BC Centre for Disease Control
An agency of the Provincial Health Services Authority

655 West 12th Avenue
Vancouver, BC V5Z 4R4

Tel 604.707.2400
Fax 604.707.2401

www.bccdc.ca

British Columbia Annual Summary of Reportable Diseases

2018

September, 2019

Provincial Health Services Authority
Province-wide solutions. Better health.

Table of Contents

To get the latest data and additional charts for a disease, click the icon below whenever you see it.

Noteworthy Diseases and Conditions in 2018

Meningococcal Disease (invasive)
Pneumococcal Disease (invasive)
Streptococcal Disease (invasive) Group A

Meningococcal Disease (invasive)

In 2018, 27 cases of invasive meningococcal disease (IMD) were reported (0.54 cases per 100,000 population), with two fatal cases. Eighteen cases were serogroup W, five serogroup Y and four serogroup B.

None of the 2018 cases reported being immunized against the serogroup that caused their disease. Only one case was eligible to receive vaccine under the publicly funded program, but had not yet been immunized while in grade 9. The remaining cases occurred among individuals not eligible for a publicly funded meningococcal vaccine indication, based on age and risk factors reported. Routine childhood meningococcal C conjugate vaccination began in BC for infants and school-age children spanning grades 6 through 12 in 2003. A routine meningococcal quadrivalent (ACYW) conjugate vaccine immunization program was implemented in grade 9 in BC in September 2016, and replaced the grade 6 meningococcal C conjugate program.

No serogroup C IMD cases were reported in 2018. Since 2008, only one case of meningococcal C disease has been reported in a person less than 25 years of age (in 2017).

Twelve of the 18 serogroup W cases had ST-typing data available. Eleven of the 12 were of the ST-11 clonal complex (cc), which has been identified in BC in prior years, but demonstrated outbreak activity for the first time in BC in 2017.[1,2] Serogroup W ST-11cc cases ranged in age from 2-97 years, with a median of 55 years. Nine of the 11 cases were over 40 years old. This differs from the previous year, when almost half of the ST-11cc cases were aged 15-24 years. ST-11cc cases were reported from seven of BC's 16 health service delivery areas (HSDAs). One of these cases was fatal; an adult over 80 years of age.

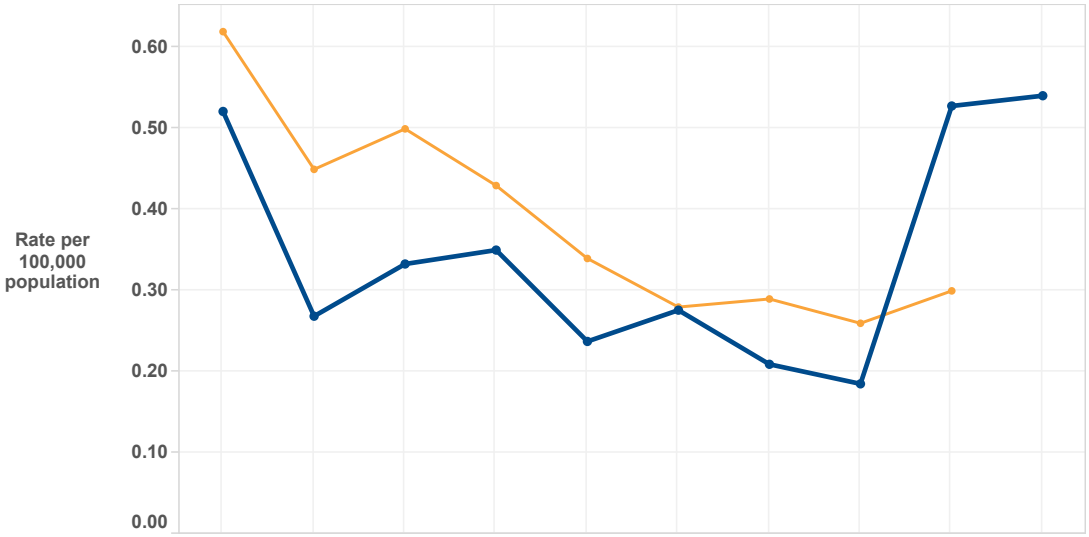
The serogroup B cases ranged in age from 19-66 years (median 49 years). The cases were reported from four HSDAs. Serogroup B incidence has fluctuated between 0.04 and 0.36 cases per 100,000 population over the past ten years.

Serogroup Y cases ranged in age from 14-71 years (median 33 years). The cases were reported from three HSDAs in the Fraser Health Authority. Serogroup Y incidence has fluctuated between 0.04 and 0.16 cases per 100,000 population over the past ten years.

1. Reference: Interior Health Authority. Meningococcal Outbreak (Okanagan). Available online at: https://www.interiorhealth.ca/YourEnvironment/CommunicableDiseaseControl/Pages/Meningococcal-Outbreak.aspx [Accessed: May 2, 2019].

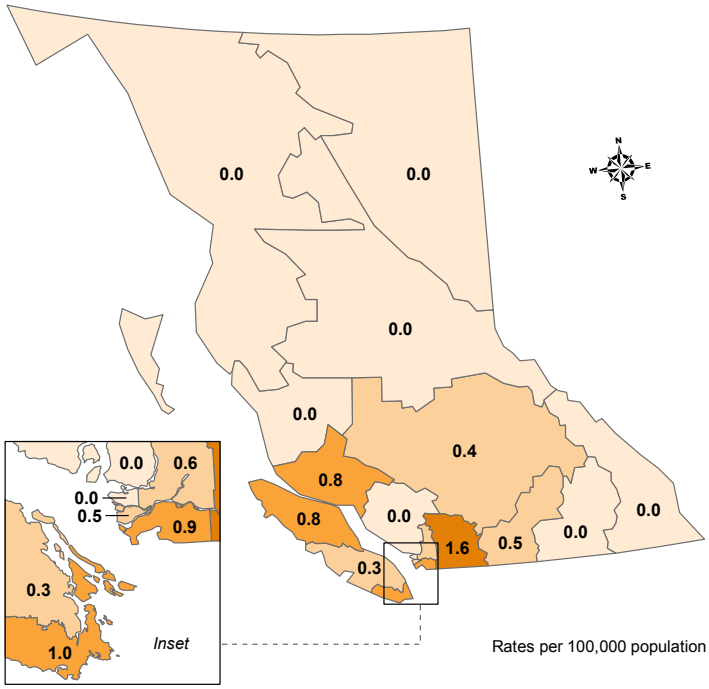
2. BC Centre for Disease Control. 2017 Annual Summary of Reportable Diseases. Noteworthy Diseases and Conditions in 2017: Meningococcal Disease (invasive). Available at http://www.bccdc.ca/resource-gallery/Documents/Statistics%20and%20Research/Statistics%20and%20Reports/Epid/Annual%20Reports/Meningococcal%20Disease%20(invasive).pdf

1.1 Meningococcal Disease (invasive) Rates by Year, 2009-2018



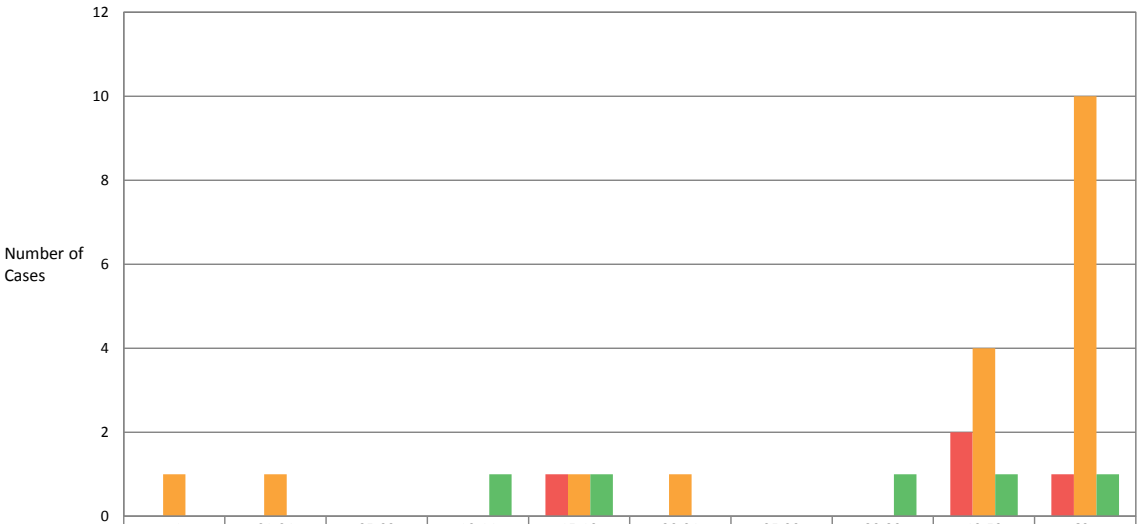
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	23	12	15	16	11	13	10	9	26	27
BC Rate	0.52	0.27	0.33	0.35	0.24	0.28	0.21	0.19	0.53	0.54
Canada Rate	0.62	0.45	0.50	0.43	0.34	0.28	0.29	0.26	0.30	

1.2 Meningococcal Disease (invasive) Rates by HSDA, 2018



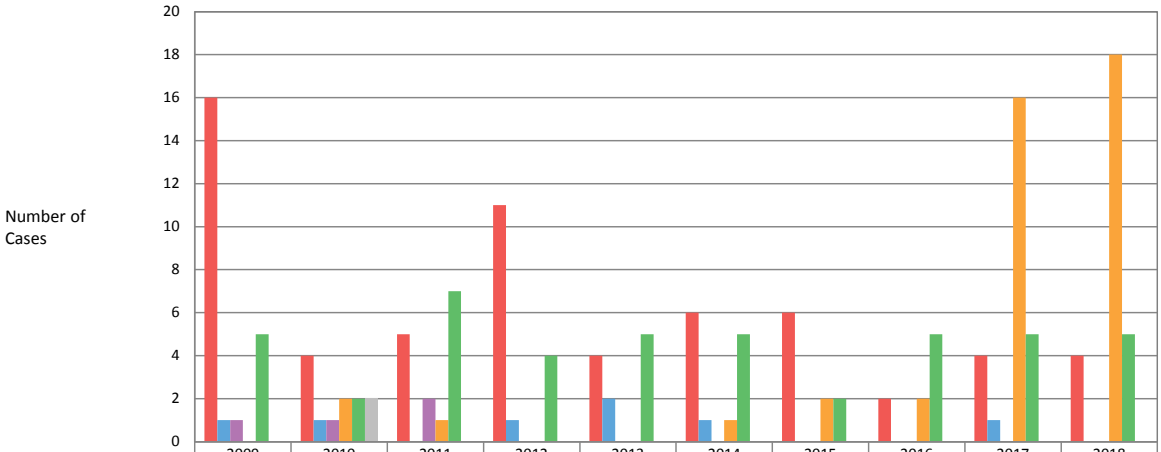
ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	0	0.0
13	Okanagan	2	0.5
14	Thompson Cariboo Shuswap	1	0.4
21	Fraser East	5	1.6
22	Fraser North	4	0.6
23	Fraser South	8	0.9
31	Richmond	1	0.5
32	Vancouver	0	0.0
33	North Shore/Coast Garibaldi	0	0.0
41	South Vancouver Island	4	1.0
42	Central Vancouver Island	1	0.3
43	North Vancouver Island	1	0.8
51	Northwest	0	0.0
52	Northern Interior	0	0.0
53	Northeast	0	0.0

1.3 Meningococcal Disease (invasive) Cases by Serotype and Age Group, 2018



	<1	01-04	05-09	10-14	15-19	20-24	25-29	30-39	40-59	60+
Serogroup B	0	0	0	0	1	0	0	0	2	1
Serogroup W	1	1	0	0	1	1	0	0	4	10
Serogroup Y	0	0	0	1	1	0	0	1	1	1

1.4 Meningococcal Disease (invasive) Cases by Serotype and Year, 2009-2018



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Serogroup B	16	4	5	11	4	6	6	2	4	4
Serogroup C	1	1	0	1	2	1	0	0	1	0
Serogroup E	1	1	2	0	0	0	0	0	0	0
Serogroup W	0	2	1	0	0	1	2	2	16	18
Serogroup Y	5	2	7	4	5	5	2	5	5	5
Non-typeable/Unknown	0	2	0	0	0	0	0	0	0	0

Pneumococcal Disease (invasive)

The increase of invasive pneumococcal disease (IPD) that began in 2016 continued in 2018 during which year 563 cases were reported (11.28 cases per 100,000 population). This was the highest number of cases ever reported, exceeding the 530 cases in 2017 as well as the 551 cases in 2007 when two outbreaks occurred.

The observed increase was largely driven by higher numbers of cases in adult age groups (aged 20 and over). The age specific rates for adults (20-24 years, 25-29 years, 30-39 years, 40-59 years, and 60+ years) were higher in 2018 than the average age specific rates for the years 2009 through 2017. Notably, adults aged 40-59 had an age specific incidence rate twice as high as the average rate from 2009 to 2017 at 16.08 cases per 100,000 population compared to 8.05 cases per 100,000 population, respectively. Age specific rates amongst cases younger than 20 years, on the other hand, were similar to or lower in 2018 compared to the 2009 through 2017 averages.

Enhanced surveillance data are collected for all pediatric IPD cases (aged 16 and younger) in BC, and there were 21 of these cases reported in 2018. Fourteen cases were under the age of five. All 21 pediatric cases were hospitalized, and meningitis was the clinical syndrome reported in one case (5%). None of these cases were fatal.

Serotype information was available for 534 (95%) of the 2018 IPD cases with serotype 4 being the most commonly reported (n=93, 17%). Amongst cases aged 65 and older, a population for which the 23-valent polysaccharide vaccine (PPV-23) is recommended, 172 cases (97%) had serotype information, and 65 of these cases (38%) were due to serotypes covered by PPV-23. Vaccination history is not routinely collected for adult cases of IPD in BC, and as a result, the proportion of cases aged 65 and older who received PPV-23 cannot be assessed.

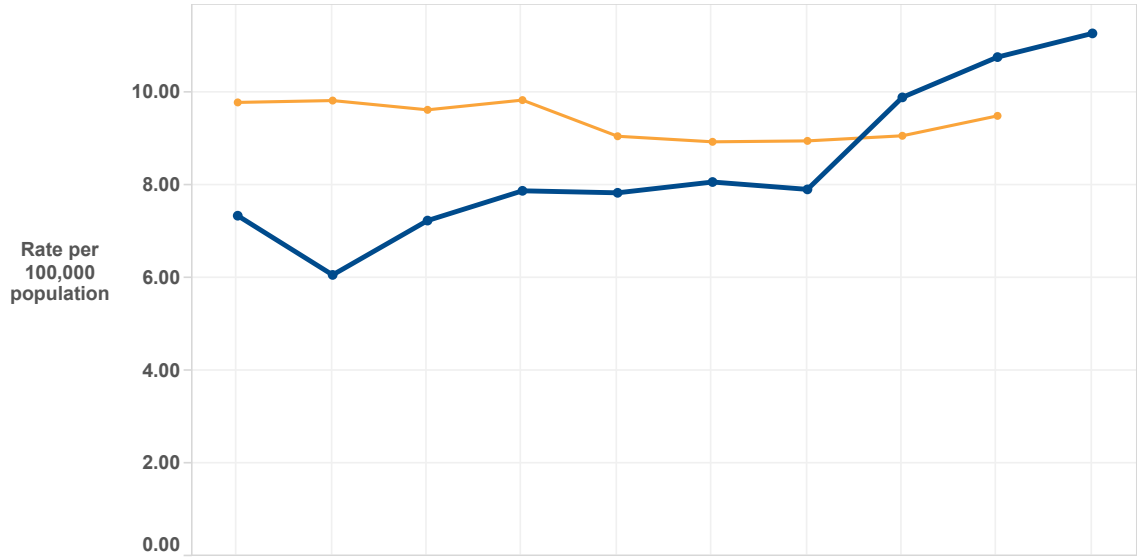
All 14 pediatric cases under age five had serotype information. Three of these cases (21%) were due to serotypes covered by the pneumococcal-conjugate 13-valent vaccine (PCV-13) routinely recommended for infants and young children in BC. Four cases (29%) were due to serotypes covered by PPV-23 but not by PCV-13. PPV-23 is only recommended for certain high risk children.

The serotypes, age at onset, and documented immunizations prior to onset of illness were reviewed against the BC immunization schedule for healthy and medically high-risk children to determine preventability by the current pneumococcal immunization program for children under 5 years of age.

All 14 cases were not preventable:

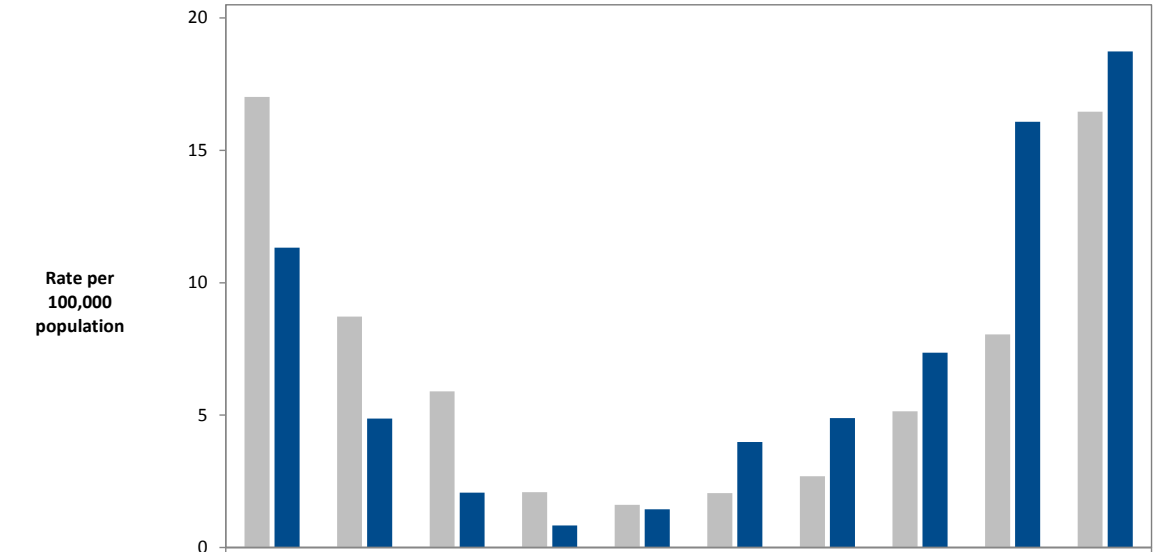
- Seven cases were due to serotypes not covered by PCV-13 or PPV-23 (15A, 15C, 23B [n=3], 29, and 35F)
- Three cases were due to serotypes covered by PPV-23 but in children who were not medically high-risk and, therefore, not eligible for that vaccine (9N, 12F, and 15B)
- Two cases were due to serotype 3 which is covered by PCV-13, and both were fully immunized according to the BC immunization schedule prior to onset of illness
- One case was due to serotype 14 which is covered by PCV-13, but the case had a valid exemption to vaccination
- One case due to serotype 33F was under 2 months old and too young to be vaccinated

2.1 Pneumococcal Disease (invasive) Rates by Year, 2009-2018



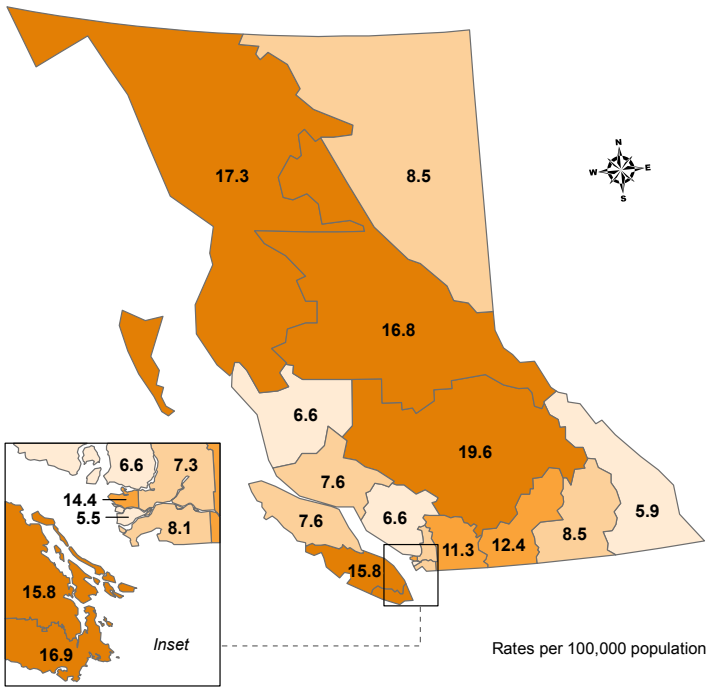
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	324	271	326	360	363	380	378	481	530	563
BC Rate	7.35	6.07	7.24	7.88	7.84	8.07	7.91	9.90	10.77	11.28
Canada Rate	9.79	9.83	9.63	9.84	9.06	8.94	8.96	9.07	9.50	

2.2 Pneumococcal Disease (invasive) Rates by Age Group, 2009-2017 and 2018



	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
2009-2017 Average Rate	17.02	8.72	5.9	2.09	1.61	2.05	2.69	5.14	8.05	16.46
2018 Rate	11.32	4.87	2.07	0.83	1.44	3.98	4.89	7.36	16.08	18.73

2.3 Pneumococcal Disease (invasive) Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	5	5.9
12	Kootenay Boundary	7	8.5
13	Okanagan	48	12.4
14	Thompson Cariboo Shuswap	46	19.6
21	Fraser East	36	11.3
22	Fraser North	50	7.3
23	Fraser South	69	8.1
31	Richmond	12	5.5
32	Vancouver	100	14.4
33	North Shore/Coast Garibaldi	20	6.6
41	South Vancouver Island	70	16.9
42	Central Vancouver Island	46	15.8
43	North Vancouver Island	10	7.6
51	Northwest	13	17.3
52	Northern Interior	25	16.8
53	Northeast	6	8.5

Rates per 100,000 population by HSDA

Streptococcal Disease (invasive) Group A

In 2018, 413 confirmed cases of invasive group A streptococcal disease (iGAS) were reported in BC (8.3 cases per 100,000 population). This is a slight decline following annual increases that started in 2015 and peaked at 8.5 cases per 100,000 population in 2017.

Fifty-nine percent of cases were male. Cases ranged in age from two to 101 years (median 49 years) and the highest incidence rates were in the 30-39 year age group, followed by the 60+ and the 40-59 year age groups.

Cases were reported from all 16 health service delivery areas (HSDA), with incidence rates by HSDA ranging from 2.8 to 21.3 cases per 100,000 population. The highest incidence rate was in the Northwest HSDA with 16 cases aged 15-95 years and six different *emm* types identified, followed by the Northern Interior HSDA with 21 cases aged 28-75 years and nine different *emm* types. The third highest incidence rate, and the largest number of cases, was in Vancouver HSDA, with 95 cases aged 12-92 years and 20 different *emm* types.

Similar to 2017, one in three cases had homelessness/under-housing and/or injection drug use as a risk factor and over half had predisposing wounds or skin infections.

Twenty-seven percent of cases had severe clinical presentations (streptococcal toxic shock syndrome, soft tissue necrosis, meningitis, pneumonia or death); this is similar to the average rates observed in the previous ten years (range 18-35%, median 28%). While almost 90% of the severe cases were over 30 years of age, there were two severe cases in children under five years old and three in children aged 10-19 years.

The 2018 case fatality rate was 5.6%. In the previous ten years, the case fatality ranged between 4.0% and 13.7% (median 7.4%). Twenty of the 23 deaths in 2018 were in adults over 30 years old. There was also one death each in the 10-14 year, 19-20 year and 20-24 year age groups.

Four cases of puerperal fever were reported in 2018. One case followed a spontaneous abortion; three were associated with live births. In the previous decade, 1-5 (median 3) confirmed cases of puerperal fever due to group A streptococcus were reported each year.

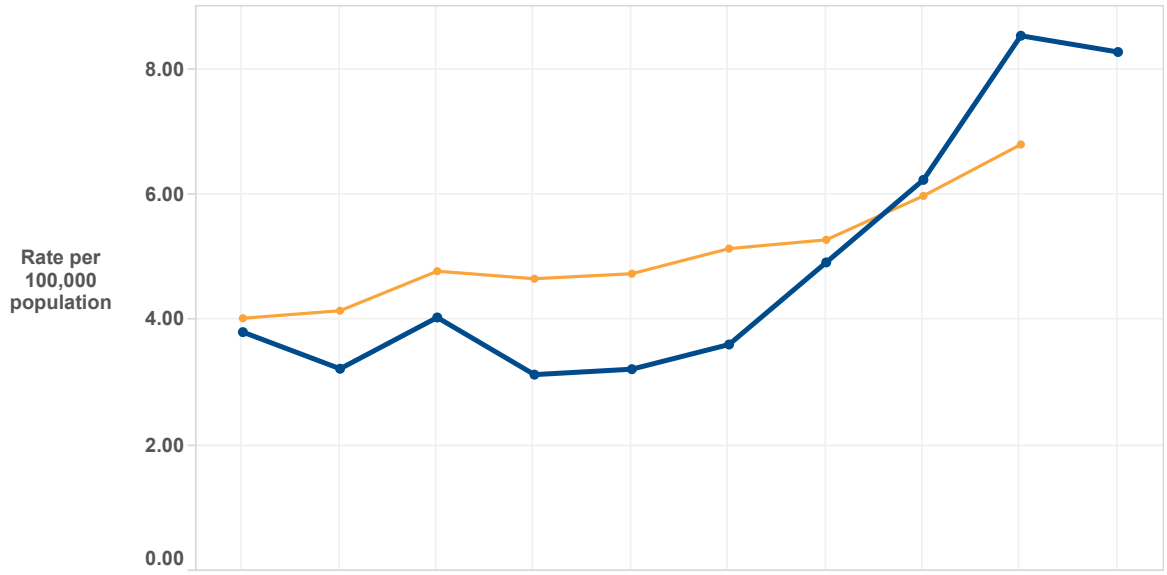
No iGAS clusters or outbreaks were identified in 2018.

Isolates from 363 of the 413 confirmed cases were typed by the National Microbiology Laboratory. The most common *emm* types were types 76 (18%), 1 (17%) and 81 (13%). This is a slight shift from 2018, when the most common *emm* types were types 1 (21%), 76 (13%) and 101 (10%).

The *emm* type distribution varied by health authority. Case risk factor profiles varied by *emm* type. Large proportions of *emm* 76 and *emm* 81 cases reported homelessness/under-housing, injection drug use, skin infections and wounds. Six of the 14 cases aged 1-14 years with known *emm* types were *emm* 1. Cases with *emm* 1 were more likely to have severe presentations and fatal outcomes, but less likely to have underlying risk factors, than other *emm* types.

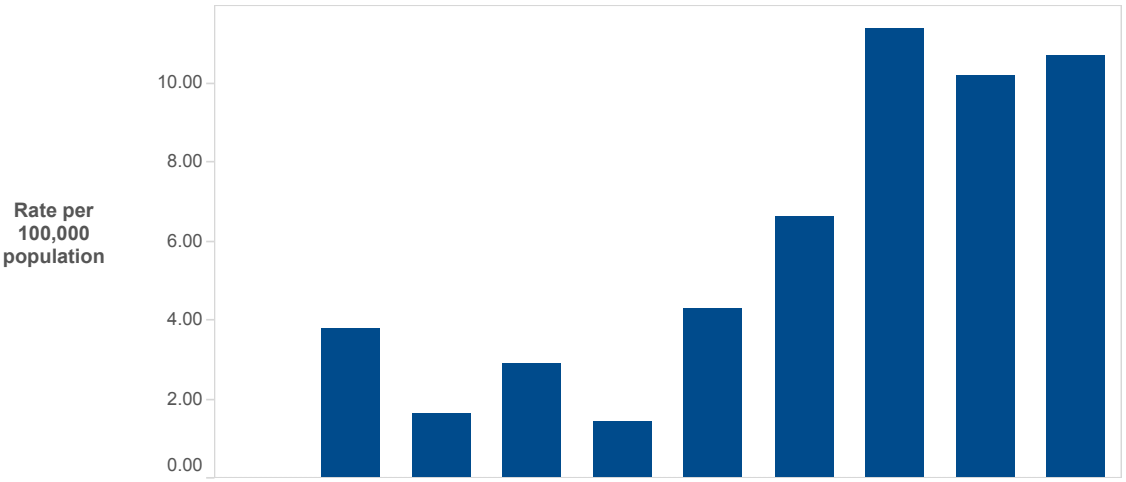
Additional detail is available in the Invasive Group A Streptococcal Disease (iGAS) in British Columbia 2018 Annual Summary report available at http://www.bccdc.ca/health-professionals/data-reports/communicable-diseases.

3.1 Streptococcal Disease (invasive) Group A Rates by Year, 2009-2018



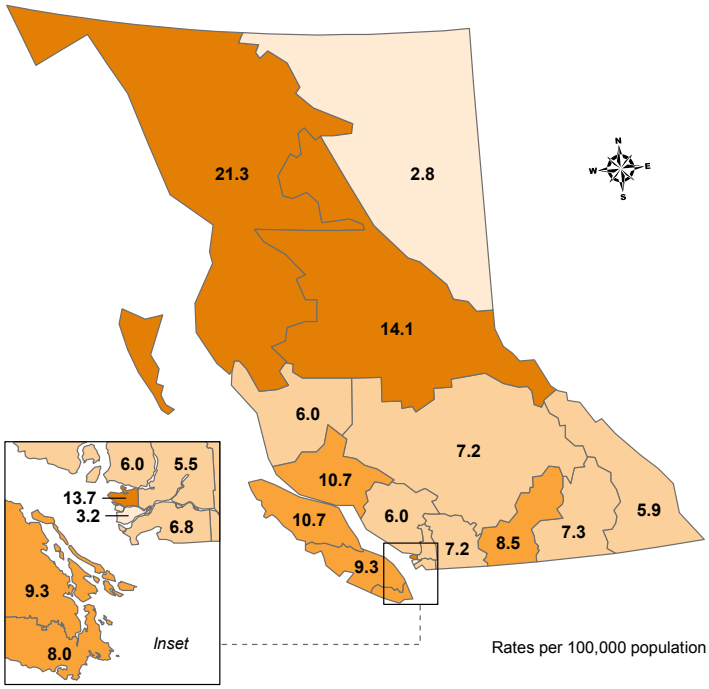
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	168	144	182	143	149	170	235	303	420	413
BC Rate	3.81	3.22	4.04	3.13	3.22	3.61	4.92	6.24	8.53	8.27
Canada Rate	4.03	4.15	4.78	4.66	4.74	5.14	5.28	5.98	6.80	

3.2 Streptococcal Disease (invasive) Group A by Age Group, 2018

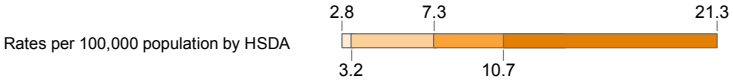


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	4	1	3	2	9	9	37	55	48
	Male	0	3	3	4	2	5	14	42	85	87
	Total	0	7	4	7	4	14	23	79	140	135
BC Rate	Female	0.00	4.49	0.85	2.53	1.48	5.80	5.30	10.72	7.81	7.22
	Male	0.00	3.13	2.43	3.27	1.40	2.92	7.85	12.08	12.68	14.61
	Total	0.00	3.79	1.66	2.90	1.44	4.29	6.61	11.40	10.18	10.71

3.3 Streptococcal Disease (invasive) Group A Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	5	5.9
12	Kootenay Boundary	6	7.3
13	Okanagan	33	8.5
14	Thompson Cariboo Shuswap	17	7.2
21	Fraser East	23	7.2
22	Fraser North	38	5.5
23	Fraser South	58	6.8
31	Richmond	7	3.2
32	Vancouver	95	13.7
33	North Shore/Coast Garibaldi	18	6.0
41	South Vancouver Island	33	8.0
42	Central Vancouver Island	27	9.3
43	North Vancouver Island	14	10.7
51	Northwest	16	21.3
52	Northern Interior	21	14.1
53	Northeast	2	2.8



Surveillance Summaries for Other Selected Diseases and Conditons

Antimicrobial Resistance

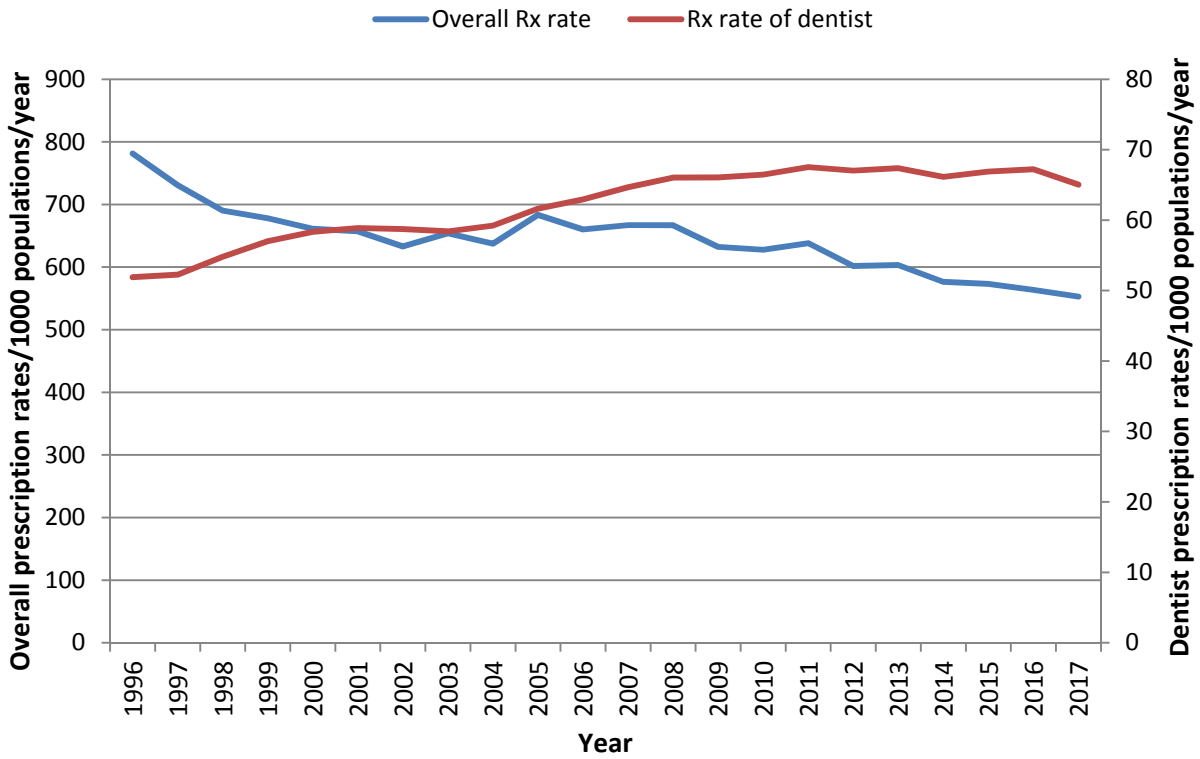
Antimicrobial utilization (AMU) and Antimicrobial resistance (AMR)

As part of the Community Antimicrobial Stewardship (formerly Do Bugs Need Drugs?) program evaluation, trends in antimicrobial utilization and antimicrobial resistance are routinely analyzed using anonymized PharmaNet BC Ministry of Health database and isolate-level antimicrobial susceptibility testing data from LifeLabs (and formerly BC Biomedical Laboratories), respectively. These surveillance findings are available in a web-based interactive data visualization platform: "BCCDC Antimicrobial Surveillance Tools" (http://www.bccdc.ca/health-professionals/data-reports). Data visualization platform is not yet updated incorporating data from 2017.

Antimicrobial Use highlights in 2017 –

- Overall, antimicrobial utilization continued to decrease in 2017 with a 19% decrease in prescription rates since 2005.
- Dentist prescription rates were previously increasing but decreased 3.2% from 2016 to 2017.
- Prescription rates of ciprofloxacin continued to decrease and of nitrofurantoin (preferred treatment of choice for UTI) continued to increase in 2017.
- Overall, clindamycin prescription rate is in decreasing trend.

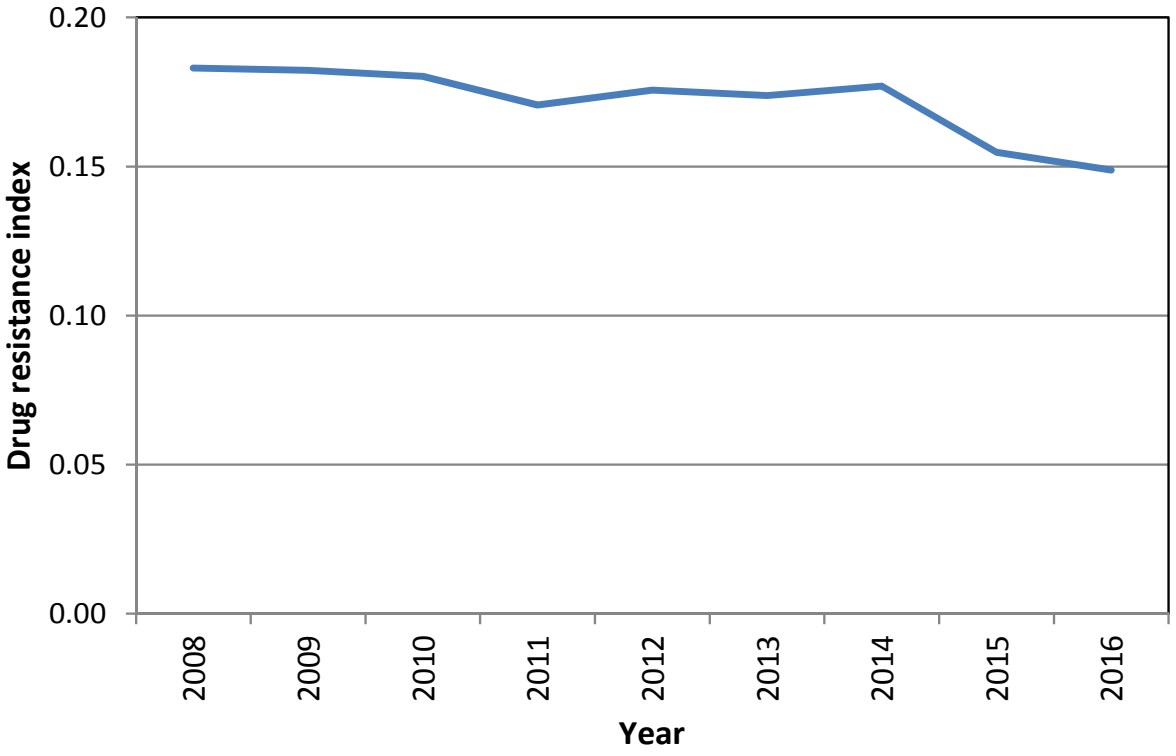
4.1 Overall and dentist prescripton in BC, 1996-2017



Antimicrobial Resistance –

Due to data analysis limitations, 2017 data was unavailable at time of creating this report. However, as part of the future strategies to make the antimicrobial resistance surveillance findings more useful and easily interpretable drug resistance indices (DRIs) are being calculated. DRI combine rates of antimicrobial resistance with prescription rates for antimicrobial drugs into a single composite measure of the effectiveness of empirical antibiotic treatment. The DRI that aggregate resistance to different drugs can be useful to assess the changes in drug resistance over time.[1]

4.2 Adaptive-use DRI for cystitis



1. Laxminarayan R, Klugman KP. Communicating trends in resistance using a drug resistance index. BMJ Open. 2011; 1:e000135. doi: 10.1136/bmjopen-2011-000135

DRI values range from 0 to 1, where 1 means that infections are untreatable with any of the antibiotics used in the given setting and 0 means all isolates included in the calculation were susceptible. Adaptive-use DRI for cystitis which accounts for the changing proportion of drug classes in each year was calculated. The graph above indicates that the adaptive-use DRI ranged from a high of 18.3% in 2008 to a low of 14.9% in 2016. This finding is encouraging, suggesting that physicians are adapting their prescribing patterns for cystitis in response to local resistance patterns and updated guidelines.

Carbapenemase producing organisms (CPOs) – The emergence of Carbapenemase producing organisms (CPOs) is a medical concern and public health threat. CPO refers to some strains of bacteria such as Klebsiella, E. coli, Acinetobacter and Pseudomonas that are resistance to most of the antibiotics including carbapenems. To know more about CPO surveillance program please visit at: https://www.picnet.ca/surveillance/cpo/
For healthcare-associated infections (e.g. MRSA, CPO, and C. difficile), please visit the Provincial Infection Control Network of British Columbia (PICNet) at: https://www.picnet.ca/surveillance/latest-surveillance-reports/

Enteric, Food and Waterborne Diseases

Enteric Disease Outbreaks
Cyclosporiasis
E.coli (Shigatoxigenic)
Hepatitis A
Listeriosis
Salmonellosis, Typhoid Fever and Paratyphoid Fever
Shigellosis
Vibrio Infection

Enteric Disease Outbreaks in BC

In 2018, 29 enteric disease outbreaks were investigated in BC (Table 5.1). The number of outbreaks was lower than 2017, but was slightly higher than previous years (Figure 5.2). This decrease is likely due to gaining familiarity with whole genome sequencing and fewer outbreaks initiated nationally. All five health authorities reported outbreaks in 2018. NHA reported the largest number of outbreaks for a regional HA and this was due to a large number of viral outbreaks reported in various work camps.

A variety of etiologies were reported in outbreaks investigation in 2018 including viruses, bacteria, parasites and chemical/toxins (Table 5.3). The pathogen was laboratory-confirmed in 19 (62.1%) outbreaks; this is lower than previous years and is primarily due to 10 viral outbreaks that were not lab-confirmed in 2018. Norovirus and *Salmonella* remained the two most frequently identified pathogens as in previous years.

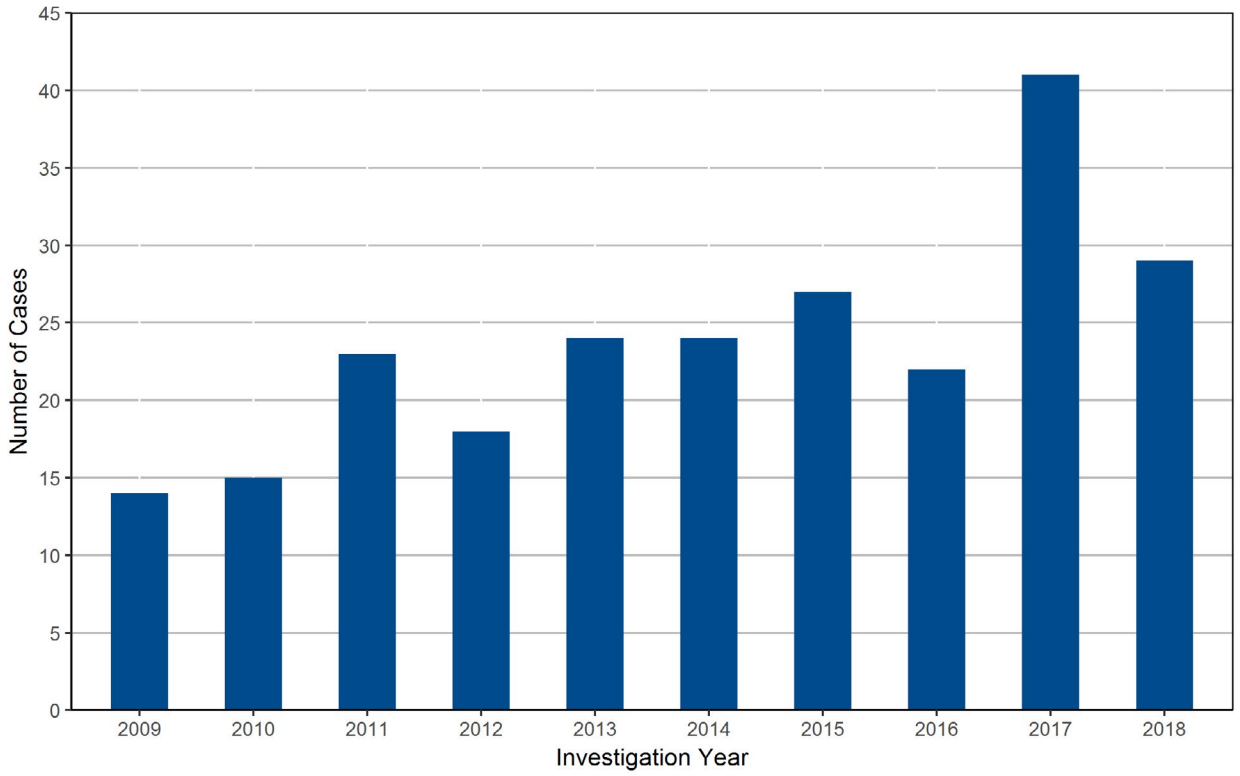
Outbreaks occurred in a variety of settings, most commonly the community and mining camps (Table 5.4). This is a slight change from previous years where food service establishments were the second most common setting. The same number of outbreaks as in similar years are reported from food service establishments.

Similar to previous years, the most common mode of transmission was foodborne (Table 5.5). Among the 16 foodborne outbreak investigations, 14 (87.5%) identified a food source, which is similar to 2017 and higher than in years prior. Meat was the most commonly reported food source (Table 5.6) and all meat outbreaks were caused by chicken. Four of these were caused by frozen breaded chicken products and led to recalls of products. Produce and seafood outbreaks were caused by a variety of different etiologies, including toxins, viruses and bacterial pathogens.

5.1 Enteric disease outbreaks by reporting organization, BC, 2018

Reporting Organization	Number of Outbreaks Investigated
Fraser Health	1
Interior Health	4
Northern Health	8
Vancouver Coastal Health	2
Island Health	3
British Columbia Centre for Disease Control	11
Total	29

5.2. Number of outbreaks by year investigation started, BC, 2009-2018 (N=237)



5.3 Characteristics of enteric outbreaks by pathogen type, BC, 2018

	Bacterial (N=11)	**Viral (N=15)**	**Parasite (N=1)**	**Toxin/ Chemical (N=2)**	**Total (N=29)**
Number of lab confirmed outbreaks	11	5	1	1	18
number of lab confirmed cases	91	17	16	3	127
number of clinical cases	11	371	0	14	396
number of hospitalizations	13	15	0	4	32
number of deaths	0	0	0	0	0
Median and range in duration of outbreak* (days)	31 Range 2-114 days	5 Range 1-32 days	32**	1.5 Range 1-2 days	6 Range 1-114 days
Causative agent	*Salmonella* (7) *E. coli* (2) *Vibrio* (2)	Norovirus (6) Astrovirus (1) Hepatitis A (1) Unknown (7)	*Cyclospora*	Paralytic shellfish poisoning (1) Carbonate (1)	

*Duration of outbreak is calculated as the time period between the earliest and last reported onset date of cases. This is calculated for outbreaks with more than one case and for columns with more than one outbreak

** Duration only

5.4 Outbreaks by setting, BC, 2018

Outbreak Setting	**Outbreaks Investigated**	
	#	**%**
Community	11	33.9
Mining camps	7	24.1
Food service establishments	4	13.8
Daycares	2	6.9
Other	5	17.2
Total	29	100.0

5.5 Outbreaks by mode of transmission, BC, 2018

Outbreak Mode of Transmission	Outbreaks Investigated	
	#	%
Foodborne	16	55.2
Person-to-person	11	37.9
Multiple	1	3.4
Unknown	1	3.4
Total	29	100.0

5.6 Source of foodborne outbreaks by pathogen, 2018, BC

	Carbonate	*Cyclospora*	*E. coli*	Hepatitis A	Norovirus	*Salmonella*	*Vibrio*	Paralytic Shellfish Poisoning	Total
Dairy	0	0	1	0	0	0	0	0	1
Meat	0	0	0	0	0	5	0	0	5
Produce	1	0	1	0	0	1	0	0	3
Seafood	0	0	0	0	1	0	2	1	4
Unknown	0	1	0	1	0	1	0	0	3
Total	1	1	2	1	1	7	2	1	16

1. Enteric disease outbreak data are reported through a national, secure web-enabled outbreak reporting tool using the Canadian Network for Public Health Intelligence (CNPHI). Data were extracted from CNPHI on May 13, 2019. Viral outbreaks in hospitals and long-term care facilities are excluded.

Cyclosporiasis

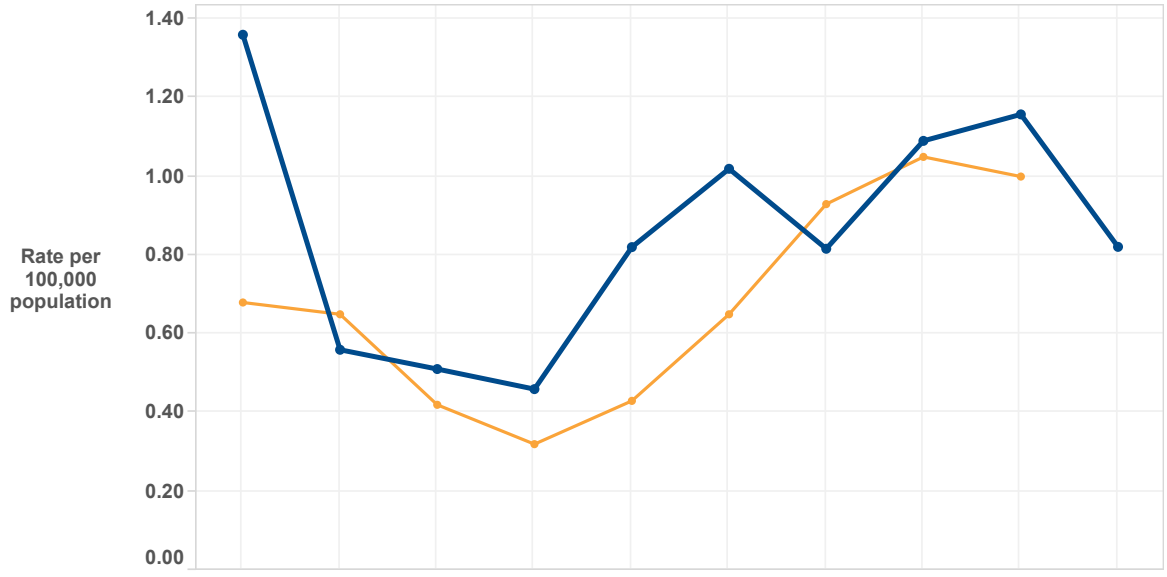
Cyclospora is not endemic in Canada. BC residents acquire infection during travel to endemic countries in South and Central America or Asia or from imported contaminated produce.

In 2018, 41 cases of cyclosporiasis were reported. Half of the cases (51%) traveled to endemic areas during their incubation period. The incidence rate decreased in 2018 to 0.82/100,000. Sixteen locally-acquired BC cases were associated with a national outbreak occurring from April to August which remained unsolved but was likely linked to fresh produce, similar to the annual outbreaks occurring between 2013 and 2017.

The majority of cases were reported in the spring and summer, in accordance with the peak incidence in endemic countries and the time period the outbreak was investigated.

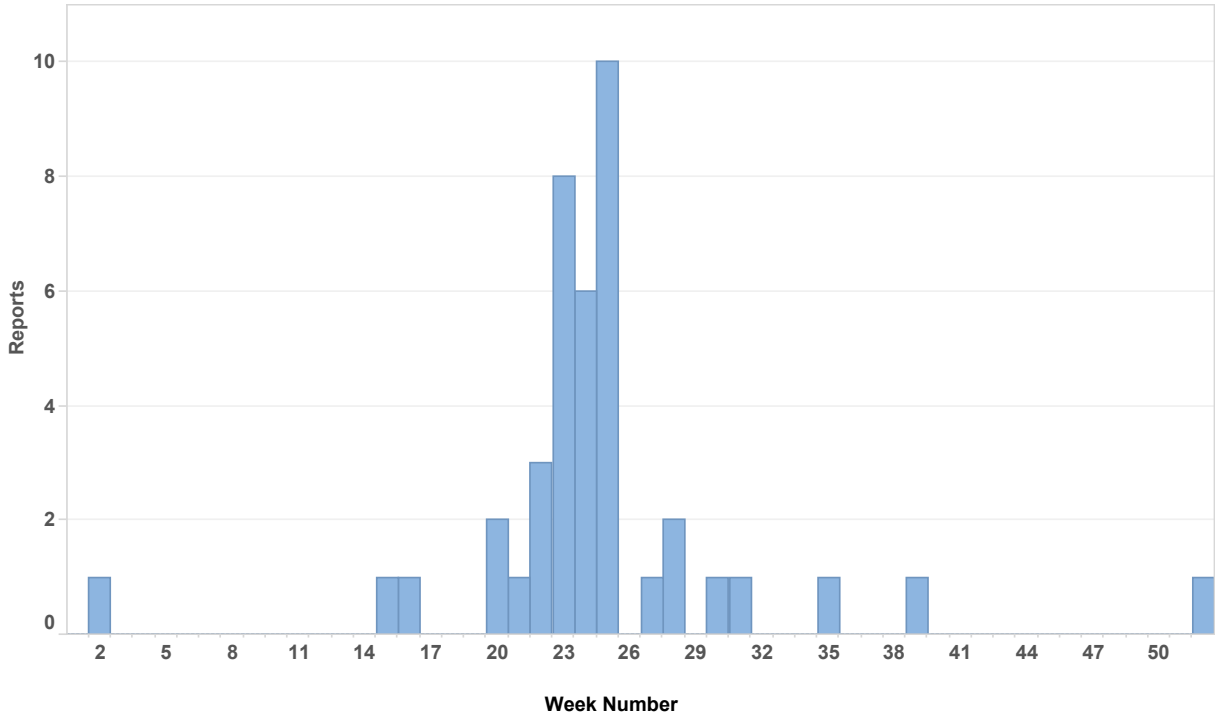
interactive dashboard

6.1 Cyclosporiasis Rates by Year, 2009-2018



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	60	25	23	21	38	48	39	53	57	41
BC Rate	1.36	0.56	0.51	0.46	0.82	1.02	0.82	1.09	1.16	0.82
Canada Rate	0.68	0.65	0.42	0.32	0.43	0.65	0.93	1.05	1.00	

6.2 Cyclosporiasis Reports by Week, 2018



E.coli (shigatoxigenic)

Shigatoxigenic *E. coli* (STEC), also known as verotoxigenic *E. coli* and enterohemorrhagic *E. coli,* causes the most serious *E. coli* infections which can lead to hemolytic uremic syndrome (or kidney failure) and death.

In 2018, 193 cases of STEC infection were reported of which 30.8% were associated with international travel. The incidence rate (3.87/100,000) has increased every year since 2015. Annual peaks in STEC incidence are usually associated with outbreaks, of which 2 occurred in 2018. In addition, changes in laboratory tests used in BC in the last few years have led to an increase in the rate of *E. coli* non-O157 which has also contributed to the overall increased incidence (Noftall 2019[1]).

There was one outbreak of 7 cases of *E. coli* O121 which was associated with a locally-produced unpasteurized cheese (BCCDC, 2018[2]) and one international outbreak including 3 BC cases of *E. coli* O157 associated with romaine lettuce (PHAC, 2018[3]).

The incidence was highest among adults aged 20-24 and children 1-4 years of age. The higher risk in children is similar to that seen in other enteric diseases and is likely due to lower immunity as well as behaviours that increase the risk of infection (e.g. use of diapers). The increased incidence in adults was likely due to the outbreak associated with unpasteurized cheese. Cases were reported in all health authorities with the highest rate in Central Vancouver Island at 12.0/100,000, the majority of cases associated with the unpasteurized cheese outbreak were also from this HSDA. Island Health reported 81 cases in 2018, higher than any other health authority. This may be associated with the use of a more sensitive nucleic acid test implemented in Island Health in 2017. Although cases were reported throughout the year, peaks occurred in the spring and fall. The fall peak coincides with the outbreak associated with unpasteurized cheese.

Since 2017, *E. coli* O121 was the most commonly reported serogroup in BC. Non-*E. coli* O157 isolates made up 70.0% of the *E. coli* isolates in BC in 2018. This may in part be due to the outbreak caused by *E. coli* O121 in 2018 as well as the increasing use of nucleic acid tests to detect *E. coli* and other enteric pathogens in VIHA laboratories. These tests are more sensitive in their detection of non-O157 serogroups. The number of *E. coli* O157 cases remained low in 2018, the reason for this low number of cases is unclear but could be due to improved meat processing practices (Pollari, 2017[4]).

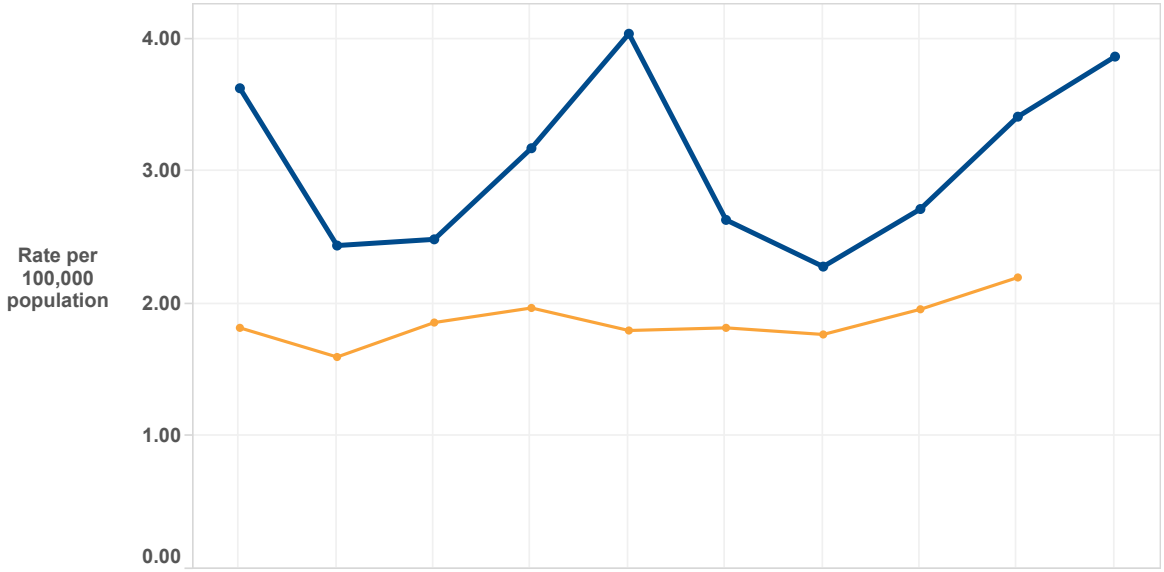
1. Noftall 2019, expect to be published in September, 2019.

2. BCCDC. Updated: Qualicum Spice cheese E. coli outbreak over. Accessed on May 10 2019 from: http://www.bccdc.ca/about/news-stories/news-releases/2018/bccdc-advises-public-to-discard-%E2%80%98qualicum-spice%E2%80%99-cheese

3. PHAC. Public Health Notice - Outbreak of E. coli infections linked to romaine lettuce. Accessed on May 10 2019 from: https://www.canada.ca/en/public-health/services/public-health-notices/2018/outbreak-ecoli-infections-linked-romaine-lettuce.html

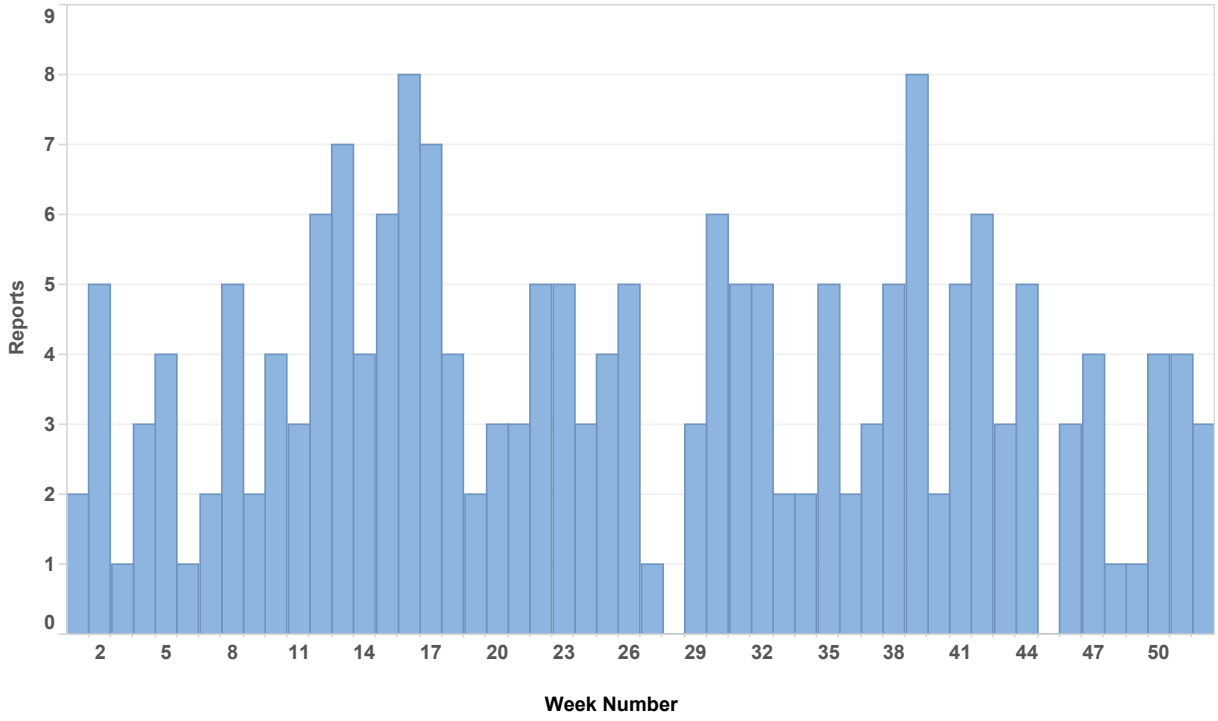
4. Pollari et al. 2017. Evidence for the ebenfits of food chain interventions on E. coli O157:H7/NM prevelance in retail ground beef and human disease incidence. Canadian Journal of Public Health. 108:71-78

7.1 Shigatoxigenic E. coli by Year, 2009-2018

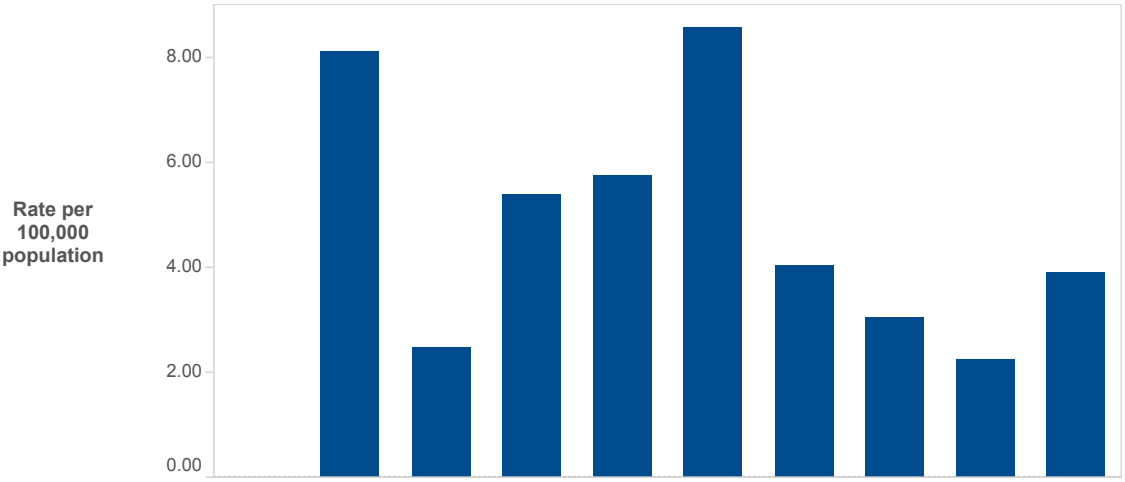


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	160	109	112	145	187	124	109	132	168	193
BC Rate	3.63	2.44	2.49	3.18	4.04	2.63	2.28	2.72	3.41	3.87
Canada Rate	1.82	1.60	1.86	1.97	1.80	1.82	1.77	1.96	2.20	

7.2 Shigatoxigenic E. coli Reports by Week, 2018

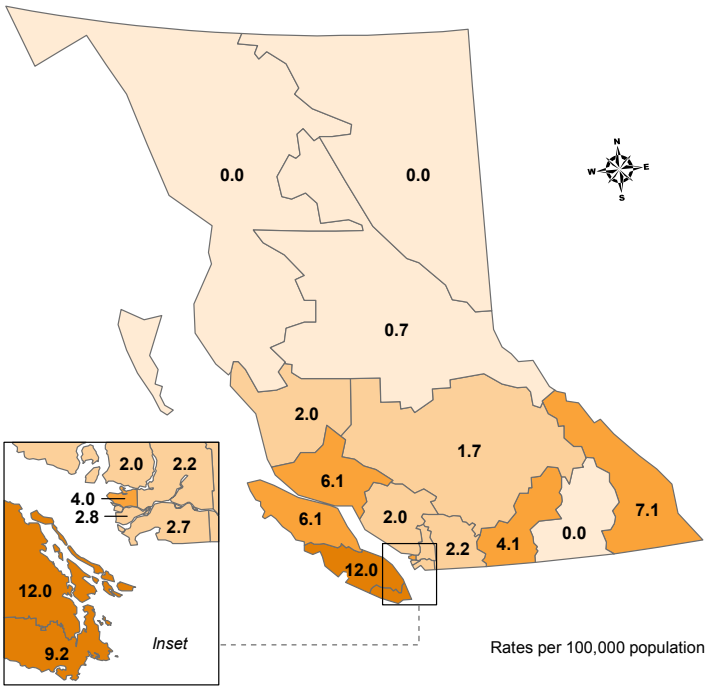


7.3 Shigatoxigenic E. coli Rates by Age Group, 2018

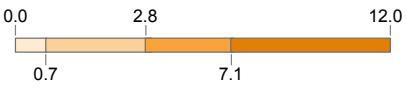


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	2	4	6	7	18	8	14	19	30
	Male	0	13	2	7	9	10	6	7	12	19
	Total	0	15	6	13	16	28	14	21	31	49
BC Rate	Female	0.00	2.25	3.41	5.05	5.18	11.60	4.71	4.06	2.70	4.51
	Male	0.00	13.57	1.62	5.72	6.28	5.84	3.37	2.01	1.79	3.19
	Total	0.00	8.12	2.49	5.39	5.75	8.58	4.02	3.03	2.26	3.89

7.4 Shigatoxigenic E. coli Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	6	7.1
12	Kootenay Boundary	0	0.0
13	Okanagan	16	4.1
14	Thompson Cariboo Shuswap	4	1.7
21	Fraser East	7	2.2
22	Fraser North	15	2.2
23	Fraser South	23	2.7
31	Richmond	6	2.8
32	Vancouver	28	4.0
33	North Shore/Coast Garibaldi	6	2.0
41	South Vancouver Island	38	9.2
42	Central Vancouver Island	35	12.0
43	North Vancouver Island	8	6.1
51	Northwest	0	0.0
52	Northern Interior	1	0.7
53	Northeast	0	0.0



7.5 Shigatoxigenic E. coli Serogroup Distribution, 2018

Rank	Serogroup	Number of Isolates	Proportion
1	O121	31	19.0%
2	O157	31	19.0%
3	O117	13	8.0%
4	O26	11	6.7%
5	O103	10	6.1%
	Other Non-O157	49	30.1%
	Only shiga-toxin gene identified	18	11.0%
	Total	163	100.0%

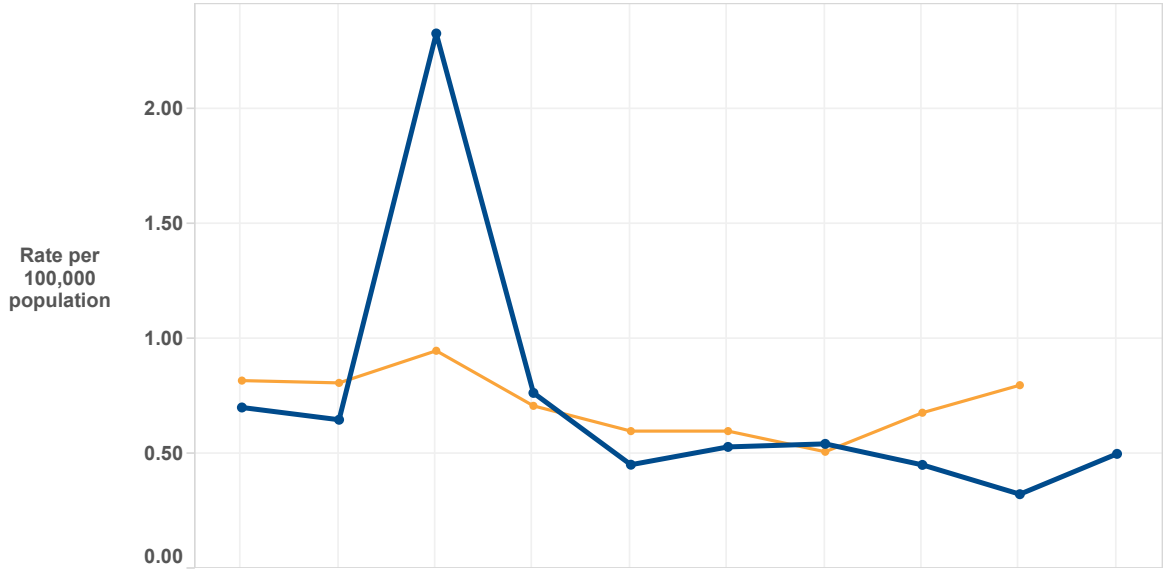
Note: Serogroup distribution is based on BCCDC PHL data. Numbers may vary from those reported in Panorama.

Hepatitis A

With 25 cases reported in 2018, the incidence of hepatitis A infection has remained stable since 2013 in BC. The majority (63%) of cases traveled to an endemic country during their exposure period. The incidence in North Island was higher than usual due to a household cluster of two cases that occurred in the fall. Cases occurred in all age groups and in both sexes. There was no evidence in BC of an outbreak among men who have sex with men, people who are homeless and/or who use drugs, similar to that occurring in other parts of North America and Europe.

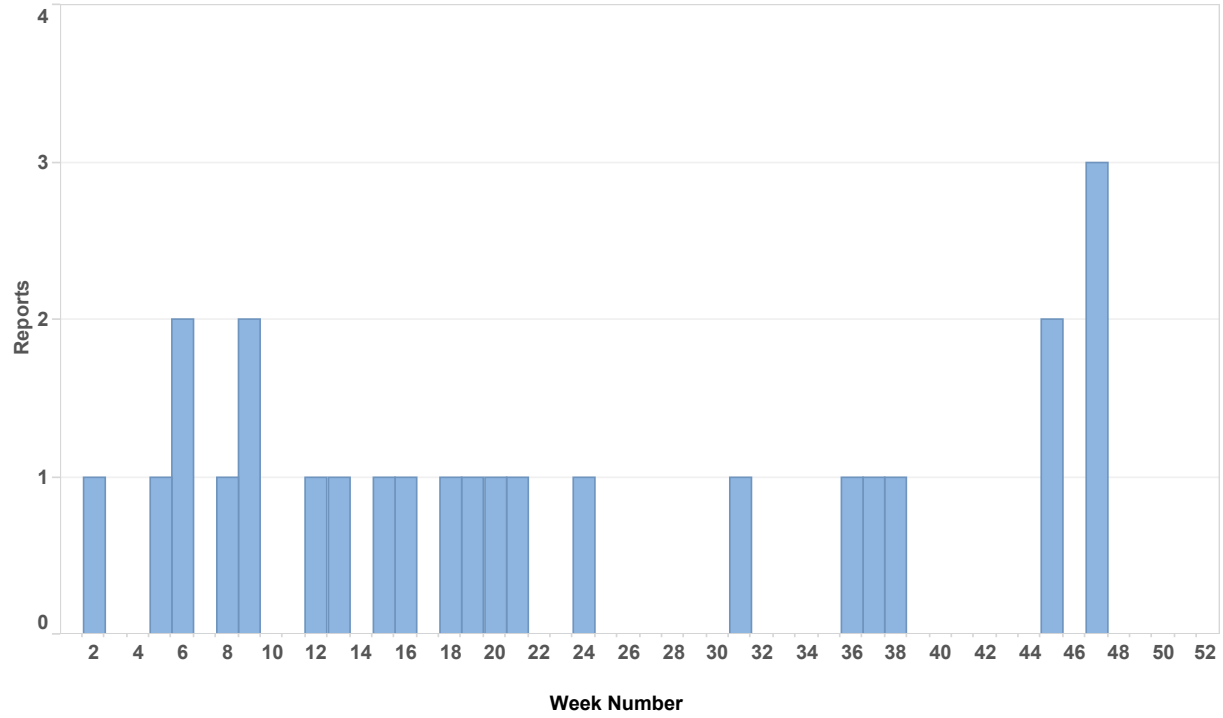
Genotyping and RNA sequencing performed at the National Microbiology Laboratory did not identify any BC-specific outbreak. Two BC cases were included in a national hepatitis A outbreak which was believed to be foodborne but remained unsolved; one case had onset in December 2017 and the other in May 2018.

8.1 Hepatitis A by Year, 2009-2018

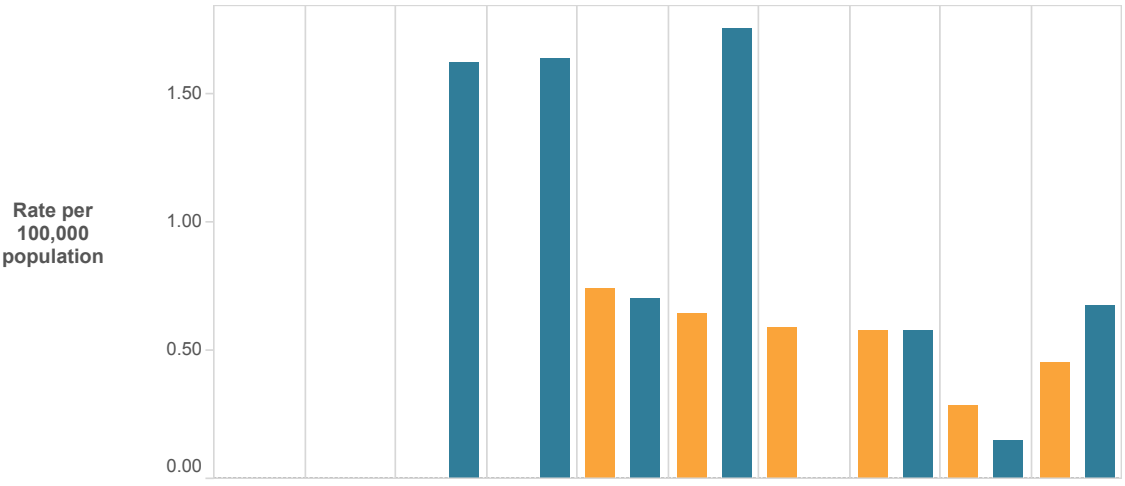


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	31	29	105	35	21	25	26	22	16	25
BC Rate	0.70	0.65	2.33	0.77	0.45	0.53	0.54	0.45	0.33	0.50
Canada Rate	0.82	0.81	0.95	0.71	0.60	0.60	0.51	0.68	0.80	

8.2 Hepatitis A Reports by Week, 2018

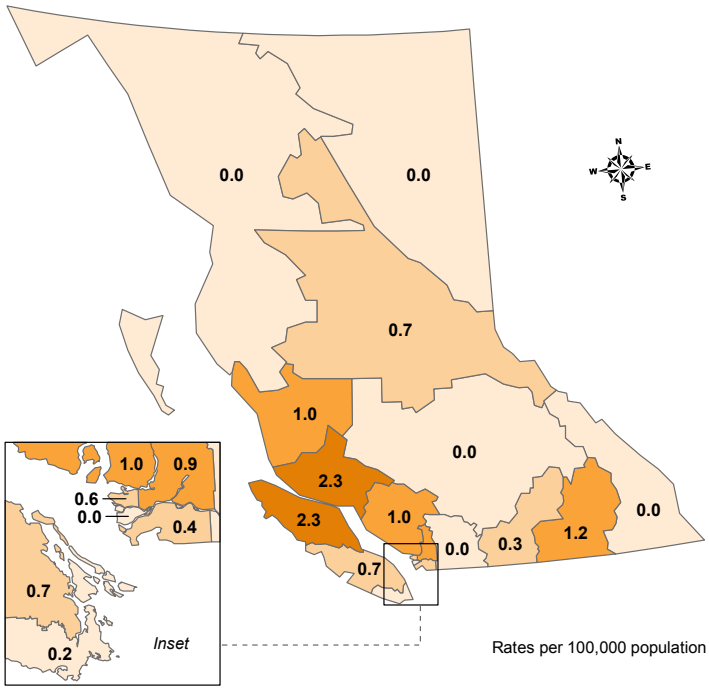


8.3 Hepatitis A Rates by Age Group and Sex, 2018

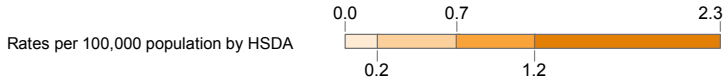


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	1	1	1	2	2	3
	Male	0	0	2	2	1	3	0	2	1	4
	Total	0	0	2	2	2	4	1	4	3	7
BC Rate	Female	0.00	0.00	0.00	0.00	0.74	0.64	0.59	0.58	0.28	0.45
	Male	0.00	0.00	1.62	1.63	0.70	1.75	0.00	0.58	0.15	0.67
	Total	0.00	0.00	0.83	0.83	0.72	1.23	0.29	0.58	0.22	0.56

8.4 Hepatitis A Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	1	1.2
13	Okanagan	1	0.3
14	Thompson Cariboo Shuswap	0	0.0
21	Fraser East	0	0.0
22	Fraser North	6	0.9
23	Fraser South	3	0.4
31	Richmond	0	0.0
32	Vancouver	4	0.6
33	North Shore/Coast Garibaldi	3	1.0
41	South Vancouver Island	1	0.2
42	Central Vancouver Island	2	0.7
43	North Vancouver Island	3	2.3
51	Northwest	0	0.0
52	Northern Interior	1	0.7
53	Northeast	0	0.0

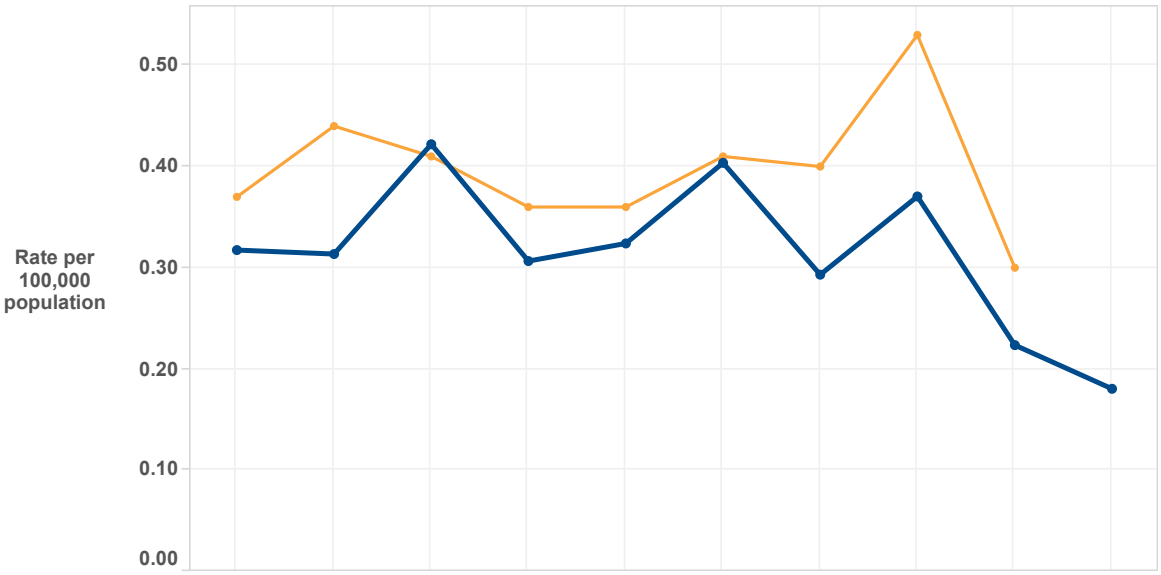


Listeriosis

The incidence of invasive listeriosis continued to decrease in 2018 and is the lowest it has been in the last decade (0.18 per 100,000). The reasons for this are unclear. All cases were infected in BC or Canada. Eight of the nine cases were among adults aged sixty years and older, which is expected given this disease affects people whose immunity has decreased with age, illness or medications. Whole genome sequencing of all *Listeria* isolates was started in January 2017; no outbreaks of listeriosis were detected in BC in 2018.

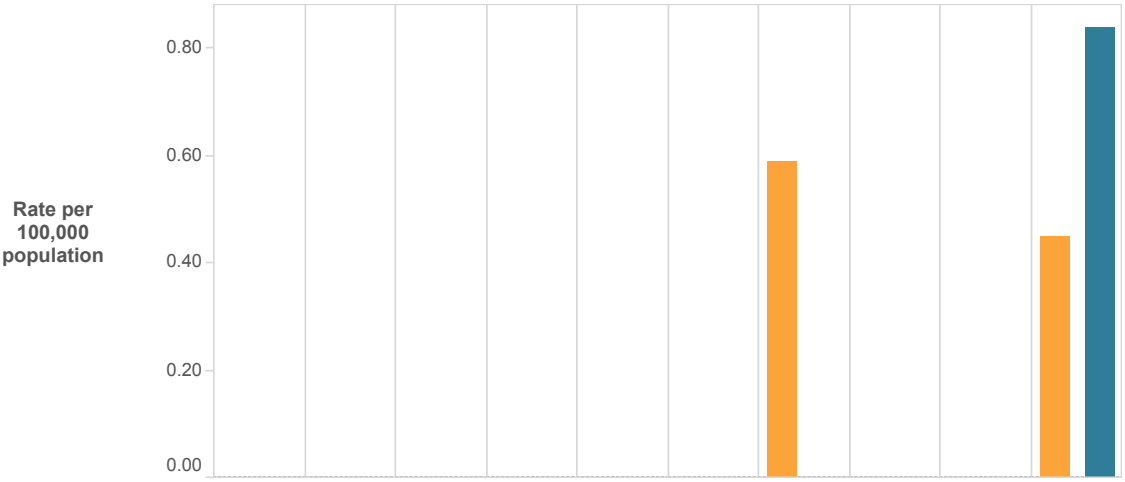
interactive dashboard

9.1 Listeriosis by Year, 2009-2018



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	14	14	19	14	15	19	14	18	11	9
BC Rate	0.32	0.31	0.42	0.31	0.32	0.40	0.29	0.37	0.22	0.18
Canada Rate	0.37	0.44	0.41	0.36	0.36	0.41	0.40	0.53	0.30	

9.2 Listeriosis by Age Group and Sex, 2018



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	0	0	1	0	0	3
	Male	0	0	0	0	0	0	0	0	0	5
	Total	0	0	0	0	0	0	1	0	0	8
BC Rate	Female	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.00	0.45
	Male	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84
	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.63

Salmonellosis, Typhoid Fever and Paratyphoid Fever

In 2018, 979 cases of salmonellosis (non-typhoidal) were reported (incidence rate 19.6/100,000); 31.4% were associated with international travel. *Salmonella* infection continues to be the second most commonly reported enteric disease in BC. The *Salmonella* incidence in 2018 continues to decrease as it has been since 2015. Although the incidence rates are decreasing, they are still higher that was reported prior to 2006. This is mainly due to the ongoing *S.* Enteritidis outbreak. Since May 2017, whole genome sequencing has been done on all human cases of salmonellosis. This lab typing method has been useful for identifying the most common strains of *Salmonella* circulating in BC and has improved our ability to detect and has led to a greater number of solved outbreaks (BCCDC, 2018[1]).

Rates were highest in children under five years of age and among residents of Northwest, Northern Interior and East Kootenay HSDA. Cases were reported throughout the year.

The incidence rate of typhoid fever (0.8/100,000) and paratyphoid fever (0.5/100,000) remained stable. The majority of cases were associated with international travel (89.5%) of typhoid fever and 76.2% of paratyphoid fever, with South Asia being the most common travel location reported. Typhoid cases clustered in the first third of the year and paratyphoid fever cases clustered at the beginning and end of the year, a temporal reflection of the travel patterns of BC residents. Most cases (73.0%) were reported from Fraser Health Authority. The highest incidence of typhoid fever and paratyphoid fever was in children and adults aged 20-29 years.

S. Enteritidis, *S.* Infantis and *S.* Typhimurium were the most commonly reported *Salmonella* serotypes in 2018. *S.* Enteritidis accounted for 42.4% of the salmonellosis cases in BC, which is a slight decrease compared to previous years. *S.* Enteritidis continues to be the dominant serotype of *Salmonella* in BC and has been for over a decade. The most notable shift was *S.* Infantis reported as the second most common serotype in BC. This was due to a national outbreak where cucumbers were the likely source of illness (PHAC, 2018[2]). *S.* Heidelberg was not reported in the top 10 for the second consecutive year.

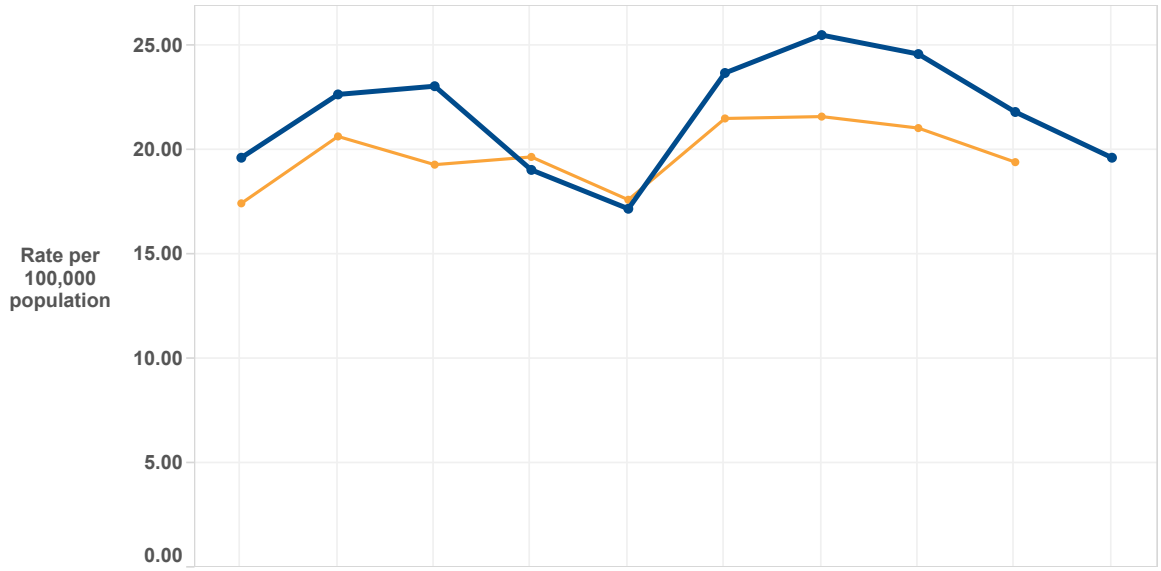
There were 7 *Salmonella* outbreaks in 2018, including four *S.* Enteritidis outbreaks, 1 *S.* Brandenburg, 1 *S.* Newport and 1 *S.* Infantis. All were foodborne and six were solved. Chicken meat was identified as the source in five of them of which 4 were frozen, breaded chicken products (see Enteric Outbreak section).

Additional analyses comparing *Salmonella* human and food chain surveillance data are available through the BC Integrated Surveillance of Foodborne Pathogens program (www.bccdc.ca/integratedfoodchainsurveillance).

1. BCCDC 2018. Epidemiological Experience and Public Health Impact of Enteric Pathogen Sequencing. Available at: http://mediasite.phsa.ca/Mediasite/Showcase/BCCDC/Presentation/0dc251c62aed48698564748bda7cd7461d

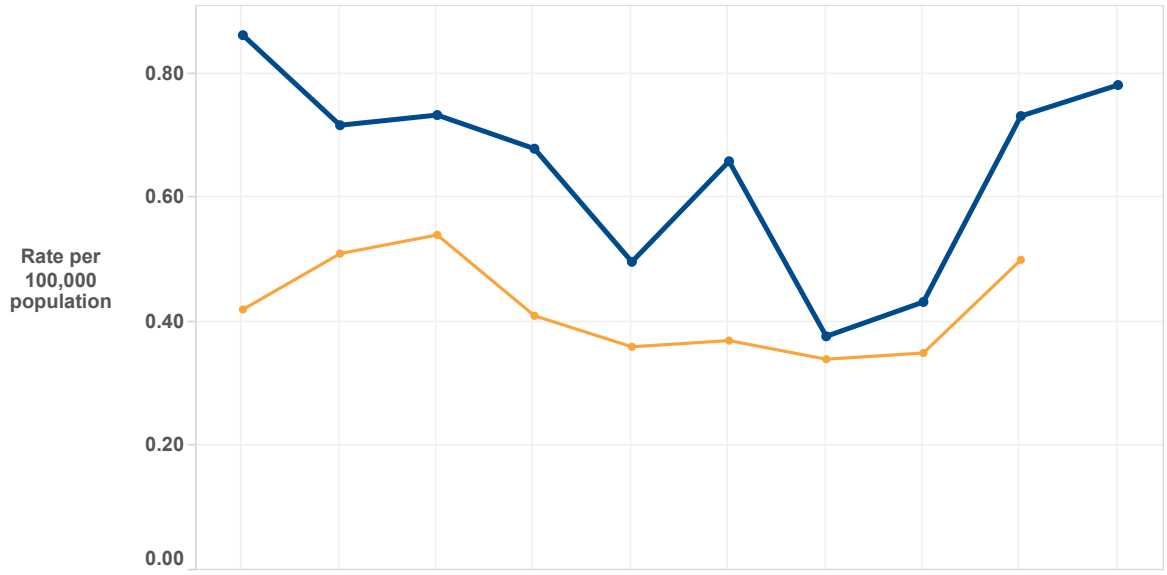
2. PHAC, 2018. Available at: https://www.canada.ca/en/public-health/services/public-health-notices/2018/outbreak-salmonella-infections-under-investigation.html

10.1 Salmonellosis (non-typhoidal) by Year, 2009-2018



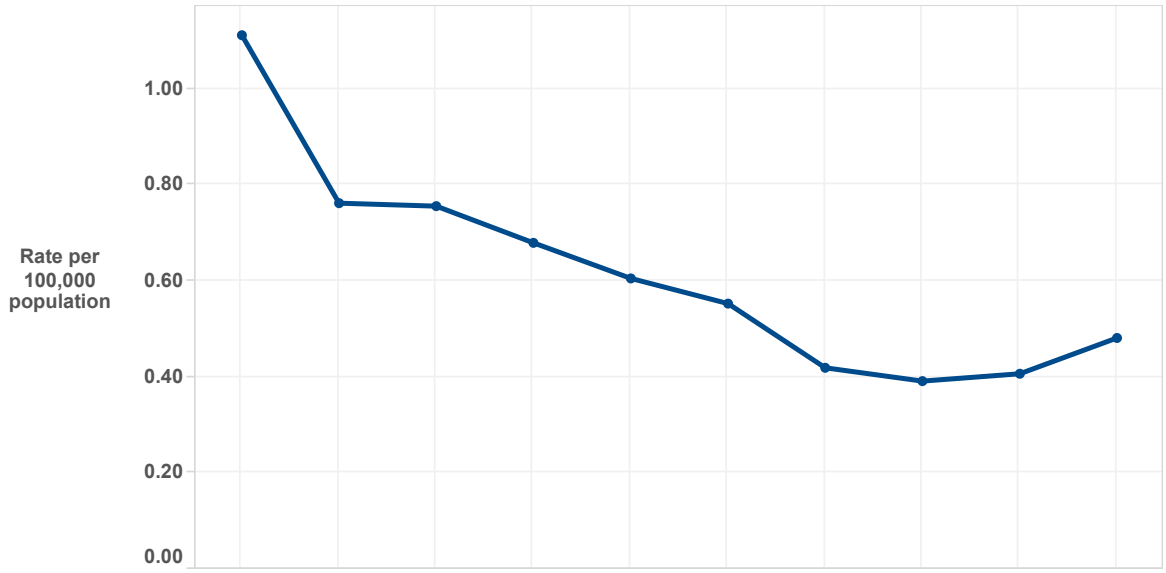
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	865	1,011	1,037	869	795	1,114	1,217	1,194	1,073	979
BC Rate	19.61	22.64	23.03	19.03	17.17	23.67	25.48	24.57	21.80	19.61
Canada Rate	17.43	20.63	19.28	19.65	17.60	21.49	21.58	21.03	19.40	

10.2 Salmonella Typhoid Fever Rates by Year, 2009-2018



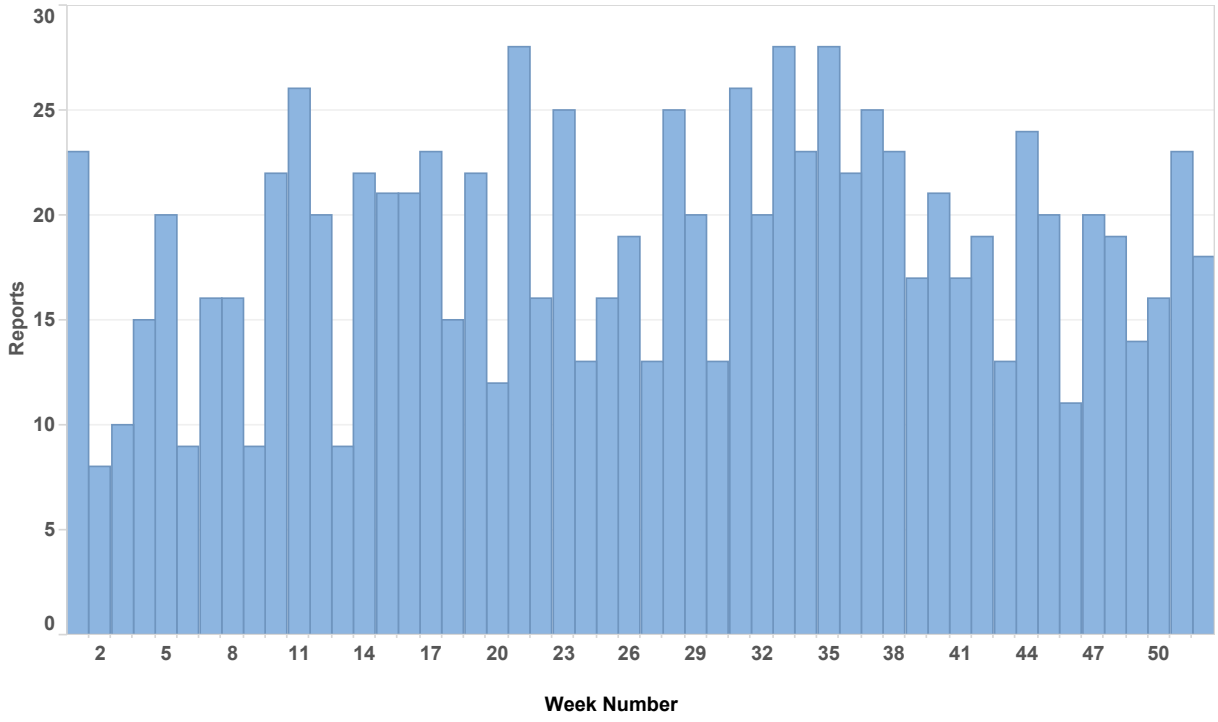
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	38	32	33	31	23	31	18	21	36	39
BC Rate	0.86	0.72	0.73	0.68	0.50	0.66	0.38	0.43	0.73	0.78
Canada Rate	0.42	0.51	0.54	0.41	0.36	0.37	0.34	0.35	0.50	

10.3 Salmonella Paratyphoid Fever Rates by Year, 2009-2018

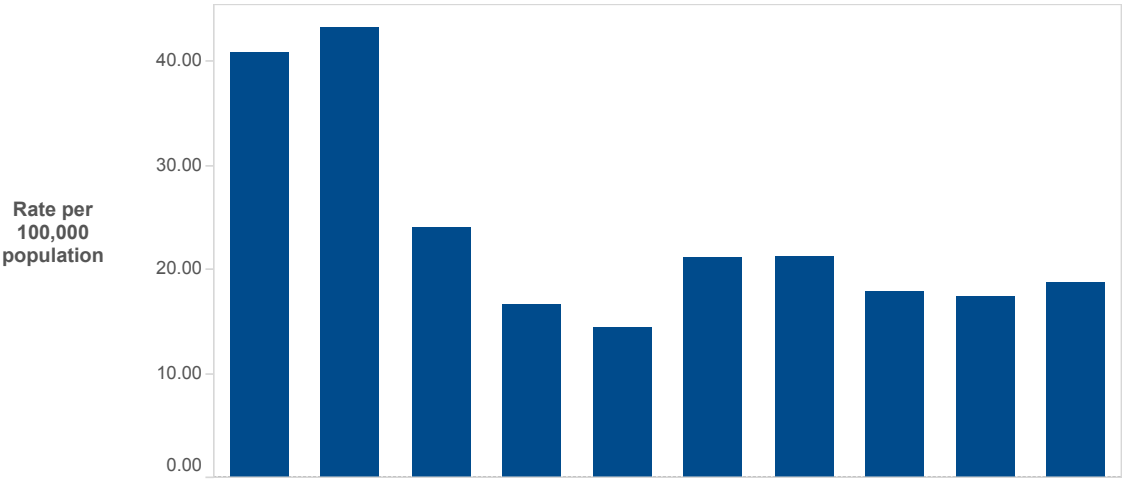


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	49	34	34	31	28	26	20	19	20	24
BC Rate	1.11	0.76	0.76	0.68	0.60	0.55	0.42	0.39	0.41	0.48

10.4 Salmonellosis (non-typhoidal) Reports by Week, 2018

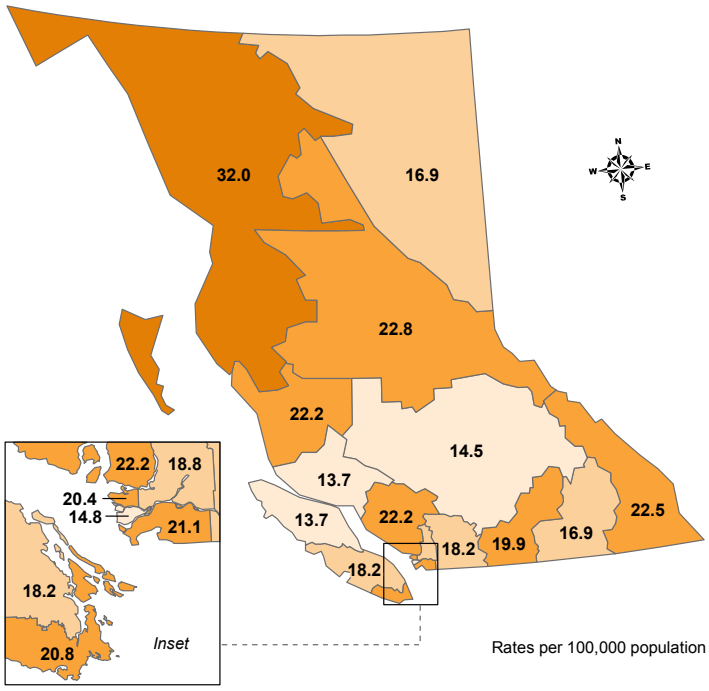


10.5 Salmonellosis (non-typhoidal) Reports by Age Group, 2018



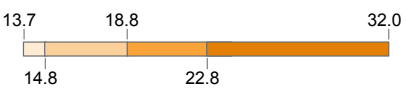
		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	11	30	23	17	18	36	36	55	125	134
	Male	7	50	35	23	22	33	38	69	114	102
	Total	18	80	58	40	40	69	74	124	239	237
BC Rate	Female	51.26	33.71	19.58	14.32	13.32	23.19	21.21	15.93	17.75	20.16
	Male	30.80	52.18	28.34	18.80	15.35	19.29	21.32	19.84	17.00	17.12
	Total	40.74	43.28	24.07	16.59	14.37	21.15	21.26	17.89	17.39	18.81

10.6 Salmonellosis (non-typhoidal) Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	19	22.5
12	Kootenay Boundary	14	16.9
13	Okanagan	77	19.9
14	Thompson Cariboo Shuswap	34	14.5
21	Fraser East	58	18.2
22	Fraser North	129	18.8
23	Fraser South	181	21.1
31	Richmond	32	14.8
32	Vancouver	141	20.4
33	North Shore/Coast Garibaldi	67	22.2
41	South Vancouver Island	86	20.8
42	Central Vancouver Island	53	18.2
43	North Vancouver Island	18	13.7
51	Northwest	24	32.0
52	Northern Interior	34	22.8
53	Northeast	12	16.9

Rates per 100,000 population by HSDA



10.7 Salmonella Serotype Distribution, 2018

Rank	Serotype	Number of Cases	Proportion
1	Enteritidis	447	42.4%
2	Infantis	76	7.2%
3	Typhimurium	58	5.5%
4	Typhi	43	4.1%
5	*Salmonella* ssp I 4,5,12:i:	34	3.2%
6	Newport	28	2.7%
7	Paratyphi A	20	1.9%
8	Stanley	19	1.8%
9	Paratyphi B var. java	17	1.6%
10	Javiana	16	1.5%
	Other	296	28.1%
	Total	1054	100.0%

Note: Serotype distribution is based on BCCDC PHL data. Numbers may vary from those reported in Panorama.

Shigellosis

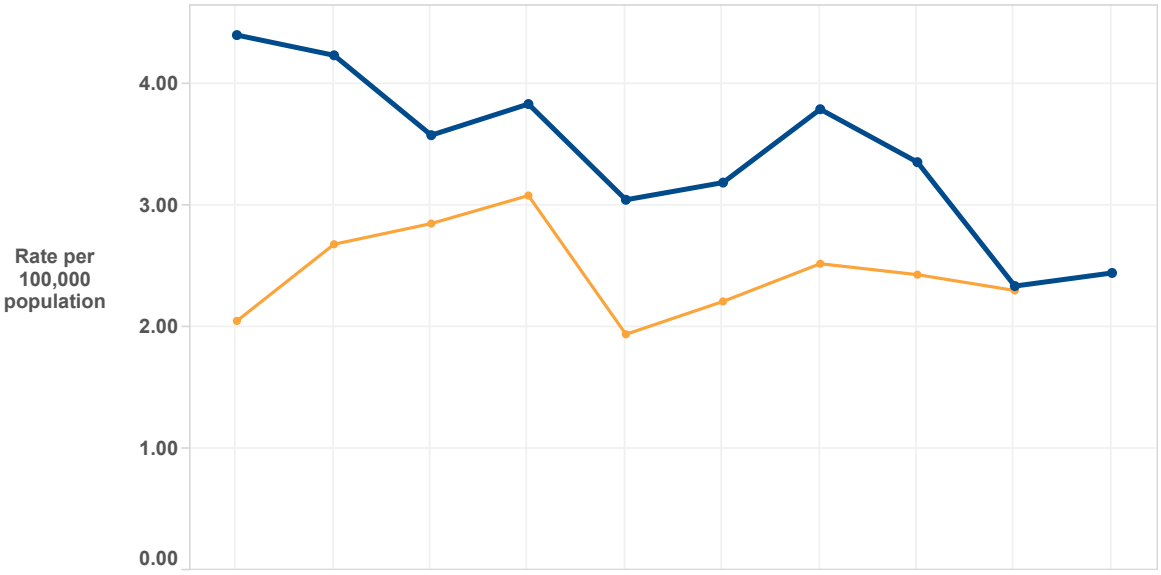
In 2018, 122 cases of shigellosis were reported; 61.9% were associated with international travel. There had been a steady decrease in shigellosis since 2015, in 2018 the incidence rate of shigellosis was stable and similar to 2017 (2.4/100,000). Similar to previous years, the incidence rate was highest in Vancouver. Incidence rates were highest amongst children aged 1-4 years and males aged 25-29 years. These two groups have known risk factors.

There were no *Shigella* outbreaks reported in 2018.

In 2018, *S. sonnei* was the most common species reported, similar to between 2015 and 2017. Between 2009 and 2014, *S. flexneri* was the most common species. The decrease in shigellosis is driven by a decrease in the number *S. sonnei* cases detected. In 2018, 40 cases were detected, compared to 92 in 2016.

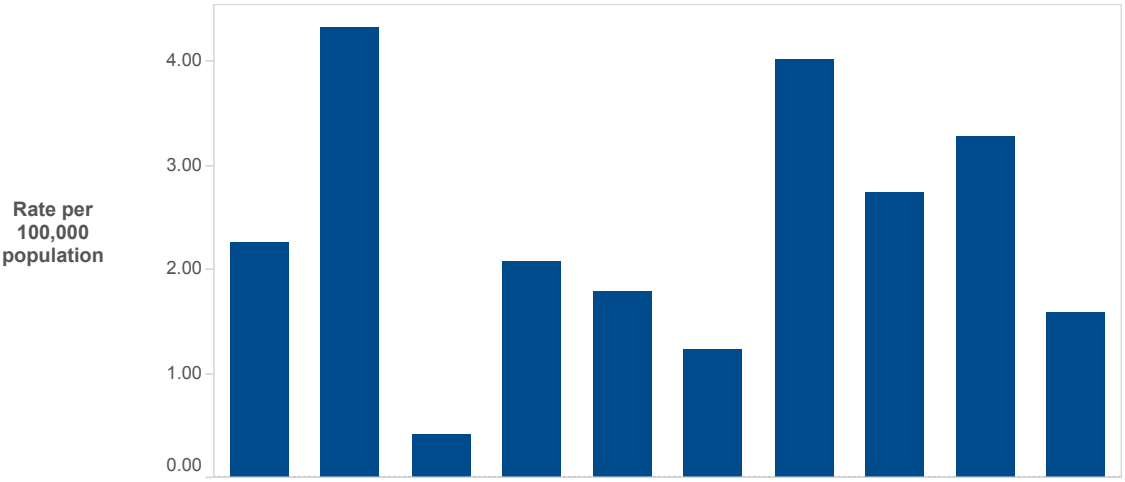
interactive dashboard

11.1 Shigellosis Rates by Year, 2009-2018



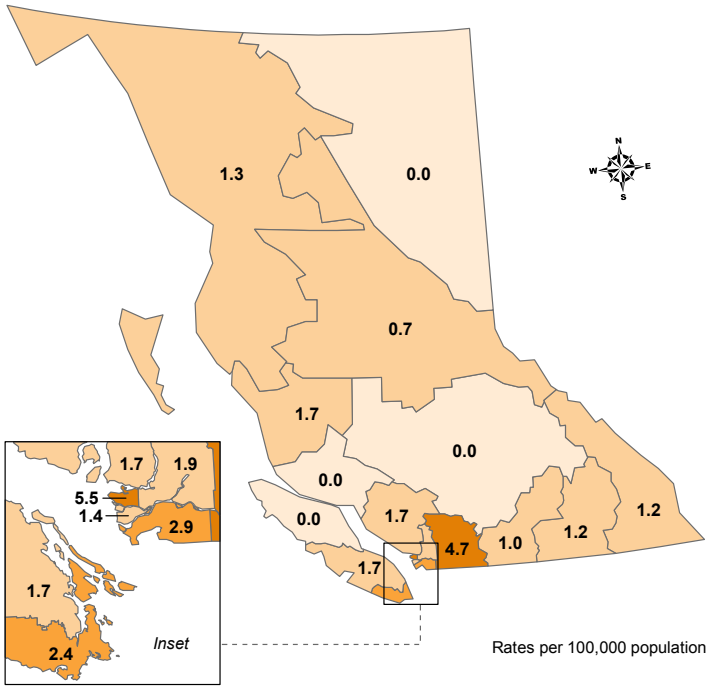
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	194	189	161	175	141	150	181	163	115	122
BC Rate	4.40	4.23	3.58	3.83	3.05	3.19	3.79	3.35	2.34	2.44
Canada Rate	2.05	2.68	2.85	3.08	1.94	2.21	2.52	2.43	2.30	

11.2 Shigellosis Rates by Age Group, 2018

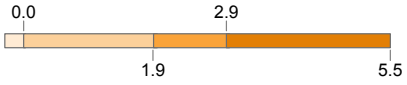


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	1	3	0	1	3	2	6	9	22	12
	Male	0	5	1	4	2	2	8	10	23	8
	Total	1	8	1	5	5	4	14	19	45	20
BC Rate	Female	4.66	3.37	0.00	0.84	2.22	1.29	3.53	2.61	3.12	1.81
	Male	0.00	5.22	0.81	3.27	1.40	1.17	4.49	2.88	3.43	1.34
	Total	2.26	4.33	0.41	2.07	1.80	1.23	4.02	2.74	3.27	1.59

11.3 Shigellosis Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	1	1.2
12	Kootenay Boundary	1	1.2
13	Okanagan	4	1.0
14	Thompson Cariboo Shuswap	0	0.0
21	Fraser East	15	4.7
22	Fraser North	13	1.9
23	Fraser South	25	2.9
31	Richmond	3	1.4
32	Vancouver	38	5.5
33	North Shore/Coast Garibaldi	5	1.7
41	South Vancouver Island	10	2.4
42	Central Vancouver Island	5	1.7
43	North Vancouver Island	0	0.0
51	Northwest	1	1.3
52	Northern Interior	1	0.7
53	Northeast	0	0.0



11.4 Shigella Species Distribution, 2018

Rank	Species	Number of cases	Proportion
1	sonnei	40	54.9%
2	flexneri	28	38.4%
3	boydii	3	4.1%
4	dysentariae	2	2.7%
	Total	73	

Note: Species distribution is based on BCCDC PHL data. Numbers may vary from those reported in Panorama.

Vibrio Infection

The incidence of *Vibrio* infections increased in 2018 to 1.28/100,000 (64 cases). After the 2015 outbreak, there was an initial decrease in reports of *Vibrio parahaemolyticus* (Vp) infection that may have been due to environmental changes (e.g. cooler ocean temperatures), a change in circulating Vp strains and/or improved awareness and industry practices. Since 2016 there has been a consistent increase in incidence for unknown reasons. The majority of Vp infections are caused by eating raw bivalve shellfish. In 2018, 22.0% of *Vibrio* infections were due to international travel.

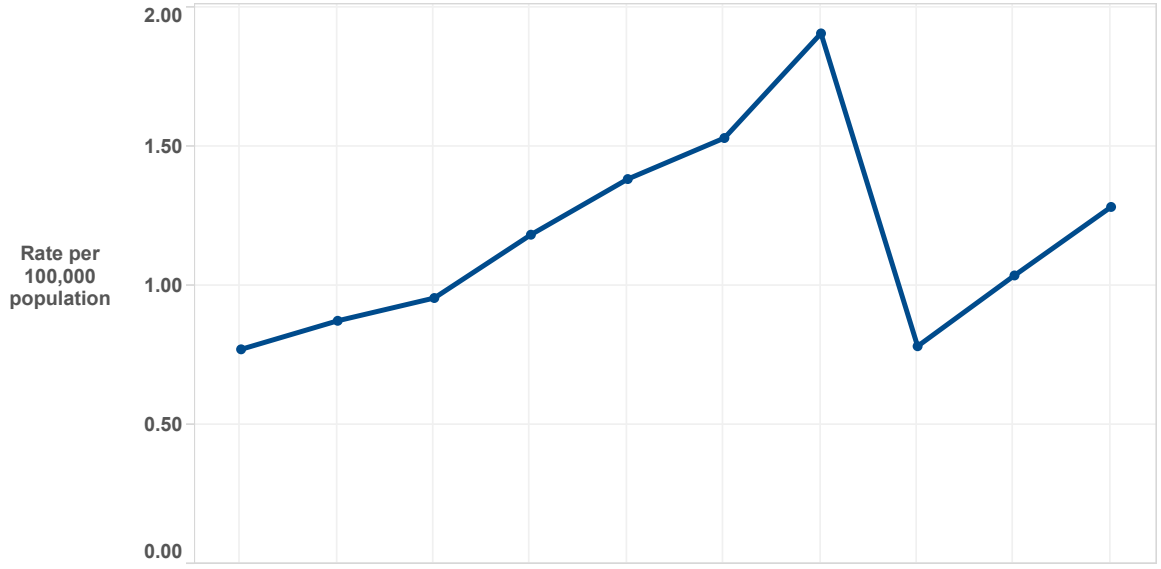
In 2018, the highest incidence rates were reported from North Vancouver Island and North Shore/Coast Garibaldi HSDA and the highest number of cases were reported from North Shore/Coast Garibaldi and Vancouver HSDA. These coastal HSDA have are a large number of retail and restaurant premises that serve raw oysters and/or include areas where self-harvest of shellfish occurs. The majority of cases occurred in adults, with the highest incidence in adults over the age of 40 years.

There is a peak in cases in the summer months when the levels of Vp are highest in the marine environment.

In 2018, there was one outbreak of *Vibrio cholera* non-O1/non-O139 on Vancouver Island. Three lab-confirmed cases were associated with the consumption of raw herring eggs harvested in the French Creek and Qualicum Bay areas. This was the first recorded outbreak of non-toxigenic *Vibrio cholera* associated with a locally-harvested product in BC (VIHA, 2018[1]).

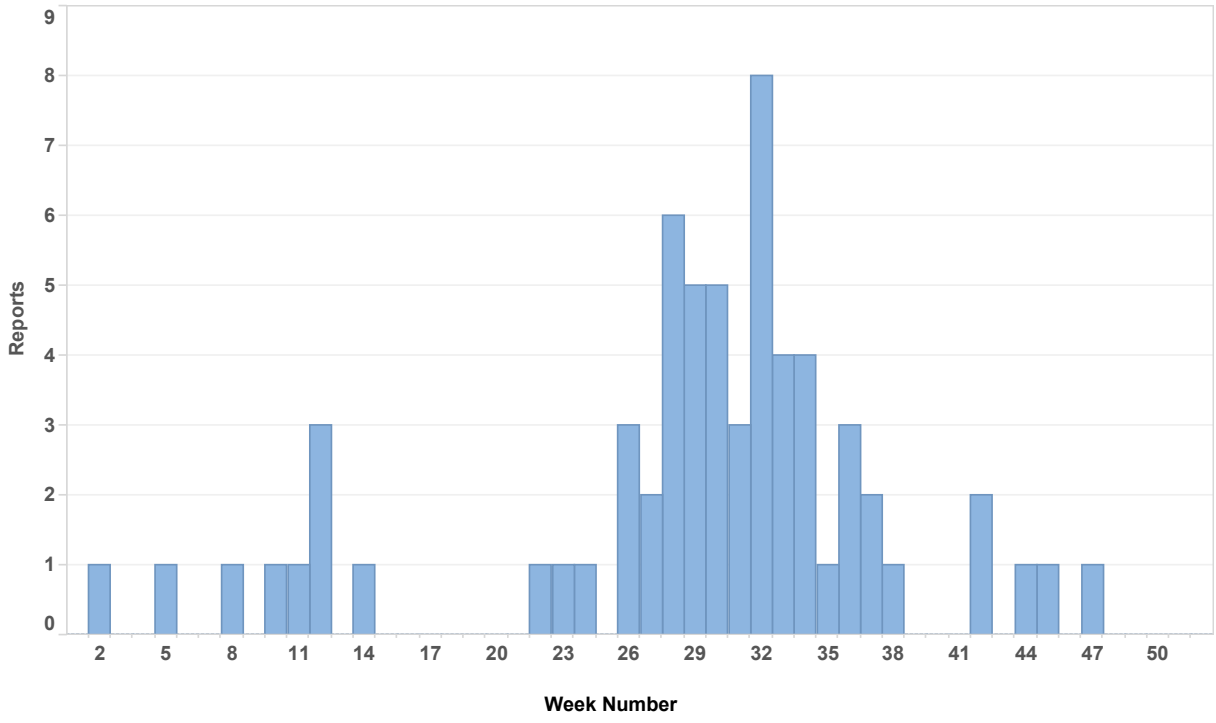
1. VIHA. Illness Associated with Herring Eggs-Vancouver Island. 2018. Accessed May 14, 2019: http://www.fnha.ca/about/news-and-events/news/illness-associated-with-herring-eggs-vancouver-island

12.1 Vibrio Infection Rates by Year, 2009-2018

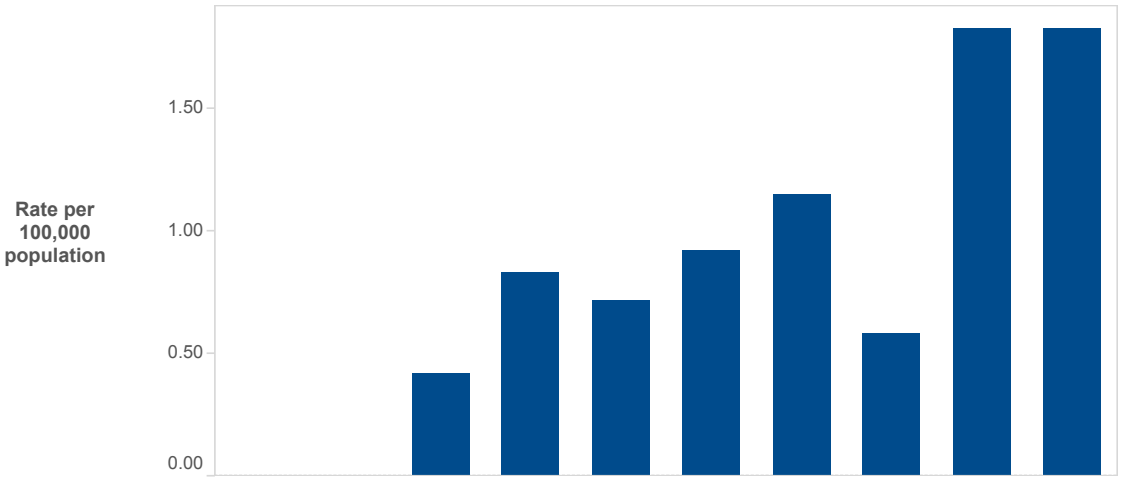


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	34	39	43	54	64	72	91	38	51	64
BC Rate	0.77	0.87	0.96	1.18	1.38	1.53	1.91	0.78	1.04	1.28

12.2 Vibrio Infection Reports by Week, 2018

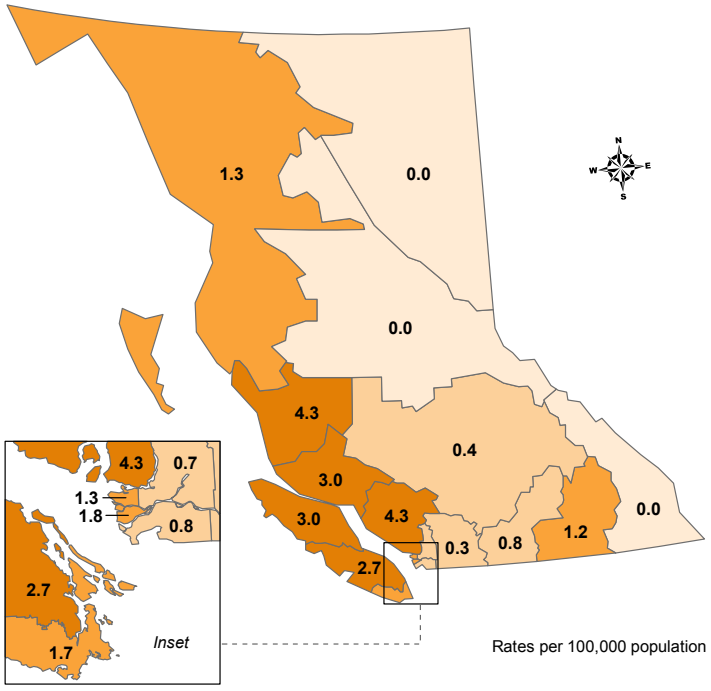


12.3 Vibrio Infection Rates by Age Group, 2018

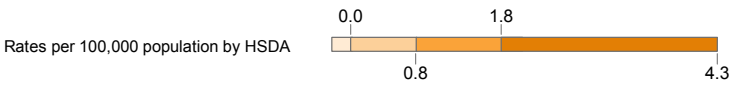


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	1	2	1	0	9	7
	Male	0	0	1	2	1	1	3	4	16	16
	Total	0	0	1	2	2	3	4	4	25	23
BC Rate	Female	0.00	0.00	0.00	0.00	0.74	1.29	0.59	0.00	1.28	1.05
	Male	0.00	0.00	0.81	1.63	0.70	0.58	1.68	1.15	2.39	2.69
	Total	0.00	0.00	0.41	0.83	0.72	0.92	1.15	0.58	1.82	1.83

12.4 Vibrio Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	1	1.2
13	Okanagan	3	0.8
14	Thompson Cariboo Shuswap	1	0.4
21	Fraser East	1	0.3
22	Fraser North	5	0.7
23	Fraser South	7	0.8
31	Richmond	4	1.8
32	Vancouver	9	1.3
33	North Shore/Coast Garibaldi	13	4.3
41	South Vancouver Island	7	1.7
42	Central Vancouver Island	8	2.7
43	North Vancouver Island	4	3.0
51	Northwest	1	1.3
52	Northern Interior	0	0.0
53	Northeast	0	0.0



12.5 Vibrio Species Distribution, 2018

Rank	Species	Number of Cases	Proportion
1	Parahaemolyticus	54	83.1%
2	Fluvialis	3	4.7%
3	Cholera non- O1/O139	3	4.7%
3	Other/unknown	4	6.3%
	Total	64	100.0%

Notes: Species distribution is based on Panaroma data

Environmental Pathogens

Cryptococuus gattii
Legionellosis

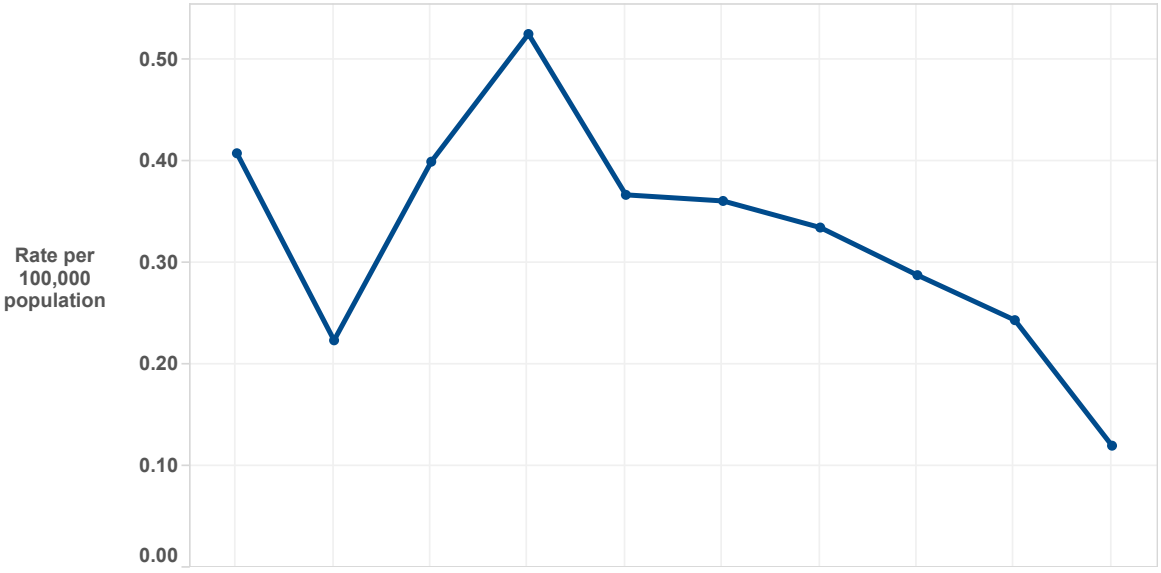
Crytococcus gattii Infection

In 2018, only 6 cases of *Cryptococcus gattii* infection were reported. This is the lowest incidence reported since this disease became reportable in 2003. The decrease is mainly attributable to no cases being reported from the historically endemic areas of South and Central Island Health. The reason for this is unclear.

All cases occurred in adults; older age is one of the most important risk factors in *C. gattii* infection. All cases were infected with strains endemic to BC; five cases were infected with VGIIa and one with VGIIb.

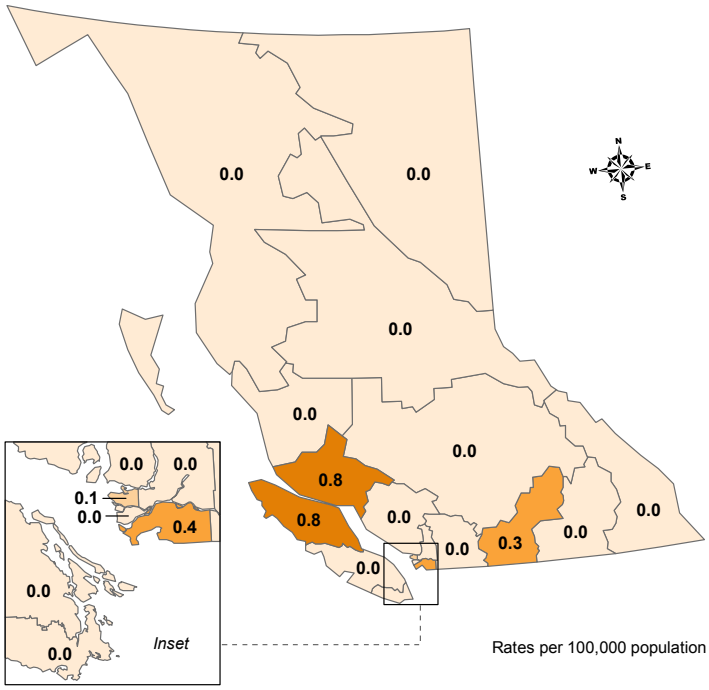
interactive dashboard

13.1 Cryptococcus gattii Rates by Year, 2009- 2018

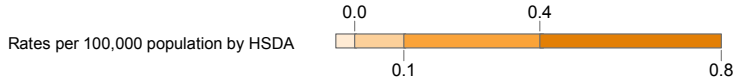


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	18	10	18	24	17	17	16	14	12	6
BC Rate	0.41	0.22	0.40	0.53	0.37	0.36	0.33	0.29	0.24	0.12

13.2 Cryptococcus gattii Infection Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	0	0.0
13	Okanagan	1	0.3
14	Thompson Cariboo Shuswap	0	0.0
21	Fraser East	0	0.0
22	Fraser North	0	0.0
23	Fraser South	3	0.4
31	Richmond	0	0.0
32	Vancouver	1	0.1
33	North Shore/Coast Garibaldi	0	0.0
41	South Vancouver Island	0	0.0
42	Central Vancouver Island	0	0.0
43	North Vancouver Island	1	0.8
51	Northwest	0	0.0
52	Northern Interior	0	0.0
53	Northeast	0	0.0

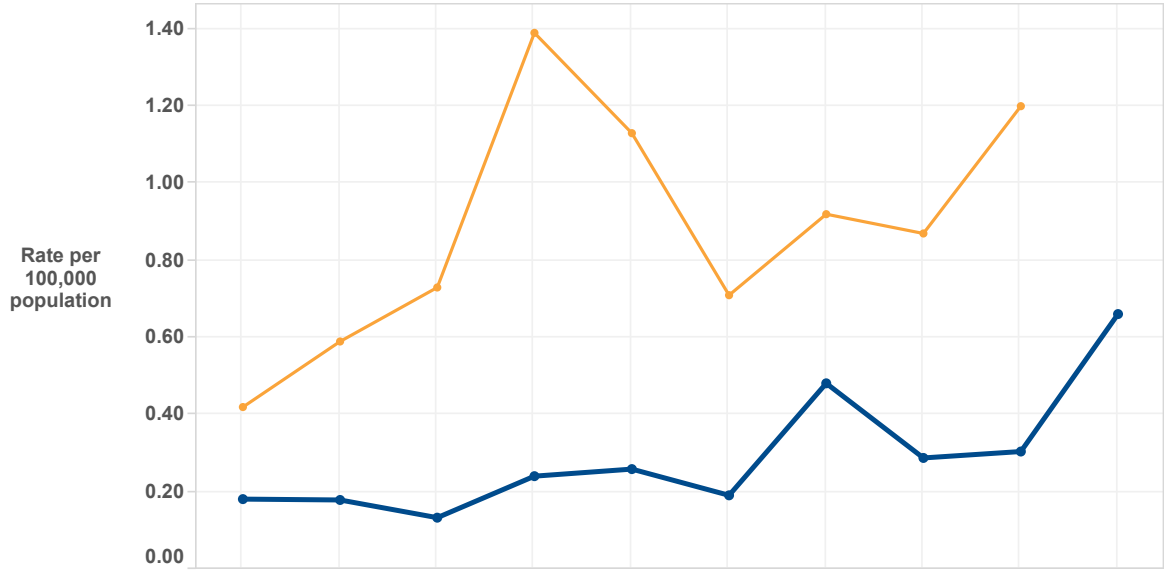


Legionellosis

In 2018, the incidence of legionellosis increased to 0.66/100,000. This is mainly due to a cooling tower-associated outbreak of *Legionella pneumophila* serogroup 1 in Fraser South HSDA involving 14 cases with onsets from June to October. In addition, incidence has been increasing since 2012, likely due to the increasing use of urine antigen testing throughout BC (Morshed 2015[1]) and the introduction of a pan-respiratory pathogen nucleic acid testing panel by the BCCDC Public Health Laboratory in 2016. The highest rates were observed in adults >60 years; older age and comorbidities are risk factors for infection. Most cases were infected by *L. pneumophila* (90.1%), 1 by *L. longbeachae* and 2 by unknown species.

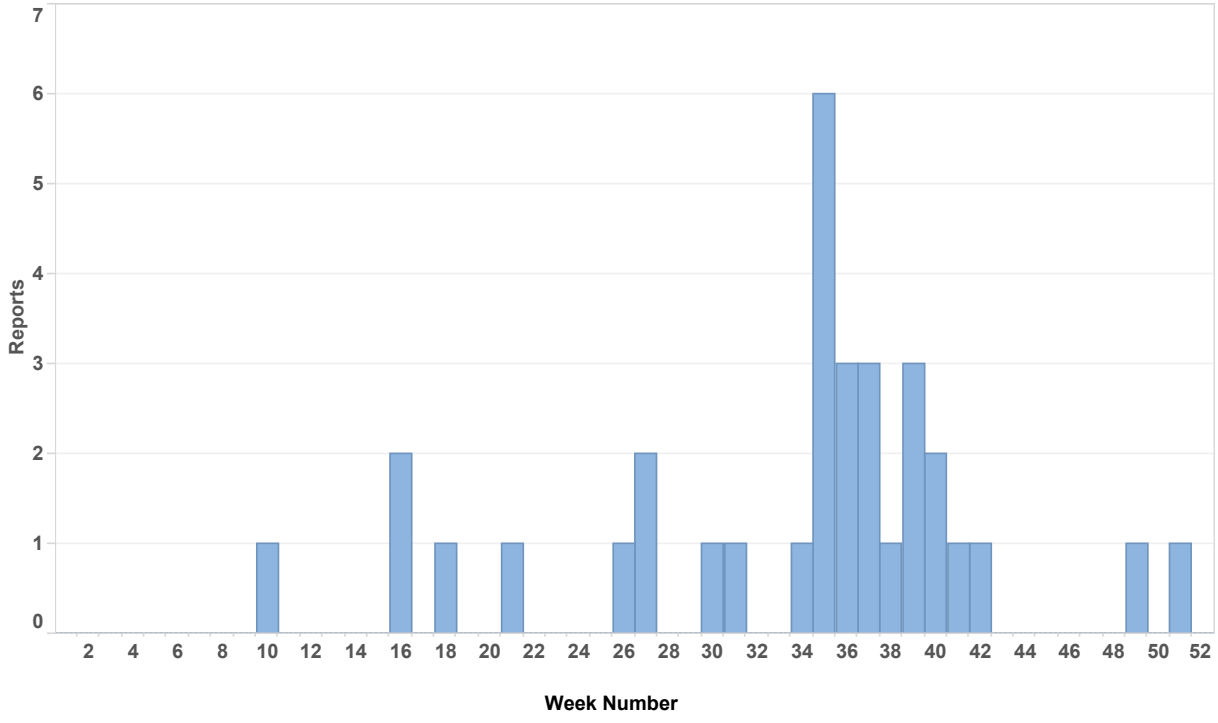
1. Morshed M, Chang Y, Hoang L. Diagnostic testing for Legionnaires' Disease: Trends in BC. BCMJ. 2015;57(10):452-3.

14.1 Legionellosis Rates by Year, 2009-2018

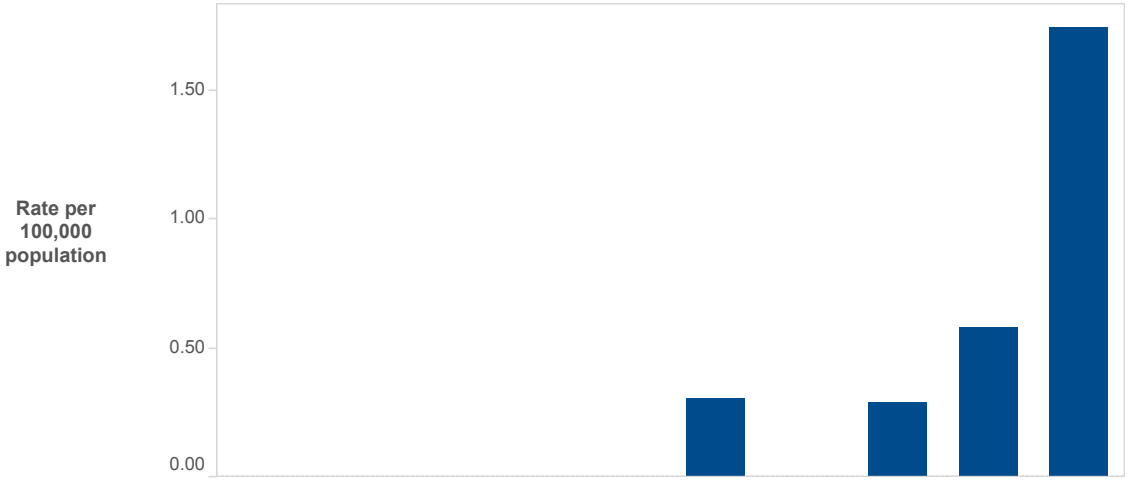


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	8	8	6	11	12	9	23	14	15	33
BC Rate	0.18	0.18	0.13	0.24	0.26	0.19	0.48	0.29	0.30	0.66
Canada Rate	0.42	0.59	0.73	1.39	1.13	0.71	0.92	0.87	1.20	

14.2 Legionellosis Rates by Week, 2018

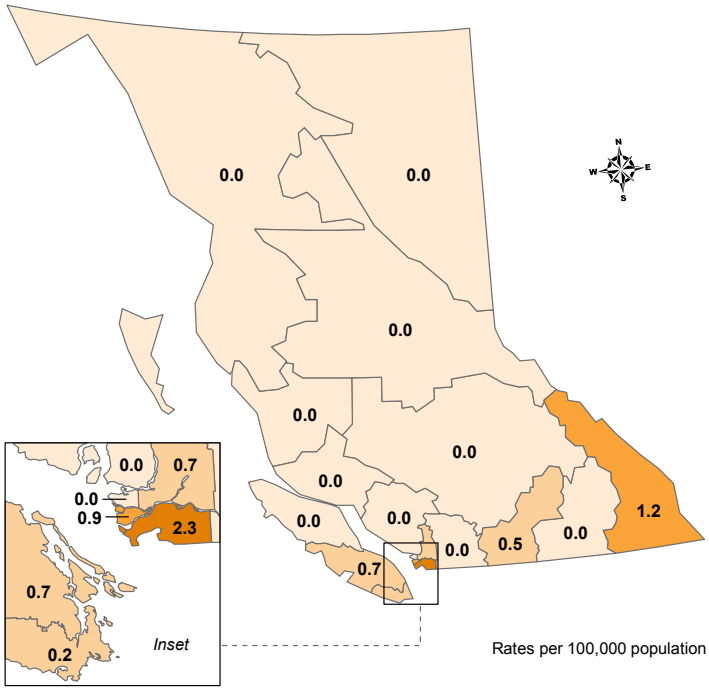


14.3 Legionellosis Rates by Age Group, 2018

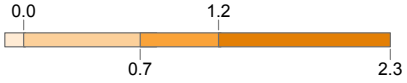


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	0	1	0	2	3	9
	Male	0	0	0	0	0	0	0	0	5	13
	Total	0	0	0	0	0	1	0	2	8	22
BC Rate	Female	0.00	0.00	0.00	0.00	0.00	0.64	0.00	0.58	0.43	1.35
	Male	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	2.18
	Total	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.29	0.58	1.75

14.4 Legionellosis Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	1	1.2
12	Kootenay Boundary	0	0.0
13	Okanagan	2	0.5
14	Thompson Cariboo Shuswap	0	0.0
21	Fraser East	0	0.0
22	Fraser North	5	0.7
23	Fraser South	20	2.3
31	Richmond	2	0.9
32	Vancouver	0	0.0
33	North Shore/Coast Garibaldi	0	0.0
41	South Vancouver Island	1	0.2
42	Central Vancouver Island	2	0.7
43	North Vancouver Island	0	0.0
51	Northwest	0	0.0
52	Northern Interior	0	0.0
53	Northeast	0	0.0



Respiratory Diseases

Streptococcal Disease (invasive) Group A
Tuberculosis

Streptococcal Disease (invasive) Group A (iGAS)

Information about Streptococcal Disease (invasive) Group A can be found in the "Noteworthy Diseases and Conditions in 2018" section.

Tuberculosis

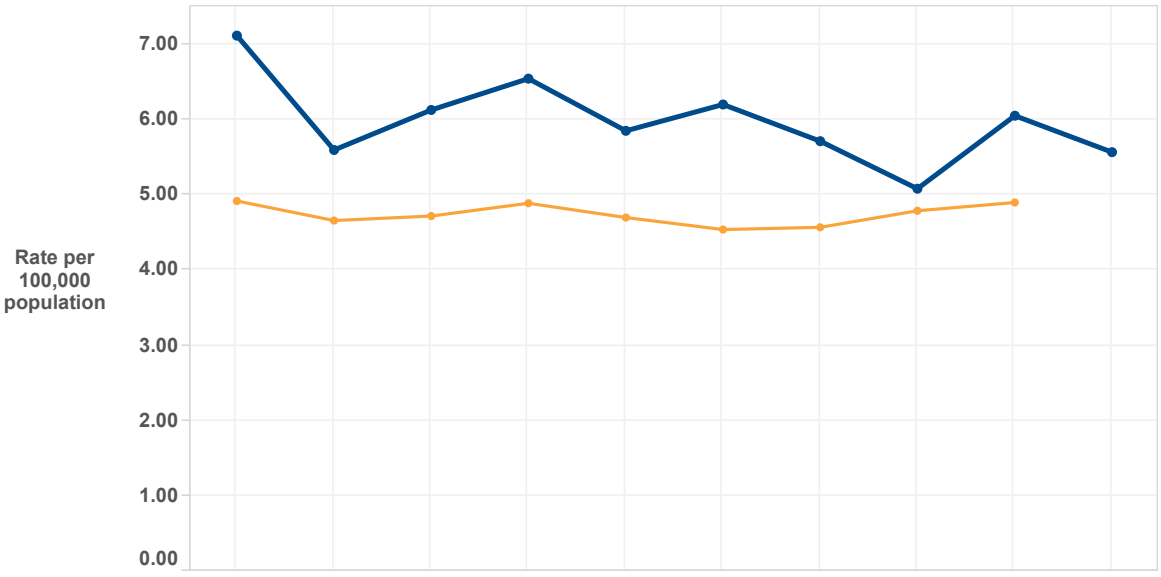
In 2018, TB incidence in BC decreased which has been the overall trend of the past decade. Compared to the Canadian rate, active TB incidence in BC has remained consistently higher because of the relatively high proportion of people living in BC who were born in TB endemic areas where exposure to TB is common. In BC, the vast majority of active TB cases are among people who were born outside of Canada, and are largely due to reactivation of latent TB infection (i.e. from exposures to TB earlier in their lives) and not from local transmission. For this reason, prevention of reactivation by treating latent TB infection is an important public health intervention to reduce the burden of TB in BC. TB rates are highest in the Lower Mainland which has a larger proportion of people who were born or lived in areas where TB is endemic compared with the rest of BC.

TB incidence is historically greater in men than in women and this trend continued in 2018. Among men and women, the majority of people diagnosed with TB were over the age of 40. Active TB in those <5 years of age indicates recent transmission because of the low probability of historic exposure and reactivation. The occurrence of active TB in those <5 years of age remains rare in BC.

For more information, please refer to the TB Annual Report.

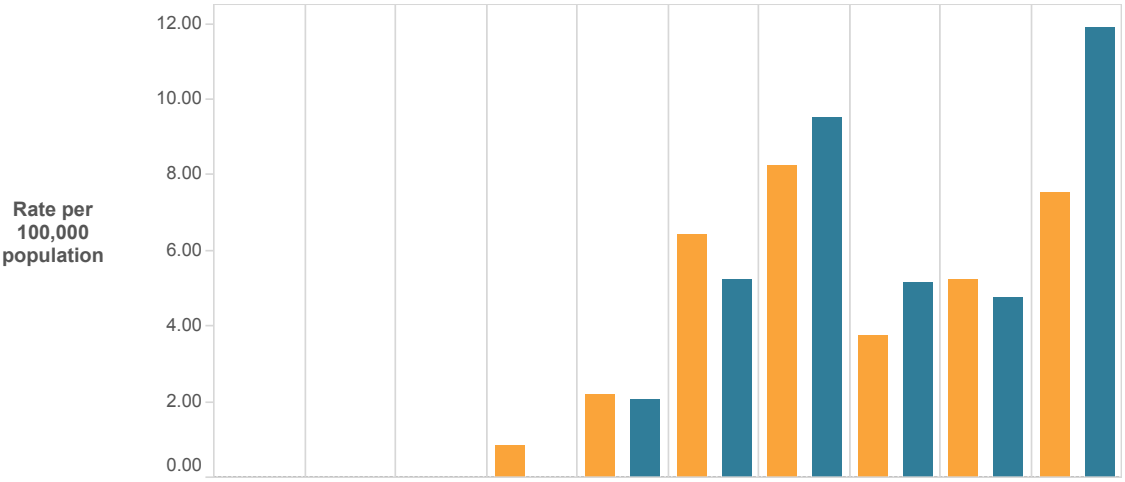
interactive dashboard

15.1 Tuberculosis Rates by Year, 2009-2018



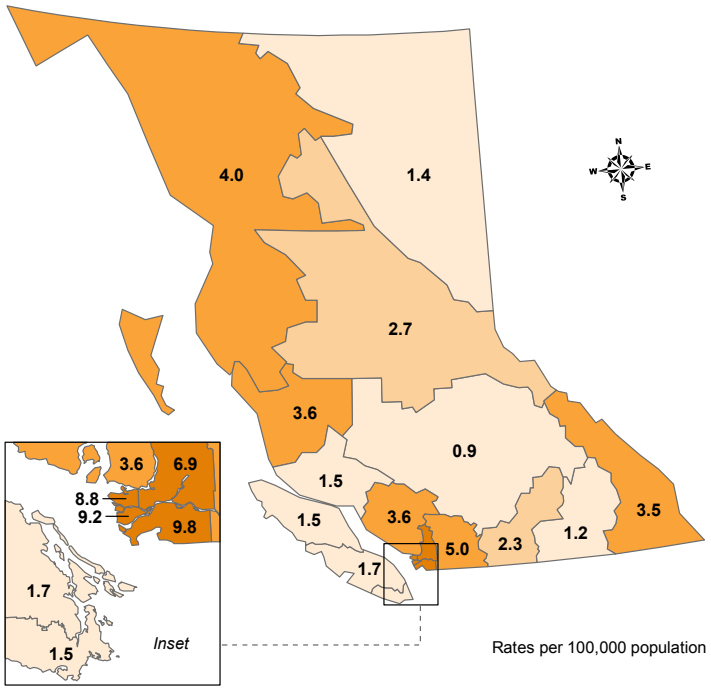
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	314	250	276	299	271	292	273	247	298	278
BC Rate	7.12	5.60	6.13	6.55	5.85	6.20	5.72	5.08	6.05	5.57
Canada Rate	4.92	4.66	4.72	4.89	4.70	4.54	4.57	4.79	4.90	

15.2 Tuberculosis Rates by Age and Sex, 2018



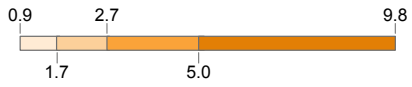
		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	1	3	10	14	13	37	50
	Male	0	0	0	0	3	9	17	18	32	71
	Total	0	0	0	1	6	19	31	31	69	121
BC Rate	Female	0.00	0.00	0.00	0.84	2.22	6.44	8.25	3.77	5.25	7.52
	Male	0.00	0.00	0.00	0.00	2.09	5.26	9.54	5.18	4.77	11.92
	Total	0.00	0.00	0.00	0.41	2.15	5.82	8.91	4.47	5.02	9.60

15.3 Tuberculosis Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	3	3.5
12	Kootenay Boundary	1	1.2
13	Okanagan	9	2.3
14	Thompson Cariboo Shuswap	2	0.9
21	Fraser East	16	5.0
22	Fraser North	47	6.9
23	Fraser South	84	9.8
31	Richmond	20	9.2
32	Vancouver	61	8.8
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	2	1.5
51	Northwest	3	4.0
52	Northern Interior	4	2.7
53	Northeast	1	1.4

Rates per 100,000 population by HSDA



Sexually Transmitted and Bloodborne Pathogens

Chlamydia (genital)
Gonorrhea (gential)
Syphilis
HIV and AIDS
Hepatitis B
Hepatitis C

Chlamydia (genital)

Data for chlamydia were not available at the time of the generation of this report. Please refer to previous versions of this report or the STI annual reports for historical chlamydia data.

Gonorrhea (gental)

Data for gonorrhea were not available at the time of the generation of this report. Please refer to previous versions of this report or the STI annual reports for historical gonorrhea data.

Syphilis

Syphilis infections are divided into several stages: primary, secondary, early latent, and late latent. The initial symptoms of syphilis may not always be recognized and without treatment, individuals generally enter a prolonged asymptomatic phase. Individuals can still however, be infectious despite not having any symptoms. Syphilis infection can lead to serious complications, including cardiovascular and neurologic disease, and may be fatal.

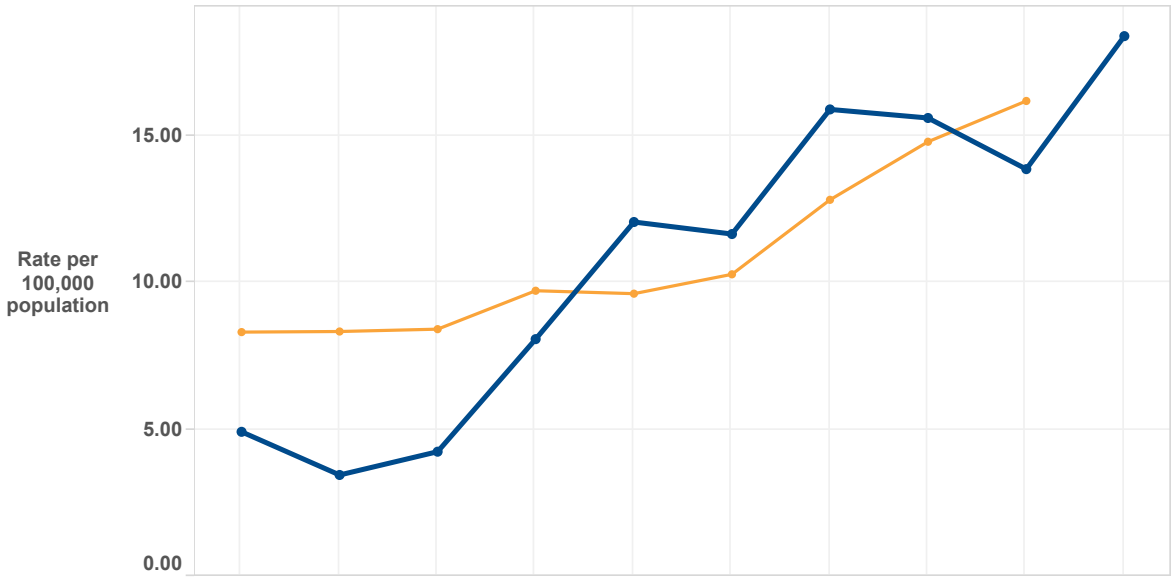
Following a decline in rates in BC in the early 1990's, infectious syphilis (i.e., primary, secondary, and early latent stages) began to re-emerge in BC starting in 1997. While provincial trends had been decreasing in 2009-2010, infectious syphilis rates began to increase in 2011 and continue to remain high in 2018.

The majority of infectious syphilis cases in BC are male. Gay, bisexual, and other men who have sex with men (MSM) continue to comprise the greatest number of infectious syphilis cases in BC.

The BCCDC has developed a multi-prong strategy (the Syphilis Action Plan http://www.bccdc.ca/resource-gallery/Documents/Statistics%20and%20Research/Statistics%20and%20Reports/STI/Syphilis%20Action%20Plan.pdf) with various partners including the regional health authorities, the First Nations Health Authority, the BCCDC Public Health Laboratory, Perinatal Services BC, and the Office of the Provincial Health Officer to address the increase in infectious syphilis rates. Goals of this multi-prong strategy include increasing the awareness of syphilis among key populations and health care providers, enhancing surveillance of syphilis, maintaining high treatment completion rates, and optimizing the care of partners in order to prevent re-infection and onward transmission.

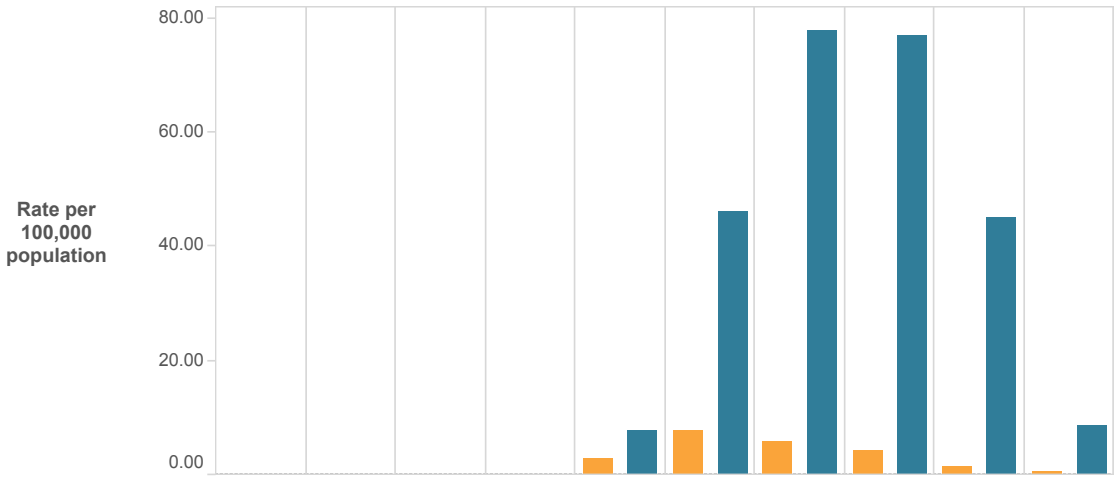
For more information on the epidemiology of infectious syphilis, please see the STI Annual Report.

16.1 Syphilis Rates by Year, 2009-2018



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	217	154	191	369	559	549	760	759	683	919
BC Rate	4.92	3.45	4.24	8.08	12.07	11.66	15.91	15.62	13.88	18.41
Canada Rate	8.32	8.34	8.42	9.73	9.63	10.29	12.83	14.81	16.20	

16.2 Syphilis Rates by Age Group and Sex, 2018



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	4	12	10	15	10	3
	Male	0	0	0	0	11	79	139	268	301	51
	Total	0	0	0	0	15	93	151	287	318	55
BC Rate	Female	0.00	0.00	0.00	0.00	2.96	7.73	5.89	4.35	1.42	0.45
	Male	0.00	0.00	0.00	0.00	7.67	46.17	77.98	77.06	44.90	8.56
	Total	0.00	0.00	0.00	0.00	5.39	28.50	43.39	41.42	23.13	4.36

HIV and AIDS

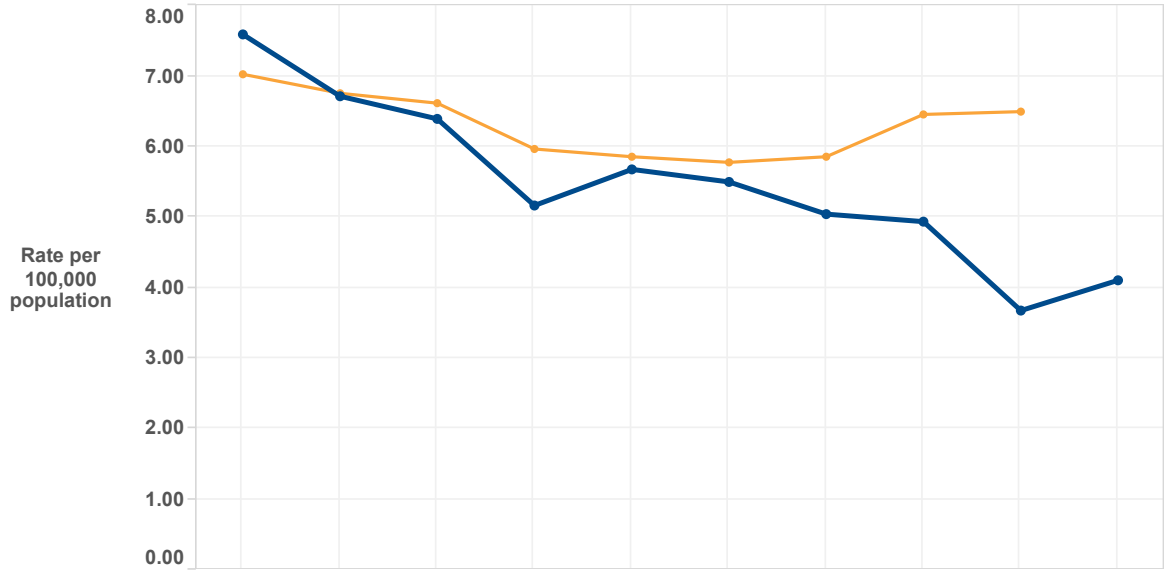
HIV became a reportable infection in BC in 2003. It should be noted that the number of new HIV diagnoses reported does not reflect the number of new HIV infections per year (i.e., HIV incidence), as individuals may be diagnosed with HIV years after their initial infection with HIV. Estimates of HIV incidence in BC using mathematical modeling are routinely done by the Public Health Agency of Canada and available in the HIV Annual Reports (http://www.bccdc.ca/health-professionals/data-reports/communicable-diseases/hiv-aids).

New HIV diagnosis rates have declined over the past decade in both males and females, primarily driven by the decrease in the number of new HIV diagnoses among people who use injection drugs (PWID). Gay, bisexual, and other men who have sex with men (MSM) continue to comprise the greatest number of new HIV diagnoses in BC. Overall, the trend in new HIV diagnoses among MSM appears to be declining slightly but not to the same extent as in other exposure categories such as PWID or people who acquire HIV through heterosexual contact. See the HIV Annual Report for more information (http://www.bccdc.ca/health-professionals/data-reports/communicable-diseases/hiv-aids).

In BC, there are a number of programs and services to prevent HIV, such as the Seek and Treat for Optimal Prevention of HIV/AIDS (STOP HIV/AIDS) which began in 2013 (http://stophivaids.ca/about/) and a publicly funded program for HIV pre-exposure prophylaxis (PrEP) which was launched in 2018 (https://news.gov.bc.ca/releases/2017HLTH0114-002108).

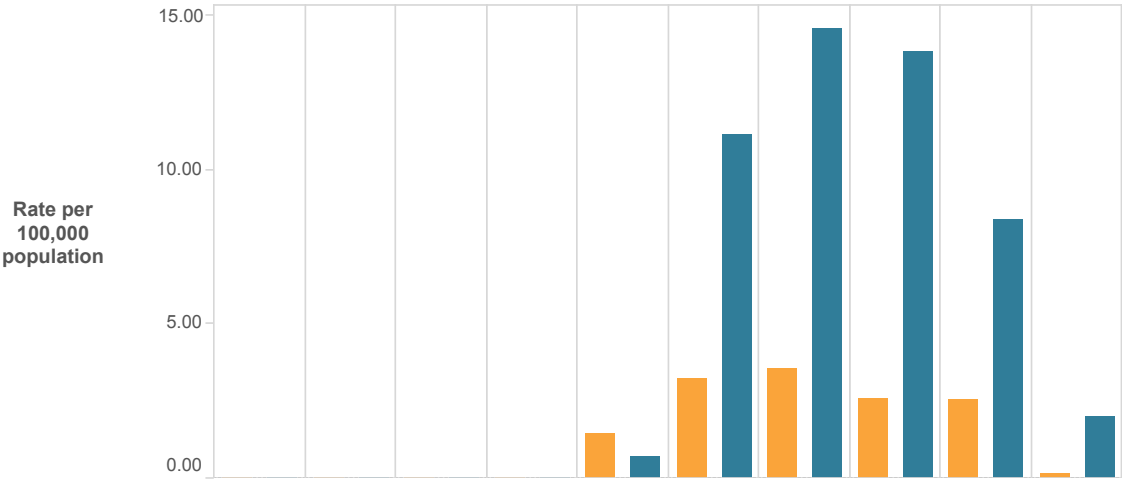
For more information on the epidemiology HIV, please see the HIV Annual Report.

17.1 HIV Rates by Year, 2009-2018



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	335	300	288	236	263	259	241	240	181	205
BC Rate	7.60	6.72	6.40	5.17	5.68	5.50	5.05	4.94	3.68	4.11
Canada Rate	7.03	6.76	6.62	5.97	5.86	5.78	5.86	6.46	6.50	

17.2 HIV Rates by Age Group and Sex, 2018



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	2	5	6	9	18	1
	Male	0	0	0	0	1	19	26	48	56	12
	Total	1	0	0	0	3	24	32	57	74	13
BC Rate	Female	0.00	0.00	0.00	0.00	1.48	3.22	3.53	2.61	2.56	0.15
	Male	0.00	0.00	0.00	0.00	0.70	11.11	14.59	13.80	8.35	2.01
	Total	2.26	0.00	0.00	0.00	1.08	7.36	9.20	8.23	5.38	1.03

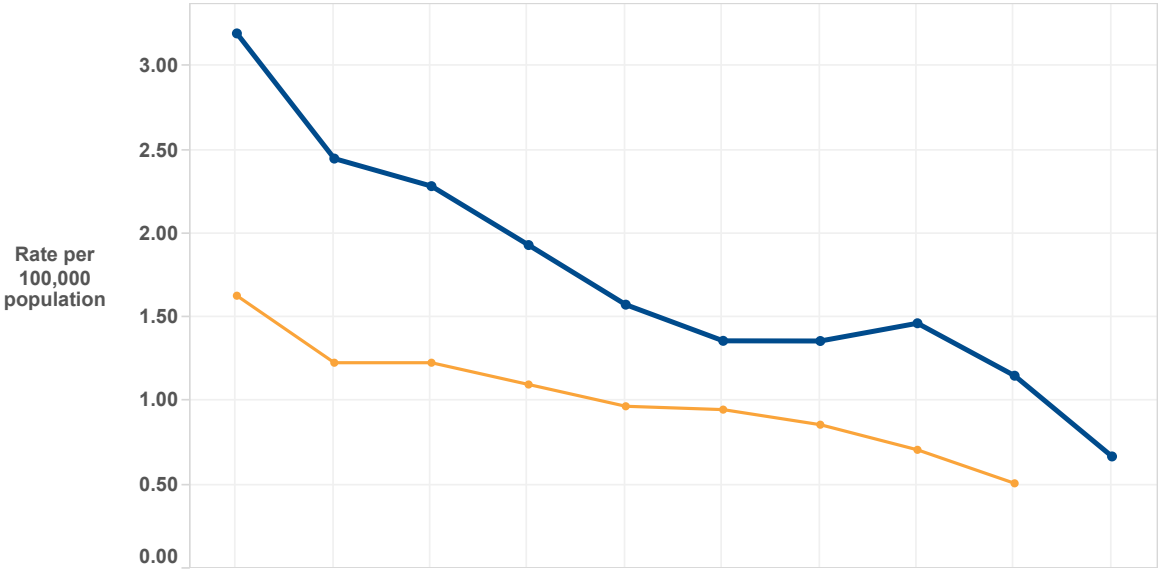
The AIDS surveillance system is a passive system that relies on clinicians reporting the case to the BCCDC. In BC, the majority of AIDS cases are reported through the Provincial HIV Drug Treatment Program at the BC Centre for Excellence in HIV/AIDS which has comprehensive clinical data on all individuals accessing antiretroviral therapy (ART) in BC. Due to delayed reporting, AIDS case reports presented in this report are up to the previous year.

The rate of AIDS and the number of AIDS case reports per year have decreased from a peak in 1993 due primarily to advances in HIV treatment which includes ART. The rate of AIDS in BC remains higher than the Canadian rate. This difference from the national rate may represent greater ascertainment of AIDS cases in BC due to routine reporting by the Provincial HIV Drug Treatment Program.

The rate of AIDS among males continues to be greater than the rate among females which likely reflects the distribution of HIV between males and females in BC.

For more information on the epidemiology AIDS, please see the HIV Annual Report.

17.3 AIDS Rates by Year, 2008-2017



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Reports	139	108	102	87	72	63	64	70	56	33
BC Rate	3.20	2.45	2.28	1.93	1.58	1.36	1.36	1.47	1.15	0.67
Canada Rate	1.63	1.23	1.23	1.10	0.97	0.95	0.86	0.71	0.51	

17.4 AIDS Rates by Age Group and Sex, 2017

		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	0	0	0	1	4	1
	Male	0	0	0	0	0	0	2	3	20	1
	Total	0	0	0	0	0	0	2	4	24	3
BC Rate	Female	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.56	0.16
	Male	0.00	0.00	0.00	0.00	0.00	0.00	1.14	0.89	2.96	0.17
	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.59	1.73	0.25

Hepatitis B

Hepatitis B infections may be acute or chronic in nature. Acute infections are new infections which are often symptomatic in adults. Chronic infections are those where the hepatitis B surface antigen (HBsAg) is detectable for more than six months and in BC are often identified in persons who have immigrated from countries where HBV is endemic and the person was infected at birth.

Hepatitis B - Chronic and Undetermined

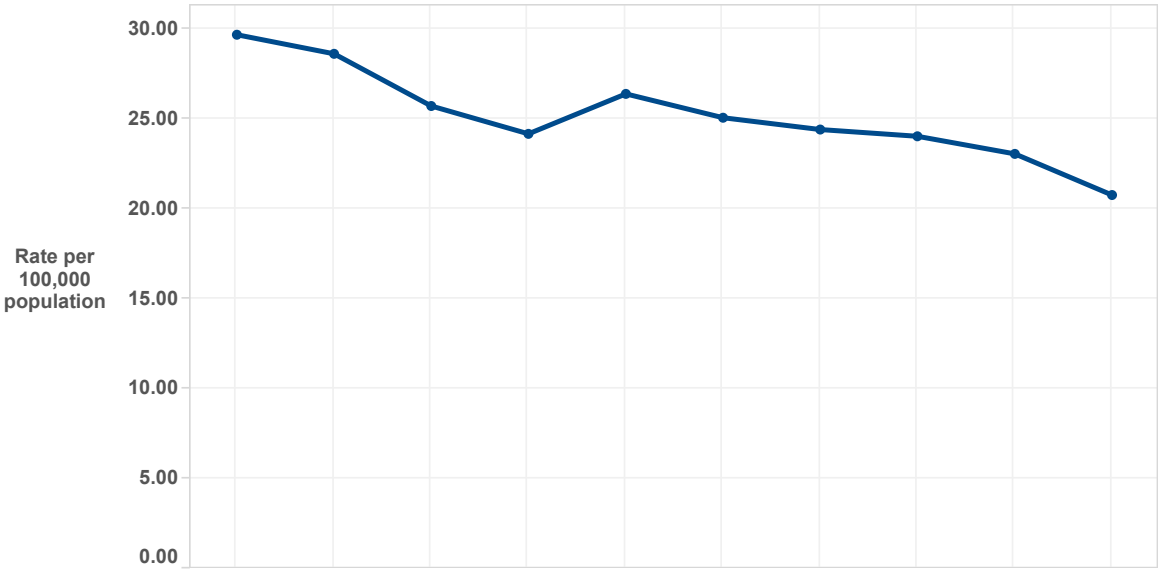
Chronic HBV cases have continued to slowly decline over time. Females exceed males in age groups between 20 to 39 years as HBV is routinely tested for during pregnancy to enable timely administration of post-exposure prophylaxis to newborns.

Hepatitis B - Acute

Cases of acute HBV in BC remained low in 2018 with no cases identified in persons less than 20 years of age, reflecting the success of routine hepatitis B immunization. Hepatitis B immunization was introduced in 1992 for grade 6 children and an infant program was introduced in 2001.

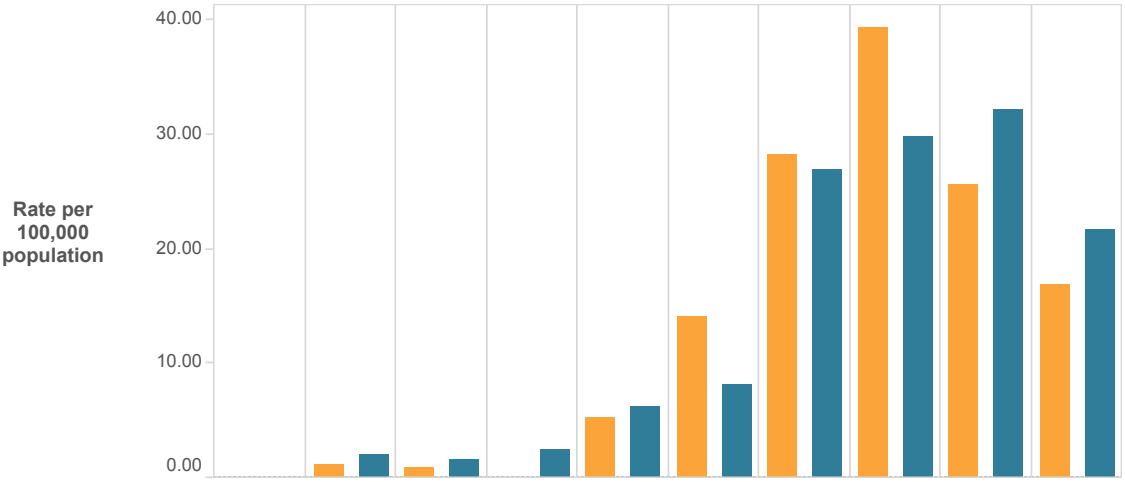
interactive dashboard

18.1 Chronic and Undetermined Hepatitis B Rates by Year, 2009-2018



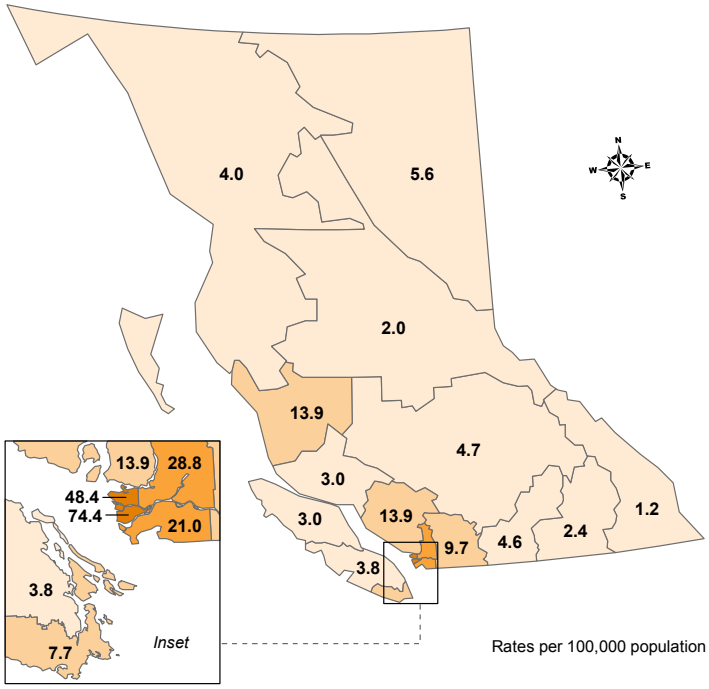
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	1,307	1,276	1,156	1,102	1,220	1,178	1,164	1,166	1,133	1,035
BC Rate	29.63	28.57	25.68	24.13	26.35	25.03	24.37	24.00	23.02	20.73

18.2 Chronic and Undetermined Hepatitis B Rates by Age Group and Sex, 2018

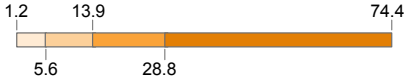


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	1	1	0	7	22	48	136	181	112
	Male	0	2	2	3	9	14	48	104	216	129
	Total	0	3	3	3	16	36	96	240	397	241
BC Rate	Female	0.00	1.12	0.85	0.00	5.18	14.17	28.28	39.40	25.70	16.85
	Male	0.00	2.09	1.62	2.45	6.28	8.18	26.93	29.90	32.22	21.66
	Total	0.00	1.62	1.24	1.24	5.75	11.03	27.59	34.63	28.88	19.12

18.3 Chronic and Undetermined Hepatitis B Rates by HSDA, 2018

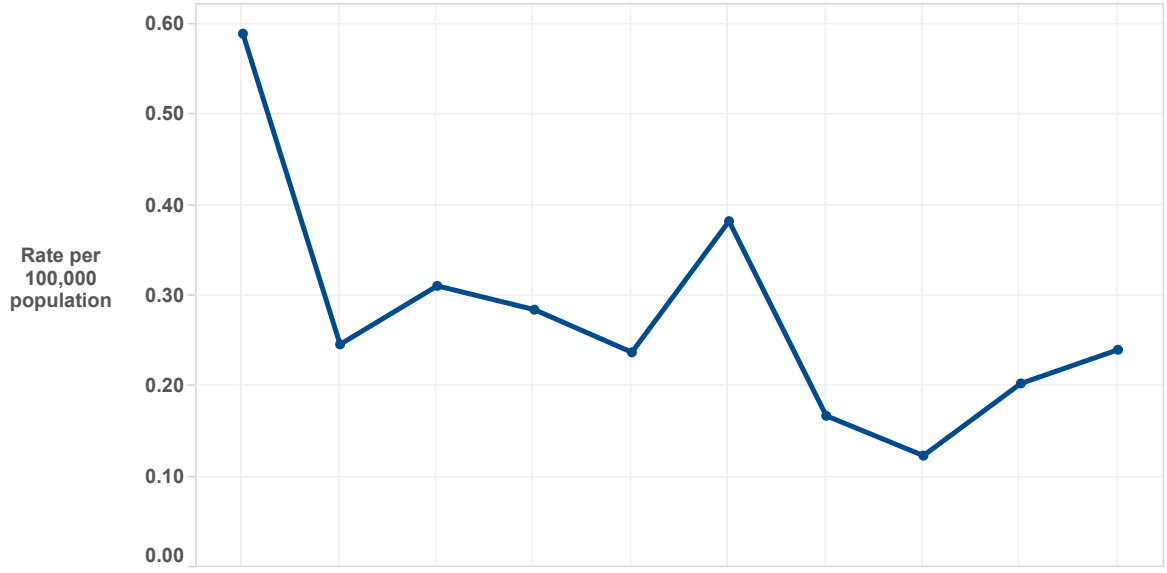


ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	1	1.2
12	Kootenay Boundary	2	2.4
13	Okanagan	18	4.6
14	Thompson Cariboo Shuswap	11	4.7
21	Fraser East	31	9.7
22	Fraser North	197	28.8
23	Fraser South	180	21.0
31	Richmond	161	74.4
32	Vancouver	335	48.4
33	North Shore/Coast Garibaldi	42	13.9
41	South Vancouver Island	32	7.7
42	Central Vancouver Island	11	3.8
43	North Vancouver Island	4	3.0
51	Northwest	3	4.0
52	Northern Interior	3	2.0
53	Northeast	4	5.6



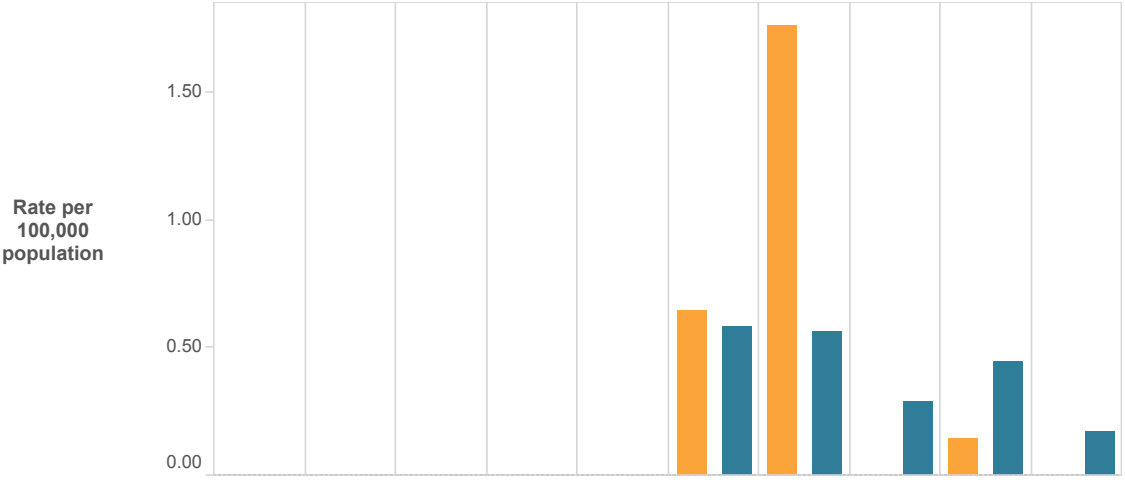
Rates per 100,000 population by HSDA

18.4 Acute Hepatitis B Rates by Year, 2009-2018



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	26	11	14	13	11	18	8	6	10	12
BC Rate	0.59	0.25	0.31	0.28	0.24	0.38	0.17	0.12	0.20	0.24

18.5 Acute Hepatitis B Rates by Age Group and Sex, 2018

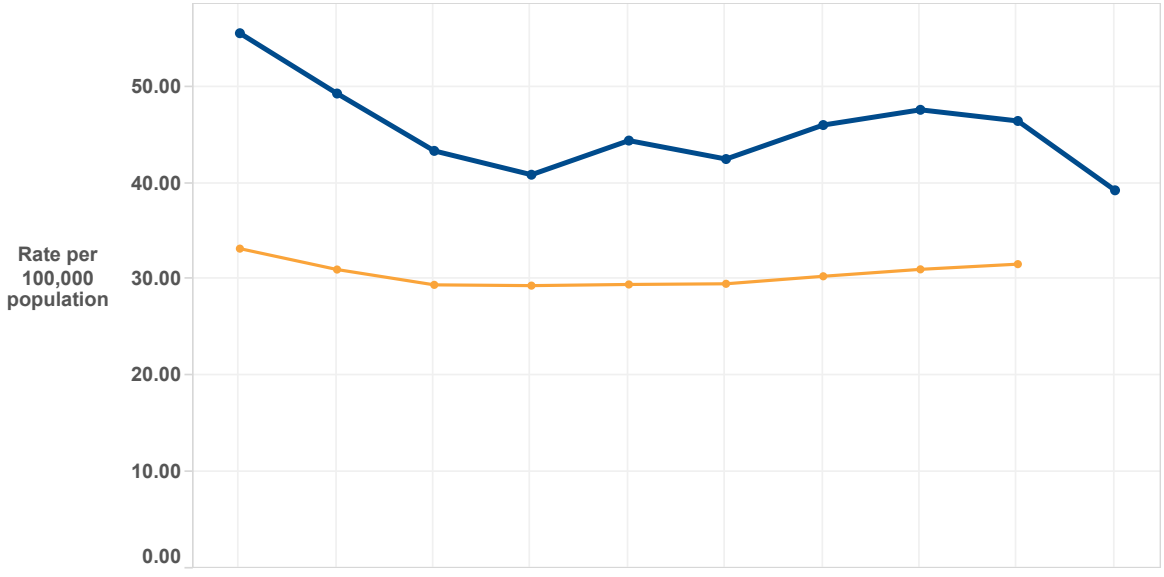


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	0	1	3	0	1	0
	Male	0	0	0	0	0	1	1	1	3	1
	Total	0	0	0	0	0	2	4	1	4	1
BC Rate	Female	0.00	0.00	0.00	0.00	0.00	0.64	1.77	0.00	0.14	0.00
	Male	0.00	0.00	0.00	0.00	0.00	0.58	0.56	0.29	0.45	0.17
	Total	0.00	0.00	0.00	0.00	0.00	0.61	1.15	0.14	0.29	0.08

Hepatitis C

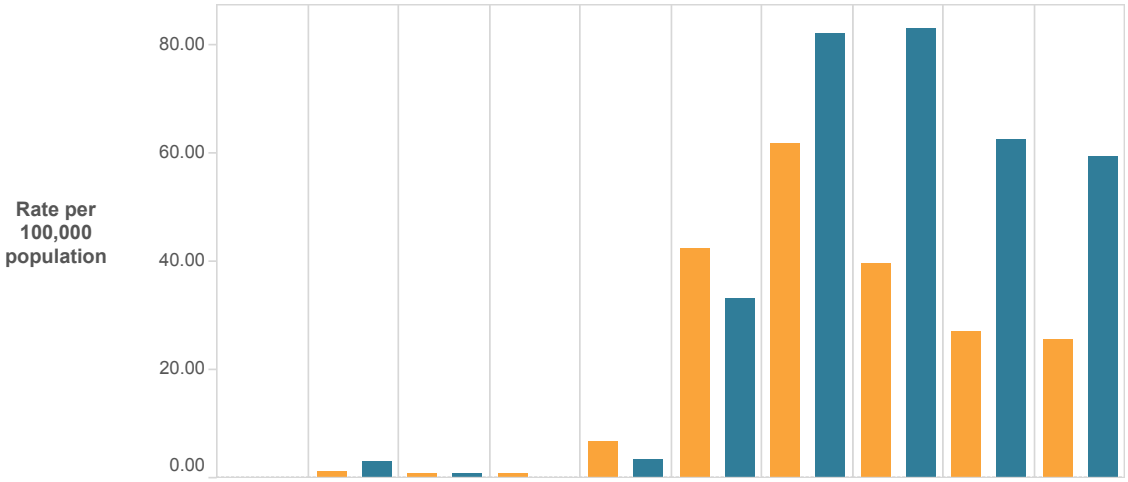
Due to the increased public awareness about hepatitis C and the availability of curable treatment with limited side effects, testing has for hepatitis C has continued to increase. However, cases of hepatitis C identified in BC declined in 2018. Hepatitis C cases are distributed across all ages with 65% identified in males. Vancouver had the highest number of cases identified, but the rates were highest in Northern Interior and Fraser East.

19.1 Hepatitis C Rates by Year, 2009-2018



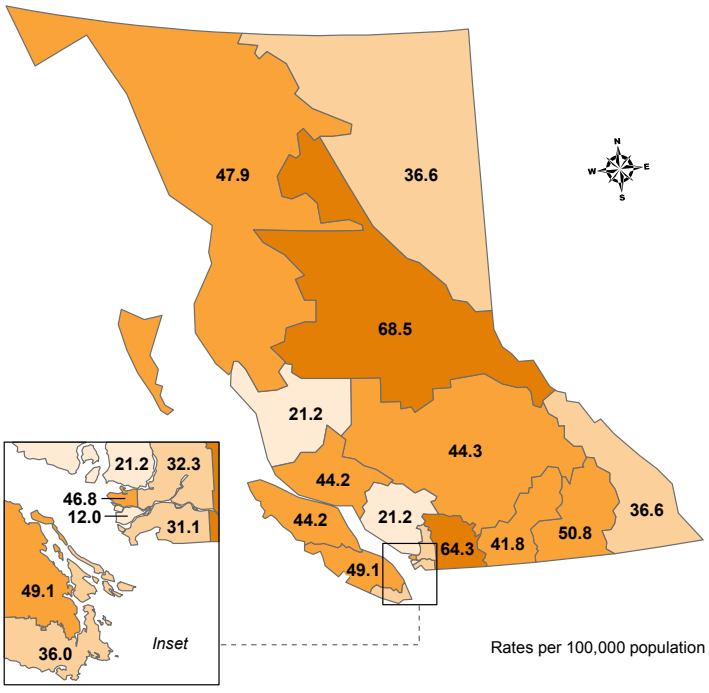
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	2,451	2,202	1,952	1,867	2,057	2,001	2,199	2,314	2,287	1,960
BC Rate	55.57	49.31	43.36	40.88	44.43	42.51	46.04	47.62	46.46	39.27
Canada Rate	33.21	31.04	29.45	29.37	29.49	29.56	30.34	31.06	31.60	

19.2 Hepatitis C Rates by Age Group and Sex, 2018

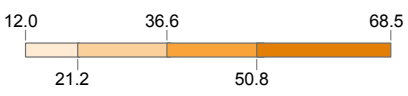


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	1	1	1	9	66	105	137	190	169
	Male	0	3	1	0	5	57	146	289	419	354
	Total	0	4	2	1	14	123	251	428	612	525
BC Rate	Female	0.00	1.12	0.85	0.84	6.66	42.52	61.85	39.69	26.98	25.43
	Male	0.00	3.13	0.81	0.00	3.49	33.32	81.91	83.10	62.50	59.43
	Total	0.00	2.16	0.83	0.41	5.03	37.69	72.13	61.76	44.52	41.66

19.3 Hepatitis C Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	31	36.6
12	Kootenay Boundary	42	50.8
13	Okanagan	162	41.8
14	Thompson Cariboo Shuswap	104	44.3
21	Fraser East	205	64.3
22	Fraser North	221	32.3
23	Fraser South	266	31.1
31	Richmond	26	12.0
32	Vancouver	324	46.8
33	North Shore/Coast Garibaldi	64	21.2
41	South Vancouver Island	149	36.0
42	Central Vancouver Island	143	49.1
43	North Vancouver Island	58	44.2
51	Northwest	36	47.9
52	Northern Interior	102	68.5
53	Northeast	26	36.6



Vaccine Preventable Diseases

***Haemophilus influenzae* type b (Hib), invasive**
Influenza
Measles
Meningococcal Disease (invasive)
Mumps
Pertussis
Pneumococcal Disease (invasive)

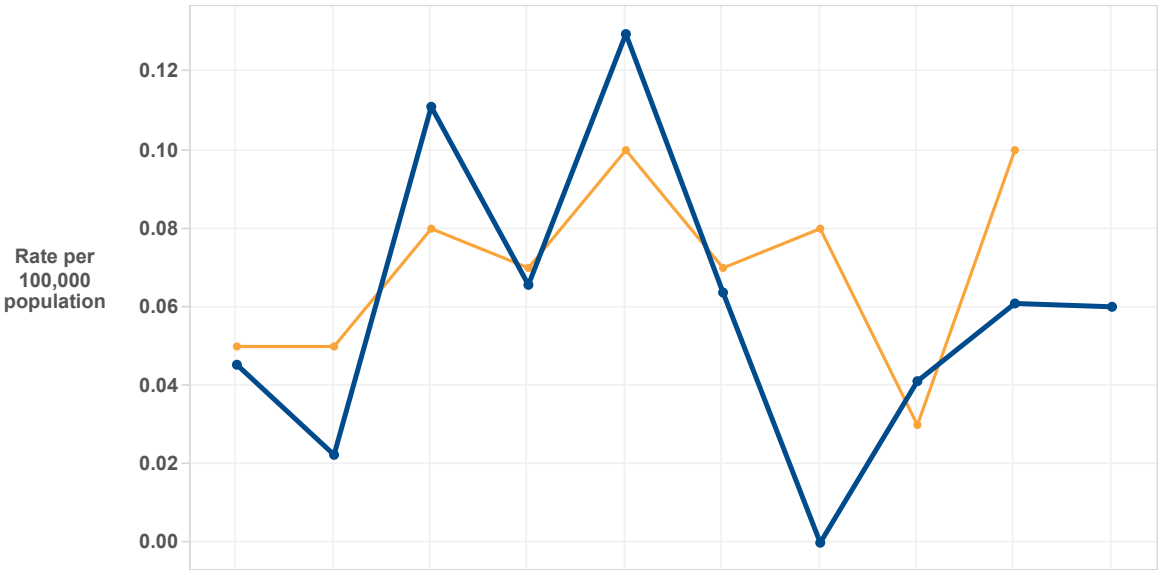
Haemophilus influenzae (invasive) type b (Hib)

Three cases of invasive *Haemophilus influenzae* type b (Hib) disease were reported in 2018. All three cases were males over 40 years of age who lived in the Vancouver Health Service Delivery Area.

Hib vaccine is routinely given in infancy with a booster dose in the second year of life. Its use in adults is limited to those with select high risk medical conditions. Hib disease has declined dramatically since the introduction of Hib vaccines in the early 1990s, with a small residual burden of illness almost exclusively in adults and unimmunized children.

interactive dashboard

20.1 Haemophilus influenzae (invasive) type b (Hib) by Year, 2009-2018



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	2	1	5	3	6	3	0	2	3	3
BC Rate	0.05	0.02	0.11	0.07	0.13	0.06	0.00	0.04	0.06	0.06
Canada Rate	0.05	0.05	0.08	0.07	0.10	0.07	0.08	0.03	0.10	

20.2 Haemophilus influenzae (invasive) type b (Hib) by Age Group and Sex, 2018

		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	0	0	0	0	0	0
	Male	0	0	0	0	0	0	0	0	2	1
	Total	0	0	0	0	0	0	0	0	2	1
BC Rate	Female	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Male	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.17
	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.08

Influenza

Influenza surveillance is conducted year-round in BC, with renewed annual monitoring typically commencing in the first week of October (week 40) and ongoing through the end of September (week 39). This report summarises surveillance data for the 2018-19 influenza season, spanning week 40 (starting October 1, 2018) through week 17 (ending April 27, 2019).

Influenza surveillance in BC consists of monitoring trends in influenza activity and circulating viruses to inform prevention and control programs, including vaccine effectiveness. Surveillance indicators for influenza and influenza-like illness (ILI) monitoring include: (1) sentinel practitioner ILI reporting; (2) BC Children's Hospital emergency room visits attributed to ILI; (3) Medical Service Plan (MSP) visits with a clinical diagnosis of influenza illness; (4) facility and school outbreak notifications; (5) provincial influenza laboratory diagnosis by the BCCDC Public Health Laboratory (PHL) and BC Children's and Women's Health Centre Laboratory; and (6) strain characterization and antiviral resistance testing by the National Microbiology Laboratory (NML) at the Public Health Agency of Canada.

Since 2004, the BCCDC has led a national surveillance initiative to monitor annual vaccine effectiveness (VE) against medically attended, laboratory-confirmed influenza, using a test-negative case-control design overlaid upon the national Sentinel Practitioner Surveillance Network (SPSN). Additional phenotypic and genetic characterization of circulating viruses is conducted to inform VE analysis and interpretation.

Detailed surveillance bulletins are issued throughout the year, distributed weekly or bi-weekly during the influenza season and periodically during inter-seasonal months, and are available from: http://www.bccdc.ca/health-professionals/data-reports/communicable-diseases/influenza-surveillance-reports.

SUMMARY

The 2018-19 influenza season in BC was characterised by unusually prolonged activity, distinguished by two successive waves of influenza A: an early primary epidemic due to A (H1N1) pdm09 peaking in late December/early January followed by an atypical secondary wave of A (H3N2) that peaked in March. Also unusual was the very low level of influenza B detection throughout the 2018-19 season compared to previous seasons. This profile is in contrast to the 2017-18 season which was comprised of dominant influenza A (H3N2) and early influenza B(Yamagata) co-circulation.

Influenza activity remained at elevated levels above historical averages for an extended period of time this season. Among respiratory specimens submitted for influenza testing at the BCCDC Public Health Laboratory (PHL) and select external sites, the proportion of respiratory specimens testing influenza positive peaked twice, with about one third testing influenza positive in each of weeks 1 and 11. This corresponds with the unusual bi-modal influenza A epidemic this season including predominant circulation of A (H1N1) pdm09 viruses during the first wave, followed by predominant A (H3N2) viruses during the second lesser wave. Community influenza-like illness (ILI) activity began to increase around early December (weeks 49-50) and peaked twice in late December/early January (weeks 52-2) and in March (week 11). Activity gradually declined thereafter; however, levels remained elevated into April. Cumulatively, from week 40 to week 17, 94 laboratory-confirmed influenza outbreaks in long-term care facilities (LTCFs) were reported. The cumulative tally of LTCF outbreaks during this season of greater A (H1N1) pdm09 contribution is lower than that of the prior two A (H3N2)-domi-

nant seasons (where 179 and 198 outbreaks were reported in 2017-18 and 2018-19, respectively). Notably, the majority of outbreaks were accrued in the latter half of the current season, consistent with the secondary wave of A (H3N2) activity. This season, around 80% of all A (H1N1) pdm09 detections were reported in individuals younger than 65 years of age. Children were particularly affected by the A (H1N1) pdm09 epidemic: 21% of A (H1N1) pdm09 detections were observed among children ≤9 years who comprise about 10% of the BC population. Conversely, the majority (57%) of A (H3N2) detections were among elderly adults 65 years of age and older who otherwise comprise <20% of the BC population.

Interim and end-of-season estimates from the BCCDC-led Canadian Sentinel Practitioner Surveillance Network (SPSN), suggest the 2018-19 northern hemisphere influenza vaccine provided substantial protection against circulating A(H1N1)pdm09 viruses; conversely, the vaccine provided little or no protection against late-season A(H3N2) viruses overall and particularly among working-age adults. SPSN investigators also reported that children under 10 years of age were more affected during the primary 2018-19 influenza A(H1N1)pdm09 epidemic compared to prior seasonal epidemics in Canada.

1. Sentinel practitioner reporting of ILI

During the 2018-19 season (week 40 to week 17), 24 active sentinel sites (with one or more contributing practitioners at each site) representing all regional health authorities in BC contributed to sentinel ILI surveillance. On average, 87% of sites reported data each week with some expected variation in timeliness and completeness, such as during holiday periods. The rate of ILI among patients presenting to these sentinel sites trended within or below 10-year historical averages for much of the season (Figure 21.1). However, during the latter stages a resurgence in the proportion of patients visits due to ILI was observed, with rates exceeding historical averages in weeks 11 through 15.

2. BC Children's Hospital emergency room visits attributed to ILI

The proportion of visits to BC Children's Hospital Emergency Room attributed to ILI (based on records with a triage chief complaint of "flu" or "influenza" or "fever/cough") peaked twice during the 2018-19 season in week 52 (29%) and week 11 (23%) (Figure 21.2). ILI rates exceeded historical norms throughout much of the season and remained elevated at season close (week 17).

3. MSP visits with an influenza diagnosis

BC Medical Services Plan (MSP) general practitioner claims with a clinical diagnosis of influenza illness (ICD-9 code 487), as a proportion of all submitted MSP claims, peaked twice during the 2018-19 season with the primary peak observed around week 52 and a secondary peak observed around week 12 (Figure 21.3). Overall, provincial MSP rates exceeded expected seasonal values during both peak periods, and remained elevated for a prolonged period compared to historical data for the past 10 years. Some expected regional variation in the timing and intensity of influenza illness activity was observed across health authorities, notably in the Interior Health Authority and Northern Health Authority where sharper primary peaks were observed, exceeding 10-year maximums.

4. Facility outbreak notifications

Residential facilities, such as long-term care facilities (LTCFs), are asked to notify their local health unit when two or more cases of ILI occur within their setting over a 7-day period. Influenza out-

breaks are defined as ILI outbreaks with at least one specimen laboratory-confirmed as influenza. Schools are asked to report when absenteeism, mostly likely due to ILI, is greater than 10% on any one day; school ILI outbreaks are generally reported without laboratory confirmation. Provincial reporting of ILI outbreaks to the BCCDC is at the discretion of the local Medical Health Officer/ health authority and varies regionally, with less consistent reporting for school ILI outbreaks (few health authorities routinely contributing), acute care facility outbreaks and facility outbreaks where non-influenza respiratory viruses were detected. Provincial reports of ILI outbreaks are not generally audited to verify that patients met specific clinical criteria.

During the 2018-19 season (week 40 to week 17), 94 laboratory-confirmed influenza outbreaks in LTCFs were reported to the BCCDC. Of the 94 LTCF outbreaks reported, 92 were attributed to influenza A and 2 to influenza B. Of the 57 out of 92 influenza A outbreaks where subtype information was available, 39 (68%) were influenza A (H3N2) and 18 (32%) were A (H1N1) pdm09. The majority (62/94; 66%) of LTCF outbreaks were accrued between weeks 8 and 14, consistent with the observed secondary wave of A (H3N2) activity which peaked around weeks 11 and 12 in BC (figure 21.4).

The cumulative tally of LTCF outbreaks this A (H1N1) pdm09-dominant season remains far below that of the prior two seasons which were dominated by A (H3N2) (94, 182 and 198 outbreaks, respectively) (Figure 21.5). The number reported this season of mixed influenza A subtype circulation is the fourth highest for the same period of the past 16 seasons (since the 2003-04 season).

In addition to LTCF outbreak reports, 21 ILI outbreaks were reported from acute care facilities, 34 from schools, 1 from a correctional facility, and 1 from a mental health facility during the 2018-19 season (week 40 to week 17).

5. Laboratory diagnosis

a. BCCDC Public Health Laboratory

The BCCDC Public Health Laboratory (PHL) routinely conducts testing for influenza and other respiratory viruses on specimens collected from inpatients at pediatric and acute care hospitals, residents of healthcare facilities associated with outbreaks, and patients presenting to community-based sentinel sites, or where otherwise clinically indicated or specifically requested. This includes specimens diagnosed with influenza A at other hospital/regional laboratories that are submitted to BCCDC PHL for influenza A subtyping. All submitted specimens are routinely tested for influenza A and B and respiratory syncytial virus (RSV), while testing for other respiratory viruses is conducted less systematically and only on a subset of influenza and RSV negative specimens. With expanded influenza testing by additional laboratories across BC this season, adjustments to percentage influenza positivity derivation were required and are summarized here based on primary specimens submitted for influenza testing at the BCCDC PHL and other external sites that shared complete testing data with the BCCDC PHL.

During the 2018-19 season (week 40 to week 17), of 16,319 specimens tested for influenza across BC, 3993 (24%) tested positive for influenza A and just 168 (1%) tested positive for influenza B. Virtually all (96%) influenza detections were therefore influenza A. Influenza A positivity began to increase in week 46, peaking twice in weeks 1 and 11 (35% and 34%, respectively) (Figure 21.6). Influenza A (H1N1) pdm09 viruses comprised the vast majority of detections during the first peak

period, while the second peak was attributed to influenza A (H3N2) viruses (Figure 21.6). Influenza B positivity remained low (0-4%) throughout the season.
Among influenza viruses typed at the BCCDC PHL this season, virtually all (97%) were influenza A. Influenza A (H1N1) pdm09 viruses predominated from October to mid-February, and accounted for 60% of subtyped influenza A viruses overall since season start. However, since mid-February (week 7), A (H3N2) viruses comprised a greater share of influenza A detections.

Children ≤9 years old were disproportionately represented among influenza A (H1N1) pdm09 detections during the 2018-19 season (21% of detections despite comprising 10% of the BC population[1]) (Figure 21.7 and 21.8). Conversely, the majority (58%) of A (H3N2) detections have been among elderly adults ≥65 years of age, despite comprising about 18% of the BC population[1].

Among other respiratory viruses detected, respiratory syncytial viruses were the most commonly detected virus (excluding influenza) for the majority of the season (weeks 52 to 14). Entero/rhinoviruses were also detected throughout the season, most notably at the beginning of the season (weeks 40-47) before influenza activity began to increase.

b. BC Children's and Women's Health Centre Laboratory

During the 2018-19 season (week 40 to week 17), the BC Children's and Women's Health Centre Laboratory conducted 2,630 tests for influenza A and B. Of these, 364 (14%) were positive for influenza A and 31 (1%) were positive for influenza B. Influenza A therefore accounted for the vast majority (92%) of influenza detections. Influenza A positivity peaked twice in week 1 (24%) and between weeks 9 and 12 (~26%), while influenza B activity fluctuated at very low levels during the latter half of the season only (weeks 4-17), peaking at 6% in week 11 (Figure 21.9).

RSV was the dominant respiratory virus detected at the BC Children's and Women's Health Centre Laboratory, with 398 out of 2577 (15%) tests positive cumulatively during the season. RSV co-circulated with influenza A throughout the season, with percent positivity peaking in week 52 at 32%.

c. Strain characterisation by the National Microbiology Laboratory

Select influenza isolates have historically been sent by the BCCDC PHL to the National Microbiology Laboratory (NML) for strain characterisation by haemagglutination inhibition (HI) assay. More recently, however, HI characterization has become more challenging and difficult to interpret, especially for A (H3N2) viruses. Recognizing that, only a small proportion of BC viruses were submitted for HI characterization and/or could be successfully characterised antigenically (or genetically) (n=38). Here we have therefore summarised HI characterisation findings based on viruses submitted to the NML from all provinces.

From September 1, 2018, to April 25, 2019, the NML characterised 2006 influenza viruses [353 A (H3N2), 1553 A (H1N1) pdm09 and 100 B (23 Yamagata lineage and 77 Victoria lineage)] received from Canadian laboratories.

Of the 1553 influenza A (H1N1) pdm09 viruses characterised, 1510 (97%) were considered antigenically similar to an A/Michigan/45/2015-like virus: the WHO-recommended influenza A (H1N1) component of the 2018-19 northern

1 Government of British Columbia, BC Stats. Population Estimates 2017. URL: https://www.bcstats.gov.bc.ca/apps/PopulationEstimates.aspx.

hemisphere influenza vaccine. However, 43 (3%) viruses showed reduced titer with ferret antisera raised against cell culture-propagated A/Michigan/45/2015.
Of the 353 influenza A (H3N2) viruses, only 189 (54%) had sufficient haemagglutination titre for successful antigenic characterisation by HI assay. Of these viruses, 111 (59%) were considered antigenically similar to an egg-propagated A/Singapore/INFIMH-16-0019/2016-like virus, the WHO-recommended A (H3N2) component of the 2018-19 northern hemisphere influenza vaccine. However, 78 (41%) viruses showed reduced titer with ferret antisera raised against egg- propagated A/Singapore/INFIMH-16-0019/2016.

Of 329 A (H3N2) viruses successfully sequenced, 38 (12%) belonged to genetic group (clade) 3C.2a, 210 belonged to genetic group 3C.2a1 (64%), and 81 (25%) belonged to genetic group 3C.3a. The 2018-19 northern hemisphere influenza vaccine included a clade 3C.2a1 virus.

Of the 100 influenza B viruses characterised, 23 (23%) belonged to the B(Yamagata) lineage and 77 (77%) to the B(Victoria) lineage. All of the B(Yamagata) viruses were considered antigenically similar to a cell-culture passaged B/Phuket/3073/2013-like virus. Among the 77 B(Victoria) viruses, 16 (21%) were antigenically similar to a cell-culture passaged B/Colorado/06/2017-like virus while 61 (79%) viruses showed reduced titre with ferret antisera raised against cell culture-propagated B/Colorado/06/2017.

For context, the WHO-recommended components of the 2018-19 and upcoming 2019-20 northern hemisphere trivalent (TIV) and quadrivalent (QIV) vaccines are listed below. Note that all influenza vaccines used in Canada are based on egg-propagated viruses that may not be identical to the WHO-recommended vaccine strains:

2018-19*	2019-20**
A/Michigan/45/2015 (H1N1) pdm09-like virus	an A/Brisbane/02/2018 (H1N1) pdm09-like virus §
A/Singapore/INFIMH-16-0019/2016 (H3N2)-like virus †	A/Kansas/14/2017 (H3N2)-like virus §
B/Colorado/06/2017-like virus (Victoria lineage) ‡	B/Colorado/06/2017-like virus (Victoria lineage)
B/Phuket/3073/2013-like virus (Yamagata lineage) [QIV only]	B/Phuket/3073/2013-like virus (Yamagata lineage) [QIV only]

* Recommended strains represent a change for two of the three components used in the 2017-18 northern hemisphere TIV.
† Recommended strain represents a change from the 2017-18 season vaccine which contained an A/Hong Kong/4801/2014 (H3N2)-like virus .
‡ Recommended strain represents a change from the 2017-18 season vaccine which contained a B/Brisbane/60/2008-like virus (Victoria lineage).
** Recommended strains represent a change for two of the three components used in the 2018-19 northern hemisphere TIV
§ Recommended strain represents a change from the 2018-19 season vaccine.

d. Antiviral resistance assessment by the National Microbiology Laboratory

Among influenza isolates submitted to the NML for HI characterization, selected viruses are also tested for antiviral drug susceptibility. Since BC contributed few viruses for characterization this season, we have summarized findings below based on viruses submitted to the NML from all provinces for the period September 1, 2018 to April 25, 2019.

Of the 428 influenza A viruses [77 A (H3N2), 351 A (H1N1) pdm09] tested against amantadine, all were resistant.

Of the 1183 influenza viruses [134 A (H3N2), 989 A (H1N1) pdm09, and 60 B] tested against oseltamivir, 1179 were sensitive, and 4 A (H1N1) pdm09 viruses with an H275Y mutation were resistant.

Of the 1182 influenza viruses [134 A (H3N2), 988 A (H1N1) pdm09, and 60 B] tested against zanamivir, all were sensitive.

6. Sentinel influenza vaccine effectiveness monitoring

Mid-season estimates of influenza vaccine effectiveness (VE) against the primary A(H1N1)pdm09 epidemic were published by the BCCDC-led Canadian Sentinel Practitioner Surveillance Network (SPSN). Given the bimodal nature of the 2018-19 influenza A epidemic, VE against both A(H1N1)pdm09 and A(H3N2) viruses could be reported in end-of-season analyses. For all sets of analyses, respiratory specimens and epidemiological information were collected from patients presenting with ILI to SPSN sites in British Columbia, Alberta, Ontario, and Quebec and VE estimates were based on the test-negative design as per usual.

Based on data collected between November 1, 2018, and April 30, 2019, VE against any influenza, foremost driven by A(H1N1)pdm09 viruses, was 56% (95% CI: 47-64%), and for A(H1N1) pdm09 alone was 67% (95% CI: 58-75%). This substantial protection against A(H1N1)pdm09 was observed in all age groups. Conversely, the SPSN reported little or no vaccine protection against A(H3N2) viruses, with an overall VE against medically-attended outpatient A(H3N2) illness of 17% (95% CI: -13-39). VE was particularly low among working-age adults 20-64 years old who comprise the majority of SPSN participants (VE of -7%; 95% CI: -56-26%). Overall, the A(H3N2) VE estimate for 2018-19 was lower than expected generally for A(H3N2) vaccines (~30%), and similar to that observed in the 2017-18 A(H3N2)-dominant season where VE was estimated at 15% (95% CI: -6-32).

As in the past several years, SPSN mid-season findings were submitted to the WHO in February 2019 to support vaccine strain selection for the 2019-20 northern hemisphere influenza vaccines. End-of-season findings are also being shared with the WHO in September 2019 to support vaccine strain selection for the 2020 southern hemisphere influenza vaccines.

Mid-season findings by the Canadian SPSN were published in *EuroSurveillance*, an open-access, online, peer-reviewed journal, on January 24, 2019: https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2019.24.4.1900055.

Late-season, updated, 2018-19 interim VE estimates were disseminated via the weekly reports produced by FluWatch (included in reports distributed since week 14): https://www.canada.ca/en/public-health/services/diseases/flu-influenza/influenza-surveillance/weekly-influenza-reports.html.

2018/19 end-of-season findings will be published in due course.

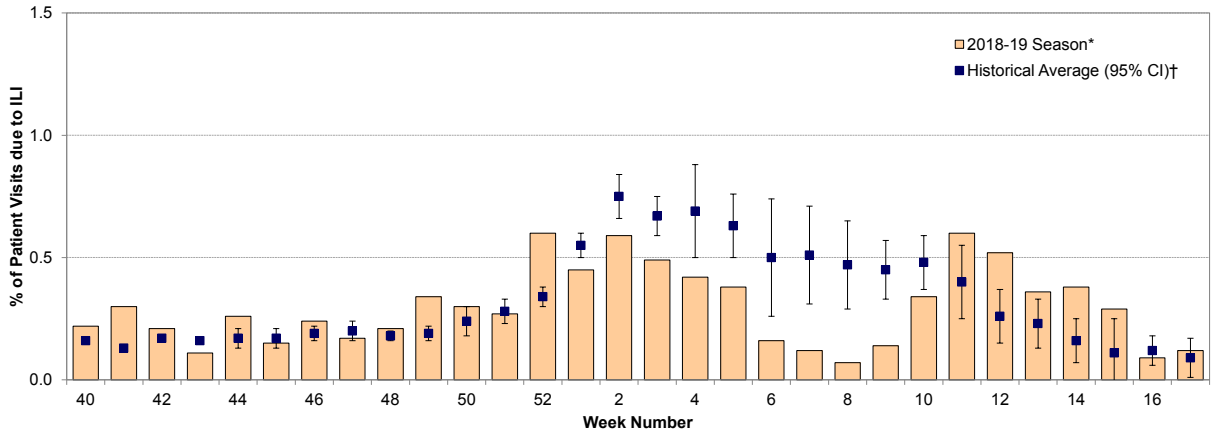
Current and historic VE findings of the Canadian SPSN since 2004-05 are available here: http://www.bccdc.ca/health-info/diseases-conditions/influenza/sentinel-network-spsn

7. Additional findings of the Canadian SPSN

SPSN investigators also published within season observations showing that children under 10 years of age were more affected during the primary 2018-19 influenza A (H1N1) pdm09 epidemic compared to prior seasonal epidemics

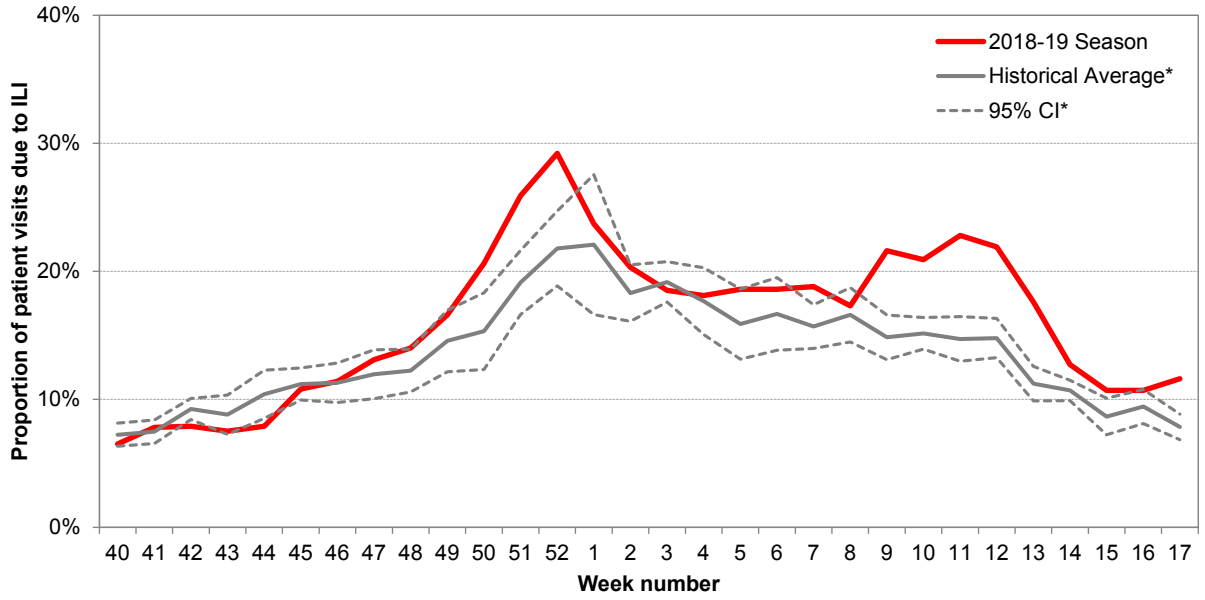
in Canada. The full report, which also explores potential reasons for this surveillance observation (notably hypothesizing a cohort effect following the 2009 pandemic), was published April 11, 2019, in *Eurosurveillance*: https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2019.24.15.1900104.

21.1 Percent of patient visits to sentinel practitioners due to influenza-like illness by week compared to the historical 10-season average, British Columbia, 2018-19 season



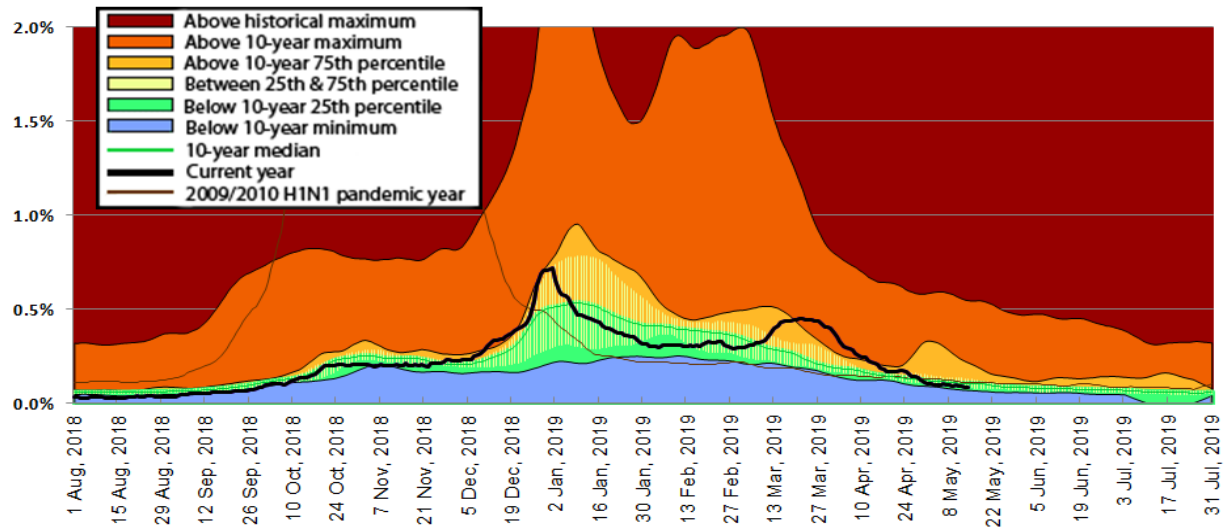
ILI: influenza-like illness; CI: confidence interval.
*Surveillance period spans week 40 (starting October 1, 2018) to week 17 (ending April 27, 2019), inclusive.
†Ten-year historical average based on 2005-06 to 2017-18 seasons, excluding 2008-09 and 2009-10 seasons due to atypical seasonality.

21.2 Percent of patients presenting to BC Children's Hospital Emergency Room attributed to influenza-like illness, British Columbia, 2018-19 season



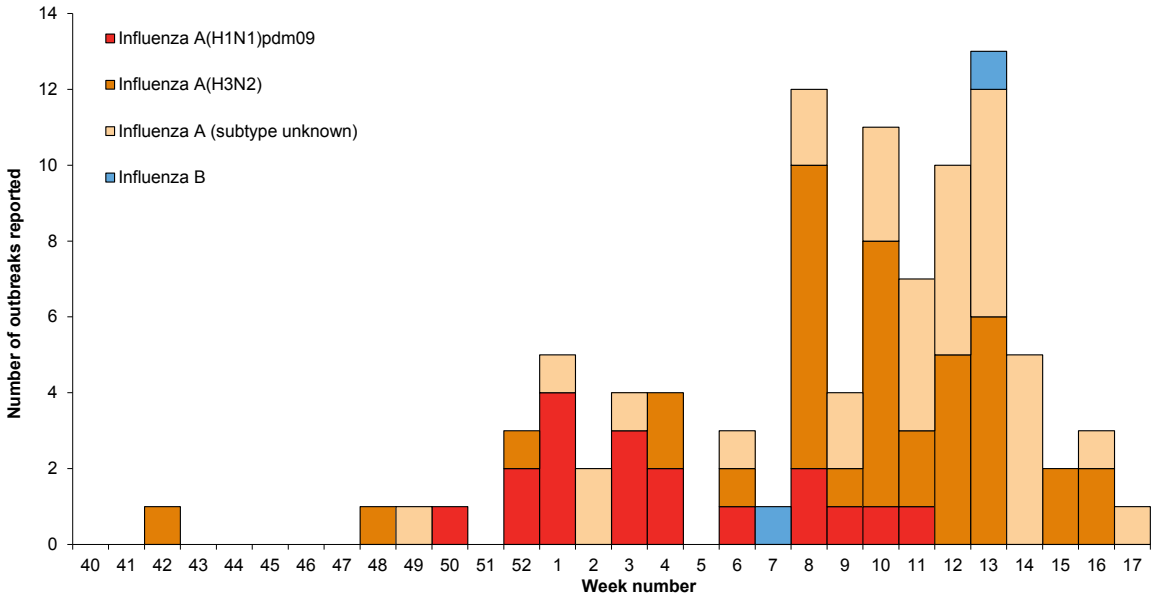
ILI: influenza-like illness; CI: confidence interval
Source: BCCH Admitting, Discharge, Transfer database. Data includes records with a triage chief complaint of "flu" or "influenza" or "fever/cough."
* 5-year historical average for 2018-19 season based on 2012-13 to 2017-18 seasons.

21.3 BC MSP general practitioner service claims for influenza illness as a proportion of all submitted service claims (7-day moving average), British Columbia, 2018-19 season



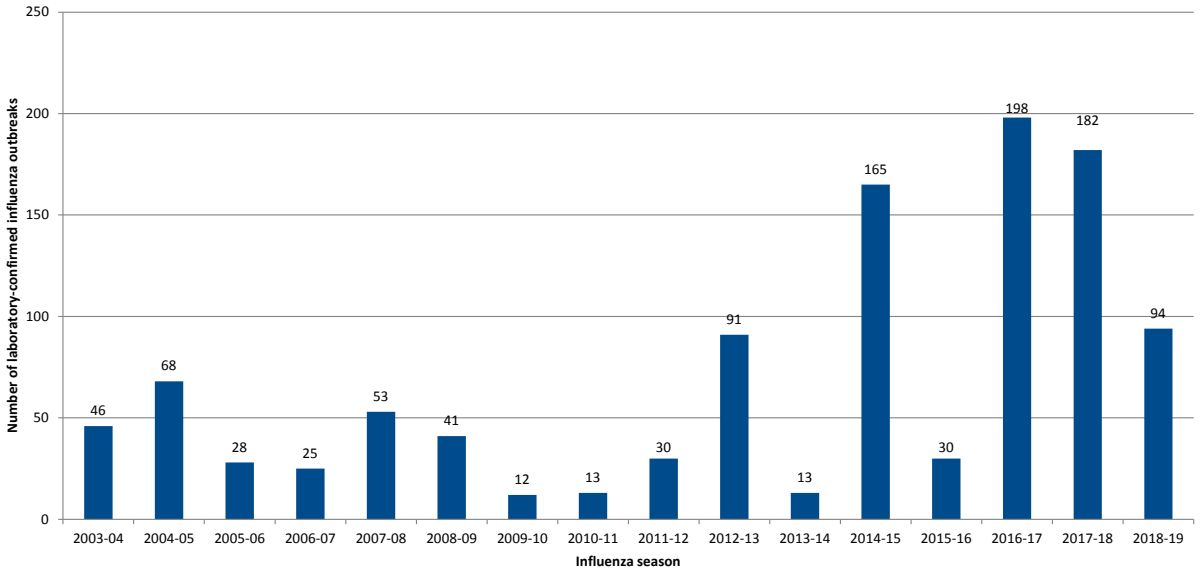
MSP: Medical Services Plan
Influenza illness is tracked as the percent of all submitted MSP service claims for selected general practitioner services with a diagnosis of influenza (ICD-9 code 487). Data are provided by Population Health Surveillance and Epidemiology, BC Ministry of Health Services. Data for the period August 1, 2009 to July 31, 2010 have been excluded from the 10-year median calculation due to atypical seasonality during the 2009-10 H1N1 pandemic year. Note: Week beginning August 1, 2018 corresponds to calendar week 31; data are current to May 14, 2019.

21.4 Number of laboratory-confirmed influenza outbreaks in long-term care facilities (LTCF) reported to the BCCDC by week, British Columbia, 2018-19 season



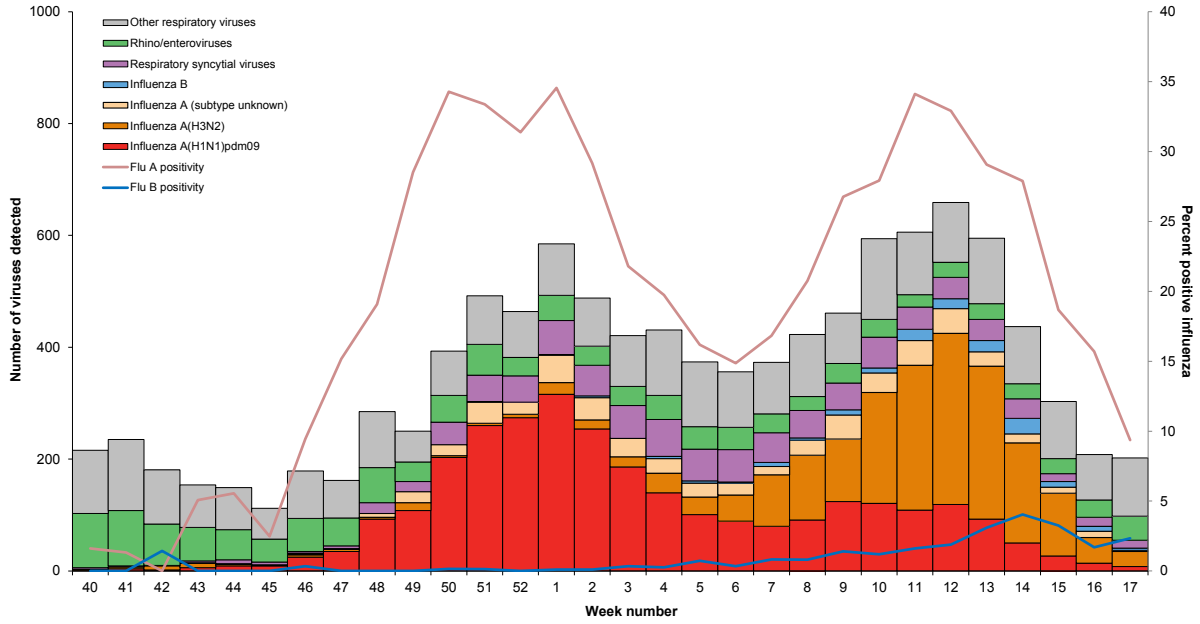
LTCF influenza outbreaks are defined as 2 or more cases of ILI within a 7-day period, with at least one specimen laboratory-confirmed as influenza.

21.5 Number of laboratory-confirmed influenza outbreaks in long-term care facilities (LTCF) reported to the BCCDC by season, British Columbia, 2003-04 - 2018-19



The 2014-15 season's outbreak tally includes one laboratory-confirmed influenza outbreak reported in an assisted living facility. Historic outbreak tallies are from the BC Annual Summary of Reportable Diseases: http://www.bccdc.ca/health-professionals/data-reports/communicable-diseases/annual-summaries-of-reportable-diseases. Tallies for 2018-19 are preliminary and may be adjusted with final data reconciliation. Influenza outbreaks are defined according to the national FluWatch case definition of two or more cases of influenza-like illness within a 7 day period including at least one laboratory-confirmed case but reporting is based upon notification by the health authority to BCCDC without further audit: https://www.canada.ca/en/public-health/services/diseases/flu-influenza/influenza-surveillance/about-fluwatch.html#a5

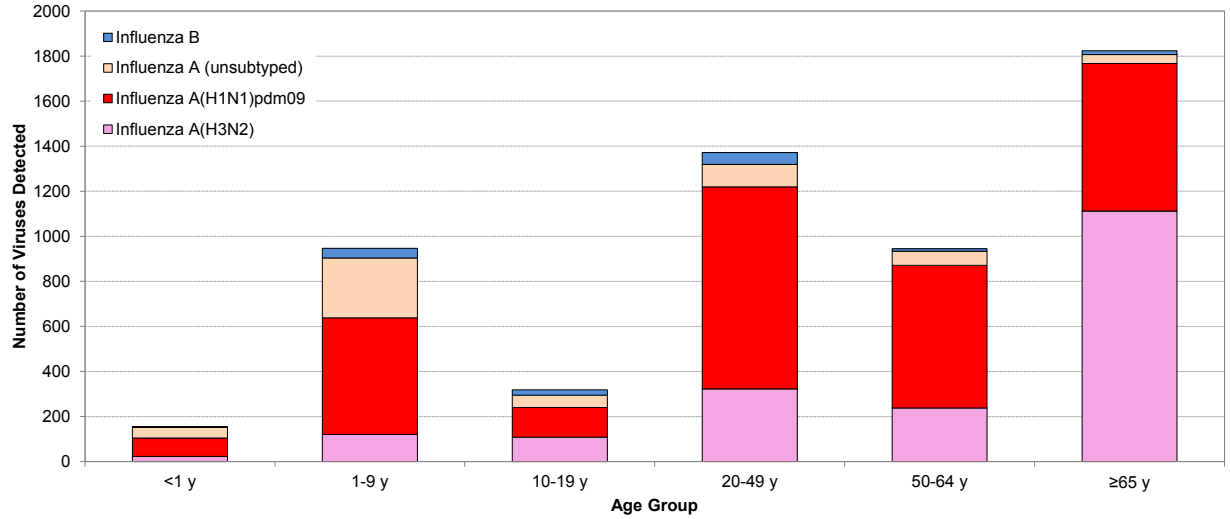
*21.6 Influenza and other respiratory virus detections among respiratory specimens submitted to the BCCDC Public Health Laboratory, British Columbia, 2018-19 Season**



* Influenza positivity is derived based on primary specimens submitted for influenza testing at the BCCDC PHL and other external sites that share complete testing data with the BCCDC PHL. Findings support trend analysis but data do not include all testing sites in British Columbia.

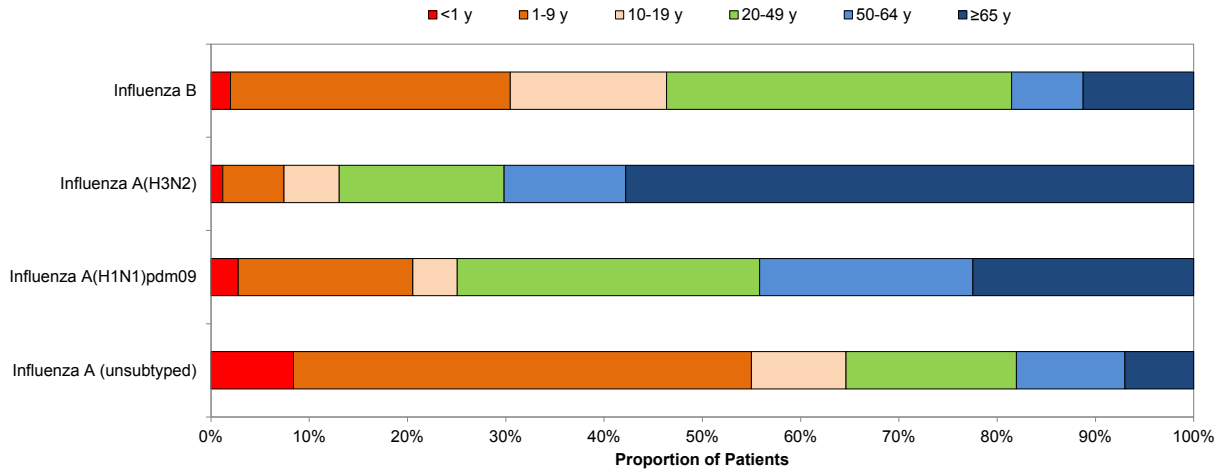
Data are current to May 22, 2019.

21.7 Cumulative number of influenza detections by type/subtype and age group, BCCDC Public Health Laboratory, 2018-19 season



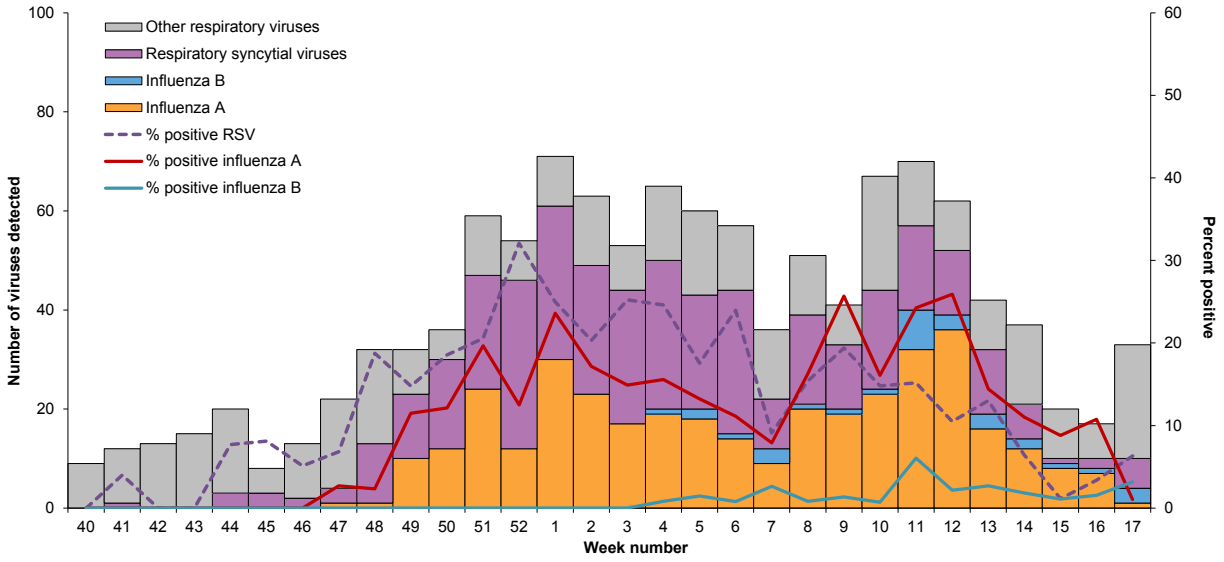
Data are current to May 22, 2019; figure includes cumulative influenza detections for specimens collected from weeks 40-17.

21.8 Age distribution of influenza detections by type/subtype, BCCDC Public Laboratory, 2018-19 season



Data are current to May 22, 2019; figure includes cumulative influenza detections for specimens collected from weeks 40-17.

21.9 Influenza and other respiratory virus detections among respiratory specimens submitted to the BC Children's and Women's Health Centre Laboratory, British Columbia, 2018-19 season



Positive rates were calculated using aggregate data. The denominators for each rate represent the total number of tests; multiple tests may be performed for a single specimen and/or patient.

Measles

In 2018, there were six confirmed cases of measles in residents of BC. Three of these acquired infection during out of country travel (imported), and three acquired their infection within BC (import-associated). All BC cases had laboratory confirmation by PCR testing. Additionally, three cases were reported in out of country visitors to BC and were not included in the 2018 annual cases.

The first of the six BC cases occurred in June in a Fraser Health resident whose travel history was compatible with acquisition of infection in India. No secondary transmission occurred. The National Microbiology Laboratory identified measles genotype D8.

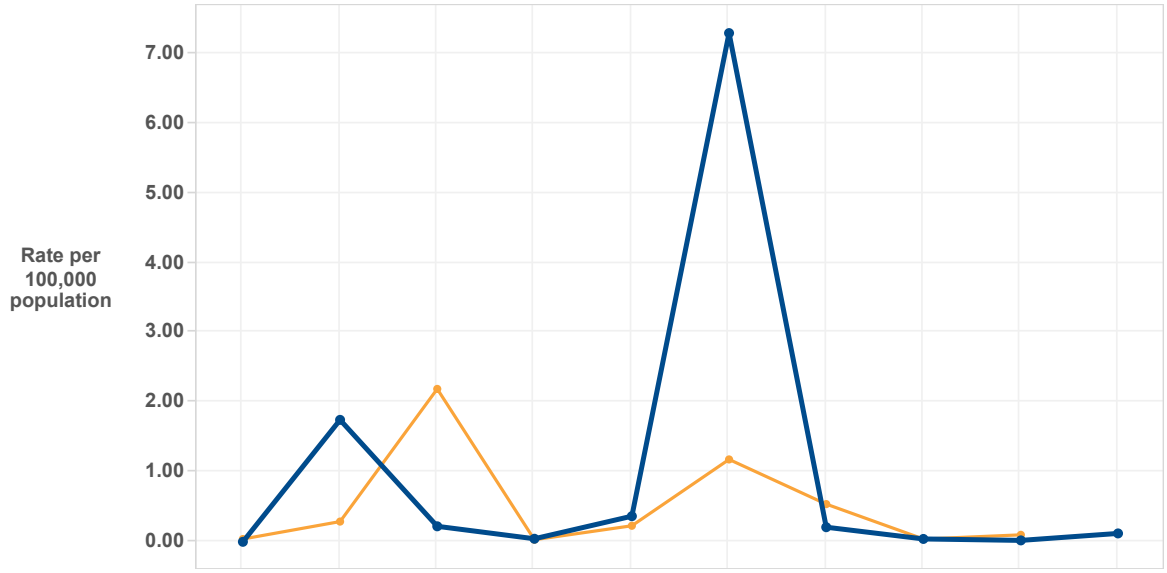
In August, a case occurred in a BC resident who had attended the Canada Place cruise ship terminal in Vancouver during the same time period as an out of country visitor with confirmed measles. One household transmission occurred from this case, with onset in September. Genotype D8 of a different strain from that of the June case was identified in both.

Separately in September, a confirmed case of measles was reported by Vancouver Coastal Health in an individual with no recent travel and no known contact with a measles case. Measles genotype D8 was again identified by the National Microbiology Laboratory. This strain was known to be circulating in Ukraine and was different from the previous D8 strains identified earlier in the year.

The last two measles cases of 2018 were reported in November. The first of these was reported by Fraser Health and was an individual with acquisition compatible with recent travel to the Philippines. This case resulted in transmission to a single secondary case exposed in a congregate setting. Genotype B3 was confirmed by the National Microbiology Laboratory for both of these cases.

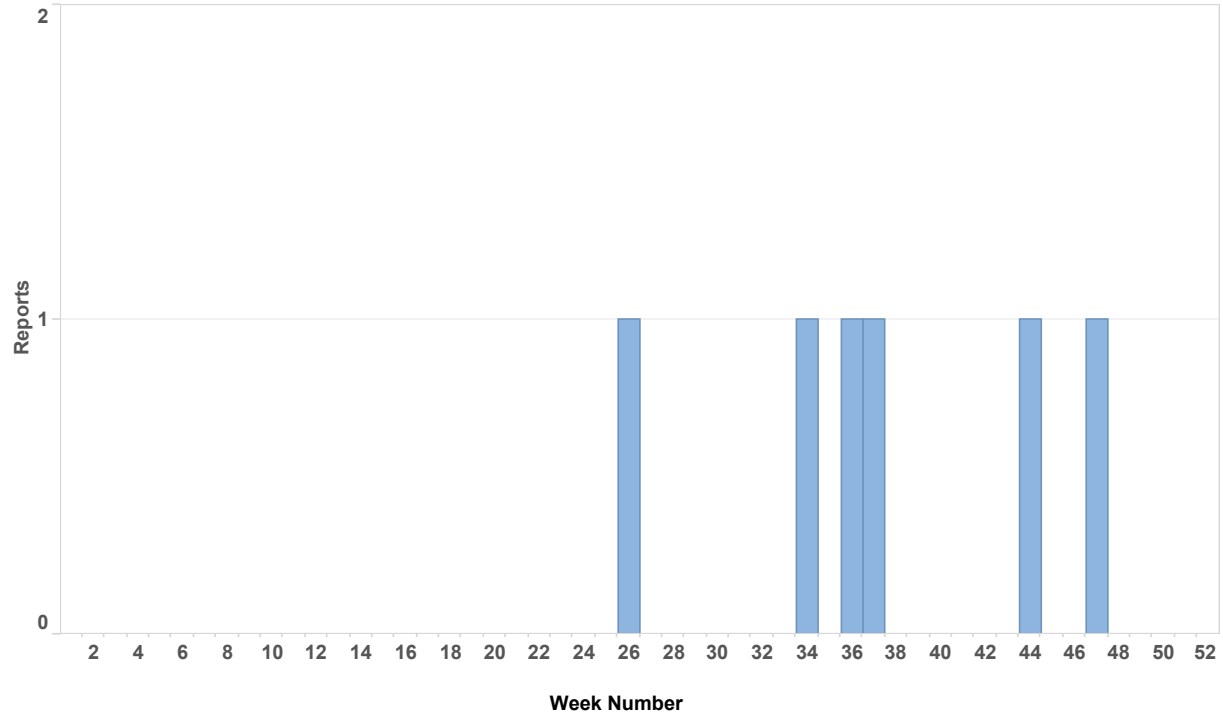
Five out of six of the BC cases reported visiting an emergency department while ill, and two were then hospitalized with full recovery. Three cases (50%) were fully immunized with two documented doses of the measles, mumps, and rubella (MMR) vaccine, and one case had one documented dose of MMR vaccine. One case provided a history of 'childhood vaccines' without documentation, and one had unknown immunization status.

22.1 Measles Rates by Year, 2009-2018



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	0	78	10	2	17	343	10	2	1	6
BC Rate	0.00	1.75	0.22	0.04	0.37	7.29	0.21	0.04	0.02	0.12
Canada Rate	0.04	0.29	2.19	0.03	0.23	1.18	0.54	0.04	0.10	

22.2 Measles Reports by Week, 2018



Meningococcal Disease (invasive)

Information about meninggococcal disease (invasive) can be found in the "Noteworthy Diseases and Conditions in 2018" section.

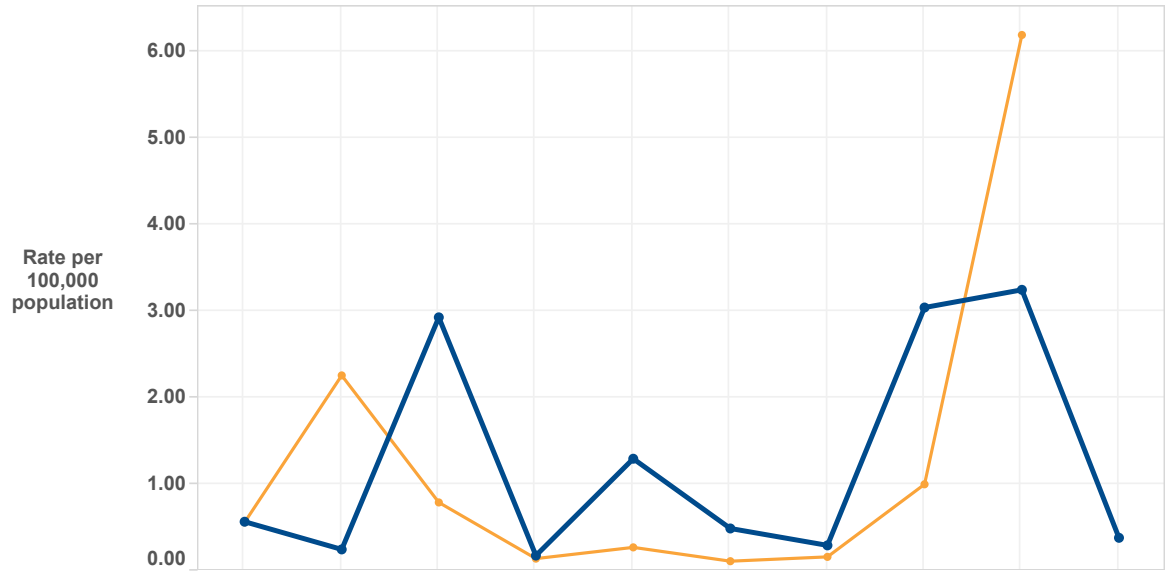
Mumps

There were 19 confirmed cases of mumps reported in BC in 2018 (0.38 cases per 100,000 population) and an additional 6 probable cases. This was a significant decline compared to the previous two years when 148 and 160 confirmed cases were reported in 2016 and 2017, respectively. Mumps remains endemic in BC, and cases were reported by each of the regional health authorities in 2018.

Sixty-eight percent of the 19 confirmed cases were male. The median age was 35 years (range 23-71). Thirteen cases (68%) were born in 1970 through 1994, a period of time when only one dose of mumps-containing vaccine was provided in the routine childhood immunization schedule. Only one case (5%) reported receipt of one documented dose of measles, mumps, and rubella (MMR) vaccine. Seven cases (34%) reported receiving MMR vaccine but were unable to provide documentation. Eleven cases (58%) reported being unimmunized or had unknown immunization history of MMR vaccine receipt.

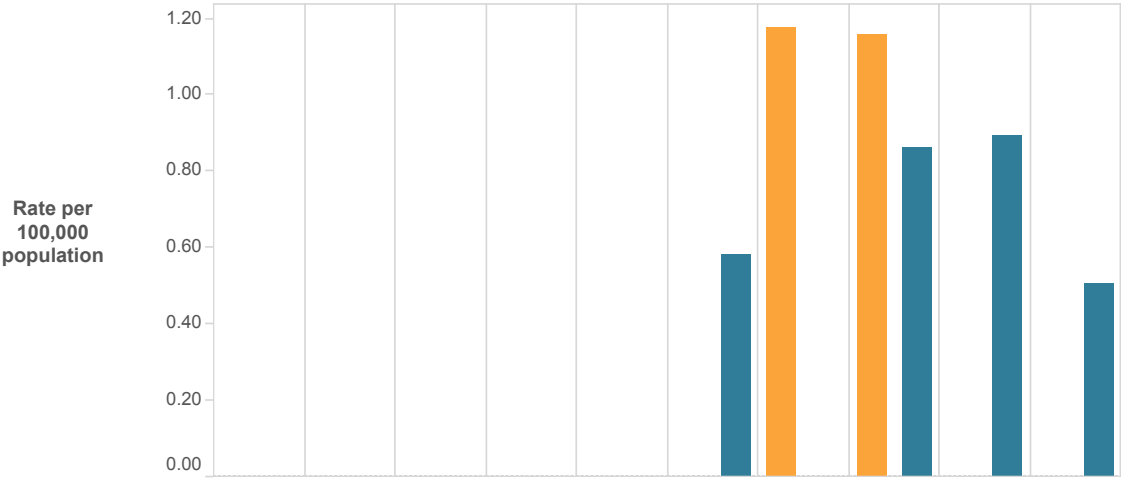
Fifteen cases were laboratory confirmed by PCR, and of these, 11 had genotype results provided by the National Microbiology Laboratory. Ten cases were genotype G, the predominant strain endemic in Canada. One case was genotype D, a strain not circulating in Canada at the time of the report. This individual had a travel history compatible with acquisition in Europe.

23.1 Mumps Rates by Year, 2009-2018



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	25	11	132	8	60	23	14	148	160	19
BC Rate	0.57	0.25	2.93	0.18	1.30	0.49	0.29	3.05	3.25	0.38
Canada Rate	0.56	2.26	0.79	0.14	0.27	0.11	0.16	1.00	6.20	

23.2 Mumps Rates by Age Group and Sex, 2018



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	0	0	2	4	0	0
	Male	0	0	0	0	0	1	0	3	6	3
	Total	0	0	0	0	0	1	2	7	6	3
BC Rate	Female	0.00	0.00	0.00	0.00	0.00	0.00	1.18	1.16	0.00	0.00
	Male	0.00	0.00	0.00	0.00	0.00	0.58	0.00	0.86	0.89	0.50
	Total	0.00	0.00	0.00	0.00	0.00	0.31	0.57	1.01	0.44	0.24

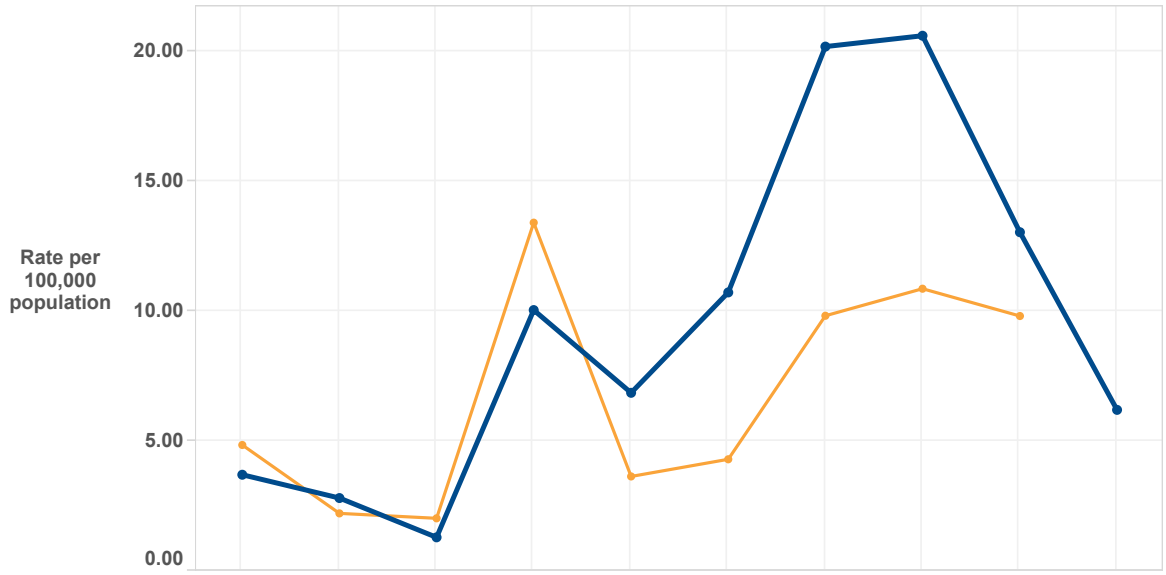
Pertussis

As elsewhere, pertussis remains an endemic disease in BC, with cyclical peaks occurring every 3-5 years. In 2018, pertussis activity in BC was at a cyclical low compared to the prior cyclical peak levels observed in 2016 (24.1), and moreover, was lower than any year since the historical trough levels observed in BC in 2011 (the latter associated with the lowest pertussis incidence in BC since at least 1992).

While low overall, incidence rates were highest in Vancouver Island Health Authority and Fraser Health Authority, driven by pockets of regional activity notably in Central and South Vancouver Island and Fraser East, respectively (24.3).
The highest age-specific incidence rates in 2018 were in infants <1 year old, next highest in pre-teens/teens 10-14 years old), followed by younger children 1-9 years old (24.2). Lower incidence was observed in older teens (15-19 years old) and was lowest among adults >60 years old. The current age distribution is consistent with prior years, including the cyclical peak of 2016, emphasising risk in young infants and pre-teens/teens.

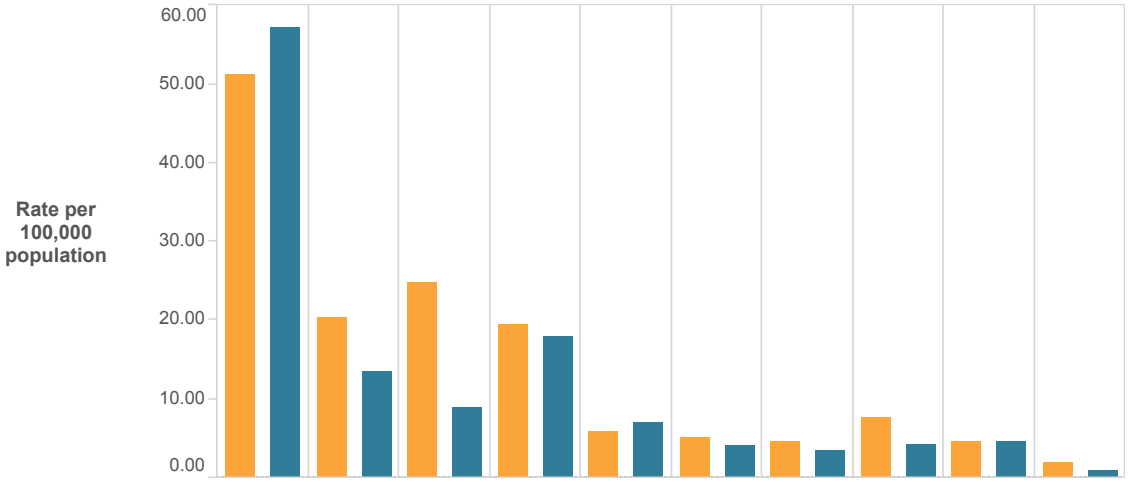
interactive dashboard

24.1 Pertusis Rates by Year, 2009-2018



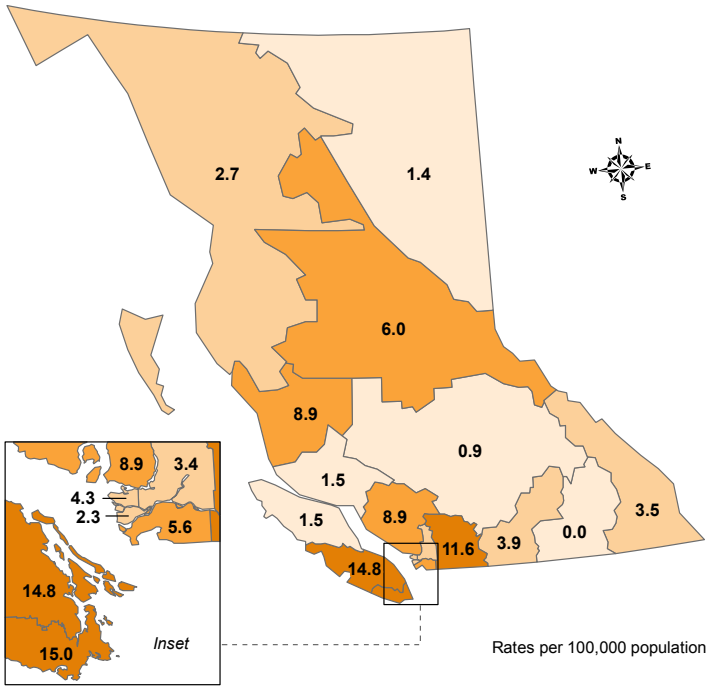
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	163	125	58	458	317	504	963	1,000	641	309
BC Rate	3.70	2.80	1.29	10.03	6.85	10.71	20.16	20.58	13.02	6.19
Canada Rate	4.84	2.21	2.02	13.39	3.63	4.29	9.81	10.85	9.80	

24.2 Pertusis Rates by Age Group and Sex, 2018

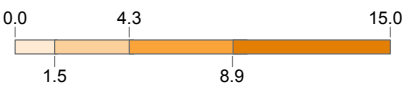


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	11	18	29	23	8	8	8	26	33	12
	Male	13	13	11	22	10	7	6	15	31	5
	Total	24	31	40	45	18	15	14	41	64	17
BC Rate	Female	51.26	20.22	24.69	19.37	5.92	5.15	4.71	7.53	4.69	1.81
	Male	57.20	13.57	8.91	17.98	6.98	4.09	3.37	4.31	4.62	0.84
	Total	54.32	16.77	16.60	18.67	6.46	4.60	4.02	5.92	4.66	1.35

24.3 Pertusis Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	3	3.5
12	Kootenay Boundary	0	0.0
13	Okanagan	15	3.9
14	Thompson Cariboo Shuswap	2	0.9
21	Fraser East	37	11.6
22	Fraser North	23	3.4
23	Fraser South	48	5.6
31	Richmond	5	2.3
32	Vancouver	30	4.3
33	North Shore/Coast Garibaldi	27	8.9
41	South Vancouver Island	62	15.0
42	Central Vancouver Island	43	14.8
43	North Vancouver Island	2	1.5
51	Northwest	2	2.7
52	Northern Interior	9	6.0
53	Northeast	1	1.4



Pneumococcal Disease (invasive)

Information about pneumococcal disease (invasive) can be found in the "Noteworthy Diseases and Conditions in 2018" section.

Vectorborne and Zoonotic Diseases

Lyme Disease
Rabies Exposure
Reportable Zoonoses in Animals
Zika Virus

Lyme Disease

In 2018, the reported number of Lyme disease cases decreased to 9 compared to 18 cases in 2017 (Figure 25.1). The fluctuation in incidence from year to year may be due to the low number of reported cases.

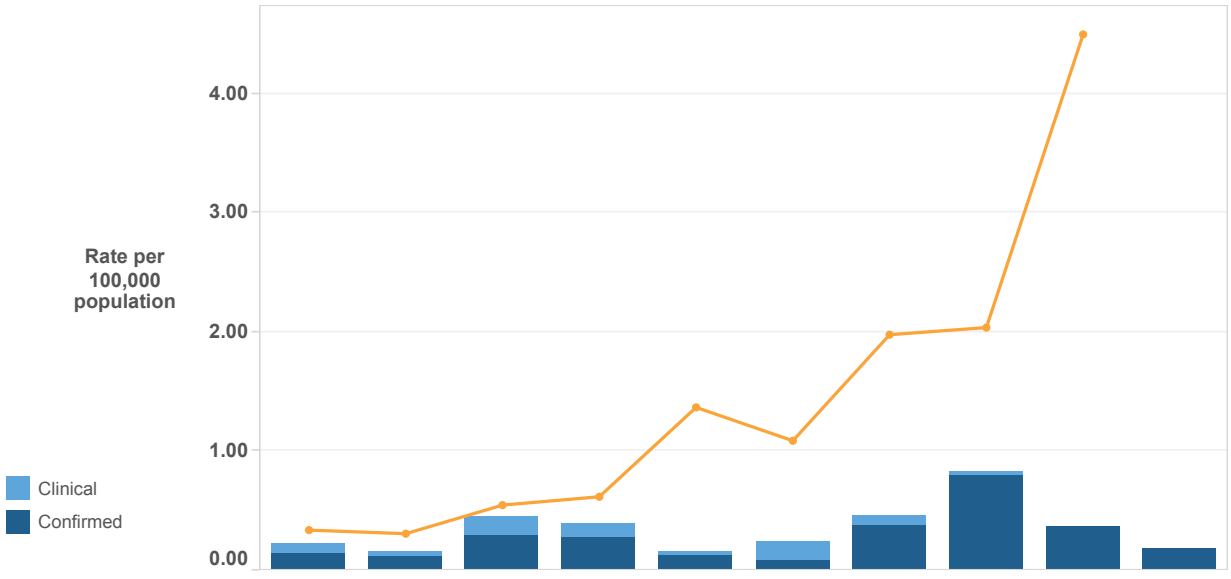
All of the reported cases were lab-confirmed. Three cases were caused by the European strains of the bacterium that causes Lyme disease which means these people were likely infected in Europe. Based on reported travel history, four additional cases likely acquired their illness outside of BC but within North America. Based on this, it is believed that two or 22% of cases were exposed in BC.

Most cases were reported in the summer and fall months, consistent with tick season. The highest number of cases was reported among adults over the age of 40 years. The highest incidence was reported from North Shore/Coast Garibaldi HSDA however all these cases acquired their illness outside of BC.

The majority of ticks that carry the bacteria that cause Lyme disease are found in southwestern BC, including Vancouver Island, the Gulf Islands, the Sunshine Coast, Greater Vancouver, and the Fraser Valley. The geographic distribution of human Lyme disease and *B. burgdorferi* in ticks in BC has remained constant.

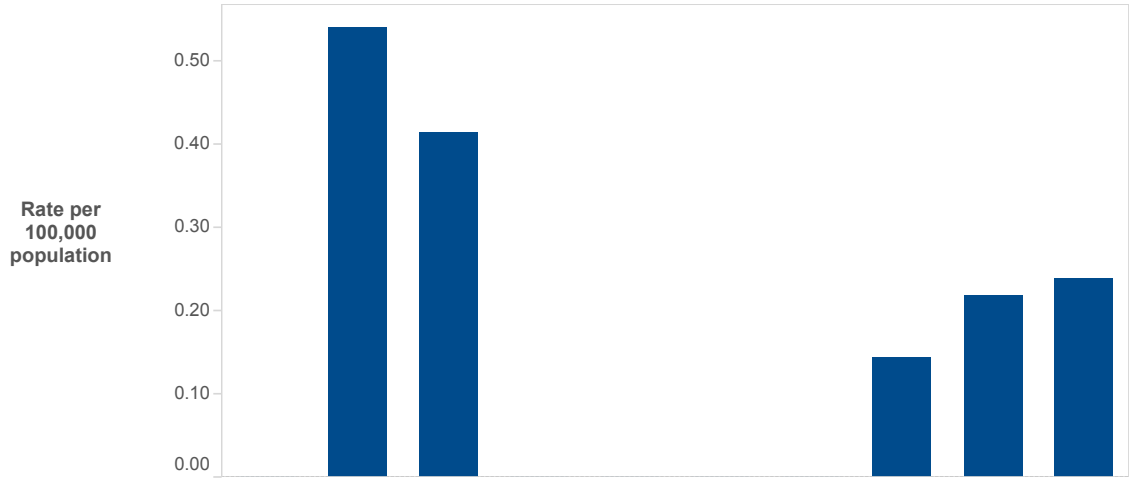
interactive dashboard

25.1 Lyme Disease Rate by Year, 2009-2018



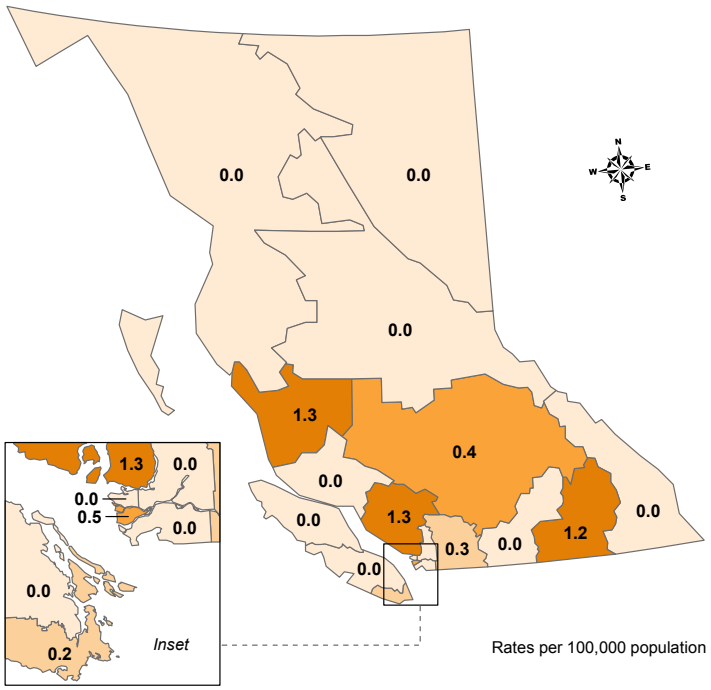
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Reports	10	7	20	18	7	11	22	40	18	9
BC Rate	0.23	0.16	0.44	0.39	0.15	0.23	0.46	0.82	0.37	0.18
Canada Rate	0.34	0.31	0.55	0.62	1.37	1.09	1.98	2.04	4.50	

25.2 Lyme Disease Rates by Age Group, 2018

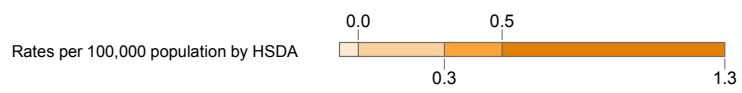


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	1	0	0	0	0	0	1	1	1
	Male	0	0	1	0	0	0	0	0	2	2
	Total	0	1	1	0	0	0	0	1	3	3
BC Rate	Female	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.29	0.14	0.15
	Male	0.00	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.30	0.34
	Total	0.00	0.54	0.41	0.00	0.00	0.00	0.00	0.14	0.22	0.24

25.3 Lyme Disease Rates by HSDA, 2018



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	1	1.2
13	Okanagan	0	0.0
14	Thompson Cariboo Shuswap	1	0.4
21	Fraser East	1	0.3
22	Fraser North	0	0.0
23	Fraser South	0	0.0
31	Richmond	1	0.5
32	Vancouver	0	0.0
33	North Shore/Coast Garibaldi	4	1.3
41	South Vancouver Island	1	0.2
42	Central Vancouver Island	0	0.0
43	North Vancouver Island	0	0.0
51	Northwest	0	0.0
52	Northern Interior	0	0.0
53	Northeast	0	0.0



Rabies Exposure

There were no human rabies cases in 2018. The last case reported in BC occurred in 2003. Bats are the only known reservoir for rabies in BC. When a person reports an encounter with a bat or other animal, public health authorities assess the rabies risk and may provide rabies post-exposure prophylaxis to prevent infection.

The rate of reported rabies exposures[1] in BC increased in 2018 for the second year in a row to 274 exposures or 5.6/100,000 (Figure 26.1). This is the highest rate in the last decade. In the last two years, there has been an increase in exposures occurring outside Canada, which accounted for 65% of all exposures in 2018. In 2018, the increase is specifically attributable to a greater number of dog exposures occurring among travelers. The exposure rate within BC and Canada has been stable for the last four years.

The majority (76%) of exposures occurring in BC or Canada involved bats, the only rabies reservoir in BC (Figure 26.2). Dogs, cats and monkeys accounted for 89% of international exposures. Ninety-two BC residents were exposed to dogs internationally, with 70% of these in various Asian countries. This is higher than in previous years when an annual average of 46 exposures to dogs occurred internationally (2013-2017). The reason for this increase is unclear. Forty-five BC residents were exposed to monkeys in 2018, the majority occurring in Thailand and Indonesia; this is similar to last year.

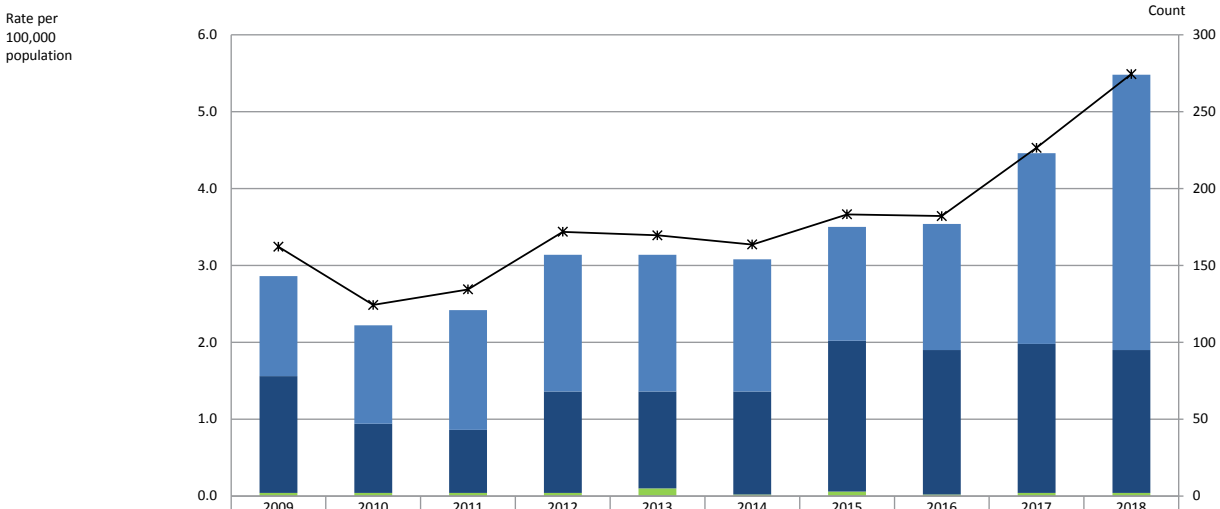
In 2018, Vancouver reported the highest rate of exposures at 8.8/100,000, with 87% of exposures occurring internationally. This HSDA experienced the largest increase in recent years, with the number of exposures outside Canada increasing to 52 in 2018. Fraser Health reported the highest number of rabies exposures (N=86) but rates close to the provincial average (Figure 26.5); the majority (69%) of exposures occurred internationally. The Northwest also reported a high exposure rate in 2018 but this represented a small number of exposures.

The highest rates of exposure were reported in young adults, the vast majority of who were exposed internationally (Figure 26.3).

Most BC/Canada exposures were reported in July and August when bats are active (Figure 26.4). International exposures occurred throughout the year.

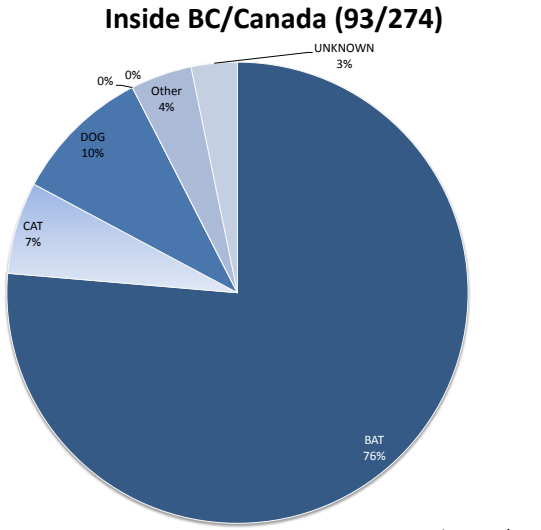
1. The terms "exposure" denotes a report of an individual exposed to an animal which presents a risk of rabies infection. Rabies exposures were defined in Panorama as "confirmed exposure" AND "MHO recommends RPEP".

26.1 Rabies Exposure Rates by Year, 2009-2018

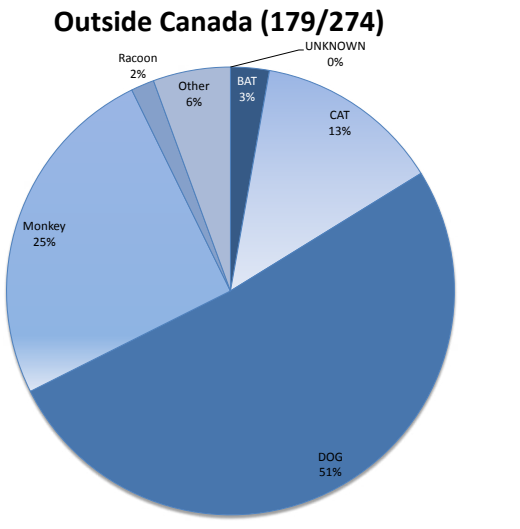


	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Outside Canada	65	64	78	89	89	86	74	82	124	179
Inside BC/Canada	76	45	41	66	63	67	98	94	97	93
Unknown	2	2	2	2	5	1	3	1	2	2
Rates per 100,000	3.2	2.5	2.7	3.4	3.4	3.3	3.7	3.6	4.5	5.5
Total Exposures	143	111	121	157	157	154	175	177	223	274

26.2 Rabies Exposures by Animal Species Involved, 2018

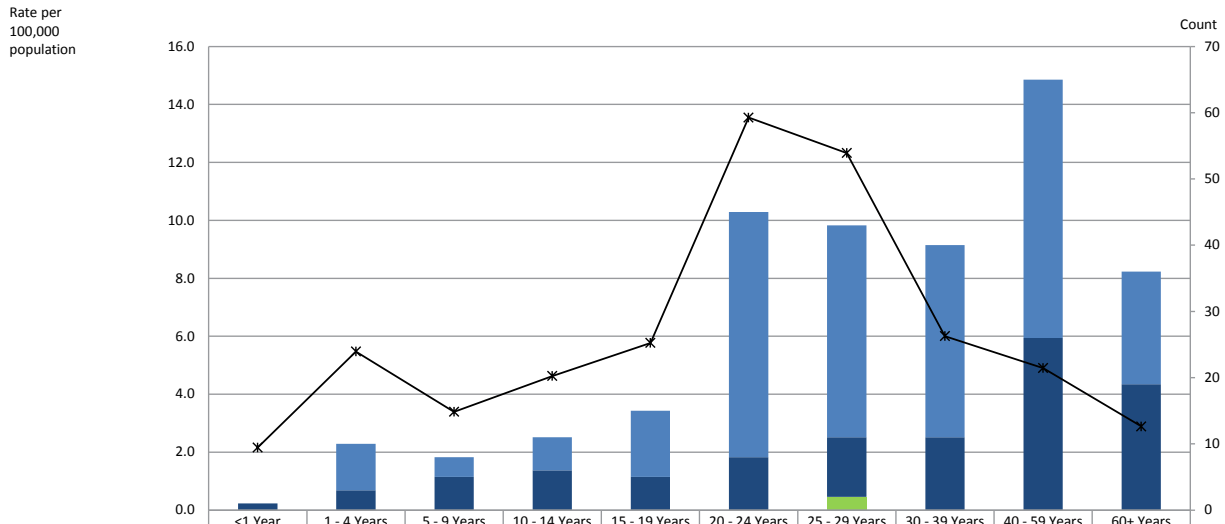


*Omit 2/274



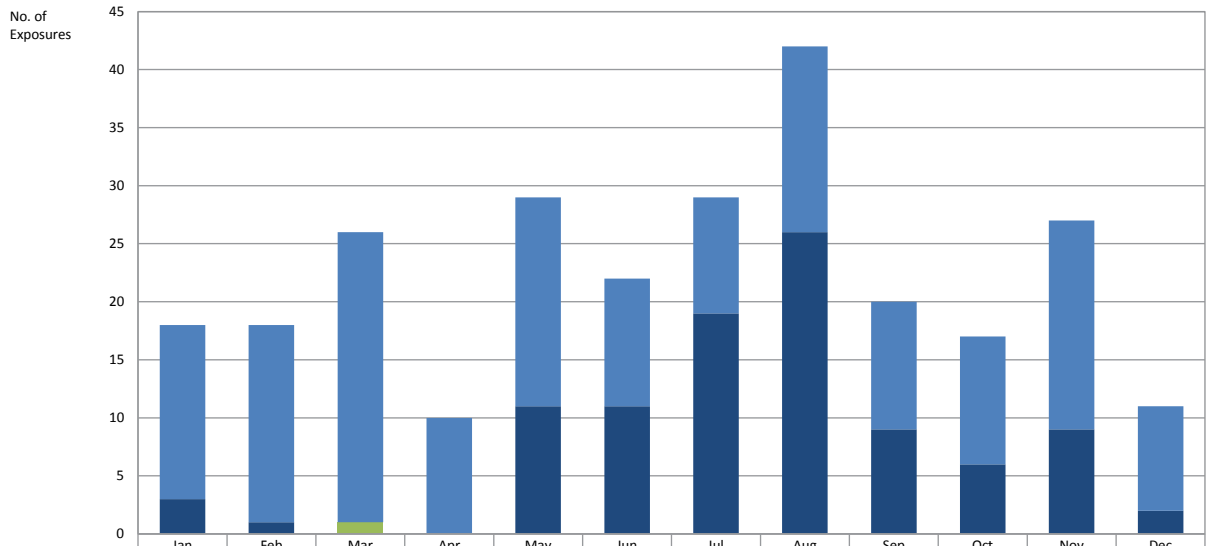
*Omit 2/274

26.3 Rabies Exposures by Age Group, 2018



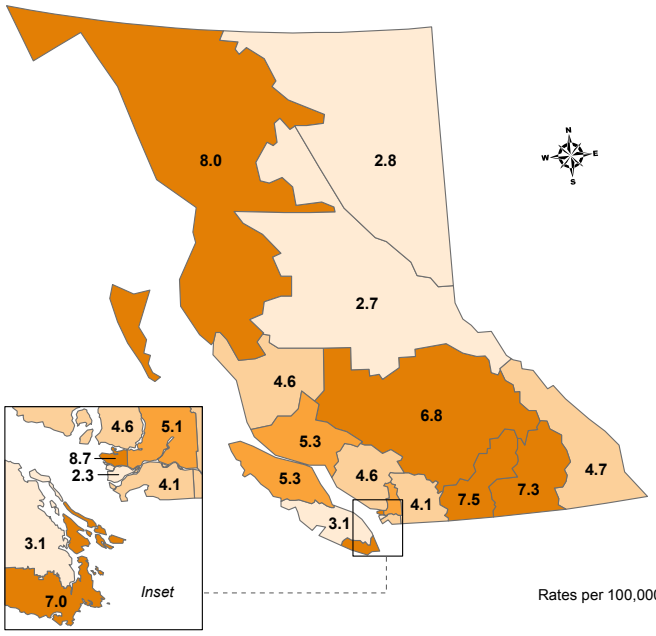
	<1 Year	1 - 4 Years	5 - 9 Years	10 - 14 Years	15 - 19 Years	20 - 24 Years	25 - 29 Years	30 - 39 Years	40 - 59 Years	60+ Years
Outside Canada		7	3	5	10	37	32	29	39	17
Inside BC/Canada	1	3	5	6	5	8	9	11	26	19
Unknown							2			
Rate per 100,000	2.2	5.5	3.4	4.6	5.8	13.5	12.3	6.0	4.9	2.9

26.4 Rabies Exposures by Month, 2018



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Outside Canada	15	17	25	10	18	11	10	16	11	11	18	9
Inside BC/Canada	3	1			11	11	19	26	9	6	9	2
Unknown			1									

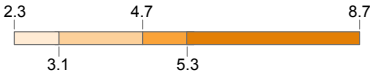
26.5 Rabies Exposure Rates by HSDA, 2018



ID	Health Service Delivery Area	Exps.	Rate	BC/Can. Exps.	Int'l Exps.
11	East Kootenay	4	4.7	4	0
12	Kootenay Boundary	6	7.3	4	2
13	Okanagan	29	7.5	11	18
14	Thompson Cariboo Shuswap	16	6.8	14	2
21	Fraser East	13	4.1	3	10
22	Fraser North	*35	5.1	10	24
23	Fraser South	*35	4.1	7	27
31	Richmond	5	2.3	1	4
32	Vancouver	60	8.7	8	52
33	North Shore/Coast Garibaldi	14	4.6	3	11
41	South Vancouver Island	29	7.0	10	19
42	Central Vancouver Island	9	3.1	6	3
43	North Vancouver Island	7	5.3	2	5
51	Northwest	6	8.0	6	0
52	Northern Interior	4	2.7	2	2
53	Northeast	2	2.8	2	0

Note: *The location of 1 exposure in Fraser North and Fraser South was not reported.

Rates per 100,000 population by HSDA



Reportable Zoonoses in Animals

Since 2015, the British Columbia Chief Veterinary Officer shares reports of selected zoonotic diseases in animals with the Provincial Health Officer or delegate (i.e. BCCDC). Fourteen zoonotic diseases, plus new or unusual diseases or clusters with potential public health significance, were identified for which the occurrence in animals is reported to the public health authorities to consider and possibly initiate a public health response. The reportable zoonoses include: anthrax, bovine spongiform encephalopathy, brucellosis, chlamydiosis (psittacosis in humans), influenza A in swine, avian influenza H5 and H7, plague, Q fever, rabies, trichinosis, tuberculosis, tularemia, West Nile virus, zoonotic viral hemorrhagic fevers. The Reportable Zoonoses Guideline[1] outlines the process for reporting and the recommended public health response. Summary guidelines for veterinarians are also available[2]. Separate guidelines dedicated to rabies for both public health professionals and veterinarians are also posted on the BCCDC website[3].

Excluding rabies, 9 events of reportable zoonoses in animals were reported to public health in 2018 (Table 27.1). Diseases included anthrax, influenza (avian and swine), chlamydiosis, bovine tuberculosis[4], and West Nile virus (WNv). The animal species affected included bison, cattle, pigeons, swine, wild waterfowl, and horses, which resided in three health authorities (Fraser, Interior, and Northern Health Authorities). The single case of WNv in a horse in 2018 was locally-acquired and was detected in the Kootenay Region of the province. The number of WNv cases remained the same in 2017 and 2018; each with 4 cases per year. No new regions of the province were identified with cases in 2018.

For rabies, many suspect animal cases are identified each year. A total of 131 samples were submitted from BC to the Canadian Food Inspection Agency laboratory for rabies testing in 2018[5] and 119 were suitable for testing. Ten percent (10/99) of bat specimens were positive for rabies virus in 2018; no other species tested positive. The 5-year average for bats in BC testing positive for rabies is 13%. An increasing trend in the percent of bats testing positive for rabies has been noted in big brown bats from an average of 15% (2004-2013) to 32% (2014-2018).

Human exposure occurred in 60% (6/10) of positive bat cases and domestic animal exposure occurred in 20% (2/10) of positive bat cases. At least one rabies positive bat was detected within the boundaries of 4 out of 5 health authorities in BC (Figure 27.2). No positive bats were detected in Northern Health in 2018; however in previous years, all health authorities have had positive rabies cases in bats.

1. http://www.bccdc.ca/resource-gallery/Documents/Guidelines%20and%20Forms/Guidelines%20and%20Manuals/Epid/CD%20Manual/Chapter%201%20-%20CDC/CompleteReportableZoonosesGuidelineFinalVers.pdf

2. http://www.bccdc.ca/health-info/disease-types/zoonotic-diseases/reportable-zoonoses

3. http://www.bccdc.ca/health-info/diseases-conditions/rabies

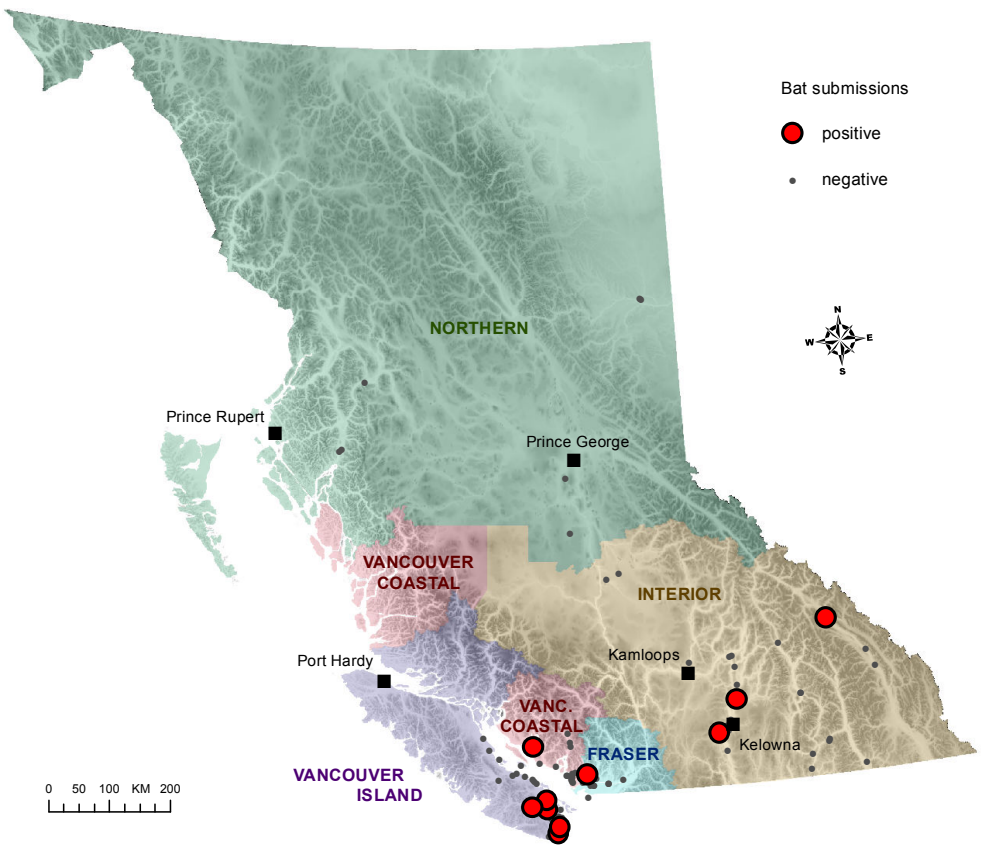
4. http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/bovine-tuberculosis/investigation-british-columbia/eng/1544220226249/1544220226495

5. http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/rabies/rabies-in-canada/eng/1519159995664/1519159996478

27.1 Reportable zoonoses in animals, BC, 2018

Disease	Month	Species	Health Authority
Anthrax	October	Bison	Northern Health
Low pathogenic avian influenza	January	Wild waterfowl	Fraser Health
Chlamydiosis	October	Pigeon	Fraser Health
Rabies	Various	Bats (10)	All areas
Swine Influenza (H1N1-09)	January	Swine	Northern Health
Swine Influenza (H1N1)	December	Swine	Fraser Health
Bovine Tuberculosis (*Mycobacterium bovis*)	November	Cattle	Interior Health
West Nile virus	September	Horse (1)	Interior Health
West Nile virus	August	Raven (2)	Interior Health
West Nile virus	September	Blue jay (1)	Interior Health

27.2 Number of bats tested for rabies in British Columbia in 2018



Zika Virus

Zika virus disease is transmitted primarily through the bite of infected *Aedes* mosquitoes, which bite during the day. The virus can also be transmitted from mother to fetus during pregnancy, through sexual contact, transfusion of blood and blood products and organ transplantation. Zika virus infection during pregnancy can cause congenital malformations and pregnancy complications (http://www.who.int/news-room/fact-sheets/detail/zika-virus).

In 2018 there were no reported confirmed Zika cases in BC. All of the previously confirmed Zika cases in BC reported travel to countries where mosquito-borne Zika virus transmission is known to occur. To date there have been no reported cases of sexually transmitted Zika virus infections among British Columbians.

Pregnant women and those planning a pregnancy should avoid travel to Zika-affected countries because of increased risk of congenital malformations in infants born to women infected with Zika virus during pregnancy. Continued surveillance among British Columbians will inform future revisions to our risk assessment.

Counts And Rates For All Reportable Diseases in 2018

Note: Chlamydia and gonorrhea data were not ready in time for this report. Other reportable diseases not included in these tables had no cases reported in BC.

BC Reportable Disease Case Reports by Health Service Delivery Area

	BC Total	Fraser Health				Interior Health				
	Provincial Total	Fraser East	Fraser North	Fraser South	**Fraser Total**	East Kootenay	Kootenay Boundary	Okanagan	Thompson Cariboo	**Interior Total**
2018 Population	**4991687**	319023	685094	856681	**1860798**	84594	82620	387135	234874	**789223**
AIDS	**33**		8	2	**10**		1	1	1	**3**
Amebiasis	**411**	22	46	69	**137**	4	2	15	7	**28**
Botulism	**3**							1		**1**
Brucellosis	**3**	1		1	**2**					
Campylobacteriosis	**1687**	101	229	285	**615**	29	27	130	74	**260**
Cryptococcus gattii	**6**			3	**3**			1		**1**
Cryptosporidiosis	**60**	8	5	15	**28**	3		2	6	**11**
Cyclosporiasis	**41**		4	6	**10**		1	3	2	**6**
Diphtheria-Carrier	**1**									
E. coli (shigatoxigenic)	**193**	7	15	23	**45**	6		16	4	**26**
Giardiasis	**508**	33	48	105	**186**	7	9	28	17	**61**
Haemophilus influenzae non-type b (invasive)	**78**	4	7	16	**27**	2	4	3	5	**14**
Haemophilus influenzae type b (invasive)	**3**									
Hepatitis A	**25**		6	3	**9**		1	1		**2**
Hepatitis B-Acute	**12**		4	2	**6**					
Hepatitis B-Chronic & Undetermined	**1035**	31	197	180	**408**	1	2	18	11	**32**
Hepatitis C	**1960**	205	221	266	**692**	31	42	162	104	**339**
Hepatitis D	**6**		2	1	**3**			1		**1**
Hepatitis E	**5**	1		2	**3**				1	**1**
HIV	**205**	10	24	28	**62**	3	1	7	2	**13**
Legionellosis	**33**		5	20	**25**	1		2		**3**
Leptospirosis	**1**									
Listeriosis	**9**	1			**1**			1	1	**2**
Lyme Disease	**9**	1			**1**		1		1	**2**
Malaria	**31**		5	8	**13**				1	**1**
Measles	**6**		2	2	**4**					
Meningococcal Disease (invasive)	**27**	5	4	8	**17**			2	1	**3**
Mumps	**19**	1	2	1	**4**	1		1		**2**
Paralytic Shellfish Poisoning	**2**									
Paratyphoid Fever	**24**	1	3	14	**18**			3		**3**
Pertussis	**309**	37	23	48	**108**	3		15	2	**20**
Pneumococcal Disease (invasive)	**563**	36	50	69	**155**	5	7	48	46	**106**
Q Fever	**3**		1		**1**			2		**2**
Rabies Exposure	**274**	13	35	35	**83**	4	6	29	16	**55**
Rickettsial Disease	**8**							1		**1**
Salmonella (non-typhoidal)	**979**	58	129	181	**368**	19	14	77	34	**144**
Shigellosis	**122**	15	13	25	**53**	1	1	4		**6**
Streptococcal Disease group A (invasive)	**413**	23	38	58	**119**	5	6	33	17	**61**
Streptococcal Disease group B (neonatal)	**15**	1	1	3	**5**					
Syphilis (infectious)	**919**	19	83	61	**163**	3	6	41	9	**59**
Tuberculosis	**278**	16	47	84	**147**	3	1	9	2	**15**
Tularemia Infection	**1**						1			**1**
Typhoid Fever	**39**	4	2	22	**28**				2	**2**
Vibrio Infection	**64**	1	5	7	**13**		1	3	1	**5**
Yellow Fever	**1**									
Yersiniosis	**758**	29	112	120	**261**	5	4	23	21	**53**

Vancouver Island Health				Northern Health				Vacouver Coastal Health			
Central Vancouver Island	North Vancouver Island	South Vancouver Island	**Vancouver Island Total**	Northeast	Northern Interior	Northwest	**Northern Total**	North Shore/Coast Garibaldi	Richmond	Vancouver	**Vancouver Coastal Total**
291209	131256	413406	**835871**	70955	148845	75104	**294904**	302363	216300	692228	**1210891**
1	1		**2**		2		**2**	2	1	13	**16**
8	3	23	**34**	2	4	9	**15**	28	8	161	**197**
1		1	**2**								
	1		**1**								
93	37	111	**241**	1	30	12	**43**	162	63	303	**528**
	1		**1**							1	**1**
2		4	**6**		2		**2**	3	2	8	**13**
		5	**5**		2		**2**	3	3	12	**18**
		1	**1**								
35	8	38	**81**		1		**1**	6	6	28	**40**
21	11	50	**82**	12	9	8	**29**	49	11	90	**150**
4	3	4	**11**	3	5	2	**10**	3	2	11	**16**
										3	**3**
2	3	1	**6**		1		**1**	3		4	**7**
								1	1	4	**6**
11	4	32	**47**	4	3	3	**10**	42	161	335	**538**
143	58	149	**350**	26	102	36	**164**	64	26	324	**414**
										2	**2**
									1		**1**
8	3	22	**33**		5	2	**7**	9	4	77	**90**
2		1	**3**						2		**2**
										1	**1**
1			**1**		1		**1**			4	**4**
		1	**1**					4	1		**5**
	1	4	**5**						2	10	**12**
									1	1	**2**
1	1	4	**6**						1		**1**
		1	**1**		1	1	**2**	2		8	**10**
2			**2**								
		1	**1**		1		**1**			1	**1**
43	2	62	**107**	1	9	2	**12**	27	5	30	**62**
46	10	70	**126**	6	25	13	**44**	20	12	100	**132**
9	7	29	**45**	2	4	6	**12**	14	5	60	**79**
2		2	**4**	1			**1**		1	1	**2**
53	18	86	**157**	12	34	24	**70**	67	32	141	**240**
5		10	**15**		1	1	**2**	5	3	38	**46**
27	14	33	**74**	2	21	16	**39**	18	7	95	**120**
3			**3**		1		**1**	1	1	4	**6**
42	16	76	**134**	2	3	3	**8**	36	28	491	**555**
5	2	6	**13**	1	4	3	**8**	11	20	61	**92**
		1	**1**							8	**8**
8	4	7	**19**			1	**1**	13	4	9	**26**
1			**1**								
47	12	84	**143**	3	13	12	**28**	67	36	170	**273**

BC Centre for Disease Control
An agency of the Provincial Health Services Authority

BC Reportable Disease Case Rates (per 100,000 population) by Health Service Delivery Area

	BC Total	Fraser Health				Interior Health				
	Provincial Total	Fraser East	Fraser North	Fraser South	**Fraser Total**	East Kootenay	Kootenay Boundary	Okanagan	Thompson Cariboo	**Interior Total**
2018 Population	**4991687**	319023	685094	856681	**1860798**	84594	82620	387135	234874	**789223**
AIDS	**0.67**	0.00	1.18	0.24	**0.55**	0.00	1.22	0.26	0.43	**0.39**
Amebiasis	**8.23**	6.90	6.71	8.05	**7.36**	4.73	2.42	3.87	2.98	**3.55**
Botulism	**0.06**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.26	0.00	**0.13**
Brucellosis	**0.06**	0.31	0.00	0.12	**0.11**	0.00	0.00	0.00	0.00	**0.00**
Campylobacteriosis	**33.80**	31.66	33.43	33.27	**33.05**	34.28	32.68	33.58	31.51	**32.94**
Cryptococcus gattii	**0.12**	0.00	0.00	0.35	**0.16**	0.00	0.00	0.26	0.00	**0.13**
Cryptosporidiosis	**1.20**	2.51	0.73	1.75	**1.50**	3.55	0.00	0.52	2.55	**1.39**
Cyclosporiasis	**0.82**	0.00	0.58	0.70	**0.54**	0.00	1.21	0.77	0.85	**0.76**
Diphtheria-Carrier	**0.02**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
E. coli (shigatoxigenic)	**3.87**	2.19	2.19	2.68	**2.42**	7.09	0.00	4.13	1.70	**3.29**
Giardiasis	**10.18**	10.34	7.01	12.26	**10.00**	8.27	10.89	7.23	7.24	**7.73**
Haemophilus influenzae non-type b (invasive)	**1.56**	1.25	1.02	1.87	**1.45**	2.36	4.84	0.77	2.13	**1.77**
Haemophilus influenzae type b (invasive)	**0.06**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
Hepatitis A	**0.50**	0.00	0.88	0.35	**0.48**	0.00	1.21	0.26	0.00	**0.25**
Hepatitis B-Acute	**0.24**	0.00	0.58	0.23	**0.32**	0.00	0.00	0.00	0.00	**0.00**
Hepatitis B-Chronic & Undetermined	**20.73**	9.72	28.76	21.01	**21.93**	1.18	2.42	4.65	4.68	**4.05**
Hepatitis C	**39.27**	64.26	32.26	31.05	**37.19**	36.65	50.84	41.85	44.28	**42.95**
Hepatitis D	**0.12**	0.00	0.29	0.12	**0.16**	0.00	0.00	0.26	0.00	**0.13**
Hepatitis E	**0.10**	0.31	0.00	0.23	**0.16**	0.00	0.00	0.00	0.43	**0.13**
HIV	**4.11**	3.13	3.50	3.27	**3.33**	3.55	1.21	1.81	0.85	**1.65**
Legionellosis	**0.66**	0.00	0.73	2.33	**1.34**	1.18	0.00	0.52	0.00	**0.38**
Leptospirosis	**0.02**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
Listeriosis	**0.18**	0.31	0.00	0.00	**0.05**	0.00	0.00	0.26	0.43	**0.25**
Lyme Disease	**0.18**	0.31	0.00	0.00	**0.05**	0.00	1.21	0.00	0.43	**0.25**
Malaria	**0.62**	0.00	0.73	0.93	**0.70**	0.00	0.00	0.00	0.43	**0.13**
Measles	**0.12**	0.00	0.29	0.23	**0.21**	0.00	0.00	0.00	0.00	**0.00**
Meningococcal Disease (invasive)	**0.54**	1.57	0.58	0.93	**0.91**	0.00	0.00	0.52	0.43	**0.38**
Mumps	**0.38**	0.31	0.29	0.12	**0.21**	1.18	0.00	0.26	0.00	**0.25**
Paralytic Shellfish Poisoning	**0.04**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
Paratyphoid Fever	**0.48**	0.31	0.44	1.63	**0.97**	0.00	0.00	0.77	0.00	**0.38**
Pertussis	**6.19**	11.60	3.36	5.60	**5.80**	3.55	0.00	3.87	0.85	**2.53**
Pneumococcal Disease (invasive)	**11.28**	11.28	7.30	8.05	**8.33**	5.91	8.47	12.40	19.58	**13.43**
Q Fever	**0.06**	0.00	0.15	0.00	**0.05**	0.00	0.00	0.52	0.00	**0.25**
Rabies Exposure	**5.49**	4.07	5.11	4.09	**4.46**	4.73	7.26	7.49	6.81	**6.97**
Rickettsial Disease	**0.16**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.26	0.00	**0.13**
Salmonella (non-typhoidal)	**19.61**	18.18	18.83	21.13	**19.78**	22.46	16.95	19.89	14.48	**18.25**
Shigellosis	**2.44**	4.70	1.90	2.92	**2.85**	1.18	1.21	1.03	0.00	**0.76**
Streptococcal Disease group A (invasive)	**8.27**	7.21	5.55	6.77	**6.40**	5.91	7.26	8.52	7.24	**7.73**
Streptococcal Disease group B (neonatal)	**33.95**	28.72	16.03	36.72	**27.95**	0.00	0.00	0.00	0.00	**0.00**
Syphilis (infectious)	**18.41**	5.96	12.12	7.12	**8.76**	3.55	7.26	10.59	3.83	**7.48**
Tuberculosis	**5.57**	5.02	6.86	9.81	**7.90**	3.55	1.21	2.32	0.85	**1.90**
Tularemia Infection	**0.02**	0.00	0.00	0.00	**0.00**	0.00	1.21	0.00	0.00	**0.13**
Typhoid Fever	**0.78**	1.25	0.29	2.57	**1.50**	0.00	0.00	0.00	0.85	**0.25**
Vibrio Infection	**1.28**	0.31	0.73	0.82	**0.70**	0.00	1.21	0.77	0.43	**0.63**
Yellow Fever	**0.02**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**
Yersiniosis	**15.19**	9.09	16.35	14.01	**14.03**	5.91	4.84	5.94	8.94	**6.72**

Vancouver Island Health				Northern Health				Vacouver Coastal Health			
Central Vancouver Island	North Vancouver Island	South Vancouver Island	**Vancouver Island Total**	Northeast	Northern Interior	Northwest	**Northern Total**	North Shore/Coast Garibaldi	Richmond	Vancouver	**Vancouver Coastal Total**
291209	131256	413406	**835871**	70955	148845	75104	**294904**	302363	216300	692228	**1210891**
0.35	0.77	0.00	**0.24**	0.00	1.35	0.00	**0.68**	0.67	0.47	1.90	**1.34**
2.75	2.29	5.56	**4.07**	2.82	2.69	11.98	**5.09**	9.26	3.70	23.26	**16.27**
0.34	0.00	0.24	**0.24**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
0.00	0.76	0.00	**0.12**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
31.94	28.19	26.85	**28.83**	1.41	20.16	15.98	**14.58**	53.58	29.13	43.77	**43.60**
0.00	0.76	0.00	**0.12**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.14	**0.08**
0.69	0.00	0.97	**0.72**	0.00	1.34	0.00	**0.68**	0.99	0.92	1.16	**1.07**
0.00	0.00	1.21	**0.60**	0.00	1.34	0.00	**0.68**	0.99	1.39	1.73	**1.49**
0.00	0.00	0.24	**0.12**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
12.02	6.09	9.19	**9.69**	0.00	0.67	0.00	**0.34**	1.98	2.77	4.04	**3.30**
7.21	8.38	12.09	**9.81**	16.91	6.05	10.65	**9.83**	16.21	5.09	13.00	**12.39**
1.37	2.29	0.97	**1.32**	4.23	3.36	2.66	**3.39**	0.99	0.92	1.59	**1.32**
0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.43	**0.25**
0.69	2.29	0.24	**0.72**	0.00	0.67	0.00	**0.34**	0.99	0.00	0.58	**0.58**
0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.33	0.46	0.58	**0.50**
3.78	3.05	7.74	**5.62**	5.64	2.02	3.99	**3.39**	13.89	74.43	48.39	**44.43**
49.11	44.19	36.04	**41.87**	36.64	68.53	47.93	**55.61**	21.17	12.02	46.81	**34.19**
0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.29	**0.17**
0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.46	0.00	**0.08**
2.75	2.29	5.32	**3.95**	0.00	3.36	2.66	**2.37**	2.98	1.85	11.12	**7.43**
0.69	0.00	0.24	**0.36**	0.00	0.00	0.00	**0.00**	0.00	0.92	0.00	**0.17**
0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.14	**0.08**
0.34	0.00	0.00	**0.12**	0.00	0.67	0.00	**0.34**	0.00	0.00	0.58	**0.33**
0.00	0.00	0.24	**0.12**	0.00	0.00	0.00	**0.00**	1.32	0.46	0.00	**0.41**
0.00	0.76	0.97	**0.60**	0.00	0.00	0.00	**0.00**	0.00	0.92	1.44	**0.99**
0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.46	0.14	**0.17**
0.34	0.76	0.97	**0.72**	0.00	0.00	0.00	**0.00**	0.00	0.46	0.00	**0.08**
0.00	0.00	0.24	**0.12**	0.00	0.67	1.33	**0.68**	0.66	0.00	1.16	**0.83**
0.69	0.00	0.00	**0.24**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
0.00	0.00	0.24	**0.12**	0.00	0.67	0.00	**0.34**	0.00	0.00	0.14	**0.08**
14.77	1.52	15.00	**12.80**	1.41	6.05	2.66	**4.07**	8.93	2.31	4.33	**5.12**
15.80	7.62	16.93	**15.07**	8.46	16.80	17.31	**14.92**	6.61	5.55	14.45	**10.90**
0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
3.09	5.33	7.01	**5.38**	2.82	2.69	7.99	**4.07**	4.63	2.31	8.67	**6.52**
0.69	0.00	0.48	**0.48**	1.41	0.00	0.00	**0.34**	0.00	0.46	0.14	**0.17**
18.20	13.71	20.80	**18.78**	16.91	22.84	31.96	**23.74**	22.16	14.79	20.37	**19.82**
1.72	0.00	2.42	**1.79**	0.00	0.67	1.33	**0.68**	1.65	1.39	5.49	**3.80**
9.27	10.67	7.98	**8.85**	2.82	14.11	21.30	**13.22**	5.95	3.24	13.72	**9.91**
133.75	0.00	0.00	**46.33**	0.00	62.00	0.00	**28.85**	44.52	52.99	68.65	**60.24**
14.42	12.19	18.38	**16.03**	2.82	2.02	3.99	**2.71**	11.91	12.94	70.93	**45.83**
1.72	1.52	1.45	**1.56**	1.41	2.69	3.99	**2.71**	3.64	9.25	8.81	**7.60**
0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
0.00	0.00	0.24	**0.12**	0.00	0.00	0.00	**0.00**	0.00	0.00	1.16	**0.66**
2.75	3.05	1.69	**2.27**	0.00	0.00	1.33	**0.34**	4.30	1.85	1.30	**2.15**
0.34	0.00	0.00	**0.12**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
16.14	9.14	20.32	**17.11**	4.23	8.73	15.98	**9.49**	22.16	16.64	24.56	**22.55**

Sources and Explanatory Remarks

1. Numbers in this report were generated in April 2019 and are subject to change due to possible late reporting and/or data clean up in the regions. This may also explain changes in the number of reported cases in previous years for some diseases.

2. All geographic breakdowns reflect place of residence at time of reporting, diagnosis, or treatment. Subsequent movement is not reflected in this report.

3. Clinical, probable, suspect, and confirmed case reports are collected from the health regions in British Columbia through Panorama, unless otherwise specified. Only confirmed cases are described in the main report, in keeping with BC reporting to the Public Health Agency of Canada. For the breakdown of cases by their confirmed or clinical case status for 2005 and previous years, see the 2005 BC Annual Summary of Reportable Diseases posted on www.bccdc.ca. The exceptions are Lyme disease and tetanus for which clinical cases are included and amebiasis for which probable cases are included.

4. All data for influenza, invasive meningococcal disease, invasive group A streptococcal disease, MRSA and VRE, as well as 2011 through 2018 data for measles, mumps, and rubella, are collected through surveillance databases maintained at BCCDC which are sourced from reporting by BC health authorities using forms specifically designed for each disease, and sometimes reconciliation with laboratory data. Data for invasive pneumococcal disease are collected through both Panorama (all age groups) and through a surveillance database (pediatric cases ≤16 years of age). The databases may not always correspond to Panorama reports, including by case classification (i.e., confirmed and clinical/probable status).

5. Enteric disease outbreak data are reported through a national, secure web-enabled outbreak reporting tool using the Canadian Network for Public Health Intelligence (CNPHI). Data were extracted from CNPHI on August 23. Viral outbreaks in residential facilities are excluded.

6. Invasive meningococcal disease, invasive group A streptococcal disease and zika virus are reported using episode date. Measles, mumps, and rubella are reported using reported date for 2008 through 2010 and episode date for 2011 through 2018. Cryptococcus gattii infections are reported using the date the diagnosis is reported by the laboratory. Other diseases are classified by the reported date which is the date reported to the health authority.

7. The BCCDC Public Health Laboratory and the National Microbiology Laboratory provide phage type data, genotyping results, and other subtyping data for several diseases included in this report.

8. Data for HIV and AIDS are collected through HAISYS, the HIV/AIDS Information System. Data for other sexually transmitted infections (STIs) are collected through the STI Information System. AIDS case reports are for 2017. The 2018 AIDS statistics will be available in our next report due to a delay associated with AIDS data collection. The BC total age group and sex numbers for AIDS, chlamydia (genital), gonorrhea (genital), HIV and syphilis (infectious) is the sum of the following genders: female, male, transgender and gender unknown.

9. The number of AIDS case reports by year from 2008 to 2017 in this report differ significantly from what is reported in the HIV Annual Report, as the HIV Annual Report includes non-BC and unknown geography AIDS case reports.

10. All TB surveillance data comes from Panorama, the public health solution for disease surveillance and management.

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.

11. 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 nationally by the Public Health Agency of Canada (PHAC). Briefly, PHAC only includes cases that started treatment in BC in the total counts for BC, while the BCCDC includes all cases who have received treatment in BC in the total counts for BC, regardless of where their treatment initially began.

12. For information on Antimicrobial Resistant Organism (ARO) Surveillance in BC, please refer to: Antimicrobial Resistance Trends in the Province of British Columbia - 2012. Available at www.bccdc.ca/prevention/AntibioticResistance.

13. Amebiasis, cryptosporidiosis and listeriosis were removed from national surveillance in January 2000. Listeriosis was made reportable nationally again in 2007. Lyme disease became nationally notifiable in 2009; methicillin resistant Staphylococcus aureus, vancomycin resistant enterococci, Vibrio Infections and yersiniosis have not been nationally notifiable diseases in the period 2005 through 2018.

14. The Jenks Natural Breaks Classification method was used for defining different classifications of disease rates in the maps. This classification method identifies gaps or depressions within the data distribution and creates the categories based on the best fit of the data (i.e., groups based on similarities).

15. Health service delivery area boundaries are taken from BC STATS; BC STATS is the central statistical agency of the Province of British Columbia.

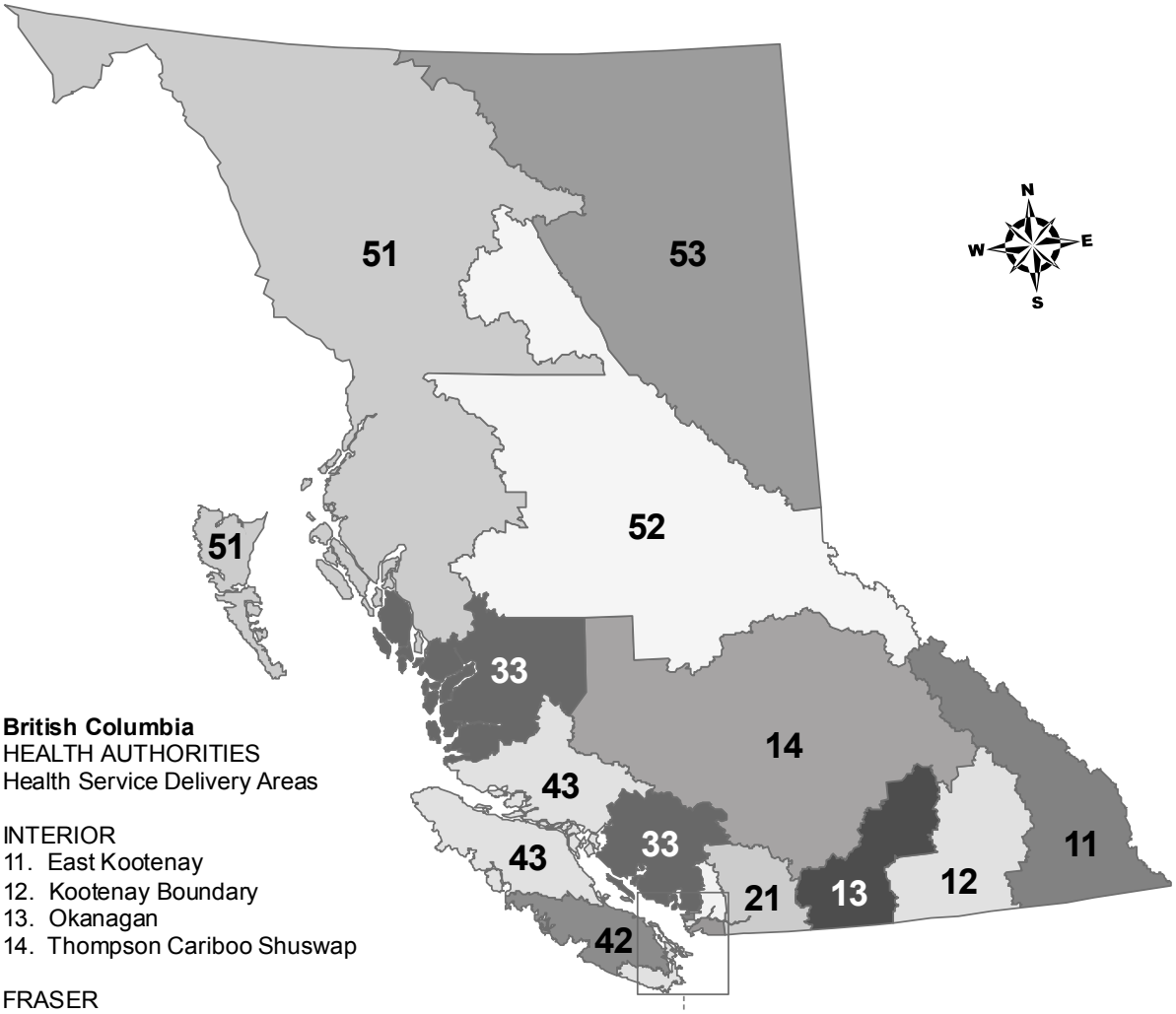
16. National rates are provided by the Public Health Agency of Canada -Division of Surveillance and Risk Assessment. In 2011, New Brunswick and Prince Edward Island did not report cyclosporiasis hence the population of those provinces have been removed for rate calculation. The resulting national rates are therefore based only on the data and populations for the remaining participating jurisdictions, and the national rates may change once reporting is complete. 2018 national rates are unavailable currently until data updates are finalized.

17. Population estimates come from BC Stats (http://www.bcstats.gov.bc.ca/Home.aspx). Please note for the 2010 BC Annual Summary of Reportable Diseases and previous years' reports, population estimates were taken from P.E.O.P.L.E. Projection (Population Extrapolation for Organizational Planning with Less Error).

18. The rates for neonatal group B Streptococcal infection under 2018 BC Reportable Disease Case Rates by HSDA (pages 109-110) are calculated based on the population under 12 months of age, instead of the entire BC population.

19. While we endeavour to include data on the majority of reportable diseases in this publication, data on some are not included. For information on the incidence of these diseases in 2018 in British Columbia, please contact adminInfo@bccdc.ca.

British Columbia Health Service Delivery Areas



British Columbia
HEALTH AUTHORITIES
Health Service Delivery Areas

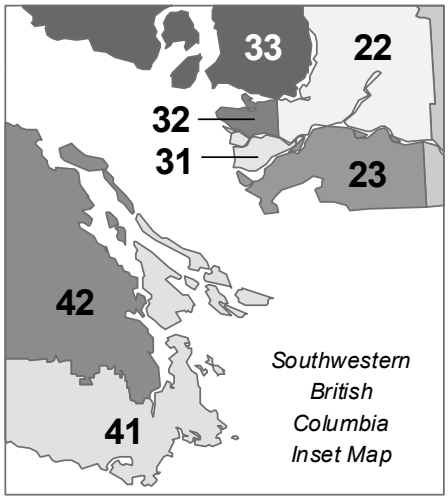
INTERIOR
11. East Kootenay
12. Kootenay Boundary
13. Okanagan
14. Thompson Cariboo Shuswap

FRASER
21. Fraser East
22. Fraser North
23. Fraser South

VANCOUVER COASTAL
31. Richmond
32. Vancouver
33. North Shore/Coast Garibaldi

VANCOUVER ISLAND
41. South Vancouver Island
42. Central Vancouver Island
43. North Vancouver Island

NORTHERN
51. Northwest
52. Northern Interior
53. Northeast



BC Centre for Disease Control
An agency of the Provincial Health Services Authority

Reportable Communicable Diseases In BC, March 2013*

Schedule A: Reportable by all sources, including laboratories

Acquired Immune Deficiency Syndrome
Anthrax
Botulism
Brucellosis
Cholera
Congenital infections:
    Toxoplasmosis, Rubella,Cytomegalovirus, Herpes Simplex, Varicella-zoster, Hepatitis B Virus, Listeriosis and any other congenital infection
Creutzfeldt-Jacob Disease
Cryptococcus neoformans
Cryptosporidiosis
Cyclospora Infection
Diffuse Lamellar Keratitis (DLK)
Diphtheria:
    Cases
    Carriers
Encephalitis:
    Post-infectious
    Subacute sclerosing panencephalitis
    Vaccine-related
    Viral
Foodborne illness:
    All causes
Gastroenteritis epidemic:
    Bacterial
    Parasitic
    Viral
Genital Chlamydia Infection
Giardiasis
H5 and H7 strains of the Influenza virus
Haemophilus Influenzae Disease, All Invasive, by Type
Hantavirus Pulmonary Syndrome
Hemolytic Uremic Syndrome
Hemorrhagic Viral Fevers
Hepatitis Viral:
    Hepatitis A
    Hepatitis B
    Hepatitis C
    Hepatitis E
    Other Viral Hepatitis
Human Immunodeficiency Virus
Invasive Group A Streptococcal Disease
Invasive Streptococcus Pneumoniae Infection
Leprosy
Lyme Disease
Measles
Meningitis: All causes
    (i) Bacterial:
    Haemophilus
    Pneumococcal
    Other
    (ii) Viral
Meningococcal Disease:
    All Invasive
    Including Primary Meningococcal Pneumonia and Primary Meningococcal Conjunctivitis
Mumps
Neonatal Group B Streptococcus Infection
Paralytic Shellfish Poisoning (PSP)
Pertussis (Whooping Cough)
Plague
Poliomyelitis
Rabies
Reye's Syndrome
Rubella:
    Congenital Rubella Syndrome
Severe Acute Respiratory Syndrome
Smallpox
Tetanus
Transfusion Transmitted Infection
Tuberculosis
Tularemia
Typhoid Fever and Paratyphoid Fever
Venereal Disease:
    Chancroid
    Gonorrhea - all sites
    Syphilis
Waterborne Illness:
    All causes
West Nile Virus Infection
Yellow Fever

Schedule B: Reportable by laboratories only

All specific bacterial and viral stool pathogens:
- (i) Bacterial:
  - Campylobacter
  - Salmonella
  - Shigella
  - Yersinia
- (ii) Viral

Amoebiasis
Borrelia burgdorferi Infection
Cerebrospinal Fluid Micro-organisms
Chlamydial Diseases, including Psittacosis
Creutzfeldt-Jacob Disease
Cryptococcus neoformans
Herpes Genitalis
Human Immunodeficiency Virus
Influenza virus, including the H5 and H7 strains
Legionellosis
Leptospirosis
Listeriosis
Malaria
Q Fever
Rickettsial Diseases
Severe Acute Respiratory Syndrome
Smallpox
Tularemia
West Nile Virus Infection

*The above list was current during the period covered by this report. A revised list effective January 2019 is available at http://www.bclaws.ca/civix/document/id/lc/statreg/167_2018.

Contributors

Dr. Jane Buxton, Physician Epidemiologist

Theodora Consolacion, Epidemiologist

Michael Coss, Coordinator

Samara David, Epidemiologist

Erin Fraser, Public Health Veterinarian

Dr. Eleni Galanis, Physician Epidemiologist

Siobhan Leir, Epidemiologist

Sunny Mak, Senior Medical Geographer

Abdullah Mamun, Epidemiologist

Kyle Noftall, Epidemiologist

Dr. Monika Naus, Medical Director

Dr. David Patrick, Physician Epidemiologist

Dr. Danuta Skowronski, Physician Epidemiologist

Marsha Taylor, Epidemiologist

Chelsea Treolar, Epidemiologist

Eva Weingartl, Epidemiologist

Elsie Wong, Federal Field Surveillance Officer

Dr. Jason Wong, Physician Epidemiologist