

British Columbia Provincial Pertussis Summary

September 6, 2023

Key Messages

- In the context of recent media reports of outbreaks elsewhere, this bulletin summarizes historic and recent pertussis trends in British Columbia (BC). See Figures 1-6 and accompanying narrative below.
- Overall, pertussis levels in BC remain well within historical levels as of August 30, 2023, notwithstanding a potentially overdue cyclical peak and summer increases that have previously occurred in BC.

Summary of historic and recent trends

As elsewhere, pertussis is an endemic disease in BC, with cyclical peaks occurring every 2-5 years¹. Infants <1 year of age are at highest risk of severe disease, including hospitalization, intensive care unit admission and death, with the very highest risk occurring in very young infants <3 months old¹. Shift toward greater rates of infection in older children began during the 1990s and early 2000s, largely attributed to advancing cohort effects associated with suboptimal effectiveness of the prior whole cell vaccine used in Canada during the 1980s and 1990s¹. Beginning in 1997, most Canadian provinces, including BC, switched to a more efficacious (and less reactogenic) acellular vaccine and beginning from 2004 added an adolescent booster dose in Grade 9 (generally teens 14-15 years of age)¹.

BC experienced trough pertussis levels from 2004 to 2011, with annual incidences of confirmed² (laboratory-confirmed and epidemiologically-linked) pertussis based on passive surveillance data consistently <5 per 100,000 population, including historically low provincial incidences of 3 per 100,000 in 2010 and one per 100,000 in 2011¹. Thereafter, BC experienced cyclical peaks in 2012 (~10 per 100,000) and 2015 and 2016 (~20 per 100,000) ([Figure 1](#)), with the highest case counts during the latter peaks occurring in the months of July or August ([Figure 2](#)). Annual incidence subsided to 13 per 100,000 in 2017 and <10 per 100,000 in 2018 and 2019 ([Figure 1](#)). These cyclical patterns were evident across age groups, but were most pronounced in infants <1 year and among pre-teens/teens aged 10-14 years ([Figure 3](#)). As described elsewhere, BC may have been spared an expected cyclical peak during the period that COVID-19 pandemic mitigation measures were in place^{3,4,5}. With population-level social restrictions implemented in BC between March 2020 and March 2022, the annual incidence of confirmed pertussis declined to 2 per 100,000 in 2020 and to <0.1 per 100,000 in 2021 and 2022 ([Figure 1](#)).

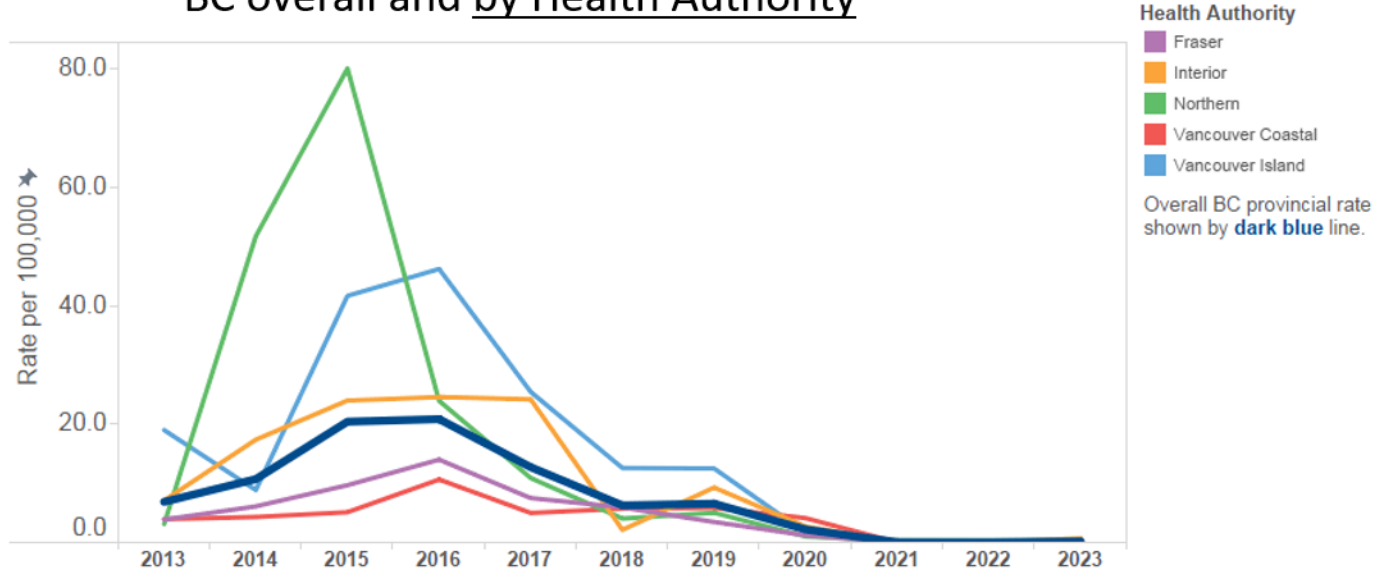
Some experts have hypothesized that disruptions in childhood vaccination schedules⁶, reduced population immunity³, and/or an accumulation of susceptible cohorts associated with an overdue cyclical peak^{3,5} may contribute to substantial pertussis resurgence following the relaxation of pandemic mitigation measures. In China, a 183% increase in pertussis was reported in 2021 compared to 2020⁷, but activity in 2021 (9,961 cases) was still lower than in 2019 (30,027 cases)⁸. Since the beginning of 2023, media reports of pertussis outbreaks in some Canadian provinces (e.g. Alberta, Ontario, Manitoba, Saskatchewan) and countries elsewhere (e.g. United States, Denmark, Israel, Malaysia, Philippines, New Zealand) have triggered concern. To place these reports into proper historical and epidemiological context (e.g. whether to be considered expected or exceptional), background data applying consistent case definitions and monitoring periods are required. However, such information, including updated Canadian pertussis surveillance data⁹, are still largely pending.

In the meantime, to inform risk assessment for BC, we compare annual ([Figure 1](#), [Figure 2](#), [Figure 3](#)) and year-to-date (YTD, [Figure 4](#), [Figure 5](#)) incidences of confirmed pertussis cases for the period between 2013 and 2023 overall for BC and by health authority and age group. As per provincial case definitions, confirmed cases are laboratory-confirmed or epidemiologically-linked events.² All YTD and 2023 data are for the period between January 1 and August 30. Although pertussis activity may sometimes increase in July and August in BC¹, we show that it currently remains well within expected historical levels with just 10 confirmed pertussis cases reported by BC health authorities thus far in 2023. This includes sporadic reports from Fraser Health Authority in epi-week 9 (n=1) and epi-week 21 (n=1), a single case from Vancouver Island Health Authority in epi-week 10 (n=1) and from Northern Health Authority in epi-week 20 (n=1), and a small series of one case per week reported from Interior Health Authority during epi-weeks 25-27 (n=3) and epi-weeks 32-34 (n=3) ([Figure 6](#)). We continue to monitor and will advise of any change with implications for overall risk assessment in BC.

References

1. Chambers C, Skowronski D, Hoang L, Li HG, Fritz C, Gustafson R, et al. Pertussis Surveillance Trends in British Columbia, Canada, over a 20-year Period: 1993-2013. *Canada Communicable Disease Report* [Internet]. 2014 Feb 7 [cited 2023 Sep 5];40(3):31–41. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5864486/>
2. BC Centre for Disease Control. Pertussis [Internet]. Public Health Services Authority. [cited 2023 Sep 5]. Available from: <http://www.bccdc.ca/health-professionals/clinical-resources/case-definitions/pertussis>
3. Matczak S, Levy C, Fortas C, Cohen JF, Stéphane Béchet, Ait F, et al. Association between the COVID-19 pandemic and pertussis derived from multiple nationwide data sources, France, 2013 to 2020. *Eurosurveillance* [Internet]. 2022 Jun 23 [cited 2023 Sep 4];27(25). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9229195/>
4. Sandoval T, Bisht A, Maurice A de S. The impact of COVID-19 and masking practices on pertussis cases at a large academic medical center (2019-2021). *American Journal of Infection Control* [Internet]. 2022 Nov 20 [cited 2023 Jun 5];51(7):S0196-6553(22)008112. Available from: <https://pubmed.ncbi.nlm.nih.gov/36417951/>
5. Tessier E, Campbell H, Ribeiro S, Rai Y, Burton S, Roy P, et al. Impact of the COVID-19 pandemic on Bordetella pertussis infections in England. *BMC Public Health* [Internet]. 2022 Feb 28;22(1). Available from: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-022-12830-9>
6. World Health Organization. COVID-19 pandemic leads to major backsliding on childhood vaccinations, new WHO, UNICEF data shows [Internet]. World Health Organization. 2021 [cited 2023 Sep 5]. Available from: <https://www.who.int/news/item/15-07-2021-covid-19-pandemic-leads-to-major-backsliding-on-childhood-vaccinations-new-who-unicef-data-shows>
7. Zuo Z, Yang C, Ye F, Wang M, Wu J, Tao C, et al. Trends in respiratory diseases before and after the COVID-19 pandemic in China from 2010 to 2021. *BMC Public Health* [Internet]. 2023 Feb 1 [cited 2023 Sep 5];23(1). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9889952/>
8. Chen Q, Wang W, Shi X, Xu Y, Zhu Y, Wang Y, et al. Seroepidemiology of pertussis in the east of China: Estimates of incidence of infection in adolescents and adults pre- and post-COVID-19. *Frontiers in Public Health* [Internet]. 2022 Dec 1 [cited 2023 Sep 5];10. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9754053/>

Figure 1. Annual incidence rates (per 100,000)
BC overall and by Health Authority



Annual Incidence rates (per 100,000)

BC	6.9	10.9	20.5	20.9	12.7	6.3	6.6	2.2	0.0	0.0	0.2
Fraser	3.9	6.1	9.7	14.0	7.5	5.9	3.5	1.2			0.1
Interior	7.1	17.4	24.0	24.6	24.2	2.1	9.3	2.7			0.7
Northern	3.1	51.7	80.1	23.9	10.9	4.0	5.0	1.0	0.3	0.3	0.3
Vancouver Coastal	3.9	4.3	5.1	10.6	5.0	5.7	5.8	4.1			
Vancouver Island	19.0	8.8	41.7	46.2	25.4	12.6	12.5	1.6	0.1		0.1

Annual Case counts

BC	318	513	978	1,015	627	315	335	113	2	1	10
Fraser	66	106	171	252	137	110	66	23			2
Interior	52	129	181	189	189	17	75	22			6
Northern	9	150	233	70	32	12	15	3	1	1	1
Vancouver Coastal	45	50	60	126	60	70	72	51			
Vancouver Island	146	69	330	376	209	105	106	14	1		1

Data Source: VPD Data Mart; current to August 30, 2023

Figure 2. Case counts by month and year, BC

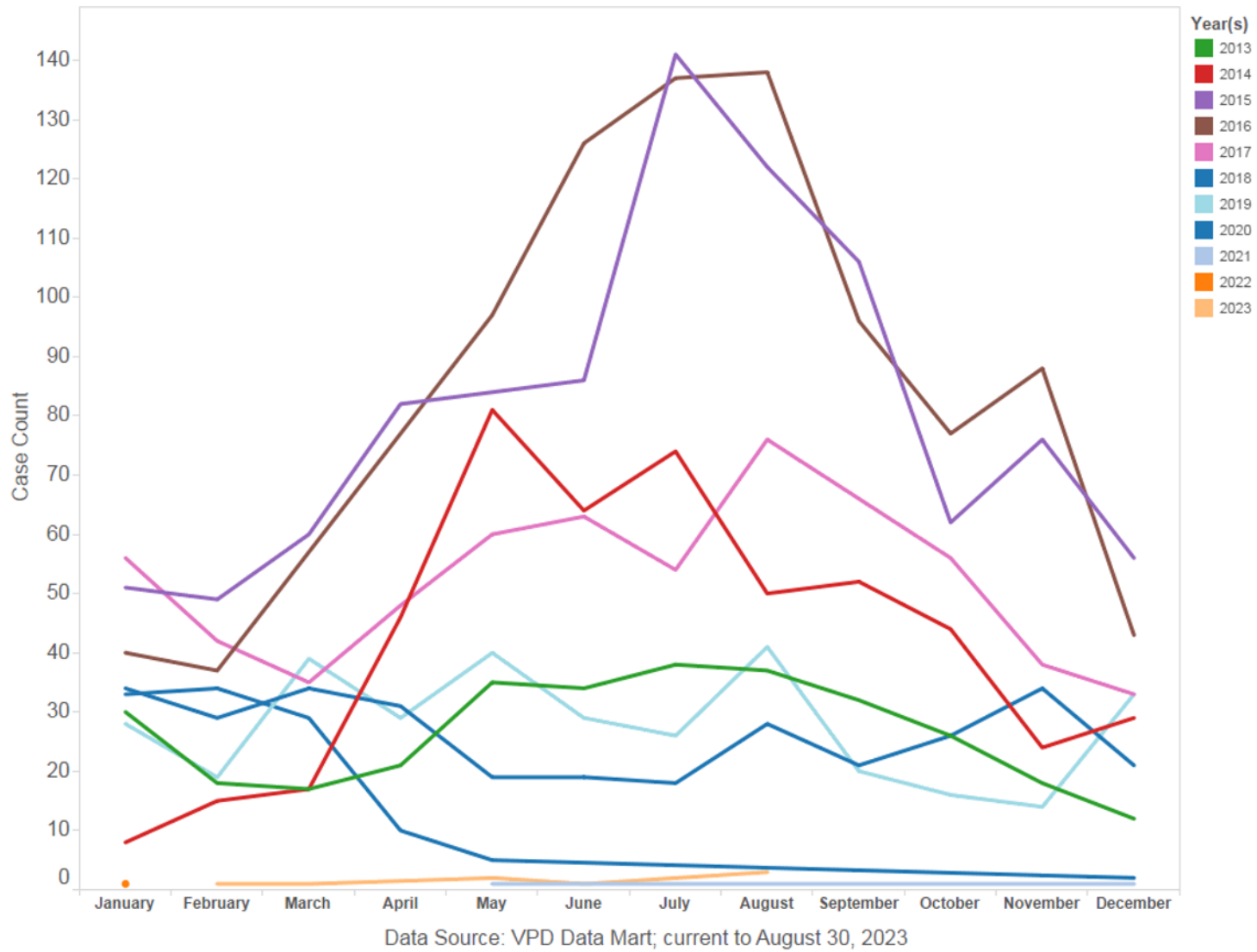
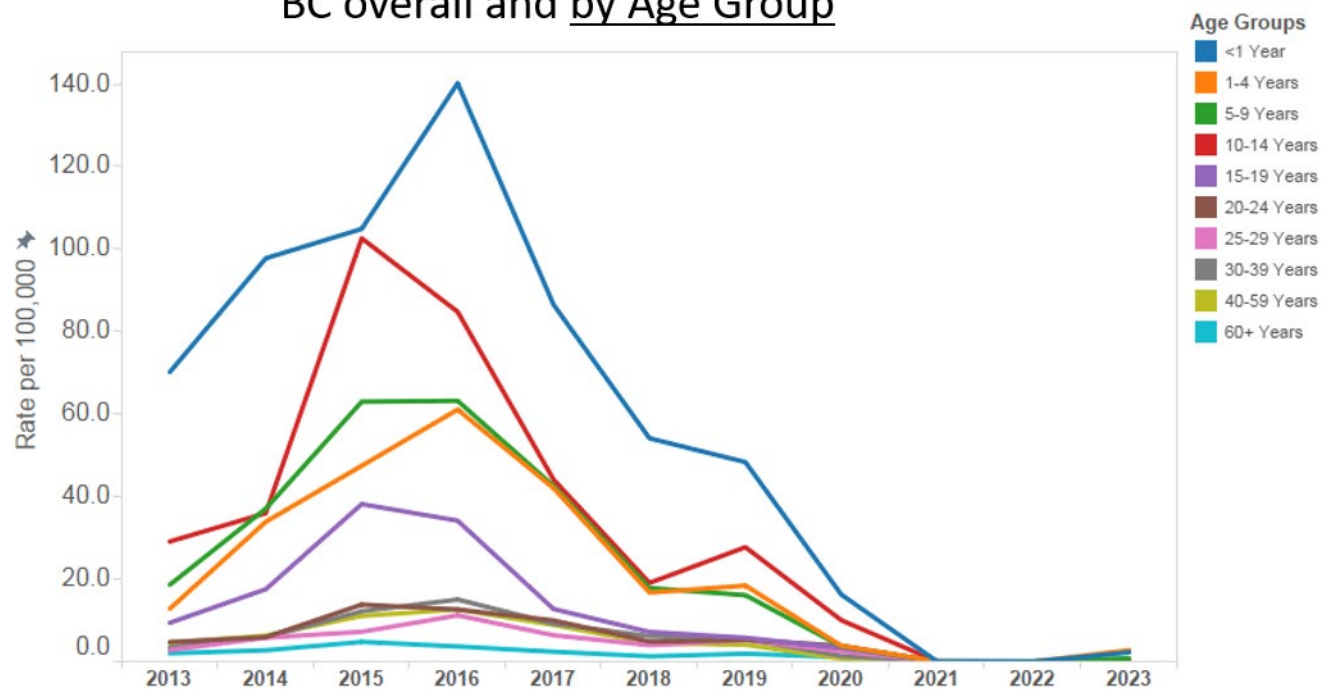


Figure 3. Annual incidence rates (per 100,000)
BC overall and by Age Group

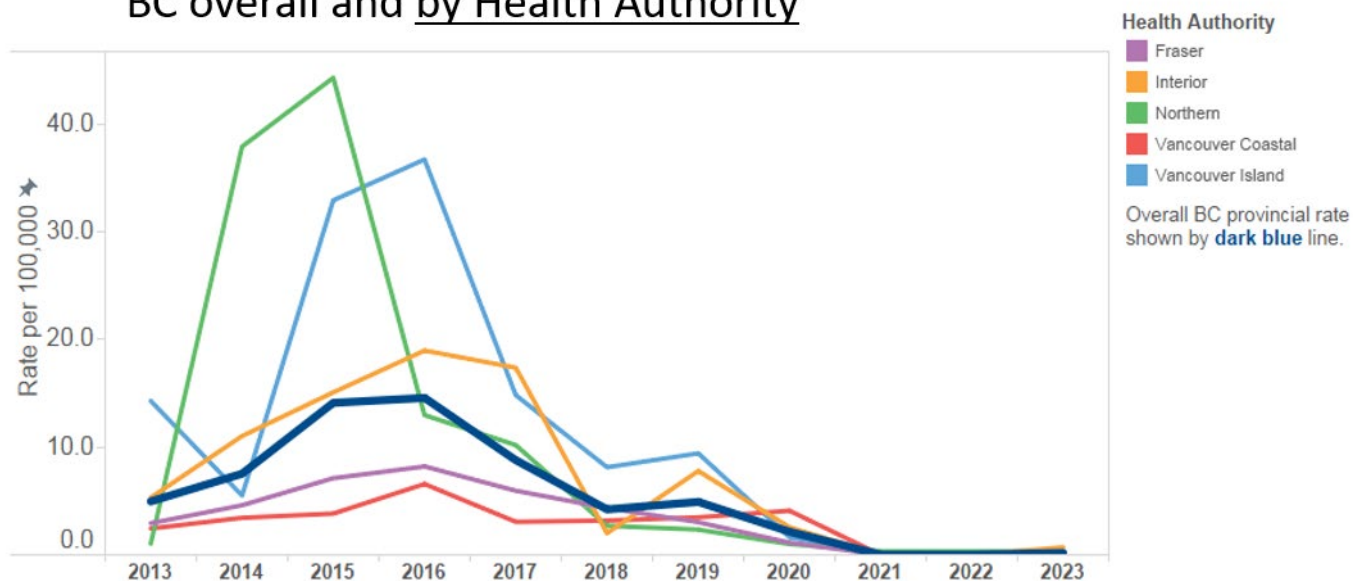


Annual Incidence rates (per 100,000)

BC	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BC	6.9	10.9	20.5	20.9	12.7	6.3	6.6	2.2	0.0	0.0	0.2
<1 Year	70.2	97.7	104.9	140.2	86.5	54.1	48.3	16.2			2.2
1-4 Years	12.8	33.9	47.5	60.5	42.0	16.7	18.4	3.8			2.8
5-9 Years	18.6	37.1	62.6	63.2	42.6	17.8	16.1	3.7			0.8
10-14 Years	29.1	36.0	102.2	84.8	44.1	19.1	27.7	10.0			
15-19 Years	9.4	16.8	38.2	33.8	12.7	6.8	5.8	3.3			
20-24 Years	4.7	5.9	13.8	12.6	10.0	4.8	5.3	3.8			
25-29 Years	2.8	5.5	7.2	11.2	6.4	4.0	5.0	2.5			
30-39 Years	3.4	5.6	12.0	15.0	9.2	6.2	5.4	1.3	0.1		0.2
40-59 Years	4.5	6.1	11.1	12.6	8.9	4.5	4.1	0.7			
60+ Years	2.0	2.7	4.8	3.7	2.4	1.3	1.9	1.0	0.1	0.1	

Data Source: VPD Data Mart; current to August 30, 2023

Figure 4. YTD (Jan 1 – Aug 30) incidence rates (per 100,000)
BC overall and by Health Authority

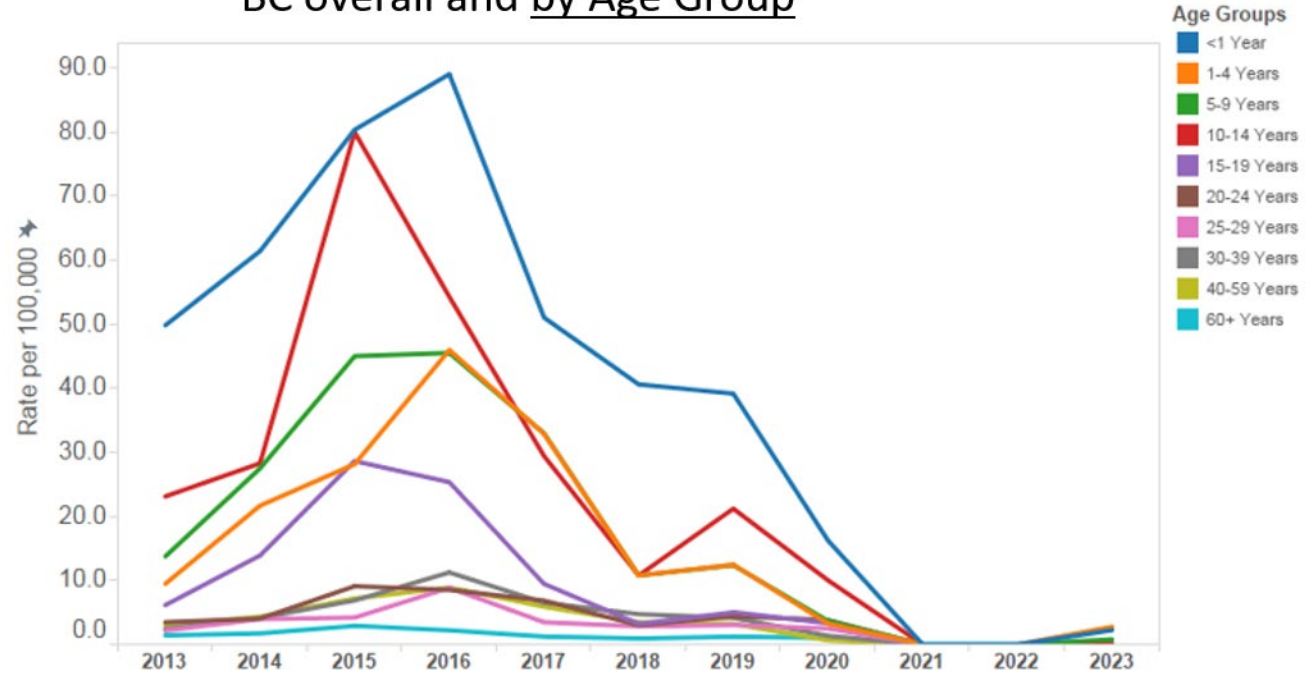


YTD Incidence rates (per 100,000)											
BC	5.0	7.7	14.2	14.6	8.8	4.2	4.9	2.2	0.0	0.0	0.2
Fraser	2.9	4.6	7.1	8.2	6.0	4.4	3.0	1.1			0.1
Interior	5.3	11.0	15.1	19.0	17.4	2.0	7.8	2.6			0.7
Northern	1.0	37.9	44.3	13.0	10.2	2.7	2.3	1.0	0.3	0.3	0.3
Vancouver Coastal	2.5	3.5	3.8	6.6	3.1	3.2	3.5	4.1			
Vancouver Island	14.3	5.5	33.0	36.8	14.8	8.1	9.4	1.6			0.1

YTD Case counts											
BC	230	364	677	711	434	212	252	111	1	1	10
Fraser	50	80	126	148	109	81	58	22			2
Interior	39	82	114	146	136	16	63	21			6
Northern	3	110	129	38	30	8	7	3	1	1	1
Vancouver Coastal	28	40	45	78	37	39	43	51			
Vancouver Island	110	43	261	299	122	68	80	14			1

Data Source: VPD Data Mart; current to August 30, 2023

Figure 5. YTD (Jan 1 – Aug 30) incidence rates (per 100,000)
BC overall and by Age Group

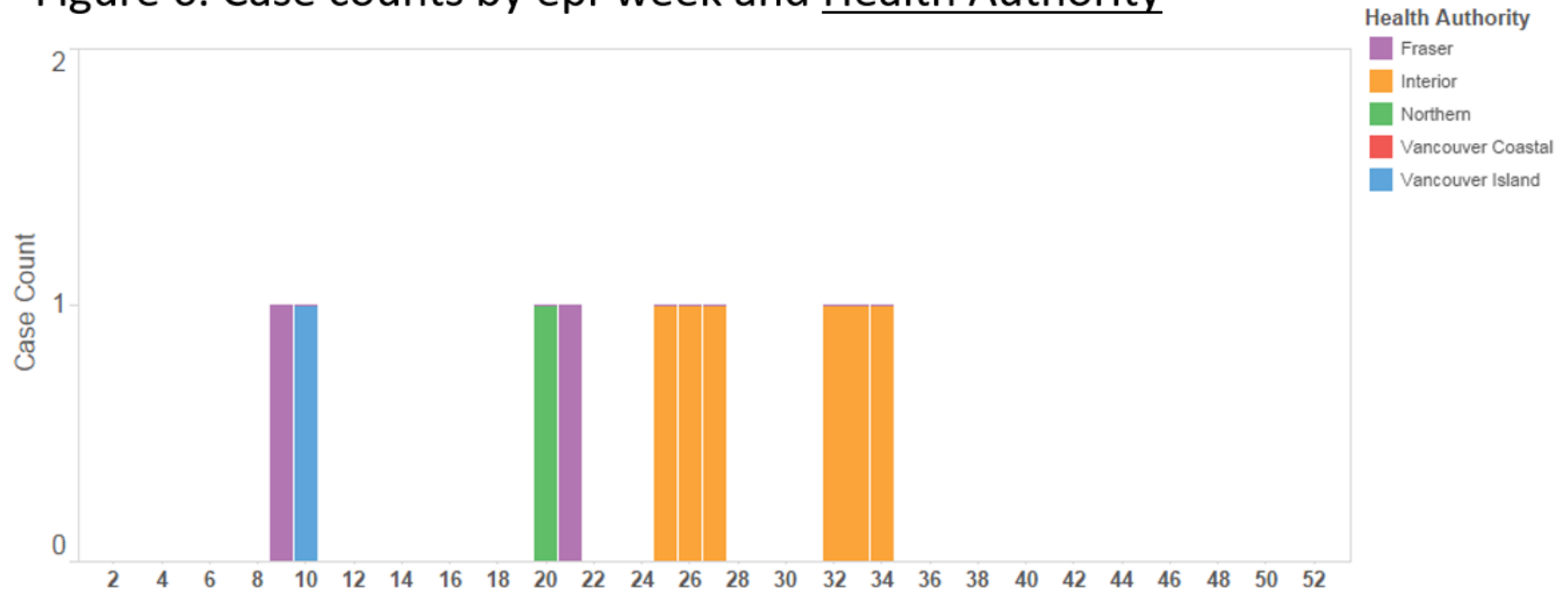


YTD Incidence rates (per 100,000)

BC	5.0	7.7	14.2	14.6	8.8	4.2	4.9	2.2	0.0	0.0	0.2
<1 Year	49.8	61.4	80.3	89.0	51.0	40.6	39.1	16.2			2.2
1-4 Years	9.5	21.7	28.1	45.4	32.9	10.8	12.5	3.3			2.8
5-9 Years	13.7	27.5	44.6	45.5	33.0	10.8	12.4	3.7			0.8
10-14 Years	23.1	28.3	79.5	54.3	29.4	10.8	21.2	10.0			
15-19 Years	6.2	13.2	28.6	25.0	9.5	3.2	5.0	3.3			
20-24 Years	3.5	4.0	9.1	8.5	6.9	3.0	4.4	3.8			
25-29 Years	2.2	3.7	4.2	8.9	3.5	2.8	2.8	2.5			
30-39 Years	2.4	3.8	6.9	11.2	6.5	4.7	4.2	1.3			0.2
40-59 Years	3.0	4.1	7.2	8.9	5.9	3.5	3.2	0.7			
60+ Years	1.4	1.7	2.9	2.2	1.2	1.0	1.2	1.0	0.1	0.1	

Data Source: VPD Data Mart; current to August 30, 2023

Figure 6. Case counts by epi-week and Health Authority



Data Source: VPD Data Mart; current to August 30, 2023