Fraser Heath (8.8/100,000 population, 178 cases), followed by Vancouver Coastal Health (7.4/100,000 population, 94 cases), Northern Health (4.3/100,000 population, 13 cases), Island Health (3.2/100,000 population, 28 cases), and Interior Health (1.8/100,000 population, 15 cases). The rate of TB disease in Interior Health, Vancouver Coastal Health, and Northern Health decreased in 2022 compared to 2021, while there was an increase for Island Health in 2022 (Table 4; Figure 2). There was no change observed for Fraser Health. Accordingly, the highest rates of TB disease at the Health Service Delivery Area (HSDA) level were observed within Fraser Health (Fraser East, Fraser North, Fraser South) and Vancouver Coastal Health (Richmond, Vancouver, North Shore/Coast Garibaldi) (Figure 3). The higher TB rates in Fraser Health and Vancouver Coastal Health regions may be influenced by the larger numbers of people from high TB incidence countries settling in these regions,[4] although rates have been relatively stable in these areas since 2018.

TB Disease by Gender and Age Group

The rate of TB disease has been historically higher in males than in females. In 2022, the TB disease rate in males was 6.5 per 100,000 population (172 cases) compared to 5.8 per 100,000 population (156 cases) in females (Table 6; Figure 4). Relative to 2021, rates slightly decreased among females and increased among males in 2022. TB disease rates among females and males were generally greater in older age groups, which has been a consistent trend (Table 8; Figure 5; Figure 6). Rates of TB disease have remained low in the youngest age groups (≤19 years) with

some annual fluctuation most notably among 10-19 year olds. TB disease in those <5 years of age usually indicates primary infection acquired from a recent transmission with a TB case. There were no cases TB disease diagnosed in those <5 years of age in 2022 (Table 7).

TB Disease by Country of Birth

In 2022, 85.1% (279 cases) of TB cases in BC occurred in those born outside of Canada (Table 10; Figure 8) which is similar to historical trends. This proportion of cases corresponds to a rate of 17.0 per 100,000 population in 2022, similar to 17.2 per 100,000 population in 2021 (Table 11; Figure 9). Rates of TB disease were greatest among those born outside of Canada across all health authorities (Table 13; Figure 11). Of all TB cases in 2022, 14.3% (47 cases) were born in Canada, similar to the 14.6% (47 cases) in 2021 (Table 10; Figure 8). In 2022, the rate of TB disease among Canadian born cases was 1.4 per 100,000 population as was seen in 2021 (Table 11; Figure 9). See Data Sources for more information on how rates were calculated.

Many of BC's recent immigrants come from regions with high rates of TB disease such as the South East Asia and Western Pacific regions as defined by the World Health Organization.[6] TB disease among individuals born outside of Canada appears to result largely from reactivation of TB infection, and local transmission is generally low.[7] Immigration, Refugees and Citizenship Canada (IRCC) currently screens immigrants applying for permanent residency for TB disease, 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 routine screening mandated by IRCC.

TB Disease by HIV Status

In 2022, 63.7% (209 cases) of TB cases had known HIV status (either through lab report or self-report of HIV diagnosis), a decrease from 75.5% (243 cases) in 2021 (Table 19; Figure 14). Over the preceding decade, less than 5% of TB cases with known HIV status were co-infected with TB/HIV. Of those with known HIV status, none had HIV infection in 2022 as compared to 1.6% (4 cases) that were co-infected in 2021.

TB Disease by Site of Disease

The diagnostic site describes the primary clinical location of TB disease. Respiratory disease is generally more transmissible than non-respiratory disease. Of the TB disease reported in BC in 2022, 75.3% (247 cases) were respiratory cases which is within historical trends (Table 21; Figure 15).

TB Disease Treatment Outcomes

Treatment outcomes are reported for TB cases diagnosed in 2021 owing to the potentially long duration of treatment and follow up, including delayed data entry. Post-mortem diagnoses are excluded (1 case in 2021). Of those diagnosed with TB disease in 2021 (321 cases), 97.5% (313

cases) were documented to have started treatment (Table 23; Figure 16). There were 8 cases (2.5%) with no treatment documented in 2021, with 6 of these cases having died before treatment was initiated (Table 22).

Among diagnosed TB cases, 83.2% (267 cases) successfully completed treatment with the majority (75.4%, 242 cases) completing treatment within 12 months (Table 23; Figure 16). There were additionally 27 cases (8.4%) that died during treatment, 4 cases (1.2%) that stopped treatment because of drug reaction/intolerance, and 5 cases (1.6%) that were either lost to follow up or had unknown or other reason for not completing treatment (Table 25; Figure 17).

Of those that died during treatment (27 cases), 24 cases (88.9%) were documented with TB contributing to, but not being the underlying cause of death, 2 cases (7.4%) had a cause of death unrelated to their TB disease, and one case (3.7%) had an unknown cause of death. In 2021, no deaths had TB disease listed as the underlying cause (Table 25). Mortality with TB as a contributory cause of death has increased and reached a high in 2021 (Table 25). This trend should be monitored closely as it may be signaling an underlying process that needs to be addressed.

TB Disease Drug Resistance

Drug resistant TB disease is an important public health issue globally that can lead to lengthier, more complex, and more expensive treatment regimens.[8] For this reason, provincial surveillance is essential. Isoniazid resistance had been increasing in BC since 2017. Nevertheless, isoniazid resistance comprised 5.8% of cases (19 cases) in 2022, down from 8.7% (28 cases) in 2021 (Table 27; Figure 18). There were 5 cases (1.5%) of multi-drug resistant TB identified in 2022 (i.e. resistance to both isoniazid and rifampin), an increase from 0.3% (1 case) in 2021 and the highest rate seen since 2016. There was one case of rifampin resistant TB in 2022, which has historically been below 1% of all cases (Table 27; Figure 18).

TB Disease Historical Trends

Table 1. TB Cases in BC, 2013 to 2022

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
BC	281	305	288	255	308	303	314	315	322	328

Table 2. TB Disease Rates* in BC and Canada, 2013 to 2022

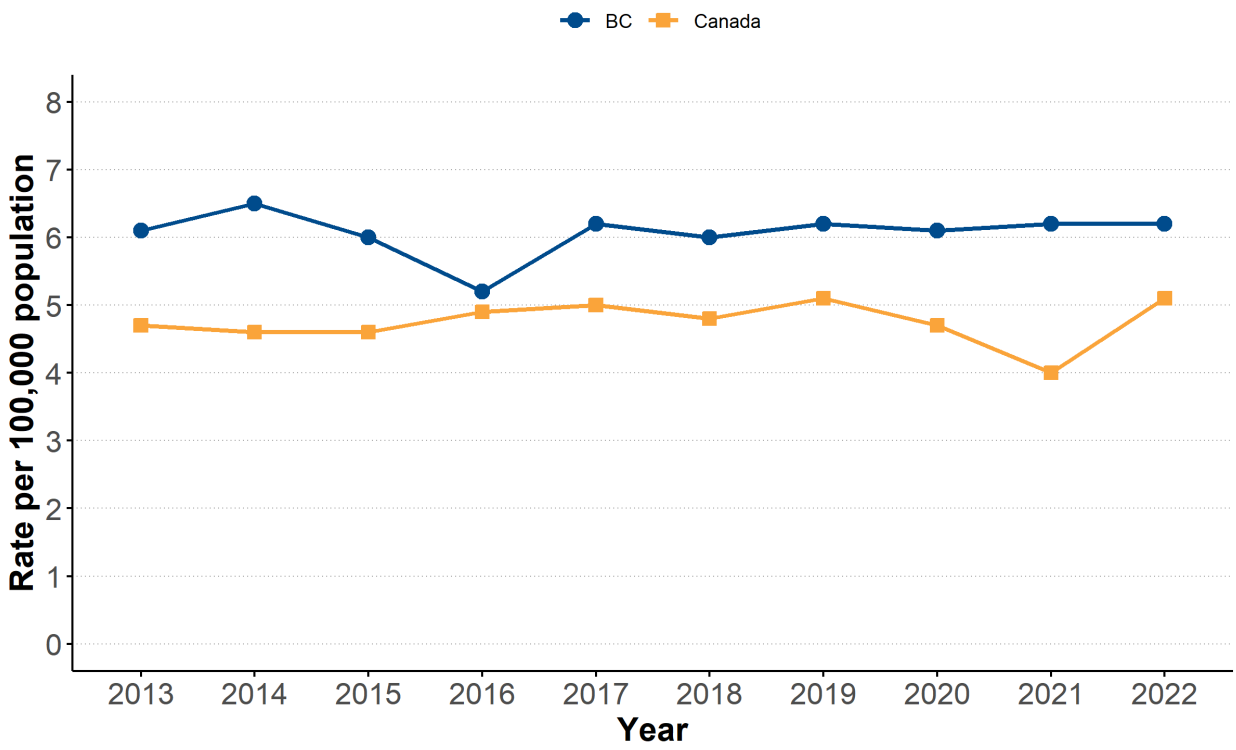
Year	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
BC[+]	6.1	6.5	6.0	5.2	6.2	6.0	6.2	6.1	6.2	6.2
Canada**	4.7	4.6	4.6	4.9	5.0	4.8	5.1	4.7	4.0	5.1

*All rates are per 100,000 population

[+]Population denominators come from 2022 Population Estimates from BC Stats[9]

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

Figure 1. TB Disease Rates in BC and Canada*, 2013 to 2022



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

TB Disease by Health Authority of Residence

Table 3. TB Cases by Health Authority in BC, 2013 to 2022

Health Authority*	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Interior Health	24	15	9	13	13	18	12	14	16	15
Fraser Health	139	143	125	128	152	164	166	173	173	178
Vancouver Coastal Health	96	125	124	95	121	97	99	106	94	94
Island Health	10	12	16	9	17	16	23	13	22	28
Northern Health	12	10	14	10	5	8	14	9	17	13

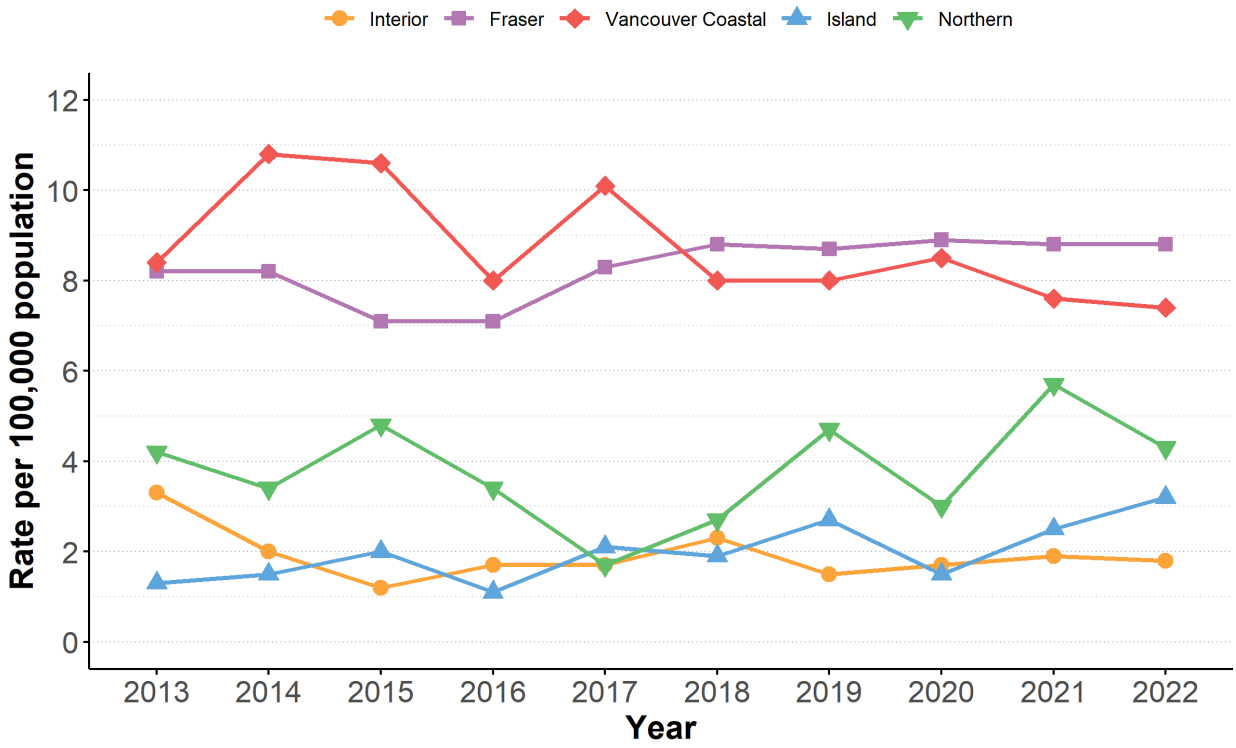
*Residence at time of diagnosis

Table 4. TB Disease Rates by Health Authority in BC, 2013 to 2022

Health Authority*	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Interior Health	3.3	2.0	1.2	1.7	1.7	2.3	1.5	1.7	1.9	1.8
Fraser Health	8.2	8.2	7.1	7.1	8.3	8.8	8.7	8.9	8.8	8.8
Vancouver Coastal Health	8.4	10.8	10.6	8.0	10.1	8.0	8.0	8.5	7.6	7.4
Island Health	1.3	1.5	2.0	1.1	2.1	1.9	2.7	1.5	2.5	3.2
Northern Health	4.2	3.4	4.8	3.4	1.7	2.7	4.7	3.0	5.7	4.3

*Residence at time of diagnosis

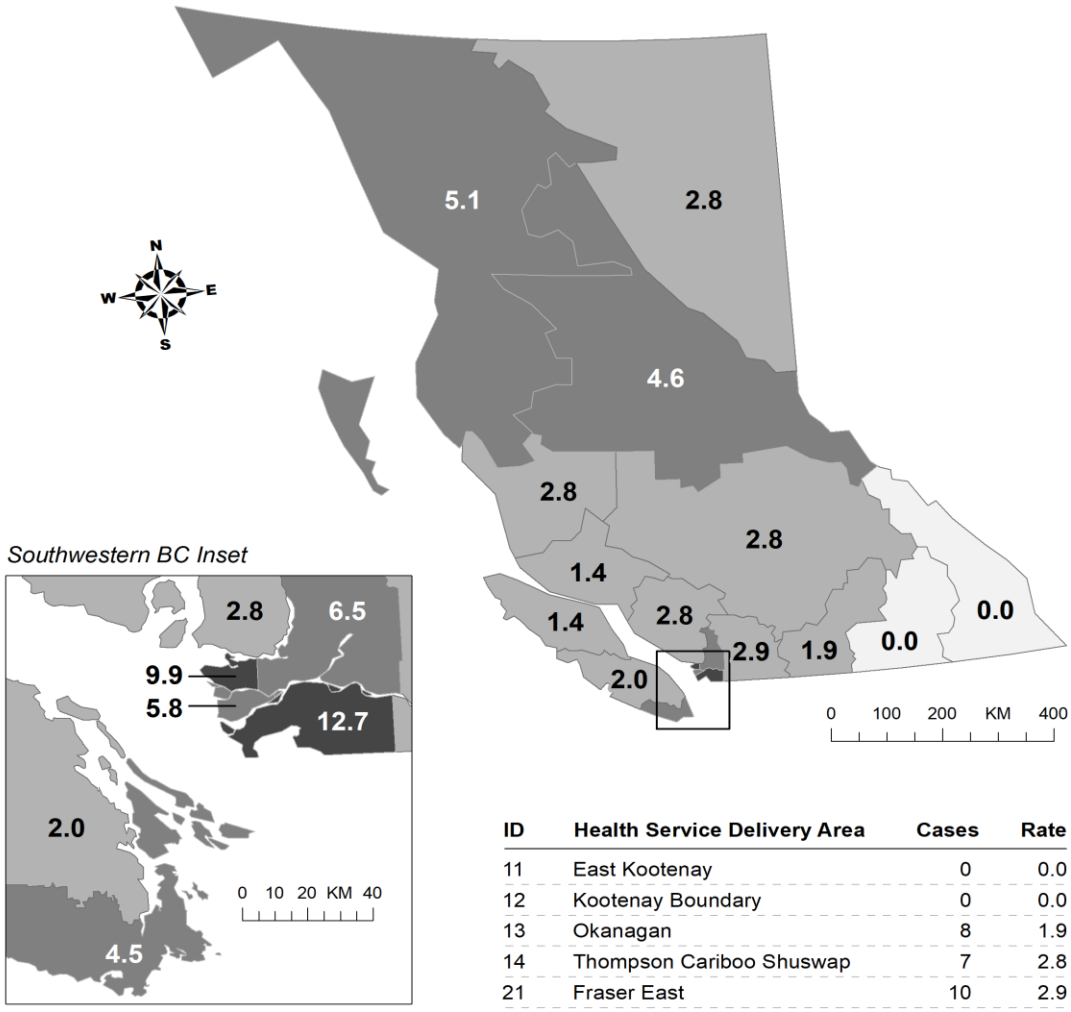
Figure 2. TB Disease Rates by Health Authority* in BC, 2013 to 2022



*Residence at time of diagnosis

TB Disease by Health Service Delivery Area

Figure 3. TB Disease Rates by Health Service Delivery Area*+ in BC, 2022



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	0	0.0
13	Okanagan	8	1.9
14	Thompson Cariboo Shuswap	7	2.8
21	Fraser East	10	2.9
22	Fraser North	48	6.5
23	Fraser South	120	12.7
31	Richmond	13	5.8
32	Vancouver	72	9.9
33	North Shore/Coast Garibaldi	9	2.8
41	South Vancouver Island	20	4.5
42	Central Vancouver Island	6	2.0
43	North Vancouver Island	2	1.4
51	Northwest	4	5.1
52	Northern Interior	7	4.6
53	Northeast	2	2.8

*Health Service Delivery Area determined by residence at time of case
+Population denominators come from 2022 Population Estimates from BC Stats[9]

TB Disease by Gender and Age Group

Table 5. TB Cases by Gender in BC, 2013 to 2022

Gender	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Female	131	137	153	119	143	139	146	147	160	156
Male	150	168	135	136	165	164	168	168	162	172

Table 6. TB Disease Rates by Gender in BC, 2013 to 2022

Gender	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Female	5.6	5.8	6.3	4.8	5.7	5.5	5.7	5.6	6.1	5.8
Male	6.5	7.2	5.7	5.7	6.8	6.6	6.7	6.6	6.3	6.5

Figure 4. TB Disease Rates by Gender in BC, 2013 to 2022

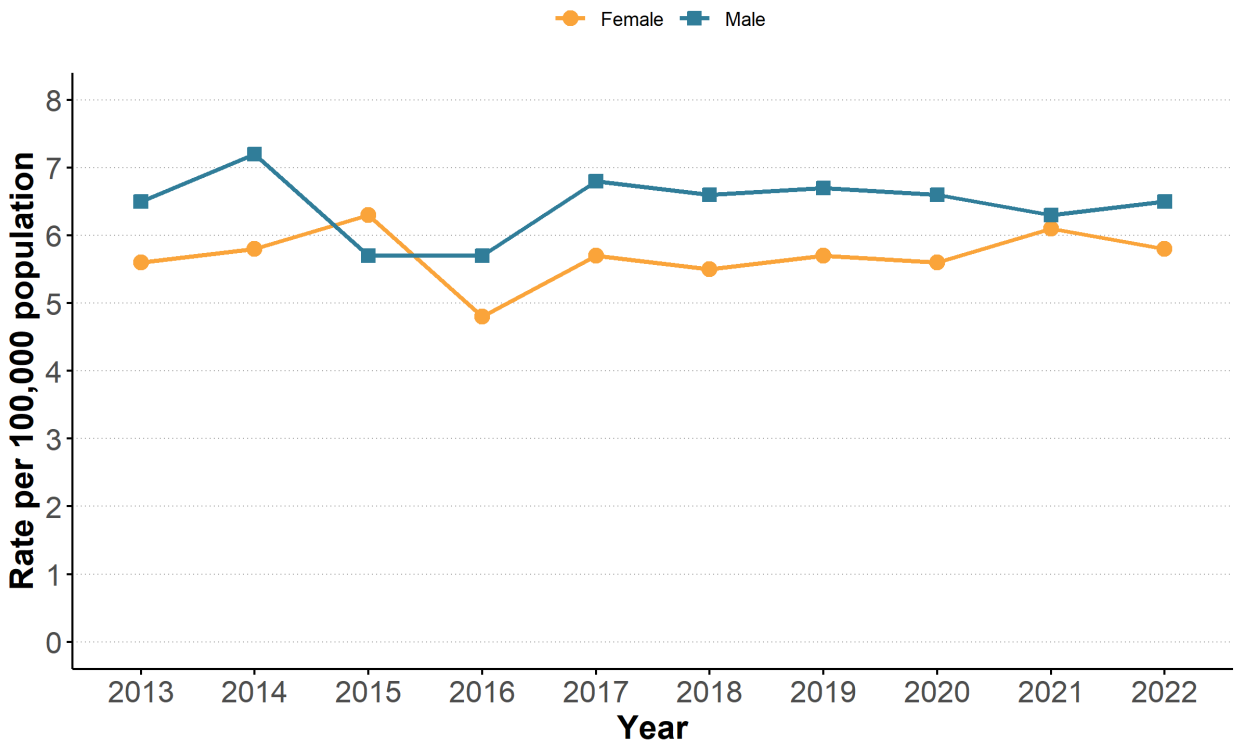


Table 7. TB Cases by Gender and Age Group in BC, 2013 to 2022

Gender	Age Group*	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Female	<1 Year	1	0	1	1	0	0	0	0	0	0
	1-4 Years	1	4	1	1	1	0	1	2	0	0
	5-9 Years	2	0	1	2	0	0	0	0	1	0
	10-19 Years	5	2	5	4	7	5	11	14	6	7
	20-39 Years	35	40	35	42	45	40	47	47	49	55
	40-59 Years	31	41	42	17	30	41	21	27	44	26
	60+ Years	56	50	68	52	60	53	66	57	60	68
Male	<1 Year	1	0	0	0	1	0	1	0	0	0
	1-4 Years	1	1	1	1	3	2	0	0	3	0
	5-9 Years	2	0	0	0	2	0	1	0	0	0
	10-19 Years	5	8	5	4	8	3	7	6	1	6
	20-39 Years	27	33	23	28	32	50	44	52	54	38
	40-59 Years	44	50	43	44	41	37	32	43	35	52
	60+ Years	70	76	63	59	78	72	83	67	69	76

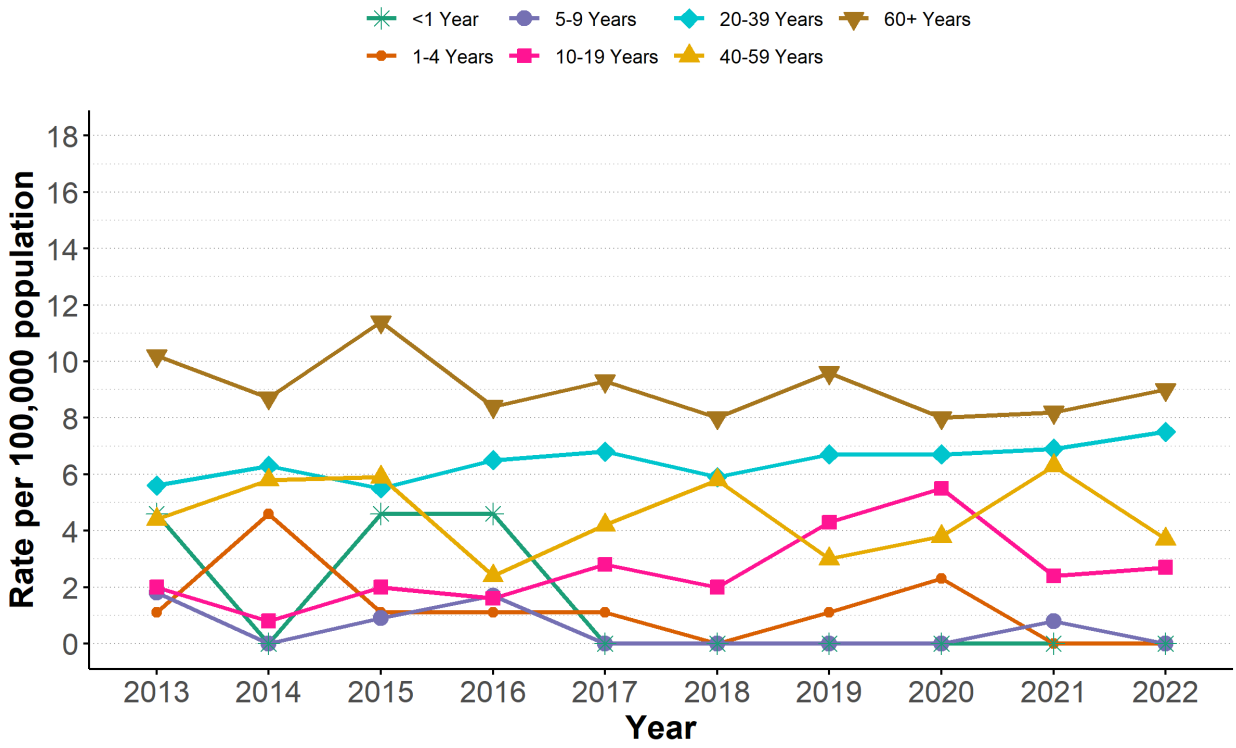
*Age at time of diagnosis

Table 8. TB Disease Rates by Gender and Age Group in BC, 2013 to 2022

Gender	Age Group*	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Female	<1 Year	4.6	0.0	4.6	4.6	0.0	0.0	0.0	0.0	0.0	0.0
	1-4 Years	1.1	4.6	1.1	1.1	1.1	0.0	1.1	2.3	0.0	0.0
	5-9 Years	1.8	0.0	0.9	1.7	0.0	0.0	0.0	0.0	0.8	0.0
	10-19 Years	2.0	0.8	2.0	1.6	2.8	2.0	4.3	5.5	2.4	2.7
	20-39 Years	5.6	6.3	5.5	6.5	6.8	5.9	6.7	6.7	6.9	7.5
	40-59 Years	4.4	5.8	5.9	2.4	4.2	5.8	3.0	3.8	6.3	3.7
	60+ Years	10.2	8.7	11.4	8.4	9.3	8.0	9.6	8.0	8.2	9.0
Male	<1 Year	4.4	0.0	0.0	0.0	4.3	0.0	4.5	0.0	0.0	0.0
	1-4 Years	1.1	1.1	1.1	1.0	3.1	2.1	0.0	0.0	3.2	0.0
	5-9 Years	1.7	0.0	0.0	0.0	1.6	0.0	0.8	0.0	0.0	0.0
	10-19 Years	1.9	3.0	1.9	1.5	3.0	1.1	2.6	2.3	0.4	2.2
	20-39 Years	4.3	5.1	3.5	4.2	4.7	7.1	6.1	7.0	7.2	4.9
	40-59 Years	6.5	7.4	6.3	6.5	6.1	5.5	4.8	6.4	5.2	7.7
	60+ Years	14.1	14.7	11.8	10.6	13.6	12.1	13.5	10.5	10.5	11.3

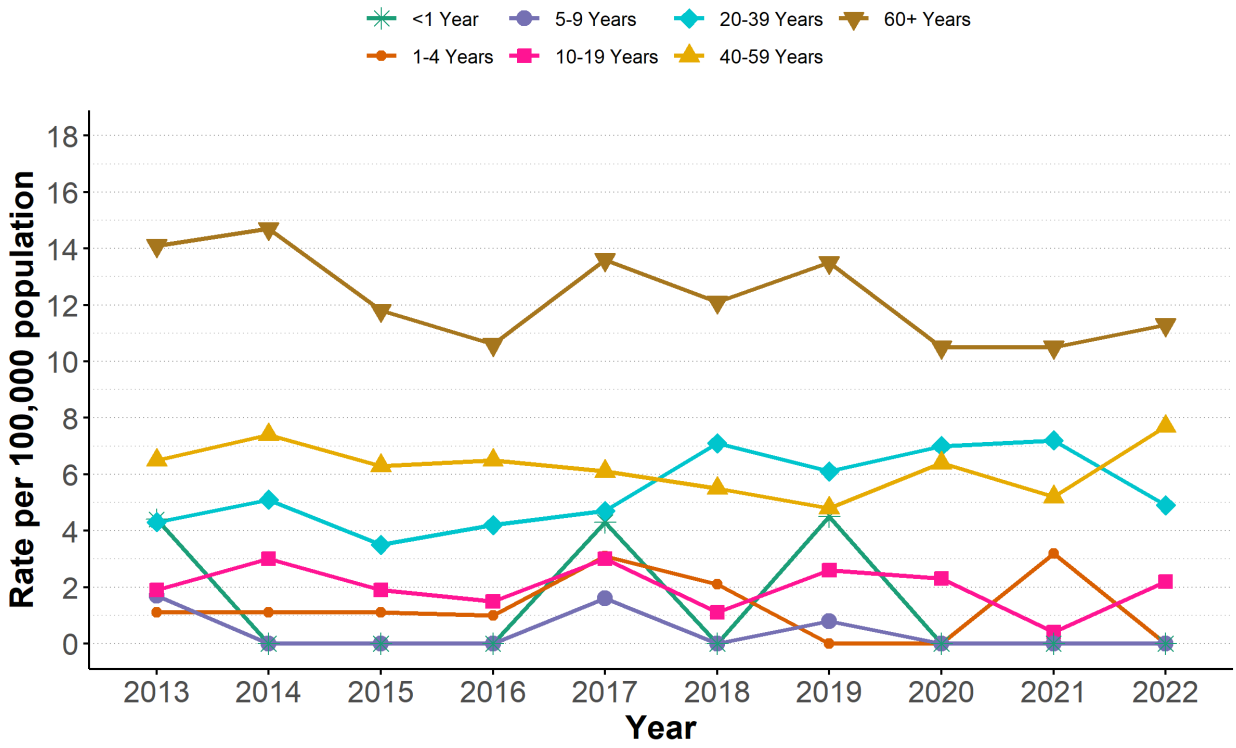
*Age at time of diagnosis

Figure 5. TB Disease Rates Among Females by Age Group* in BC, 2013 to 2022



*Age at time of diagnosis

Figure 6. TB Disease Rates Among Males by Age Group in BC, 2013 to 2022



*Age at time of diagnosis

TB Disease by Country of Birth

Table 9. TB Cases by Country of Birth in BC, 2013 to 2022

Country of Birth	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Born Outside of Canada	221	247	245	211	259	269	264	263	274	279
Canadian Born	54	57	39	33	44	32	47	49	47	47
Missing*	6	1	4	11	5	2	3	3	1	2

*Unknown or undocumented country of birth

Figure 7. TB Cases by Country of Birth in BC, 2013 to 2022

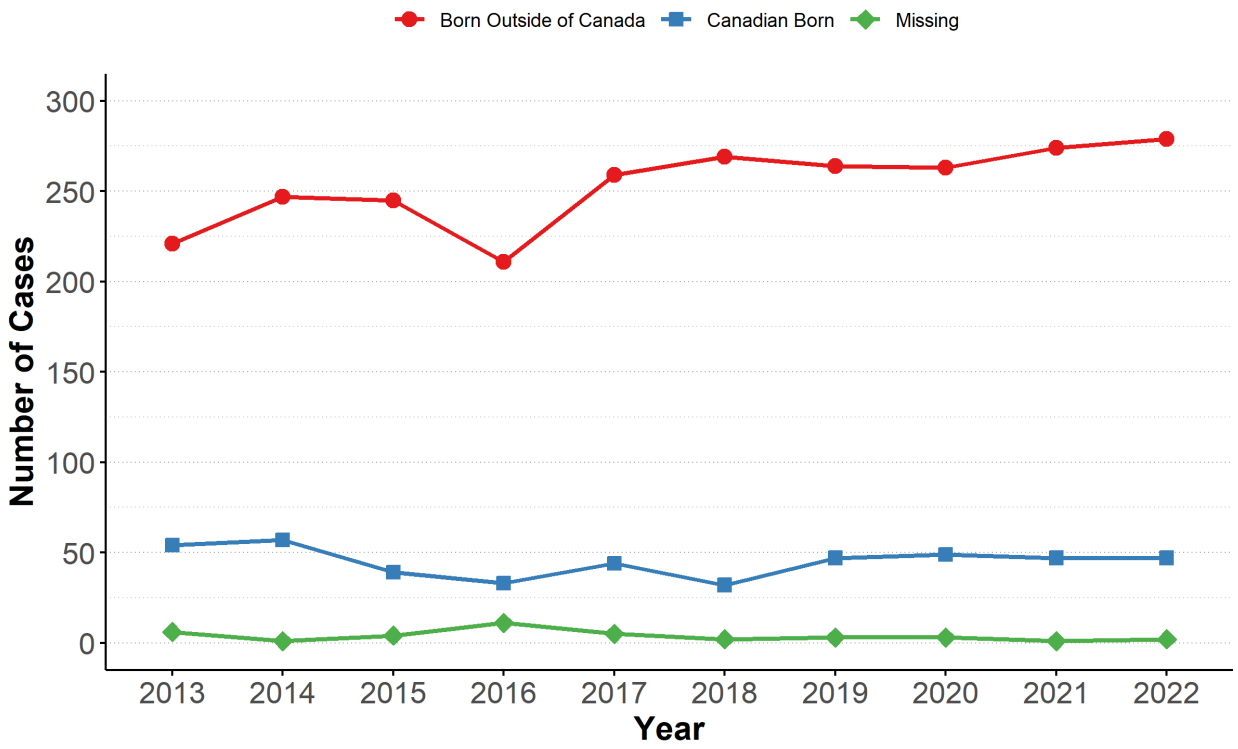


Table 10. Percentage of TB Cases by Country of Birth in BC, 2013 to 2022

Country of Birth	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Born Outside of Canada	78.6	81.0	85.1	82.7	84.1	88.8	84.1	83.5	85.1	85.1
Canadian Born	19.2	18.7	13.5	12.9	14.3	10.6	15.0	15.6	14.6	14.3
Missing*	2.1	0.3	1.4	4.3	1.6	0.7	1.0	1.0	0.3	0.6

*Unknown or undocumented country of birth

Figure 8. Percentage of TB Cases by Country of Birth in BC, 2013 to 2022

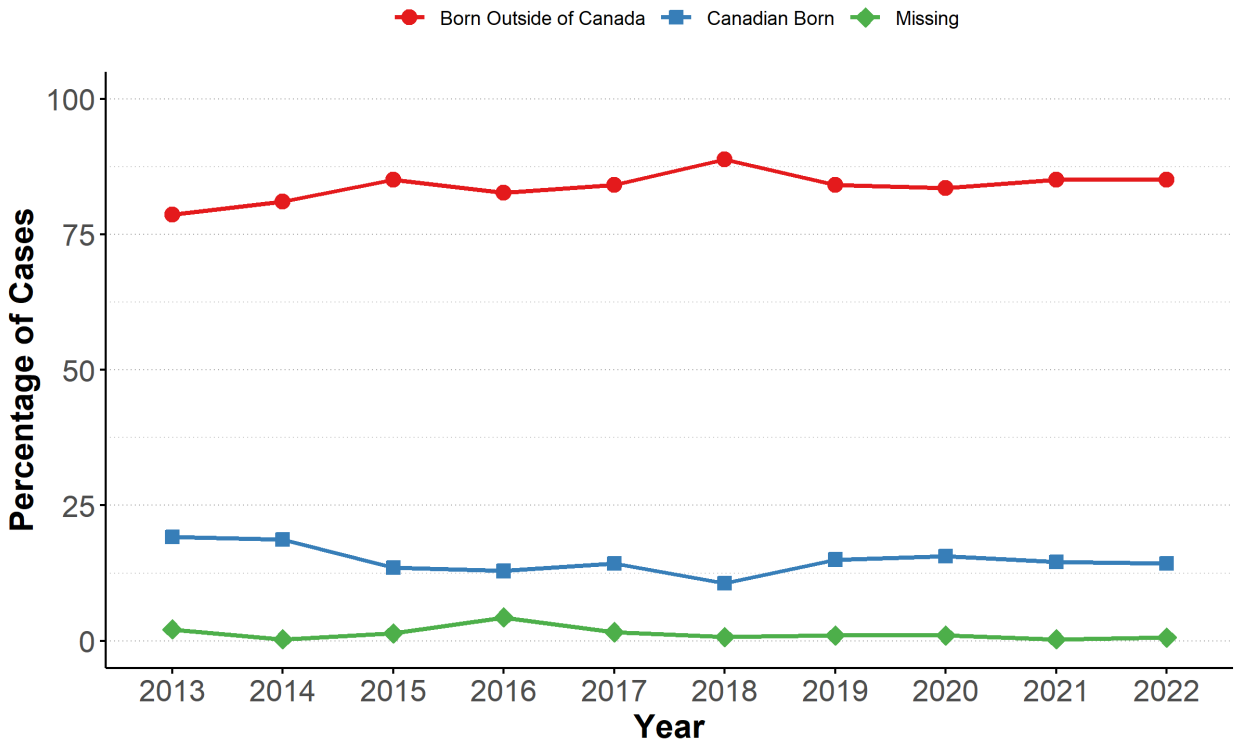
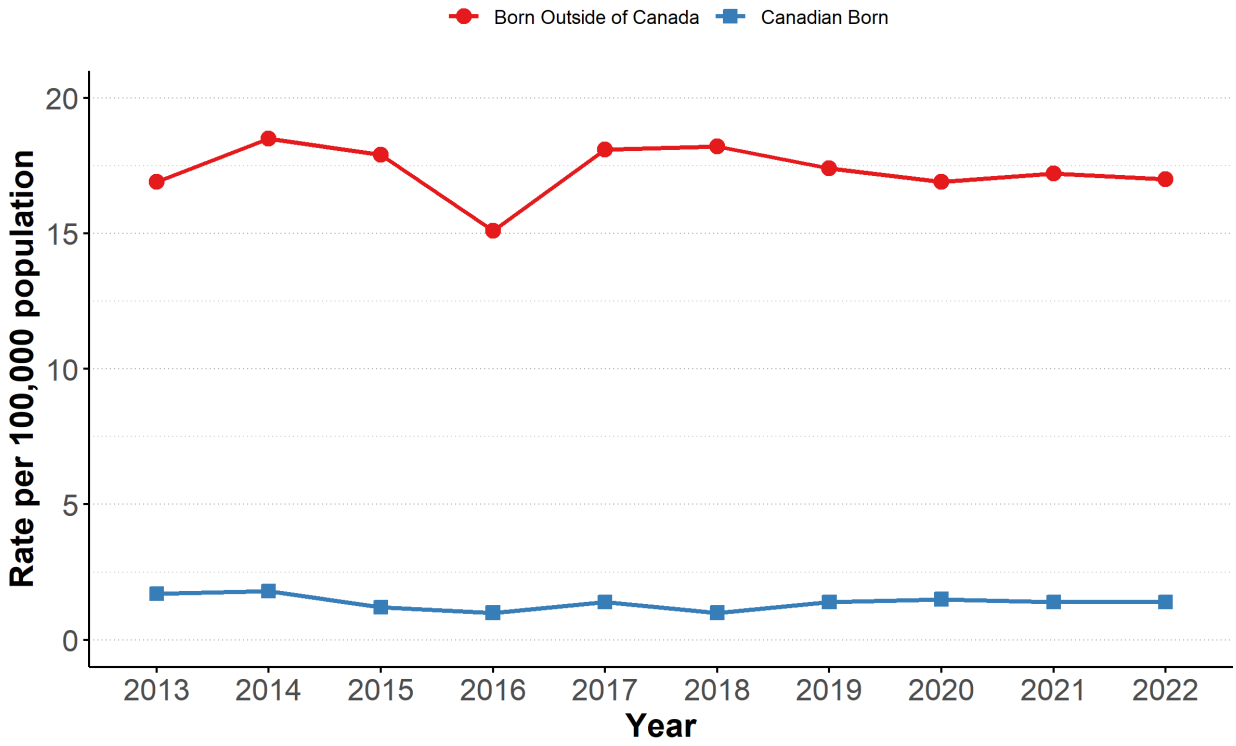


Table 11. TB Disease Rates by Country of Birth in BC, 2013 to 2022

Country of Birth	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Born Outside of Canada	16.9	18.5	17.9	15.1	18.1	18.2	17.4	16.9	17.2	17.0
Canadian Born	1.7	1.8	1.2	1.0	1.4	1.0	1.4	1.5	1.4	1.4

Figure 9. TB Disease Rates by Country of Birth in BC, 2013 to 2022



TB Disease by Country of Birth and Health Authority

Table 12. TB Cases by Country of Birth and Health Authority in BC, 2013 to 2022

Health Authority*	Country of Birth	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Interior Health	Born Outside of Canada	14	7	8	10	12	13	11	10	10	14
	Canadian Born	8	8	1	2	1	5	1	4	6	1
Fraser Health	Born Outside of Canada	118	125	113	115	133	146	145	149	161	169
	Canadian Born	18	18	10	8	18	18	19	23	11	8
Vancouver Coastal Health	Born Outside of Canada	80	103	110	78	106	93	87	94	85	76
	Canadian Born	15	22	13	13	13	4	11	11	9	18
Island Health	Born Outside of Canada	5	8	10	6	8	14	13	9	11	15
	Canadian Born	5	4	6	3	7	2	10	4	11	12
Northern Health	Born Outside of Canada	4	4	4	2	0	3	8	1	7	5
	Canadian Born	8	5	9	7	5	3	6	7	10	8

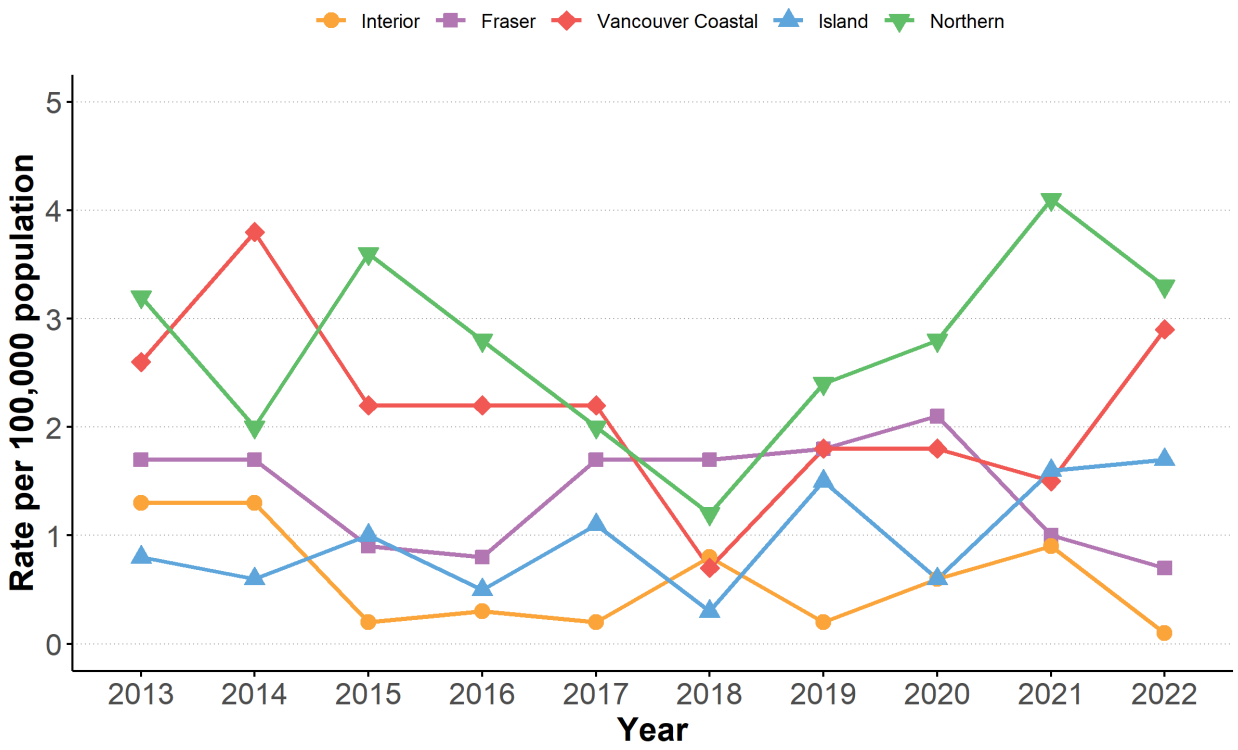
*Residence at time of diagnosis

Table 13. TB Disease Rates by Country of Birth and Health Authority in BC, 2013 to 2022

Health Authority*	Country of Birth	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Interior Health	Born Outside of Canada	16.6	8.1	9.1	11.2	13.0	13.6	11.2	9.9	9.6	13.1
	Canadian Born	1.3	1.3	0.2	0.3	0.2	0.8	0.2	0.6	0.9	0.1
Fraser Health	Born Outside of Canada	20.4	21.0	18.5	18.3	20.3	21.5	20.6	20.4	21.3	21.7
	Canadian Born	1.7	1.7	0.9	0.8	1.7	1.7	1.8	2.1	1.0	0.7
Vancouver Coastal Health	Born Outside of Canada	16.0	20.4	21.5	15.1	20.1	17.4	16.0	17.0	15.1	13.3
	Canadian Born	2.6	3.8	2.2	2.2	2.2	0.7	1.8	1.8	1.5	2.9
Island Health	Born Outside of Canada	4.1	6.4	7.9	4.6	6.0	10.3	9.4	6.4	7.6	10.2
	Canadian Born	0.8	0.6	1.0	0.5	1.1	0.3	1.5	0.6	1.6	1.7
Northern Health	Born Outside of Canada	14.9	14.7	14.5	7.1	0.0	10.3	27.2	3.3	23.1	16.3
	Canadian Born	3.2	2.0	3.6	2.8	2.0	1.2	2.4	2.8	4.1	3.3

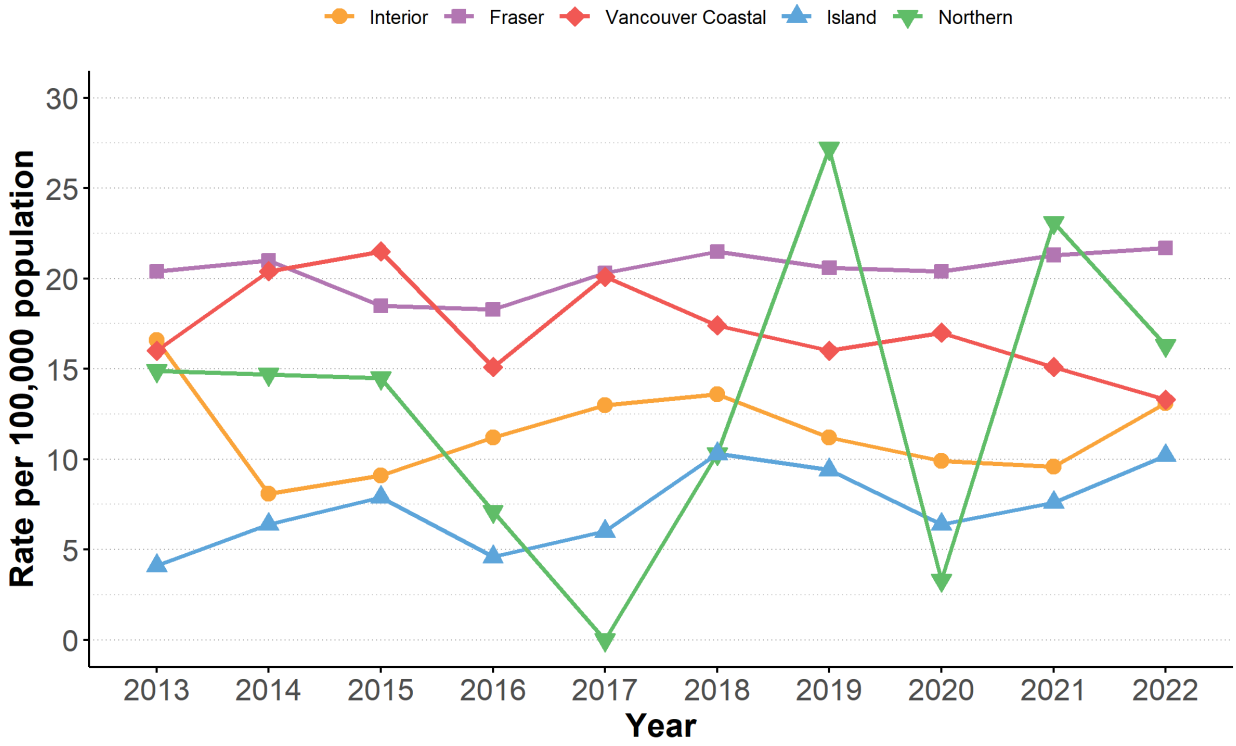
*Residence at time of diagnosis

Figure 10. TB Disease Rates Among Canadian Born Population by Health Authority* in BC, 2013 to 2022



*Residence at time of diagnosis

Figure 11. TB Disease Rates Among Population Born Outside of Canada by Health Authority* in BC, 2013 to 2022



*Residence at time of diagnosis

TB Disease Among Canadian Born Population by Age Group

Table 14. TB Cases Among Canadian Born Population by Age Group, 2013 to 2022

Age Group*	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<1 Year	2	0	1	1	1	0	1	0	0	0
1-4 Years	1	4	1	2	3	0	0	2	2	0
5-9 Years	2	0	0	2	2	0	0	0	1	0
10-19 Years	4	3	4	1	4	0	4	5	1	2
20-39 Years	8	14	8	8	14	6	9	10	10	10
40-59 Years	23	21	14	9	13	13	14	18	18	16
60+ Years	14	15	11	10	7	13	19	14	15	19

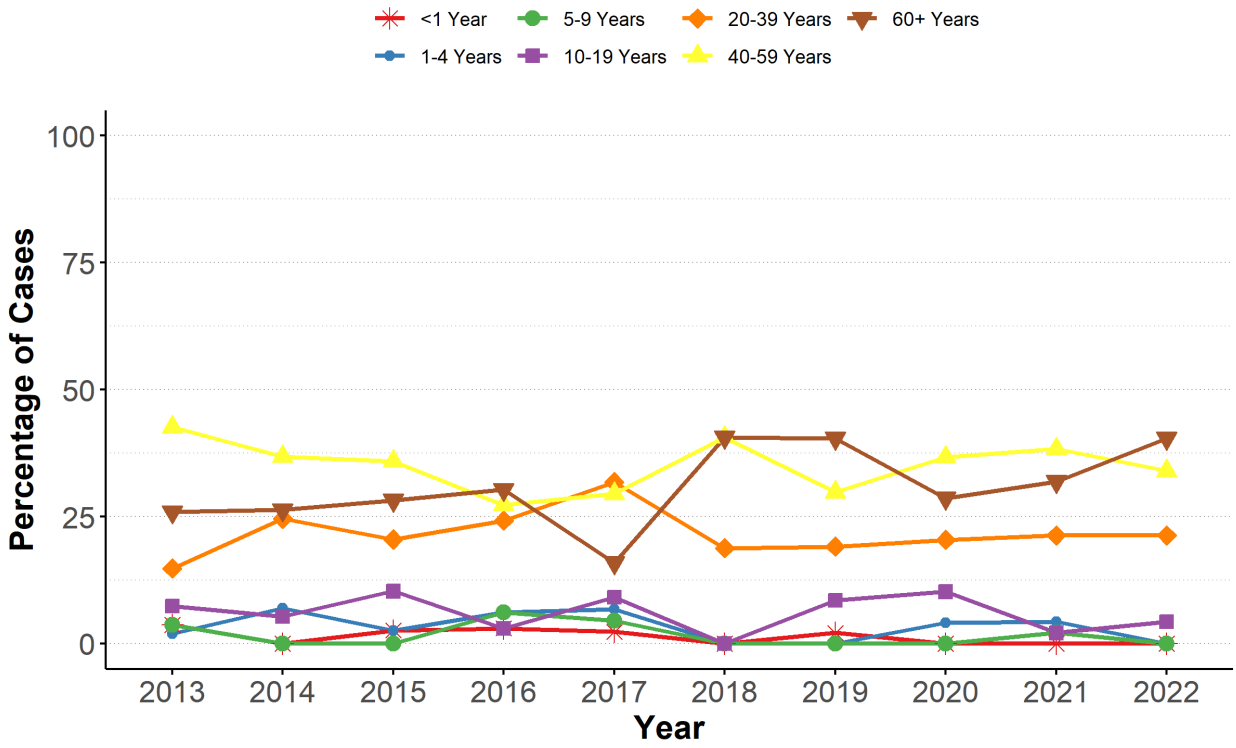
*Age at time of diagnosis

Table 15. Percentage of TB Cases Among Canadian Born Population by Age Group, 2013 to 2022

Age Group*	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<1 Year	3.7	0.0	2.6	3.0	2.3	0.0	2.1	0.0	0.0	0.0
1-4 Years	1.9	7.0	2.6	6.1	6.8	0.0	0.0	4.1	4.3	0.0
5-9 Years	3.7	0.0	0.0	6.1	4.5	0.0	0.0	0.0	2.1	0.0
10-19 Years	7.4	5.3	10.3	3.0	9.1	0.0	8.5	10.2	2.1	4.3
20-39 Years	14.8	24.6	20.5	24.2	31.8	18.8	19.1	20.4	21.3	21.3
40-59 Years	42.6	36.8	35.9	27.3	29.5	40.6	29.8	36.7	38.3	34.0
60+ Years	25.9	26.3	28.2	30.3	15.9	40.6	40.4	28.6	31.9	40.4

*Age at time of diagnosis

Figure 12. Percentage of TB Cases Among Canadian Born Population by Age Group*, 2013 to 2022



*Age at time of diagnosis

TB Disease Among Population Born Outside of Canada by Age Group

Table 16. TB Cases Among Population Born Outside of Canada by Age Group, 2013 to 2022

Age Group*	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<1 Year	0	0	0	0	0	0	0	0	0	0
1-4 Years	1	1	1	0	1	2	0	0	1	0
5-9 Years	2	0	1	0	0	0	1	0	0	0
10-19 Years	6	7	6	7	11	8	14	15	6	11
20-39 Years	54	59	50	60	62	84	82	88	93	82
40-59 Years	51	70	69	49	57	65	38	52	61	61
60+ Years	107	110	118	95	128	110	129	108	113	125

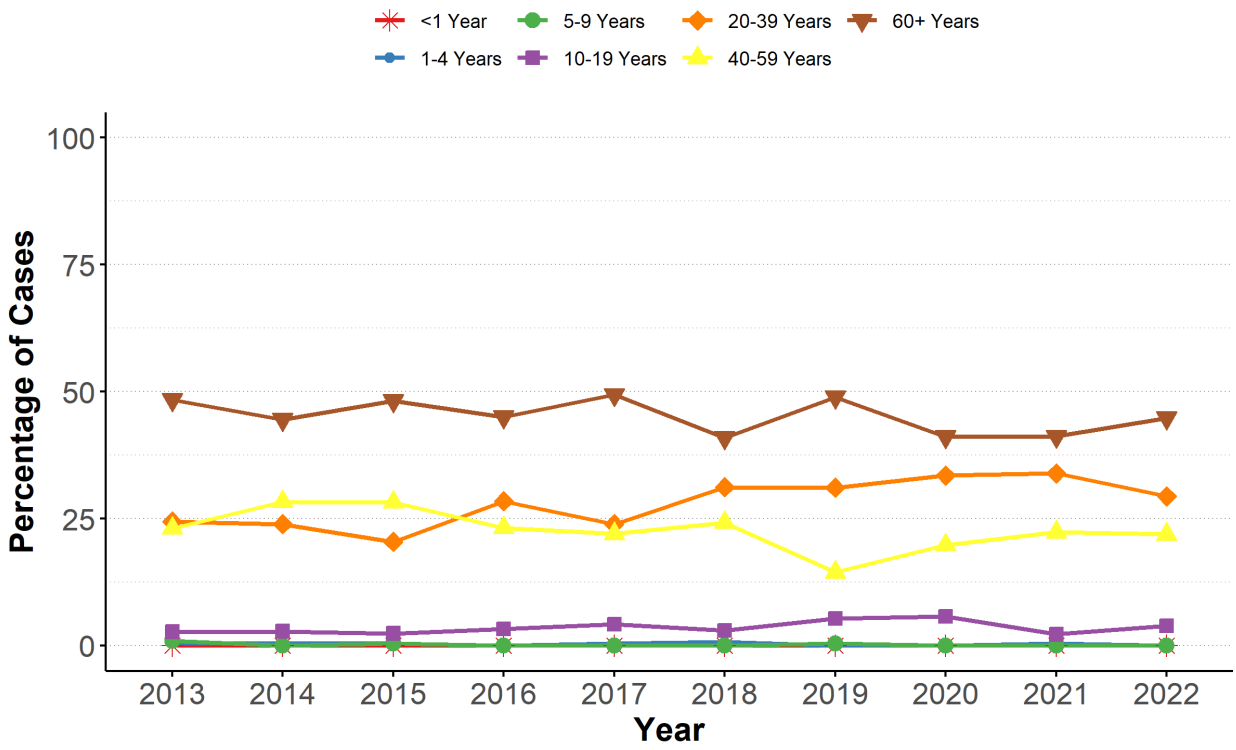
*Age at time of diagnosis

Table 17. Percentage of TB Cases Among Population Born Outside of Canada by Age Group, 2013 to 2022

Age Group*	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<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	0.4	0.4	0.0	0.4	0.7	0.0	0.0	0.4	0.0
5-9 Years	0.9	0.0	0.4	0.0	0.0	0.0	0.4	0.0	0.0	0.0
10-19 Years	2.7	2.8	2.4	3.3	4.2	3.0	5.3	5.7	2.2	3.9
20-39 Years	24.4	23.9	20.4	28.4	23.9	31.2	31.1	33.5	33.9	29.4
40-59 Years	23.1	28.3	28.2	23.2	22.0	24.2	14.4	19.8	22.3	21.9
60+ Years	48.4	44.5	48.2	45.0	49.4	40.9	48.9	41.1	41.2	44.8

*Age at time of diagnosis

Figure 13. Percentage of TB Cases Among Population Born Outside of Canada by Age Group*, 2013 to 2022



*Age at time of diagnosis

TB Disease and HIV Status

Table 18. TB Cases by Known HIV Status, 2013* to 2022

HIV Status	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
HIV Positive	8	8	10	5	2	4	4	3	4	0
Known HIV Status**	220	262	215	220	253	214	227	238	243	209

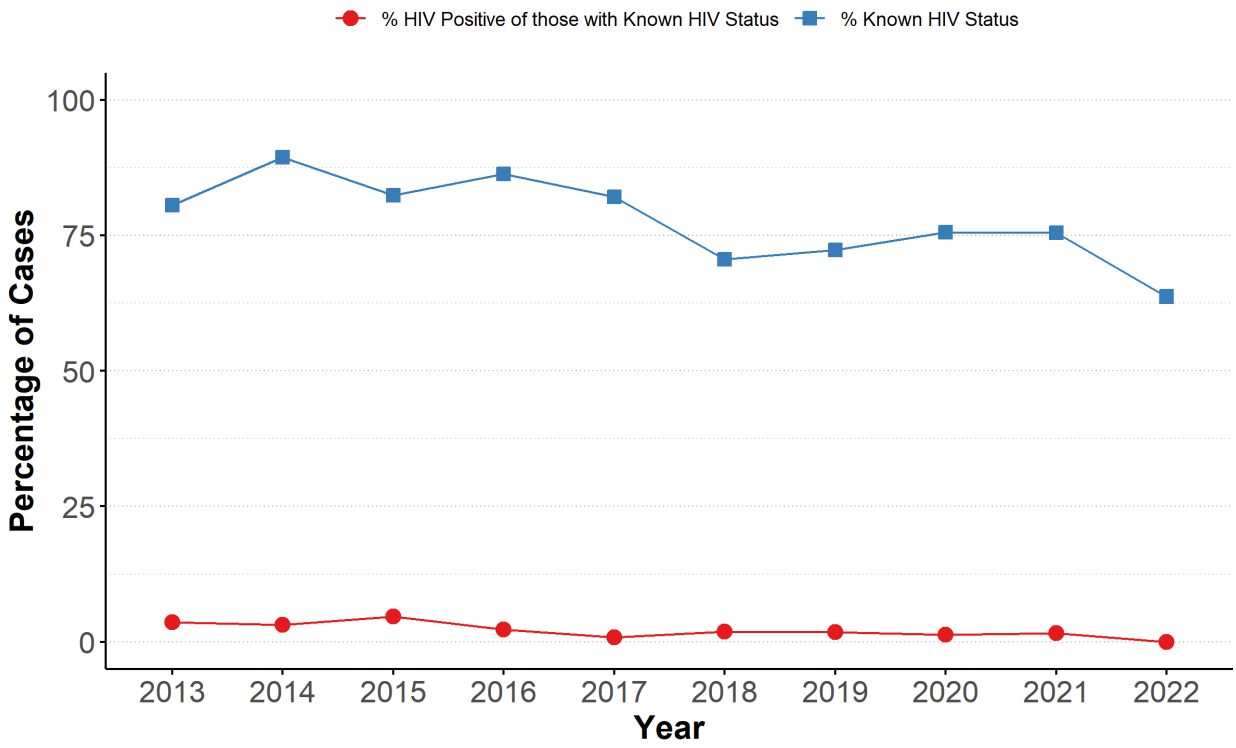
*Data from 2013-2015 are static and were obtained from iPHIS.[10] See Technical Appendix.
**TB cases with known HIV status (either through lab report or self-report of HIV diagnosis). See Case Definitions.

Table 19. Percentage of TB Cases by Known HIV Status, 2013* to 2022

HIV Status	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
% HIV Positive**	3.6	3.1	4.7	2.3	0.8	1.9	1.8	1.3	1.6	0.0
% Known HIV Status	80.6	89.4	82.4	86.3	82.1	70.6	72.3	75.6	75.5	63.7

*Data from 2013-2015 are static and were obtained from iPHIS.[10] See Technical Appendix.
**% HIV positive of those with known HIV status. See Case Definitions.

Figure 14. Percentage of TB Cases by Known HIV Status, 2013 to 2022



TB Disease by Site of Disease

Table 20. TB Cases by Site of Disease, 2013 to 2022

Site of Disease	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Respiratory*	230	234	216	200	241	233	247	252	254	247
Non-respiratory only**	51	71	72	55	67	70	67	63	68	81

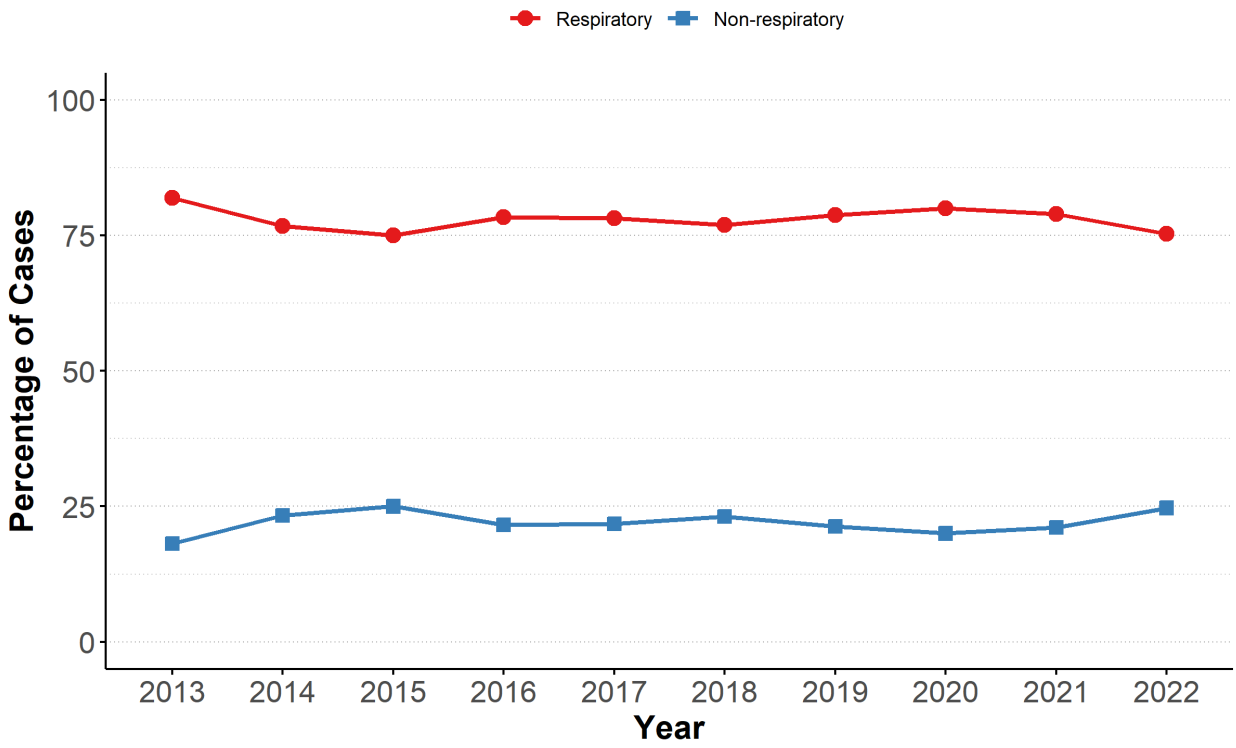
*Respiratory includes all cases with at least one respiratory site present (i.e. defined as pulmonary, primary, miliary, and other pulmonary) (see Case Definitions)
**Non-respiratory only includes all cases with no respiratory site present but at least one non-respiratory site present (see Case Definitions)

Table 21. Percentage of TB Cases by Site of Disease, 2013 to 2022

Site of Disease	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Respiratory*	81.9	76.7	75.0	78.4	78.2	76.9	78.7	80.0	78.9	75.3
Non-respiratory only**	18.1	23.3	25.0	21.6	21.8	23.1	21.3	20.0	21.1	24.7

*Respiratory includes all cases with at least one respiratory site present (i.e. defined as pulmonary, primary, miliary, and other pulmonary) (see Case Definitions)
**Non-respiratory only includes all cases with no respiratory site present but at least one non-respiratory site present (see Case Definitions)

Figure 15. Percentage of TB Cases by Site of Disease, 2013 to 2022



Treatment Outcomes of TB Disease

Table 22. TB Cases by Treatment Outcome, 2013 to 2021

Treatment Outcome*	2013	2014	2015	2016	2017	2018	2019	2020	2021
Treatment Completed	**242**	**253**	**234**	**198**	**250**	**241**	**250**	**264**	**267**
- Within 12 Months	210	212	187	162	214	215	204	210	242
- Greater Than 12 Months	32	41	47	36	36	26	46	54	25
Incomplete Treatment	**20**	**30**	**36**	**34**	**36**	**33**	**41**	**36**	**36**
Left Province During Treatment	**4**	**14**	**9**	**18**	**5**	**15**	**17**	**6**	**10**
No Treatment Documented	**4**	**0**	**8**	**2**	**13**	**12**	**4**	**4**	**8**

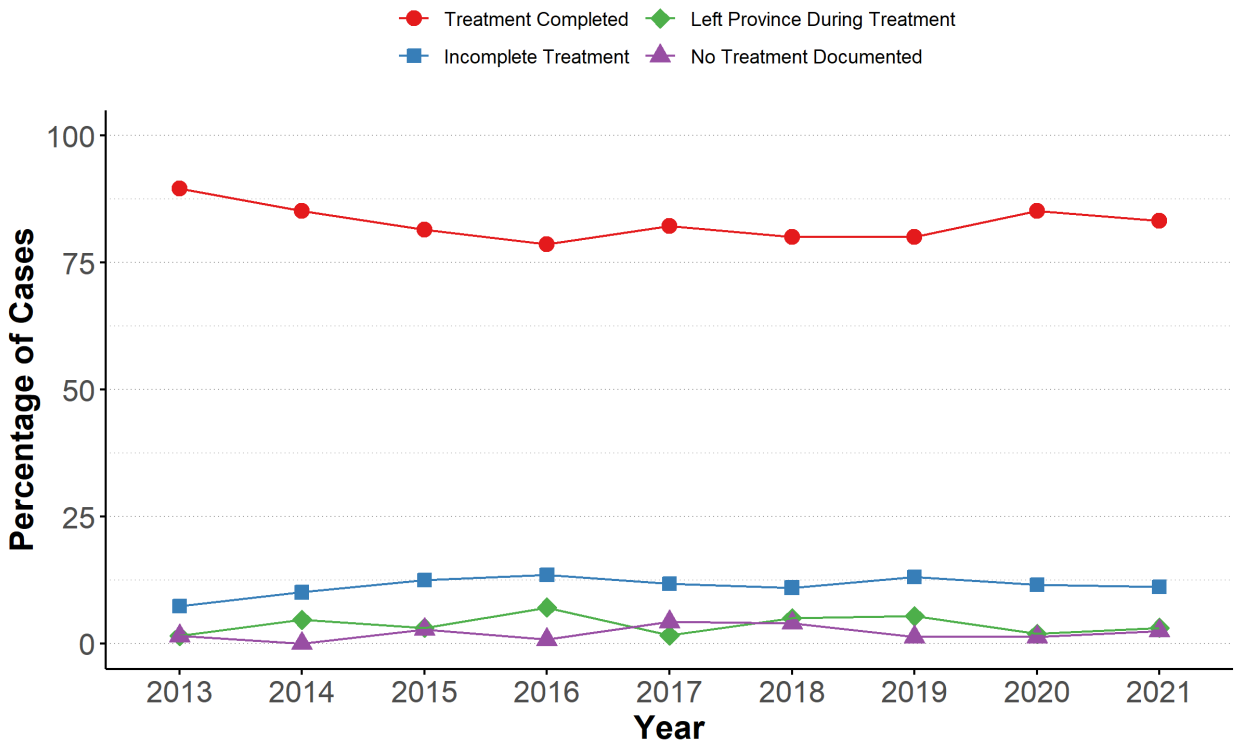
*Excludes those diagnosed post-mortem. See Case Definitions.

Table 23. Percentage of TB Cases by Treatment Outcome, 2013 to 2021

Treatment Outcome*	2013	2014	2015	2016	2017	2018	2019	2020	2021
Treatment Completed	**89.7**	**85.2**	**81.6**	**78.6**	**82.2**	**80.0**	**80.1**	**85.1**	**83.2**
- Within 12 Months	77.8	71.4	65.2	64.3	70.4	71.4	65.4	67.7	75.4
- Greater Than 12 Months	11.9	13.8	16.4	14.3	11.8	8.6	14.7	17.4	7.8
Incomplete Treatment	**7.4**	**10.1**	**12.5**	**13.5**	**11.8**	**11.0**	**13.1**	**11.6**	**11.2**
Left Province During Treatment	**1.5**	**4.7**	**3.1**	**7.1**	**1.6**	**5.0**	**5.4**	**1.9**	**3.1**
No Treatment Documented	**1.5**	**0.0**	**2.8**	**0.8**	**4.3**	**4.0**	**1.3**	**1.3**	**2.5**

*Excludes those diagnosed post-mortem. See Case Definitions.

Figure 16. Percentage of TB Cases by Treatment Outcome, 2013 to 2021



Incomplete Treatment for TB Disease

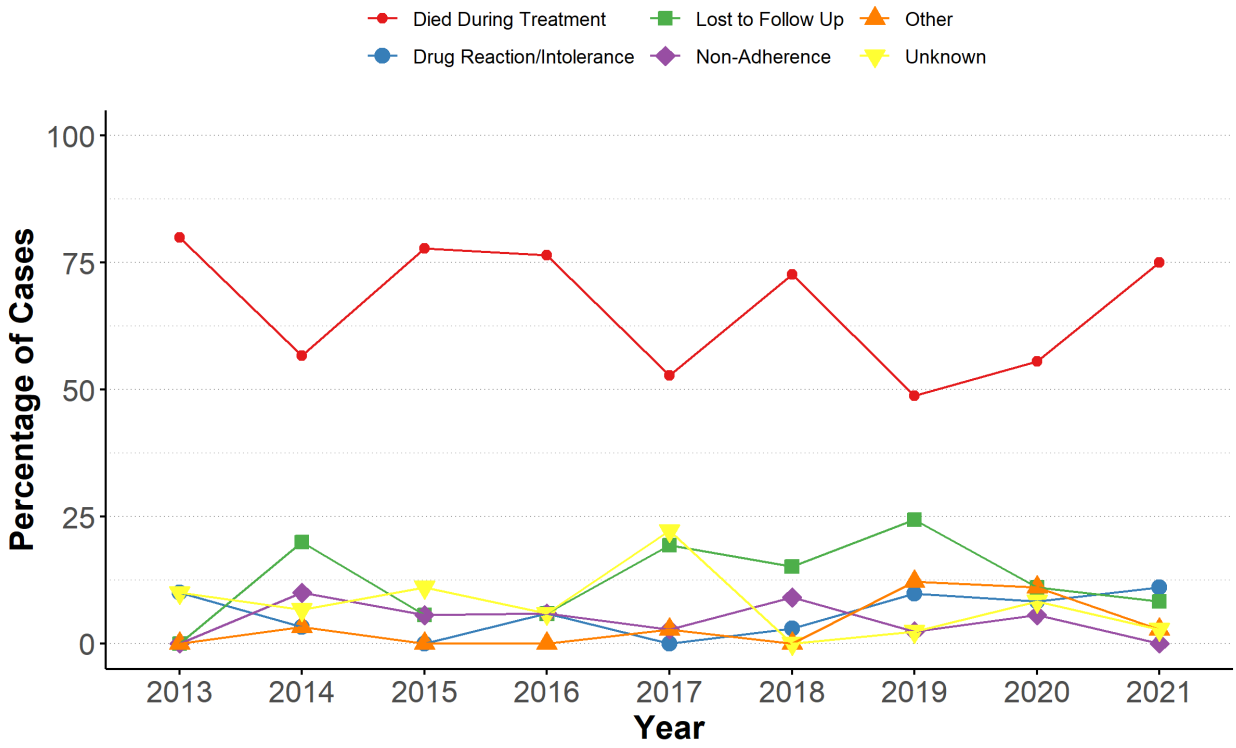
Table 24. TB Cases by Reason for Incomplete Treatment, 2013 to 2021

Reason	2013	2014	2015	2016	2017	2018	2019	2020	2021
Died During Treatment	**16**	**17**	**28**	**26**	**19**	**24**	**20**	**20**	**27**
- TB Underlying Cause	1	3	3	5	3	1	1	1	0
- TB Contributed, Not Underlying Cause	7	9	18	9	13	12	9	10	24
- TB Unrelated to Death	7	3	5	9	3	5	9	9	2
- Unknown	1	2	2	3	0	6	1	1	1
Drug Reaction/Intolerance	**2**	**1**	**0**	**2**	**0**	**1**	**4**	**3**	**4**
Lost to Follow Up	**0**	**6**	**2**	**2**	**7**	**5**	**10**	**4**	**3**
Non-Adherence	**0**	**3**	**2**	**2**	**1**	**3**	**1**	**2**	**0**
Other	**0**	**1**	**0**	**0**	**1**	**0**	**5**	**4**	**1**
Unknown	**2**	**2**	**4**	**2**	**8**	**0**	**1**	**3**	**1**

Table 25. Percentage of TB Cases by Reason for Incomplete Treatment, 2013 to 2021

Documented Reason	2013	2014	2015	2016	2017	2018	2019	2020	2021
Died During Treatment	**80.0**	**56.7**	**77.8**	**76.5**	**52.8**	**72.7**	**48.8**	**55.6**	**75.0**
- TB Underlying Cause	5.0	10.0	8.3	14.7	8.3	3.0	2.4	2.8	0.0
- TB Contributed, Not Underlying Cause	35.0	30.0	50.0	26.5	36.1	36.4	22.0	27.8	66.7
- TB Unrelated to Death	35.0	10.0	13.9	26.5	8.3	15.2	22.0	25.0	5.6
- Unknown	5.0	6.7	5.6	8.8	0.0	18.2	2.4	2.8	2.8
Drug Reaction/Intolerance	**10.0**	**3.3**	**0.0**	**5.9**	**0.0**	**3.0**	**9.8**	**8.3**	**11.1**
Lost to Follow Up	**0.0**	**20.0**	**5.6**	**5.9**	**19.4**	**15.2**	**24.4**	**11.1**	**8.3**
Non-Adherence	**0.0**	**10.0**	**5.6**	**5.9**	**2.8**	**9.1**	**2.4**	**5.6**	**0.0**
Other	**0.0**	**3.3**	**0.0**	**0.0**	**2.8**	**0.0**	**12.2**	**11.1**	**2.8**
Unknown	**10.0**	**6.7**	**11.1**	**5.9**	**22.2**	**0.0**	**2.4**	**8.3**	**2.8**

Figure 17. Percentage of TB cases by Reason for Incomplete Treatment, 2013 to 2021



Drug Resistant TB Disease

Table 26. TB Cases by Resistance Type, 2016* to 2022

Resistance	2016	2017	2018	2019	2020	2021	2022
Isoniazid Only	19	16	18	21	23	28	19
Rifampin Only	0	0	2	0	0	0	1
Multi-Drug**	3	2	1	2	2	1	5
Susceptible***	174	240	231	244	253	246	267
No Resistance Information Documented	59	50	51	47	37	47	36

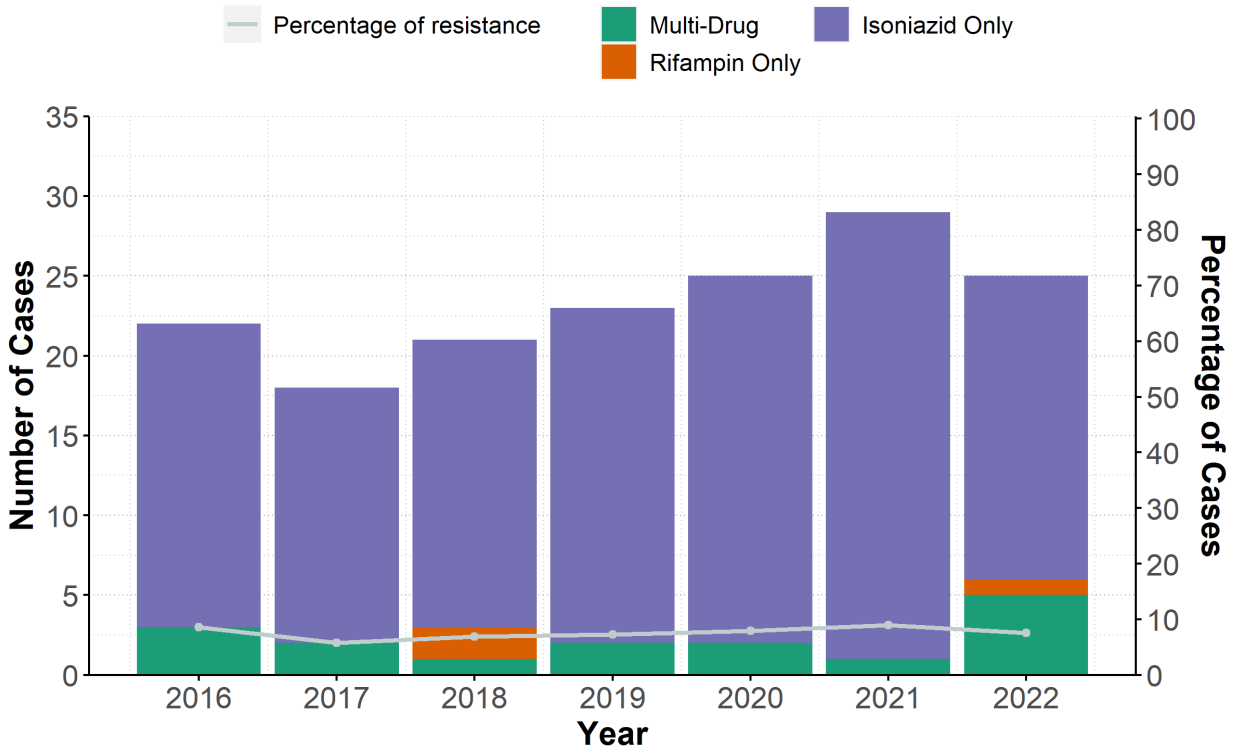
*iPHIS data before 2016 was not available for reporting
**Multi-drug resistance is defined as resistance to both isoniazid and rifampin
***Susceptible to isoniazid and rifampin

Table 27. Percentage of TB Cases by Resistance Type, 2016* to 2022

Resistance	2016	2017	2018	2019	2020	2021	2022
Isoniazid Only	7.5	5.2	5.9	6.7	7.3	8.7	5.8
Rifampin Only	0.0	0.0	0.7	0.0	0.0	0.0	0.3
Multi-Drug**	1.2	0.6	0.3	0.6	0.6	0.3	1.5
Susceptible***	68.2	77.9	76.2	77.7	80.3	76.4	81.4
No Resistance Information Documented	23.1	16.2	16.8	15.0	11.7	14.6	11.0

*iPHIS data before 2016 was not available for reporting
**Multi-drug resistance is defined as resistance to both isoniazid and rifampin
***Susceptible to isoniazid and rifampin

Figure 18. TB Cases by Resistance Type, 2016 to 2022



TB Infection Treatment

Tuberculosis infection (TBI) is a clinical diagnosis in which an individual is suspected to have the non-infectious or dormant phase of TB. The recommendation to treat TBI is based on a clinical assessment of the patient balancing the risks for progression to TB disease against the risks associated with treatment. Not everyone with TBI is offered or needs treatment but there are tools that can help clinicians with decision making.[11]

Here we report on TBI outcomes for treatment started in 2021 due to the potentially extended duration of treatment and follow up – including data entry – that could contribute to reporting delays. Any TBI treatment starts not documented in Panorama (e.g. treatment given in federal and provincial correctional facilities) would not be captured in this report (see Technical Appendix and Case Definitions). Note that clients receiving primary prophylaxis are not reported here.

In 2021, 664 total clients started TBI treatment. Of those who started TBI treatment in 2021, 85.4% (567 clients) successfully completed treatment, with 64.5% (428 clients) completing treatment within 6 months, 19.7% (131 clients) completing treatment within 6-12 months, and only 1.2% (8 clients) taking more than 12 months to complete treatment (Table 29; Figure 19). Since 2017, the proportion of treatment completed within 6 months has increased while the proportion of treatment completed within 6-12 months and incomplete treatment have decreased. This is likely attributed to the introduction of newer regimens (e.g. 3HP, 4R) that provide shorter yet effective treatment.[12]

Of those starting treatment in 2021 (664 clients), 68.2% (453 clients) were born outside of Canada, 15.4% (102 clients) were Canadian born, and 16.4% (109 clients) had an unknown country of birth or had missing data (Table 31; Figure 20). In 2021, 33.6% (223 clients) were 40-59 years of age, 31.0% (206 clients) were 60 years of age and older, and 29.7% (197 clients) were 20-39 years of age (Table 33). Overall, TBI treatment was primarily documented in the three oldest age groups (Figure 21).

TBI Treatment Outcomes

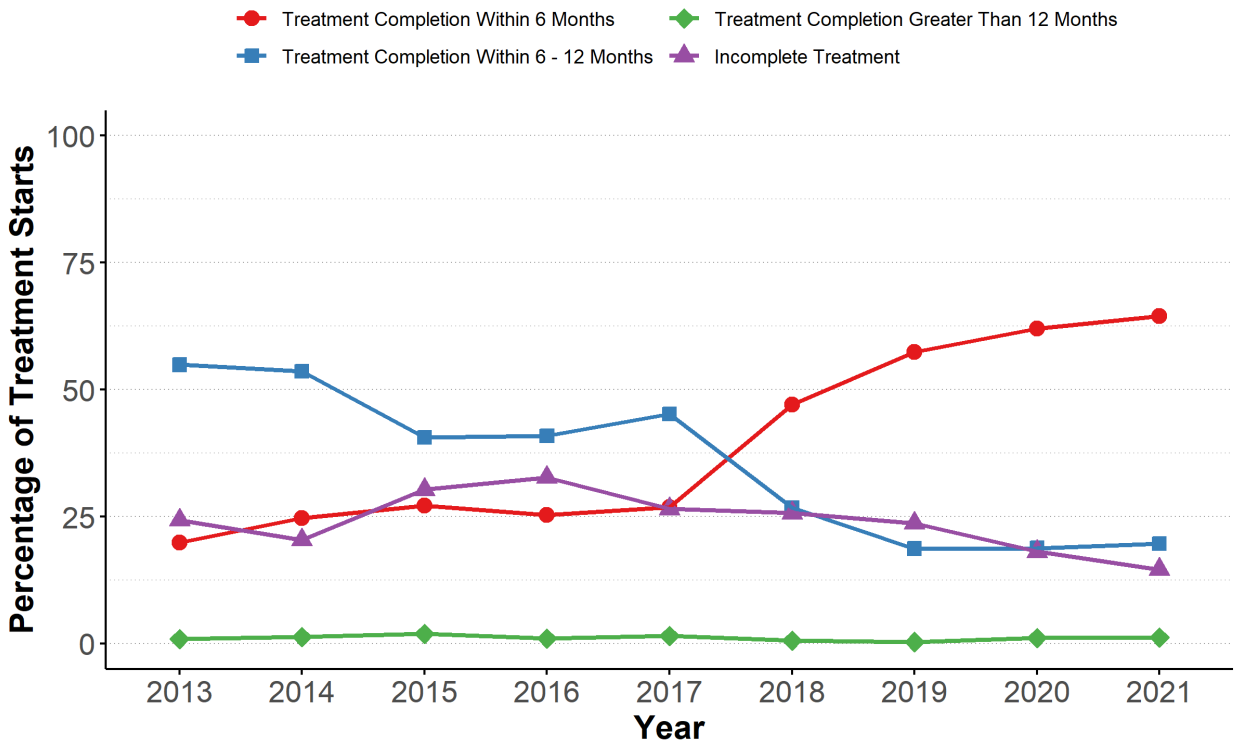
Table 28. TBI Treatment Initiation by Treatment Outcome, 2013 to 2021

Treatment Outcome	2013	2014	2015	2016	2017	2018	2019	2020	2021
Treatment Completed	**606**	**635**	**599**	**454**	**504**	**617**	**584**	**526**	**567**
- Within 6 Months	159	197	234	171	184	390	439	398	428
- Within 6 - 12 Months	440	428	349	276	310	222	143	121	131
- Greater Than 12 Months	7	10	16	7	10	5	2	7	8
Incomplete Treatment	**195**	**163**	**260**	**221**	**182**	**213**	**181**	**116**	**97**
Total	**801**	**798**	**859**	**675**	**686**	**830**	**765**	**642**	**664**

Table 29. Percentage of TBI Treatment Initiation by Treatment Outcome, 2013 to 2021

Treatment Outcome	2013	2014	2015	2016	2017	2018	2019	2020	2021
Treatment Completed	**75.7**	**79.6**	**69.7**	**67.2**	**73.5**	**74.3**	**76.4**	**81.9**	**85.4**
- Within 6 Months	19.9	24.7	27.2	25.3	26.8	47.0	57.4	62.0	64.5
- Within 6 - 12 Months	54.9	53.6	40.6	40.9	45.2	26.7	18.7	18.8	19.7
- Greater Than 12 Months	0.9	1.3	1.9	1.0	1.5	0.6	0.3	1.1	1.2
Incomplete Treatment	**24.3**	**20.4**	**30.3**	**32.7**	**26.5**	**25.7**	**23.7**	**18.1**	**14.6**

Figure 19. Percentage of TBI Treatment Initiation by Treatment Outcome, 2013 to 2021



TBI Treatment Initiation by Country of Birth

Table 30. TBI Treatment Initiation by Country of Birth, 2013 to 2021

Country of Birth	2013	2014	2015	2016	2017	2018	2019	2020	2021
Born Outside of Canada	570	597	647	506	487	637	523	426	453
Canadian Born	212	189	195	149	154	148	160	103	102
Missing*	19	12	17	20	45	45	82	113	109

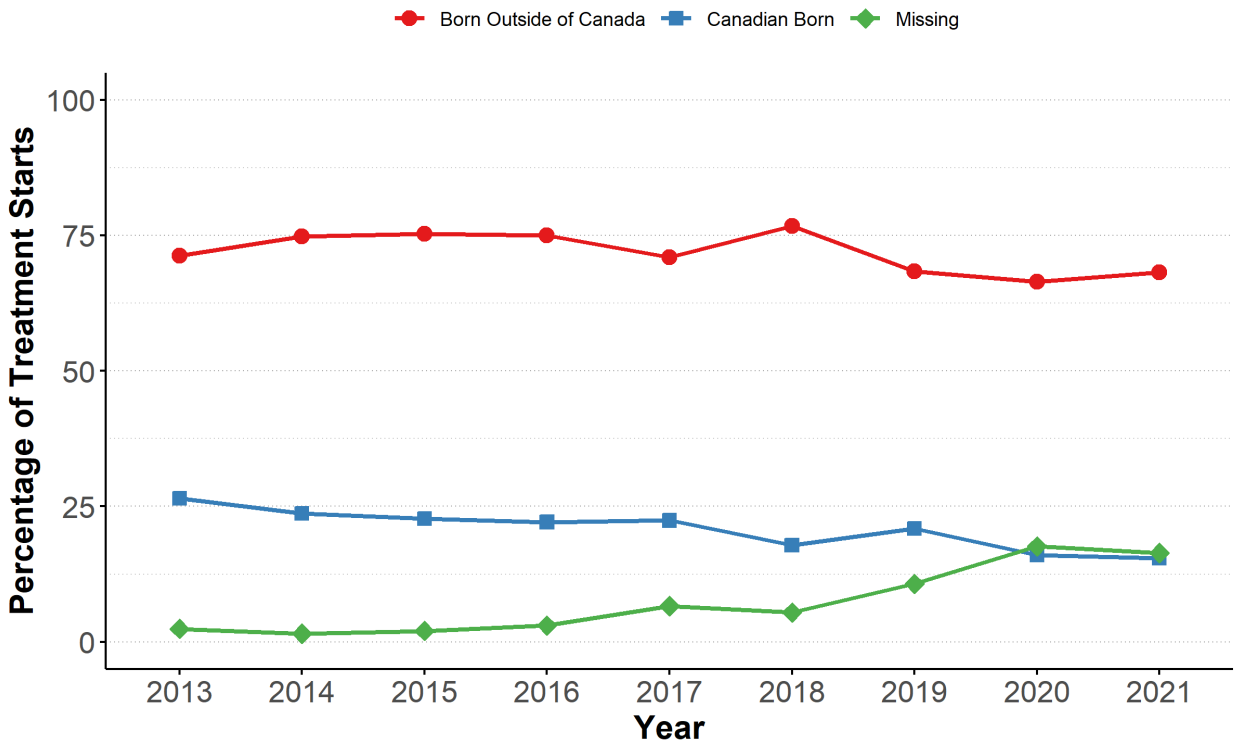
*Unknown or undocumented country of birth

Table 31. Percentage of TBI Treatment Initiation by Country of Birth, 2013 to 2021

Country of Birth	2013	2014	2015	2016	2017	2018	2019	2020	2021
Born Outside of Canada	71.2	74.8	75.3	75.0	71.0	76.7	68.4	66.4	68.2
Canadian Born	26.5	23.7	22.7	22.1	22.4	17.8	20.9	16.0	15.4
Missing*	2.4	1.5	2.0	3.0	6.6	5.4	10.7	17.6	16.4

*Unknown or undocumented country of birth

Figure 20. Percentage of TBI Treatment Initiation by Country of Birth, 2013 to 2021



TBI Treatment Initiation by Age Group

Table 32. TBI Treatment Initiation by Age Group in BC, 2013 to 2021

Age Group*	2013	2014	2015	2016	2017	2018	2019	2020	2021
<1 Year	0	1	1	3	1	2	1	2	4
1-4 Years	13	9	12	8	9	7	9	5	5
5-9 Years	16	11	13	4	10	8	9	6	6
10-19 Years	41	43	36	17	13	38	22	30	23
20-39 Years	227	232	242	199	185	235	207	165	197
40-59 Years	343	335	342	262	271	300	293	232	223
60+ Years	161	167	213	182	197	240	224	202	206

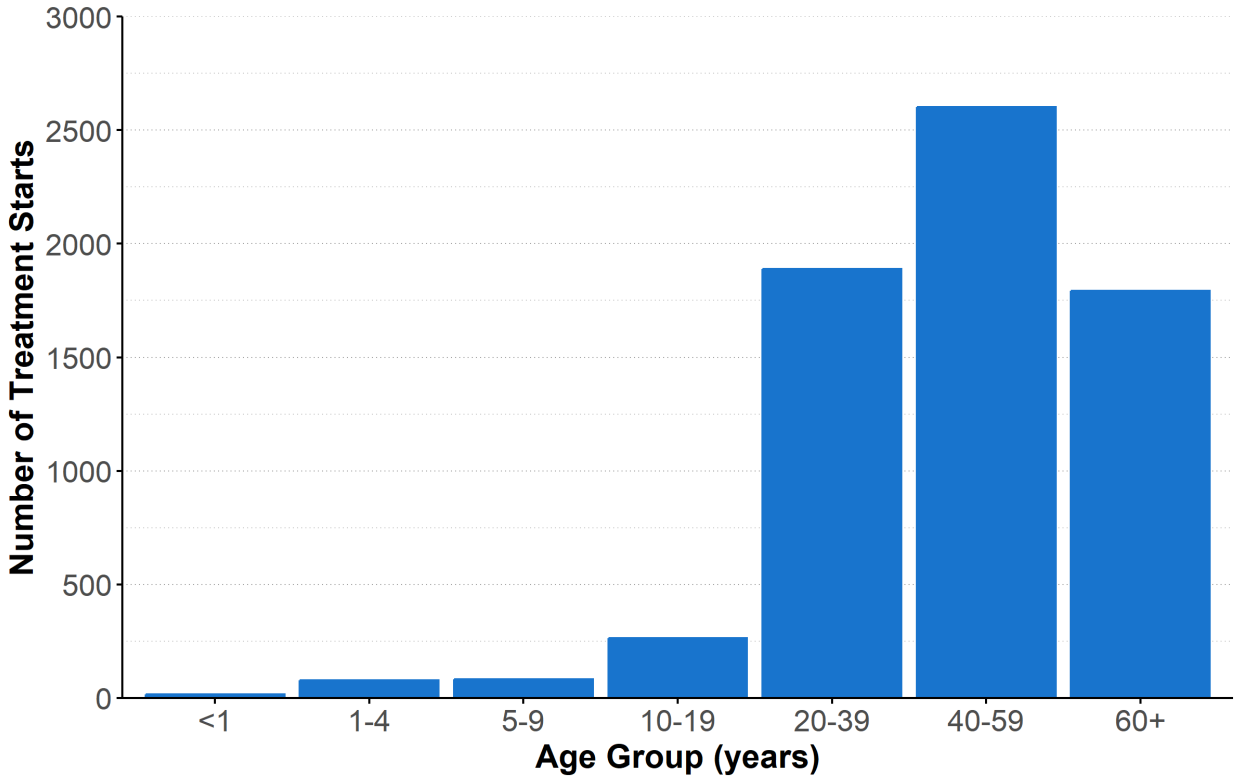
*Age at time of TBI treatment

Table 33. Percentage of TBI Treatment Initiation by Age Group in BC, 2013 to 2021

Age Group*	2013	2014	2015	2016	2017	2018	2019	2020	2021
<1 Year	0.0	0.1	0.1	0.4	0.1	0.2	0.1	0.3	0.6
1-4 Years	1.6	1.1	1.4	1.2	1.3	0.8	1.2	0.8	0.8
5-9 Years	2.0	1.4	1.5	0.6	1.5	1.0	1.2	0.9	0.9
10-19 Years	5.1	5.4	4.2	2.5	1.9	4.6	2.9	4.7	3.5
20-39 Years	28.3	29.1	28.2	29.5	27.0	28.3	27.1	25.7	29.7
40-59 Years	42.8	42.0	39.8	38.8	39.5	36.1	38.3	36.1	33.6
60+ Years	20.1	20.9	24.8	27.0	28.7	28.9	29.3	31.5	31.0

*Age at time of TBI treatment

Figure 21. Total TBI Treatment Initiation by Age Group* in BC, 2013 to 2021



*Age at time of TBI treatment

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 TB disease as a result of having shared air space with a person that has TB disease (i.e. TB case, source 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.[13] This section of the report provides data on contacts of known TB cases diagnosed in BC and those contacts residing in BC at time of investigation (i.e. contacts identified as part of federally managed airplane screening, contacts of non-resident cases, or contacts residing outside of BC are not included). Anonymous contacts are not included in this report. Note that contacts and screening results – specifically contacts with negative screening results – are underreported in Panorama due to data entry practices. This should be considered when interpreting the data.

Among the 247 respiratory TB cases (see Case Definitions) in 2022, a total of 986 unique contacts were identified in Panorama (Table 34). This corresponds to a mean of 4.0 contacts per respiratory TB case (median=2.0), a decrease compared to a mean of 6.0 (median = 3.0) observed in 2021. The maximum number of contacts associated with a single case in 2022 was 35 – this figure has ranged from 44 to 234 contacts from 2013 to 2022. Of the contacts reported in 2022, 33.0% (325 contacts) occurred in those 20-39 years of age, 27.9% (275 contacts) occurred in those 40-59 years of age, and 17.5% (173 contacts) occurred in those 60 years of age and older (Table 36; Figure 22). In 2022, 47.2% (465 contacts) of contacts were born outside of Canada, 38.9% (384 contacts) were Canadian born, and 13.9% (137 contacts) had no country of birth documented (Table 38; Figure 23).

Overall, there was a decrease in reported contacts since 2020 – reaching a minimum in 2022. This was likely due to the reallocation of public health resources and services during the COVID-19 pandemic, as well as the public health measures that reduced contact between individuals. While TB contact tracing was still performed for respiratory TB cases throughout the pandemic, in many jurisdictions it was primarily focused on high priority contacts before this was expanded, and ultimately transitioned back to normal contact tracing procedures. This should be considered when comparing contact data from during the pandemic to what was reported pre-pandemic. Continued monitoring will establish whether the yield from contact tracing since COVID-19 will return to pre-pandemic levels.

Contacts per TB Case

Table 34. Mean, Median, Max, and Total Number of Contacts* Reported per Respiratory TB Case in BC, 2013 to 2022**

Measure	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Mean	19.9	10.3	10.3	9.4	10.3	10.2	8.9	5.2	6.0	4.0
Median	11.0	5.0	6.0	6.0	5.0	4.0	3.0	3.0	3.0	2.0
Max	182	97	99	89	234	98	216	44	78	35
Total	4184	1963	1864	1887	2476	2368	2199	1299	1527	986

*Excludes anonymous contacts

** Data from 2013-2015 are static and were obtained from iPHIS.[10] See Technical Appendix.

Contacts by Age Group

Table 35. Contacts of Respiratory TB Cases in BC by Age Group, 2013* to 2022

Age Group**	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<1 Year	29	6	20	31	21	26	18	24	19	24
1-4 Years	98	69	104	114	157	91	105	55	52	80
5-9 Years	150	57	66	87	68	76	45	53	54	34
10-19 Years	337	151	84	111	134	156	300	126	257	75
20-39 Years	1172	624	537	578	756	883	681	452	482	325
40-59 Years	1538	712	665	573	814	792	711	356	390	275
60+ Years	828	318	366	389	526	344	339	233	273	173
Unknown	32	26	22	4	0	0	0	0	0	0

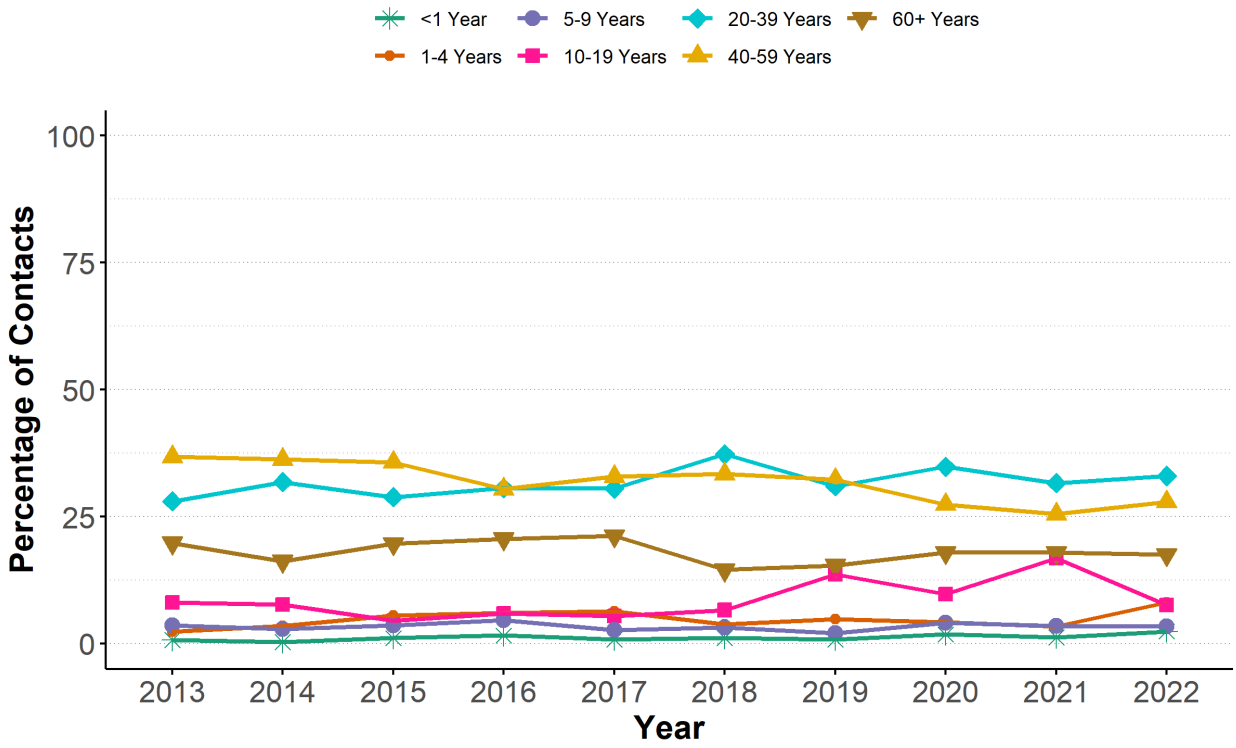
*Data from 2013-2015 are static and were obtained from iPHIS.[10] See Technical Appendix.
**Age of contact at time of source TB case diagnosis

Table 36. Percentage of Contacts of Respiratory TB Cases in BC by Age Group, 2013* to 2022

Age Group**	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
<1 Year	0.7	0.3	1.1	1.6	0.8	1.1	0.8	1.8	1.2	2.4
1-4 Years	2.3	3.5	5.6	6.0	6.3	3.8	4.8	4.2	3.4	8.1
5-9 Years	3.6	2.9	3.5	4.6	2.7	3.2	2.0	4.1	3.5	3.4
10-19 Years	8.1	7.7	4.5	5.9	5.4	6.6	13.6	9.7	16.8	7.6
20-39 Years	28.0	31.8	28.8	30.6	30.5	37.3	31.0	34.8	31.6	33.0
40-59 Years	36.8	36.3	35.7	30.4	32.9	33.4	32.3	27.4	25.5	27.9
60+ Years	19.8	16.2	19.6	20.6	21.2	14.5	15.4	17.9	17.9	17.5
Unknown	0.8	1.3	1.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0

*Data from 2013-2015 are static and were obtained from iPHIS.[10] See Technical Appendix.
**Age of contact at time of source TB case diagnosis

Figure 22. Percentage of Contacts of Respiratory TB Cases in BC by Age Group*, 2022



*Age of contact at time of source TB case diagnosis

Contacts by Country of Birth

Table 37. Contacts of Respiratory TB Cases in BC by Country of Birth, 2013* to 2022

Country of Birth	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Born Outside of Canada	1604	888	906	769	973	1176	758	619	702	465
Canadian Born	1701	778	769	787	989	921	936	502	646	384
Missing**	879	297	189	331	514	271	505	178	179	137

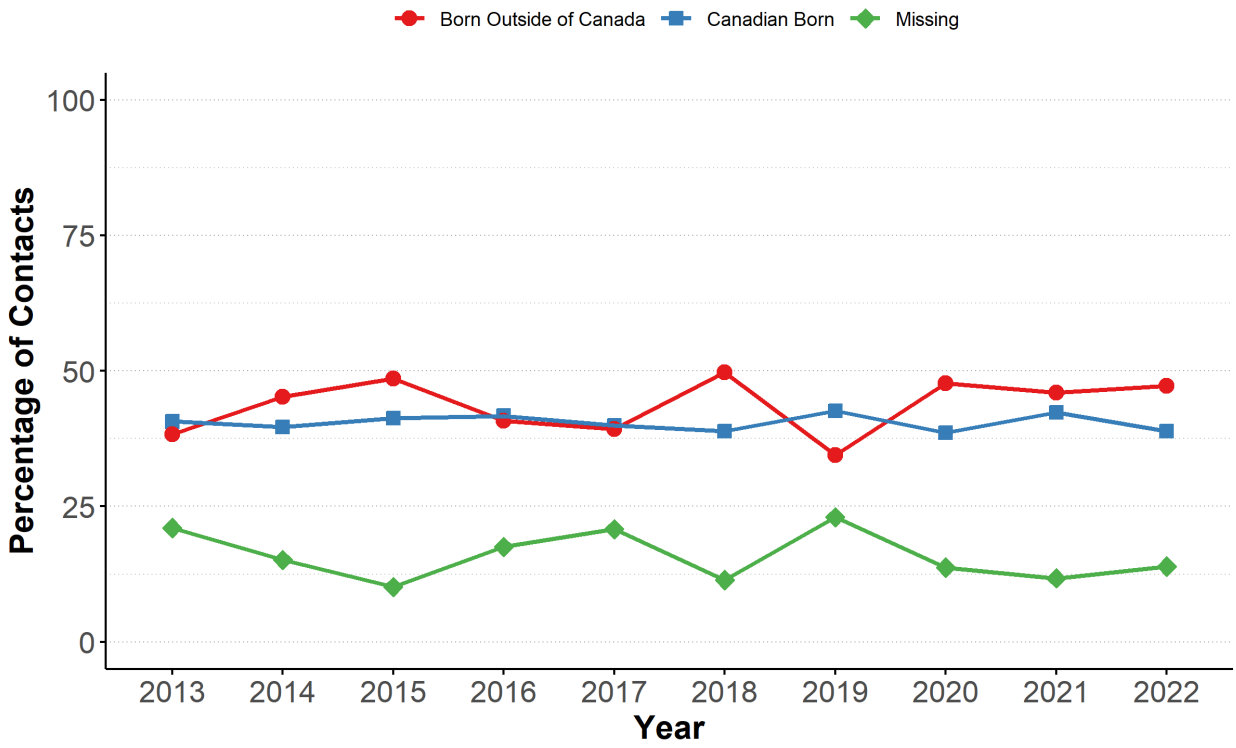
*Data from 2013-2015 are static and were obtained from iPHIS.[10] See Technical Appendix.
**Unknown or undocumented country of birth

Table 38. Percentage of Contacts of Respiratory TB Cases in BC by Country of Birth, 2013* to 2022

Country of Birth	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Born Outside of Canada	38.3	45.2	48.6	40.8	39.3	49.7	34.5	47.7	46.0	47.2
Canadian Born	40.7	39.6	41.3	41.7	39.9	38.9	42.6	38.6	42.3	38.9
Missing**	21.0	15.1	10.1	17.5	20.8	11.4	23.0	13.7	11.7	13.9

*Data from 2013-2015 are static and were obtained from iPHIS.[10] See Technical Appendix.
**Unknown or undocumented country of birth

Figure 23. Percentage of Contacts of Respiratory TB Cases in BC by Country of Birth, 2013 to 2022



Contact Tracing Cascade of Care

The contact tracing cascade of care provides insights on activities aimed to end the cycle of transmission through prompt assessment and treatment of potentially infected 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 for indicator definitions.

This report presents data on the cascade of care for reported contacts of respiratory TB cases in BC that are aged 5 years and older, with indicators stratified by time after source case diagnosis (12, 26, and 52 weeks). Additionally, total completion is reported at 2 years post source case diagnosis for all indicators except for secondary case identification that may be reported up to the date of data extraction (see Technical Appendix). TB cases less than 5 years of age – and any associated contacts – were excluded as they typically represent primary infection from recent transmission and the approach here is to identify the source case rather than to contact trace (i.e. reverse contact investigation). Due to the potentially extended duration of follow up that could contribute to delays in reporting, the contact cascade of care is presented for contacts of source cases diagnosed in 2019, 2020, and 2021.

Of respiratory TB cases diagnosed in 2021 and over the age of 5 years, there were a total of 1525 contacts identified among whom 84.4% (1287 contacts) completed an initial assessment, 12.8% (195 contacts) had a positive IGRA or TST screen (a proxy for TBI), and only 0.9% (13 contacts) were identified as secondary cases that were diagnosed with TB disease (Table 42; Figure 25). The vast majority of contacts (78.6%, 1199 contacts) completed an initial assessment within 26 weeks of the source case diagnosis in 2021, which is consistent with previous years (Table 40; Figure 24). Of the 195 contacts who had a positive screen within 2 years post source diagnosis, 53.3% (104 contacts) started and completed TBI treatment (Table 42; Figure 25). Across all years, and once contacts with a positive screen have been identified, treatment initiation and completion have been areas along the cascade of care where the greatest drops were observed. The data has shown that it can take 52 weeks or more post source TB case diagnosis to get contacts through a treatment regiment, underscoring the unique challenges inherent in TB prevention and care.

Table 39. Contact Tracing Indicators Among Contacts of Respiratory TB Cases 5 Years and Older at 12 Weeks Post Source Case Diagnosis in BC, 2019 to 2021

12 Weeks Post Source Case Diagnosis	Count			Percentage^		
Indicator	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Number of contacts	**2199**	**1299**	**1525**	**100.0**	**100.0**	**100.0**
Started initial assessment	**1499**	**633**	**799**	**68.2**	**48.7**	**52.4**
Completed initial assessment*	**1416**	**629**	**787**	**64.4**	**48.4**	**51.6**
- IGRA	58	86	112	2.6	6.6	7.3
- TST	1075	301	444	48.9	23.2	29.1
- X-ray	283	242	231	12.9	18.6	15.1
Secondary cases	**4**	**4**	**10**	**0.2**	**0.3**	**0.7**
Positive screen**	**176**	**69**	**107**	**8.0**	**5.3**	**7.0**
- IGRA	22	23	35	1.0	1.8	2.3
- TST	154	46	72	7.0	3.5	4.7
Started treatment	**22**	**10**	**14**	**1.0**	**0.8**	**0.9**
Completed treatment	**0**	**0**	**0**	**0.0**	**0.0**	**0.0**

*Using earliest screening date
**For contacts with both IGRA and TST positive results, the IGRA date and result was used
^Percentage of total contacts reported

Table 40. Contact Tracing Indicators Among Contacts of Respiratory TB Cases 5 Years and Older at 26 Weeks Post Source Case Diagnosis in BC, 2019 to 2021

26 Weeks Post Source Case Diagnosis	Count			Percentage^		
Indicator	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Number of contacts	**2199**	**1299**	**1525**	**100.0**	**100.0**	**100.0**
Started initial assessment	**1952**	**1051**	**1207**	**88.8**	**80.9**	**79.1**
Completed initial assessment*	**1851**	**1050**	**1199**	**84.2**	**80.8**	**78.6**
- IGRA	75	348	342	3.4	26.8	22.4
- TST	1418	364	521	64.5	28.0	34.2
- X-ray	358	338	336	16.3	26.0	22.0
Secondary cases	**6**	**8**	**12**	**0.3**	**0.6**	**0.8**
Positive screen**	**288**	**146**	**182**	**13.1**	**11.2**	**11.9**
- IGRA	70	96	97	3.2	7.4	6.4
- TST	218	50	85	9.9	3.8	5.6
Started treatment	**81**	**42**	**54**	**3.7**	**3.2**	**3.5**
Completed treatment	**7**	**4**	**4**	**0.3**	**0.3**	**0.3**

*Using earliest screening date
**For contacts with both IGRA and TST positive results, the IGRA date and result was used
^Percentage of total contacts reported

Table 41. Contact Tracing Indicators Among Contacts of Respiratory TB Cases 5 Years and Older at 52 Weeks Post Source Case Diagnosis in BC, 2019 to 2021

52 Weeks Post Source Case Diagnosis	Count			Percentage^		
Indicator	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Number of contacts	**2199**	**1299**	**1525**	**100.0**	**100.0**	**100.0**
Started initial assessment	**1993**	**1094**	**1283**	**90.6**	**84.2**	**84.1**
Completed initial assessment*	**1892**	**1092**	**1277**	**86.0**	**84.1**	**83.7**
- IGRA	77	366	387	3.5	28.2	25.4
- TST	1445	371	541	65.7	28.6	35.5
- X-ray	370	355	349	16.8	27.3	22.9
Secondary cases	**7**	**11**	**13**	**0.3**	**0.8**	**0.9**
Positive screen**	**319**	**167**	**195**	**14.5**	**12.9**	**12.8**
- IGRA	99	114	106	4.5	8.8	7.0
- TST	220	53	89	10.0	4.1	5.8
Started treatment	**132**	**91**	**107**	**6.0**	**7.0**	**7.0**
Completed treatment	**82**	**56**	**58**	**3.7**	**4.3**	**3.8**

*Using earliest screening date
**For contacts with both IGRA and TST positive results, the IGRA date and result was used
^Percentage of total contacts reported

Table 42. Contact Tracing Indicators Among Contacts of Respiratory TB Cases 5 Years and Older at Total Completion† Post Source Case Diagnosis in BC, 2019 to 2021

Total Completion Post Source Case Diagnosis	Count			Percentage^		
Indicator	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Number of contacts	**2199**	**1299**	**1525**	**100.0**	**100.0**	**100.0**
Started initial assessment	**2004**	**1110**	**1293**	**91.1**	**85.5**	**84.8**
Completed initial assessment*	**1904**	**1108**	**1287**	**86.6**	**85.3**	**84.4**
- IGRA	81	370	390	3.7	28.5	25.6
- TST	1449	380	546	65.9	29.3	35.8
- X-ray	374	358	351	17.0	27.6	23.0
Secondary cases	**18**	**12**	**13**	**0.8**	**0.9**	**0.9**
Positive screen**	**334**	**174**	**195**	**15.2**	**13.4**	**12.8**
- IGRA	112	117	106	5.1	9.0	7.0
- TST	222	57	89	10.1	4.4	5.8
Started treatment	**152**	**102**	**120**	**6.9**	**7.9**	**7.9**
Completed treatment	**125**	**92**	**104**	**5.7**	**7.1**	**6.8**

†Total completion is reported at 2 years post source case diagnosis for all indicators except for secondary case identification, which may be reported up to the date of data extraction
*Using earliest screening date
**For contacts with both IGRA and TST positive results, the IGRA date and result was used
^Percentage of total contacts reported

Figure 24. Contact Tracing Indicators Among Contacts of Respiratory TB Cases 5 Years and Older by Completion Post Source Case Diagnosis in BC, 2021

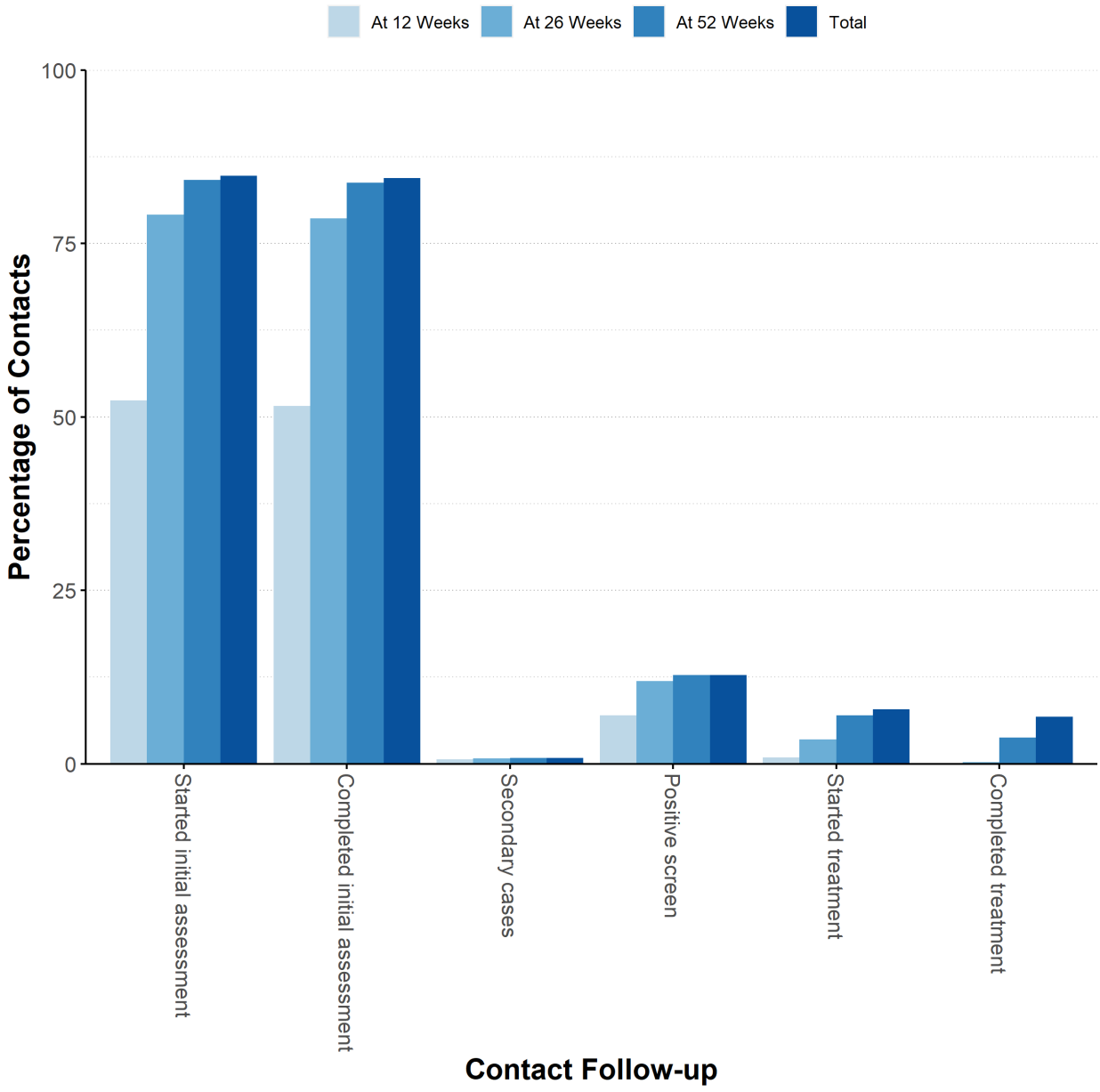
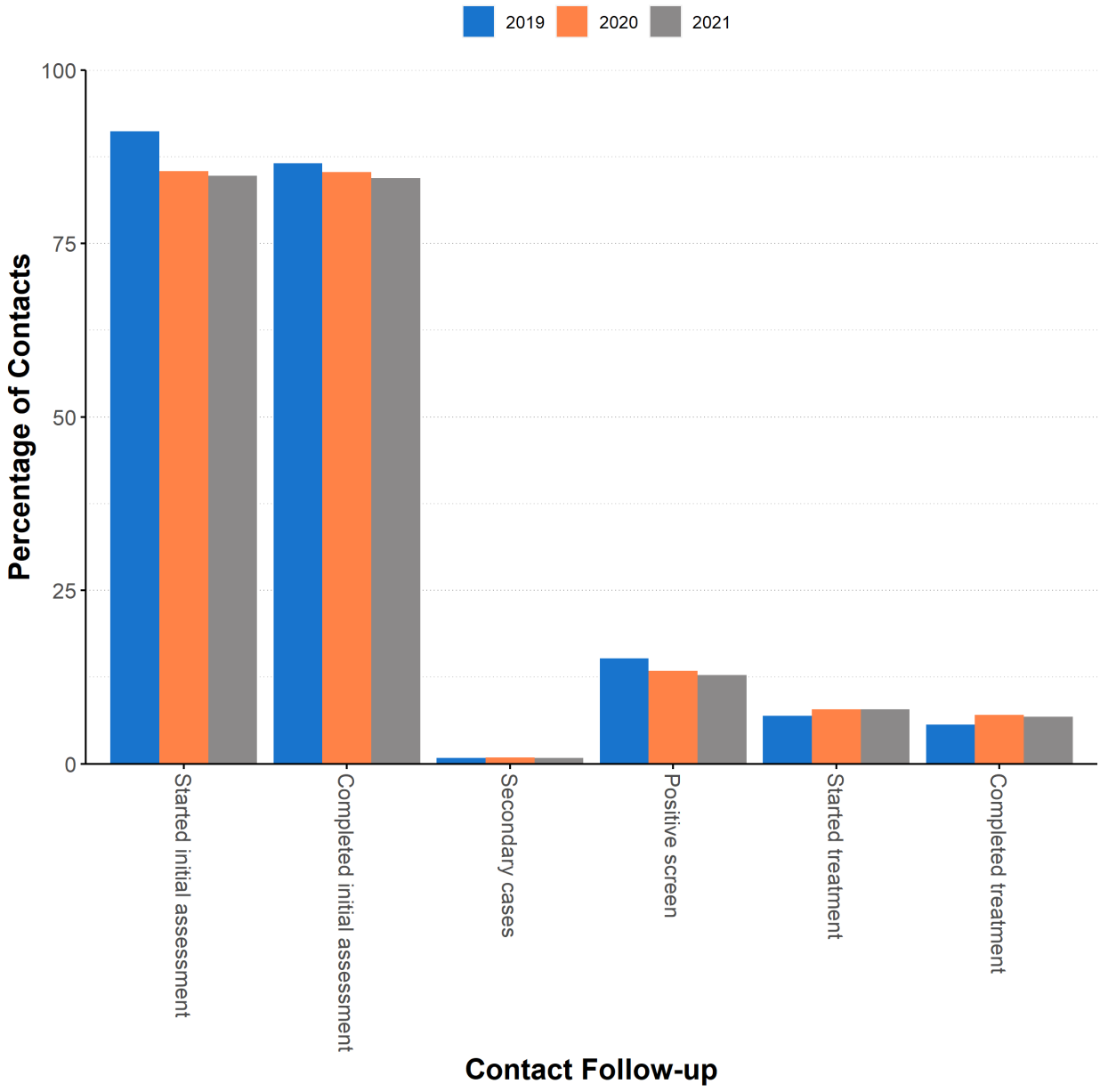


Figure 25. Contact Tracing Indicators Among Contacts of Respiratory TB Cases 5 Years and Older at Total Completion Post Source Case Diagnosis, 2019 to 2021



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- The BCCDC Public Health Laboratory staff for collecting and compiling TB and HIV requisition data.
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- The BCCDC TB Services Health Registry Clerk and the Island TB Program staff for their help with TB disease data entry and remediation.
- Sunny Mak from the BCCDC for creating the map of TB disease rates by Health Service Delivery Areas.
- The BCCDC Public Health Reporting Data Warehouse team for modelling TB data to the Communicable Disease Data Mart and making it accessible for reporting.
- Tuberculosis Section, Centre for Communicable Disease and Infection Control, Public Health Agency of Canada (PHAC) for providing the annual rates of TB disease in Canada.

Technical Appendix

- All TB surveillance data comes from Panorama Public Health Solution for Disease Surveillance and Management, unless otherwise noted. The BCCDC 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.
- All geographic breakdowns reflect place of residence in BC at time of diagnosis or time of treatment (including temporary residence). If residence is unknown, the case is assigned to the health region where the individual was diagnosed or screened. Subsequent movement is not reflected in this report.
- The gender variable is based on values collected in Panorama. The data shown reflects male and female responses only and may cause misperception as gender and sex have different meanings. Gender values presented in this report are not preserved at time of diagnosis and may change over time with an individual's gender identity.
- All TB disease, TB infection, contact tracing, and laboratory data were extracted from Panorama on February 7, 2024.
- TB disease 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.
- TB disease 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 includes only those cases that started treatment in BC in provincial totals. However, the BCCDC includes all cases who have been diagnosed or received treatment in BC in provincial totals – regardless of where the treatment initially began.
- This report includes HIV status and co-infection reliant on testing or self-reporting done at time of TB disease diagnosis. Accordingly, TB cases living with HIV that were not tested for HIV or did not self-report their HIV diagnosis at the time of TB diagnosis would not be represented in this data. 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 and HIV/AIDS case reports.
- For TB cases, HIV status data from 2013 to 2015 were not readily accessible for reporting out of Panorama. Thus, case counts and proportions for this period were

obtained from static historical iPHIS data[10] to enable assessment of trends. Historic case counts and proportions should be interpreted with caution as they have changed slightly over time.

- TBI treatment data presented in this report is from Panorama only. Any TBI treatment data not documented in Panorama (e.g. treatment given in federal and provincial correctional facilities) would not be represented here.

- The contact information presented in this report includes only contacts of TB cases (i.e. source cases) identified in BC, who were residing in BC at time of investigation, and who were 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 identified in BC, or anonymous contacts. Regions have separate databases for contact investigations that may not be reported in Panorama. As a result, the data presented does not reflect the full workload of contact tracing teams. Trends in the number of contacts are affected by the circumstances of each case and differences in the collection, entry and reporting of contact data. Provincial workflows for contact tracing and contact data entry changed in in 2016 with the implementation of Panorama and should be considered when interpreting the provincial surveillance data presented here.

- Contact data from 2013 to 2015 were not readily accessible for reporting out of Panorama. Thus, counts and proportions for this period were obtained from static historical iPHIS data[10] to enable assessment of trends. Historic counts and proportions should be interpreted with caution as they may have changed slightly over time.

- The contact tracing cascade of care indicators are based on screening, diagnosis, and treatment completed after the source case was diagnosed, and does not capture contact tracing activities initiated before the source case was diagnosed. Total completion is reported at 2 years post source case diagnosis for all indicators except for secondary case identification (Indicator 3), which may be reported up to the date of data extraction (i.e. any time after source case diagnosis). Each indicator (i.e. step along the cascade of care) is a subset of the previous step, except for secondary cases (Indicator 3) which is derived from all contacts (i.e. denominator).

Case Definitions

A. TB Disease

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

Laboratory confirmed case

- cases with *Mycobacterium tuberculosis* complex (excluding *M. bovis* BCG strain), isolated by culture from a clinical specimen; OR
- cases with laboratory detection of *Mycobacterium tuberculosis* complex by nucleic acid amplification (NAAT) and with clinical findings with current active tuberculosis disease.

Clinically confirmed case

In the absence of culture or NAAT 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 (e.g. meningeal, bone, kidney, peripheral lymph nodes, etc.);
- pathologic evidence of active tuberculosis (e.g. compatible histopathology, positive AFB staining);
- post-mortem evidence of active tuberculosis;
- favorable response to therapeutic trial of anti-tuberculosis drugs.

Re-treatment exclusion:

A re-treatment case of tuberculosis is a case that has both current active tuberculosis disease and historic documentation of previous active disease. Where re-treatment commences within 6 months after the end of treatment for previously active tuberculosis, the re-treatment is not counted as a new case of active tuberculosis. This is consistent with the Public Health Agency of Canada's case definition of re-treatment.

HIV Screening and Co-infection

HIV co-infection

- TB cases with a positive HIV test result at the time of TB disease diagnosis;
- TB cases with self-reported HIV diagnosis at the time of TB disease diagnosis.

Known HIV status

- TB cases with a positive or negative HIV test result at the time of TB disease diagnosis;
- TB cases with self-reported HIV diagnosis at the time of TB disease diagnosis.

Drug Resistance

TB cases are classified as resistant to isoniazid, rifampin, or both (i.e. multi-drug resistant). Resistance to other TB medications is not reported here.

B. Site of Disease

Since the implementation of 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 classified as respiratory if at least one respiratory site is present. Tuberculosis is considered non-respiratory if no respiratory site is present but at least one non-respiratory site is present.

Respiratory sites

- bronchiectasis tuberculosis
- bronchus tuberculosis (excluding isolated tracheal or bronchial tuberculosis)
- cavitation of lung tuberculosis
- fibrosis of lung tuberculosis
- infiltrative of lung TB
- intrathoracic lymph node tuberculosis
- isolated tracheal or bronchial tuberculosis
- laryngitis tuberculosis (excluding esophageal tuberculosis)
- miliary tuberculosis
- nodular of lung tuberculosis
- nose or sinus tuberculosis
- pleurisy tuberculosis
- pneumonia tuberculosis
- pneumothorax tuberculosis

- primary tuberculosis
- primary progressive tuberculosis
- pulmonary tuberculosis

Non-respiratory sites

- adrenal gland tuberculosis
- bone tuberculosis (including mastoid, dactyl tuberculosis)
- bone and joint tuberculosis
- central nervous system tuberculosis
- ear tuberculosis
- erythema nodosum tuberculosis
- epididymis tuberculosis
- eye tuberculosis
- gastrointestinal tuberculosis (including lymph nodes)
- genital tuberculosis
- genitourinary tuberculosis
- hip tuberculosis
- joint tuberculosis
- kidney tuberculosis
- knee tuberculosis
- lymph node tuberculosis (peripheral)
- meningitis of brain and/or spine tuberculosis
- meningeal or central nervous system tuberculosis
- meningeal tuberculoma
- other organ tuberculosis (excluding respiratory)
- peripheral lymph node tuberculosis
- peritoneal tuberculosis
- skin and subcutaneous tuberculosis
- spinal column tuberculosis
- spleen tuberculosis
- thyroid gland tuberculosis
- urinary tuberculosis

C. Tuberculosis Infection (TBI)

The clinical definition for TBI is based on a complex mix of demographic characteristics and the presence of co-morbidities. As a surrogate, we report on clients who have documentation of TBI treatment initiation in Panorama, which is likely an underestimate of the actual number of persons with TBI.

D. Treatment Completion

For the purposes of this report, treatment completion for TB disease and TBI documented in Panorama excludes TB cases diagnosed post-mortem and is defined as the following:

Treatment Completed: A treatment start date, treatment end date, and treatment status reported as "Completed-satisfactory". The length of treatment is calculated based on the treatment start date and treatment end date.

Incomplete Treatment: A treatment start date, treatment end date, and treatment status other than "Completed-satisfactory" (i.e. "Completed-unsatisfactory", "Incomplete", "Other", "Unknown"), or no treatment end date is documented.

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

Each indicator (i.e. step) in the cascade is a subset of the previous, except for secondary cases (Indicator 3) which is derived from all contacts (i.e. denominator). Indicators are reported based on the year the source case was diagnosed.

Denominator - Number of contacts: Number of unique contacts linked to respiratory TB cases aged 5 years and older in BC, 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 diagnosis date) was used.

Indicator 1 - Started initial assessment: Number of contacts who started any of the following after the source case 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 screening date was used.

Indicator 2 - Completed initial assessment: Number of contacts who completed any of the following after the source case diagnosis 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 screening date was used.

Indicator 3 - Secondary cases: Number of total contacts (i.e. denominator) diagnosed with confirmed or clinical TB disease after the source case diagnosis date.

Indicator 4 - Positive screen: Number of contacts – who are not secondary cases – with any of the following after the source case diagnosis date: a reactive IGRA, or a positive TST (without a subsequent non-reactive IGRA). For contacts with multiple TST or IGRA results, the earliest screening date was used. For contacts with both IGRA and TST positive results, the IGRA date and result was used. This is a proxy measure for clients with TBI.

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

Indicator 6 - Completed treatment: Number of contacts with a treatment start date, treatment end date, and treatment status reported as “Completed-satisfactory” after the source case diagnosis date.

Data Sources

Panorama

Data presented in this report was extracted from Panorama. The BCCDC 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, HIV status and co-infection, contact follow-up), and these data were obtained from iPHIS using the 2015 TB Annual Report[10] to produce trend lines 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 late reporting); therefore, these trends should be interpreted with caution.

Population Data

Population data and associated rates for the general BC population, age, gender, regional health authority, and health service delivery area were based on the Population Estimates released by BC Stats on December 21, 2023.[9]

Population data and associated rates for those born outside of Canada and Canadian born individuals were estimated from the 2011, 2016, and 2021 Census Program, conducted by Statistics Canada.[14] 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.

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