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

2016

November 2017

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

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

Click this icon wherever you see it to get the latest data and additional charts for a disease.

Executive Summary

Communicable disease control has been at the core of public health activities for 150 years and BC enjoys a relatively low burden of disease from infections compared with historical rates. Maintaining a strong monitoring and response system is essential to keeping it that way, because emerging infections are the only category of human illness that can grow logarithmically if unchecked.

In 2016, we continued to observe benefit to some of our longstanding control programs. Rates of key infections now preventable by vaccine such as hepatitis B, hepatitis A and Meningococcal disease continue to fall. BC continues to make strides against tuberculosis, the original disease for which public health practitioners have considered "treatment to be prevention". Strides in genomics now mean that remaining BC patients with TB can be very sure that their treatment will be effective.

We continue to see new cases of HIV diagnosed in BC but have enjoyed a long term decline in incidence. However, there has been growth in the rates of some other sexually transmitted infections. Chlamydia, gonorrhea and syphilis have been on the rise. The explanations are complex but no doubt relate to a diminished fear of HIV now that it is less common and less fatal, a lamentable decline in safe sexual practices in casual encounters and the impact of internet partnering.

BC saw several notable infectious disease outbreaks in 2016.

- An increase in Norovirus infections (causing severe vomiting and diarrhea) was associated with eating contaminated oysters.
- High rates of mumps transmission, including a large sporting event resulted in 148 cases. Those most at risk were people aged 21-46 who would have received only one dose of vaccine.
- Invasive infections caused by Group A Streptococci were also on the rise last year. There was a case fatality rate of 7.9% among the 303 cases. While no strain clearly dominated, those injecting drugs or experiencing homelessness were at higher risk.
- Forty- four British Columbians came home from the Caribbean, Central or South America with Zika virus infection during 2016. Offspring born to four affected pregnant women have been well to date and rates in 2017 are well below what was seen last year.
- During the summer and fall of 2016, BC had an increase in reports of enterovirus D 68. This virus can cause fever and rash but can also cause neurological complications and resulted in at least 50 hospitalizations.

BC prescribers are doing their bit to slow down the threat of antimicrobial resistant organisms. The overall rate of antibiotic prescribing was down 15% in the first 10 years of the Do Bugs Need Drugs? program and BC prescribers have been switching away from excessive use of fluoroquinolones and new macrolides toward first line agents.

British Columbia's Regional Health Authorities and BCCDC continue to engage and investigate enteric outbreaks. During 2016, norovirus and Salmonella were the dominant causes. BCCDC and the regional health authorities are collaborating in longer term investigations to understand the continued slow rise in the rate of Salmonella disease in Canada.

The 2016/17 influenza season was more active than most years, in line with the observed dominance of Influenza A H3N2 for most of the season. Such strains tend to cause more morbidity, cause more outbreaks in long-term care facilities as was observed last year and are a challenge for vaccine makers. BC estimates of last year's vaccine effectiveness against Influenza A H3N2 was 42%, essentially the same

estimate as that observed by the US CDC in the same period.

There was an increase in the rate of reporting of Lyme disease in BC during 2016. This most likely results from increasing testing volume due to awareness and institution of new diagnostic tests at BCCDC Public Health Laboratory and the National Microbiology Laboratory (NML). Fully 68% of cases received a diagnosis using a new test for European Lyme strains at NML (yet to be fully assessed for accuracy in Canada) and are most likely acquired outside of BC.

Going forward, BCCDC will continue to unite the sciences of epidemiology and laboratory medicine to prevent infectious diseases and reduce their burden on the population. Innovative new programs of coordinated hepatitis C diagnosis and treatment are underway to reduce the risk of liver disease from this common viral infection in our province. We will continue to engage with community to address the ongoing challenge of sexually transmitted diseases and look forward to increasing the benefits of immunization for British Columbians. We greatly value the integrated and collaborative approach to managing reporting and outbreak investigation with our regional health authority partners, without whom the BC public health efforts in communicable disease control would be impossible.

David M. Patrick

Medical Epidemiologist, BCCDC

2016 Year in Review:
Communicable Diseases in BC

Increased

- Chlamydia
- Streptococcal disease group A (invasive)
- Yersiniosis
- Mumps
- Pneumococcal disease (invasive)
- Cryptosporidiosis
- Pertussis

Decreased

- Acute hepatitis B
- Meningococcal disease (invasive)
- Active tuberculosis
- Vibrio infection

Norovirus

Caused by eating contaminated oysters from geographically dispersed oyster farms in BC

347 BC norovirus outbreak cases in 2016 and 2017

12 oyster farms closed

SEWER

speculate sewage contamination associated with environmental factors causing the outbreak

Zika Virus

44 total cases in 2016

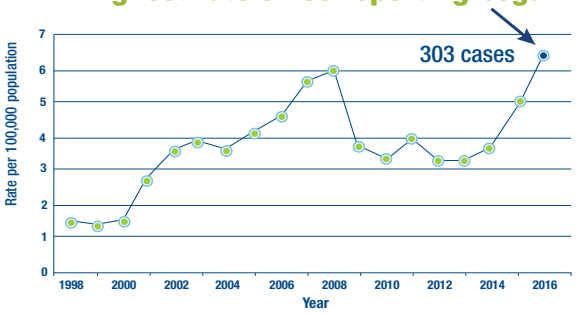
4 pregnant cases

All cases were travel related and most cases were contracted in:

- Carribean
- Central America
- Mexico

Invasive Group A Streptococcal Disease

Highest rate since reporting began

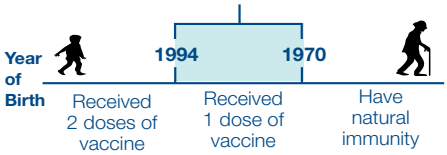


1 in 3 cases in 2016 reported injection drug use

Mumps

148 cases in 2016

- **76% of confirmed mumps cases were reported in 21-46 year olds**
- **This age group was immunized during a period when guidelines recommended only 1 dose of mumps-containing vaccine**



- **6 cases acquired mumps at a mass sporting event**
- **Transmission from one or more of these cases, or from undetected cases, resulted in at least 91 other cases with the same genotype in BC**

Noteworthy Diseases and Conditions in 2016

Mumps
Streptococcal Disease (invasive) Group A
Zika
Norovirus

Mumps

Mumps remains endemic in Canada. In most years in BC, mumps cases occur sporadically, but in the past decade, outbreaks occurred in 2008, 2011, 2013, and 2016.

In 2016, 148 cases of mumps were confirmed in BC residents (3.11 per 100,000 population). Of those, 133 were associated with an outbreak that began following an exposure at a mass sporting event held in Vancouver in March. The outbreak subsequently became centered in Whistler, with most cases among young adults. All regions of the province reported outbreak-associated cases.

Fifty-four percent of the 2016 cases occurred in Vancouver Coastal, followed by Fraser (24%) and Island (18%) health authority regions. Seventy-six percent of confirmed cases were aged 21 to 46; this age group received their childhood immunizations during a period when guidelines recommended only 1 dose of mumps-containing vaccine. Fifty-one percent of cases were female, and 41% reported known contact with a mumps case. Seventeen percent had received 2 doses of MMR vaccine, 24% had received 1 dose, 26% reported undocumented childhood vaccinations, 24% had unknown vaccination status, and 9% were unvaccinated.

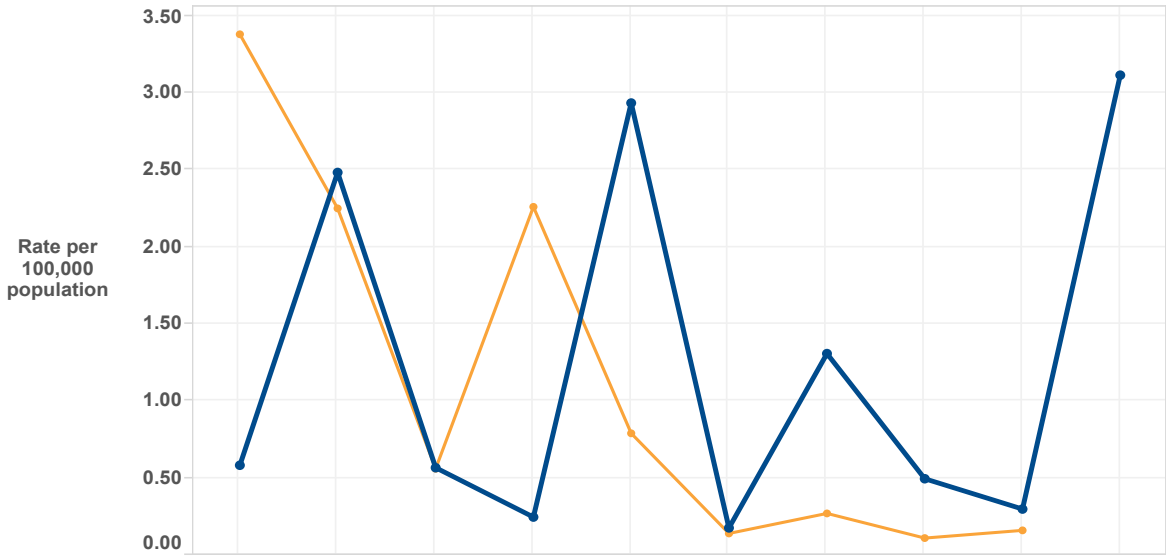
Forty-one percent of confirmed cases reported visiting an emergency department; one case was hospitalized. No complications of meningitis, encephalitis or permanent hearing loss were reported.

The outbreak virus strain was identified as genotype G related to the endemic MuVi/Sheffield.GBR/1.05 strain but formed a distinct cluster based on conserved variants in five nucleotides. It was identified in 95 of the 131 laboratory confirmed cases. Five cases had other genotypes (1 C, 1 F, 1 H, and 2 K), four of which had travel histories compatible with exposure abroad or known contact with an imported case.

More detailed reports about mumps epidemiology in BC are available here.

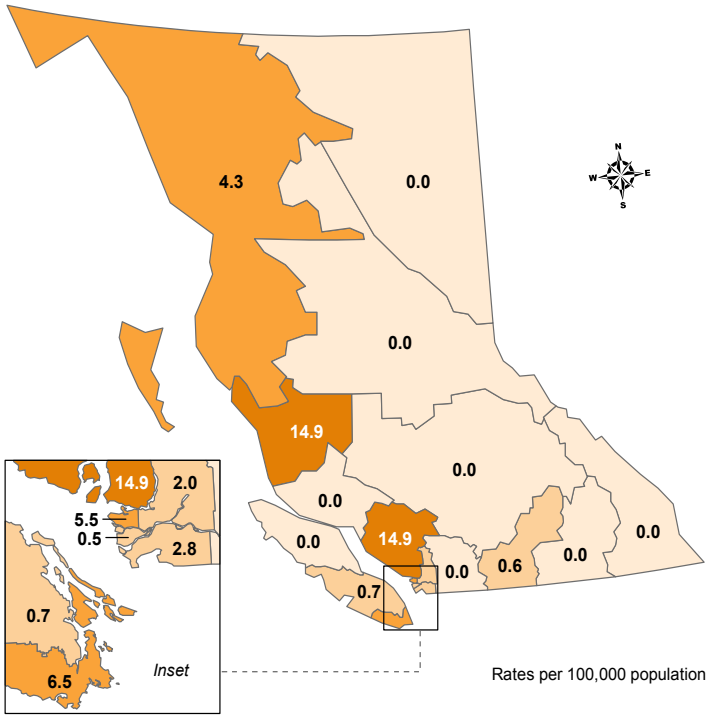
interactive dashboard

1.1 Mumps Rates by Year 2007-2016



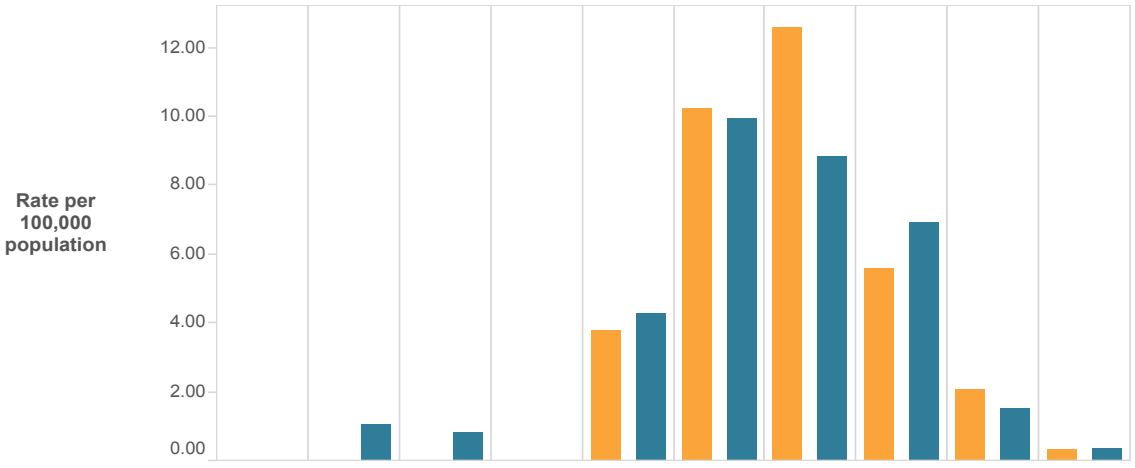
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	25	108	25	11	132	8	60	23	14	148
BC Rate	0.58	2.48	0.57	0.25	2.93	0.18	1.31	0.50	0.30	3.11
Canada Rate	3.38	2.25	0.56	2.26	0.79	0.14	0.27	0.11	0.16	

1.2 Mumps Rates by HSDA 2016



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	0	0.0
13	Okanagan	2	0.6
14	Thompson Cariboo Shuswap	0	0.0
21	Fraser East	0	0.0
22	Fraser North	13	2.0
23	Fraser South	23	2.8
31	Richmond	1	0.5
32	Vancouver	37	5.5
33	North Shore/Coast Garibaldi	42	14.9
41	South Vancouver Island	25	6.5
42	Central Vancouver Island	2	0.7
43	North Vancouver Island	0	0.0
51	Northwest	3	4.3
52	Northern Interior	0	0.0
53	Northeast	0	0.0

1.3 Mumps Rates by Age Group and Sex, 2016



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	5	16	20	18	14	2
	Male	0	1	1	0	6	17	14	22	10	2
	Total	0	1	1	0	11	33	34	40	24	4
BC Rate	Female	0.00	0.00	0.00	0.00	3.78	10.24	12.60	5.56	2.06	0.33
	Male	0.00	1.07	0.83	0.00	4.28	9.96	8.83	6.94	1.52	0.36
	Total	0.00	0.55	0.43	0.00	4.04	10.10	10.71	6.24	1.80	0.34

Streptococcal Disease Group A (invasive)

In 2016, 303 confirmed cases of invasive Group A Streptococcal disease (iGAS) were reported, with an incidence rate of 6.4 cases per 100,000 population. This the highest rate of iGAS in BC since it became reportable in 1997.

Cases ranged in age from 0 to 97 years. The age distribution and mean age (46 years) were similar to those observed in 2007-2015, with a slightly higher proportion of cases in the 25-29 year age group, and lower proportions in the 0-4 year and 20-24 year age groups, than in previous years.

Cases occurred in all Health Service Delivery Areas, with incidence rates ranging from 1.6 to 12.5 cases per 100,000 population. The highest rate was in Vancouver HSDA, with 84 cases aged 5-83 years and thirteen different *emm* types identified.

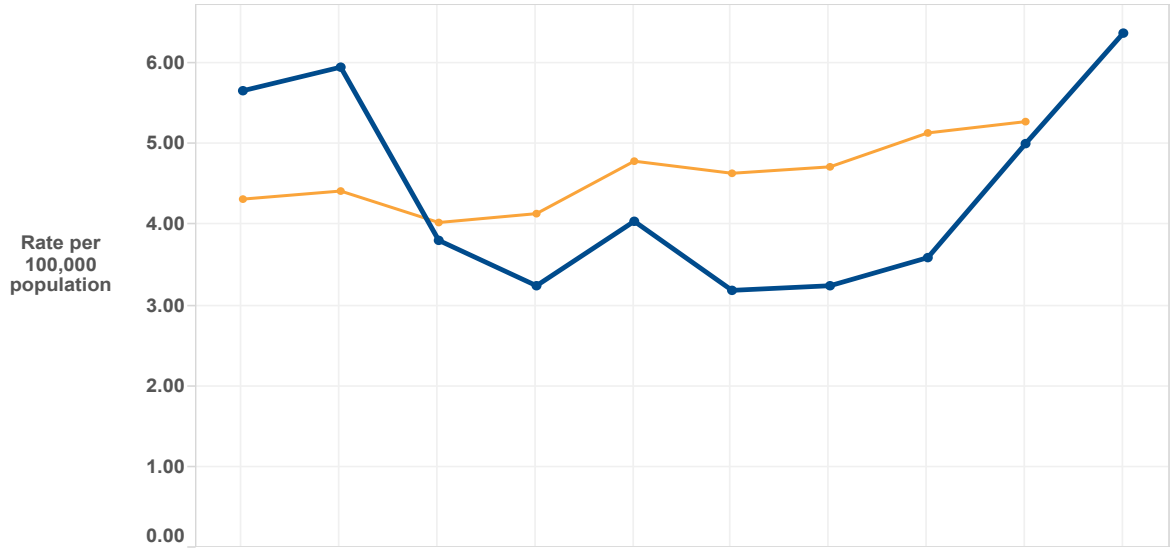
Eighty-five cases (28%) were reported with severe presentations (streptococcal toxic shock syndrome, soft tissue necrosis, meningitis, pneumonia or death). This is similar to the proportion of severe presentations observed in 2007-2015, (range 18-35%, median 28%). Over 70% of the severe cases were over 40 years of age; there were no severe cases under 5 years of age.

The case fatality rate was 7.9%. This is similar to case fatality rates observed in 2007-2015 (range 6.0-13.7%, median 7.2%). Of the 24 deaths in 2016, one was in an adolescent and the rest were adults over 40 years old. Those aged 60 years and older had the highest age-specific case fatality rate (12.6%).

Isolates from 262 of the 303 confirmed cases were typed by the National Microbiology Laboratory. The most common *emm* types were types 82 (20.2%), 101 (16.8%) and 1 (11.8%). From 2007 to 2015, the most common *emm* types among confirmed cases were types 1 (17.4%), 59 (11.0%) and 89 (8.1%). Eight of the 16 cases aged 1-14 years with known *emm* types were *emm* 1. *Emm* types 82 and 101 were most common among the injection drug-using and homeless/under-housed populations (40.1% and 28.4% of cases with known *emm* types, respectively).

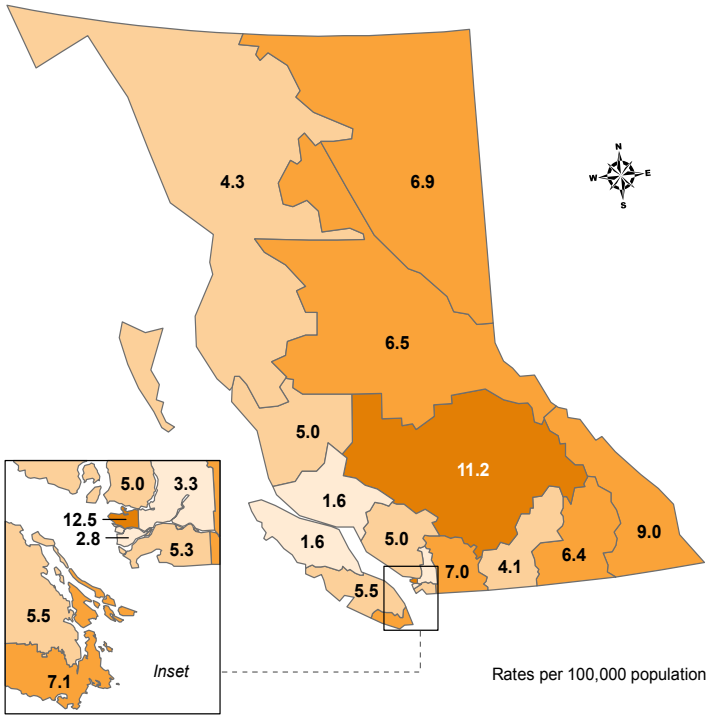
Compared to previous years, there was a higher prevalence reported of each of the risk factors assessed, except for immunocompromise. Most notably, 31% of cases reported injection drug use (compared to 17% in 2007-2015), 26% reported being homeless or under-housed (compared to 16% in 2015) and 54% reported a predisposing wound and/or skin infection (compared to 34% in 2007-2015). Two-thirds of injection drug-using and/or homeless/under-housed cases reported a pre-existing wound or skin infection.

2.1 Streptococcal Disease Group A (invasive) Rates by Year, 2007-2016

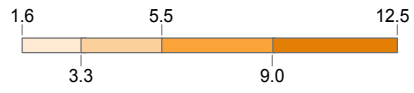


	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	243	259	168	145	182	145	149	167	235	303
BC Rate	5.66	5.95	3.81	3.25	4.05	3.19	3.25	3.60	5.01	6.38
Canada Rate	4.32	4.42	4.03	4.14	4.79	4.64	4.72	5.14	5.28	

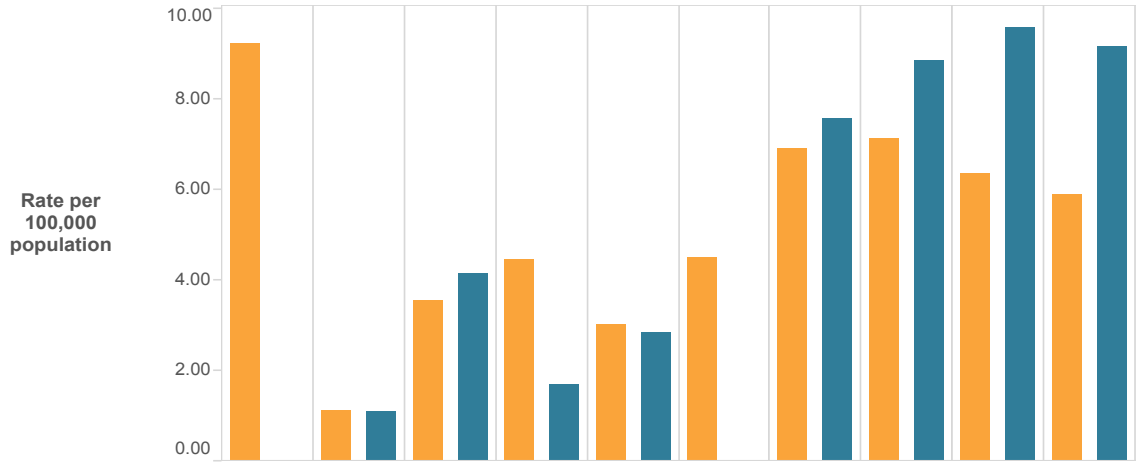
2.2 Streptococcal Disease Group A (invasive) Rates by HSDA, 2016



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	7	9.0
12	Kootenay Boundary	5	6.4
13	Okanagan	15	4.1
14	Thompson Cariboo Shuswap	25	11.2
21	Fraser East	21	7.0
22	Fraser North	22	3.3
23	Fraser South	43	5.3
31	Richmond	6	2.8
32	Vancouver	84	12.5
33	North Shore/Coast Garibaldi	14	5.0
41	South Vancouver Island	27	7.1
42	Central Vancouver Island	15	5.5
43	North Vancouver Island	2	1.6
51	Northwest	3	4.3
52	Northern Interior	9	6.5
53	Northeast	5	6.9



2.3 Streptococcal Disease Group A (invasive) Rates by Age Group and Sex, 2016



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	2	1	4	5	4	7	11	23	43	36
	Male	0	1	5	2	4	0	12	28	63	51
	Total	2	2	9	7	8	7	23	52	106	87
BC Rate	Female	9.23	1.14	3.55	4.45	3.03	4.48	6.93	7.11	6.34	5.90
	Male	0.00	1.07	4.13	1.67	2.85	0.00	7.57	8.83	9.59	9.16
	Total	4.48	1.10	3.85	3.02	2.94	2.14	7.25	8.11	7.94	7.46

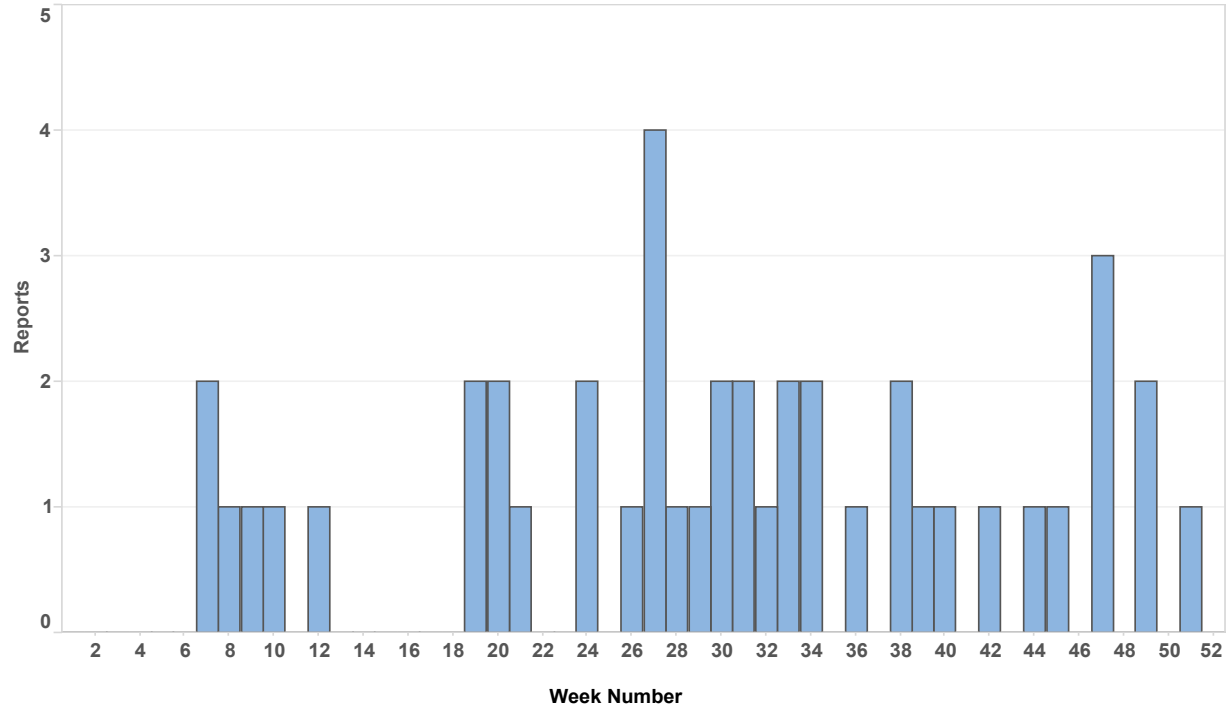
Zika Virus

Zika virus can be transmitted through bites by infected *Aedes* mosquitoes, sex and from a pregnant women to her fetus. The Zika virus outbreak in Americas has been linked to a spectrum of congenital anomalies and adverse pregnancy outcomes. Overall, Zika virus continued to spread in 2016 worldwide, including 28 countries with reported congenital malformations potentially associated with Zika virus infection in pregnant women (http://apps.who.int/iris/bitstream/10665/251811/1/zikasitrep1Dec2016-eng.pdf?ua=1). Guidelines for Zika virus testing for British Columbians were established in early 2016. By the end of the year, 44 confirmed cases were identified. Weekly counts of Zika virus infection were fairly consistent across 2016, ranging from 0 to 4 cases and averaging about 1 case per week. Of the 44 cases, 25 were female (57%) and 19 male (43%). Four of the 25 female cases were pregnant at the time of infection.

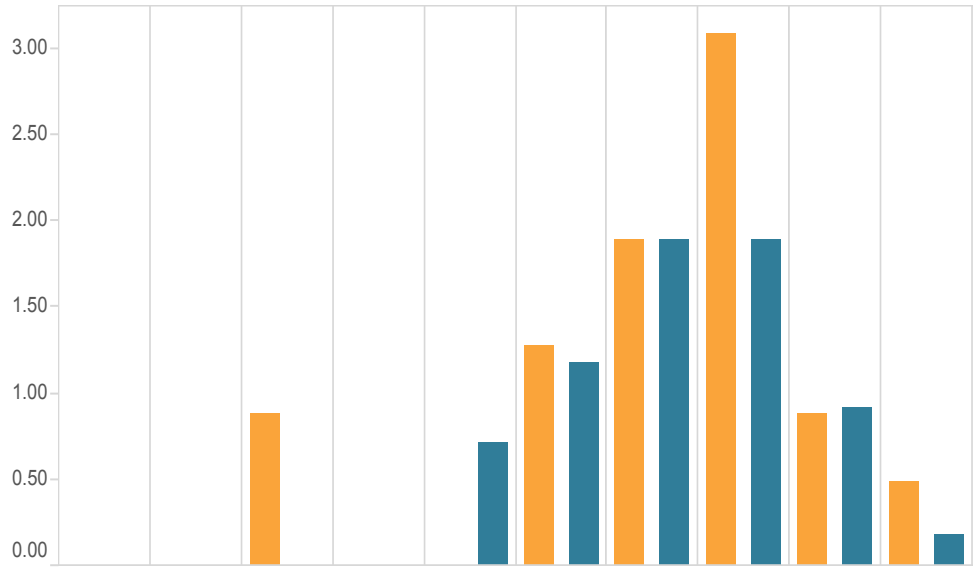
All cases reported travel to countries where mosquito-borne Zika virus transmission is known to occur. Common travel destinations included countries in the Caribbean (46%), Central America (25%) and Mexico (18%). To date there have been no reported cases of sexually transmitted Zika virus infections among British Columbians.

It remains to be seen how international Zika virus activity will continue to impact BC travellers in 2017 and beyond. While endemic transmission in Mexico and the Americas is still occurring in 2017, it is not at the magnitude seen in 2016. Despite this, great concern remains for the potential implications of Zika virus infection in British Columbians where pregnancy is involved or planned, whether aquisition is through travel or sexual transmission.

3.1 Zika Virus Reports Epi-Curve by Week,2016



3.2 Zika Reports by Age Group and Sex, 2016



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	1	0	0	2	3	10	6	3
	Male	0	0	0	0	1	2	3	6	6	1
	Total	0	0	1	0	1	4	6	16	12	4

Norovirus

Norovirus (NV) is a highly communicable virus that leads to widespread community outbreaks every winter, from November to March. It causes vomiting and diarrhea that last 1-3 days and can lead to dehydration in the very young, the elderly and other vulnerable individuals. The vast majority of cases are transmitted from person-to-person, often in facilities such as hospitals, long-term care and schools. In some situations, an ill foodhandler can contaminate food which can lead to foodborne NV outbreaks. Contamination of food at its source is highly unusual.

In the winter of 2016-17, BC experienced a prolonged NV outbreak associated with the consumption of raw and insufficiently cooked oysters sourced from geographically disparate harvest areas.

The outbreak started with an initial NV outbreak (N=118 cases in 19 separte clusters[1]) in Tofino with cases becoming ill from Nov 17 to 28 2016. Six cases were lab-confirmed as NV genotype I (GI). The majority of cases consumed raw oysters at a local oyster festival; the rest of the cases consumed raw oysters at local restaurants in the same time period. Oysters from one BC farm harvested on Nov 13 and 14 explained the majority of cases. Leftover oysters and oysters harvested from this farm tested positive for NV GI.

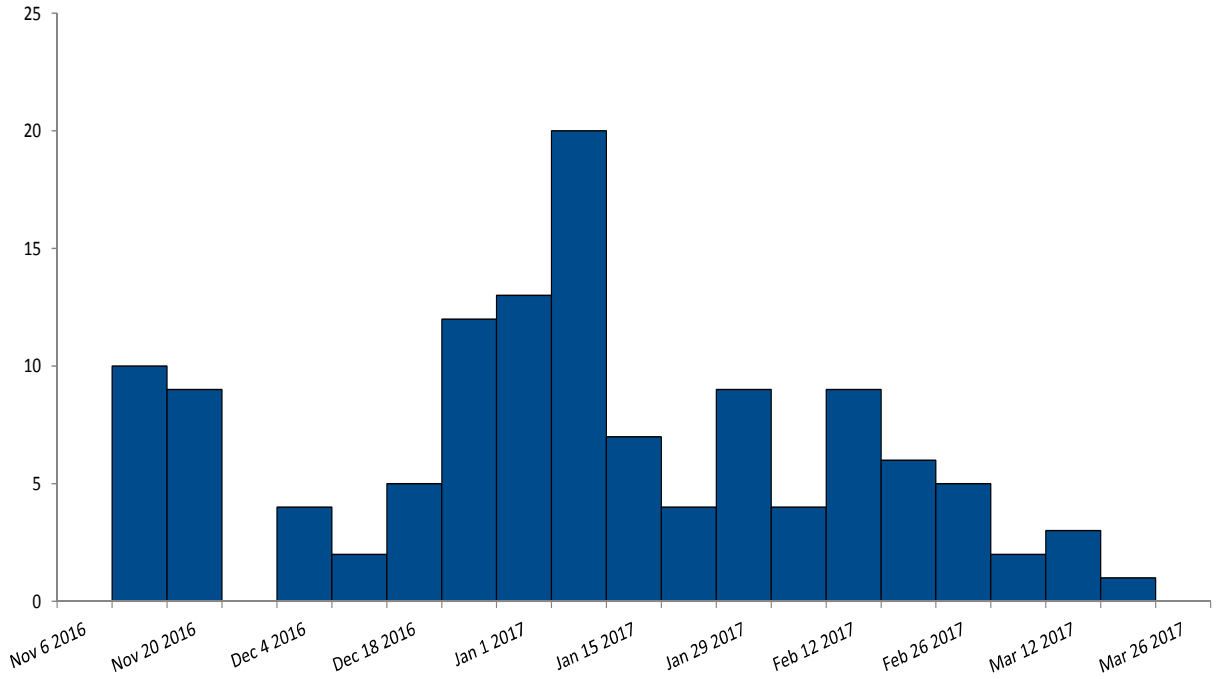
Between Dec 6 2016 and Mar 26 2017, an additional 331 NV cases (145 separate clusters) were reported in BC (N=229), Alberta and Ontario following the consumption of oysters from BC. Eighteen clusters were lab-confirmed as NV GI or GII. Farms from various BC harvest areas were implicated. Testing of leftover oysters and/or oysters from 14 farms identified 6 positive for NV GI or GII.

A series of communications and control measures were taken to minimise the public health risk. These included a public health alert, and the education of BC restaurant staff. The Canadian Food and Inspection Agency and the Department of Fisheries and Oceans closed 12 oyster farms between Dec and Apr 2017. The incidence of NV decreased in March and the outbreak was declared over on Apr 18 2017.

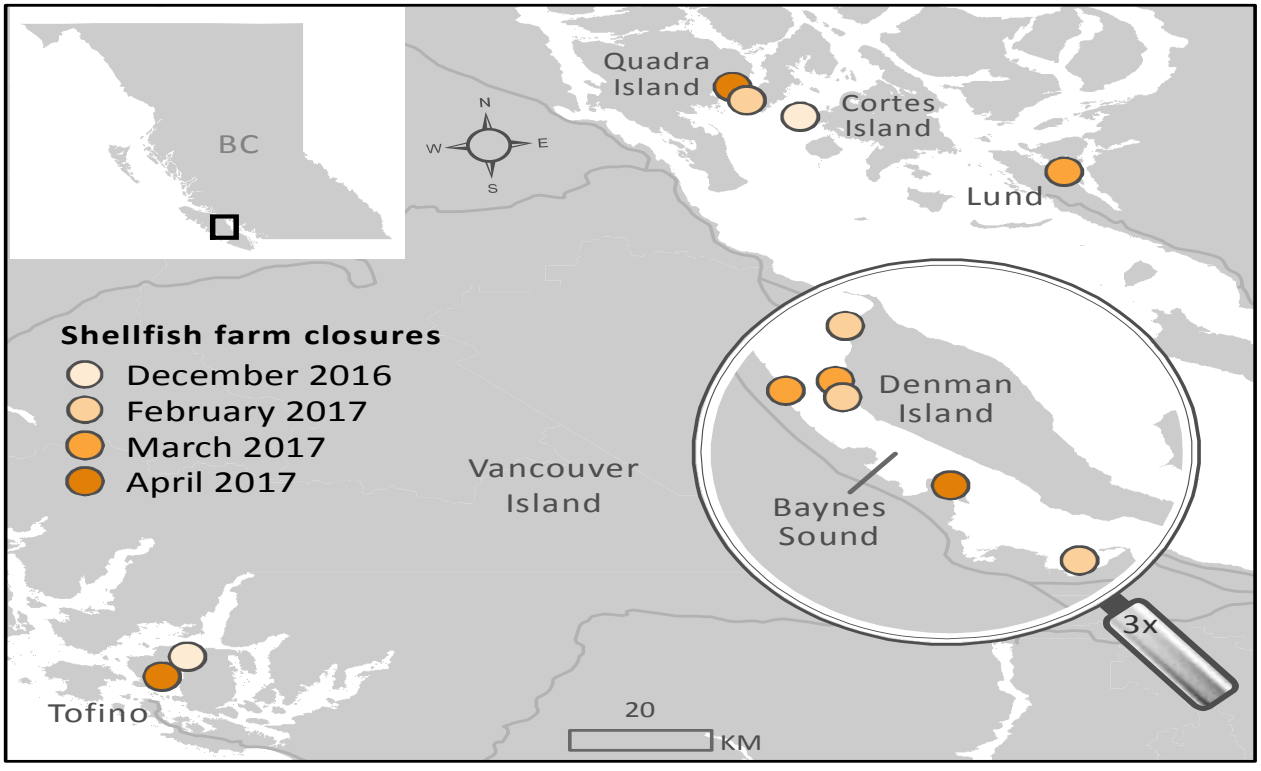
It is hypothesised that human sewage led to the contamination of the marine environment. It is likely that environmental conditions such as prior heavy rainfalls, followed by cold temperatures and low UV light played a role in allowing NV to persist and contaminate shellfish beds. Efforts are underway to improve early detection of NV in oysters, more rapidly control outbreaks and identify the source of environmental contamination.

1. A cluster is defined as illness in one or more individuals all exposed together to the same shellfish at the same time in the same location.

4.1 Number of clusters of norovirus infection or norovirus-like illness associated with oysters reported by week of onset of first case, BC, Nov 6 2016-April 1 2017



4.2 Shellfish farm closures associated with a norovirus outbreak, BC, Dec 2016-April 2017



Surveillance Summaries for Other Selected Diseases and Conditions

ANTIMICROBIAL RESISTANCE

Antimicrobial Resistant Organism Surveillance in BC

As a component of the Do Bugs Need Drugs? program evaluation, trends in resistance are ana¬lyzed and compiled using anonymized, isolate-level antimicrobial susceptibility testing data from Lifelabs (and formerly BC Biomedical), representing 90% of community laboratories in British Columbia (BC). In 2016, the traditional static report that summarised these findings was replaced by a web-embedded and interactive data visualization platform called the BCCDC Antimicrobial Surveillance Tools.

The "Antimicrobial Resistance Dashboard" sur-veil¬lance tool allows users to examine and manipu-late the aforementioned data in an intuitive point-and-click format, and is accompanied by an interactive Execu¬tive Summary that highlights overall trends of interest. The tool and summary are viewable here: http://www.bccdc.ca/health-professionals/data-re-ports/antimicro¬bial-surveillance-tools

Highlights of the 2016 Lifelabs (and formerly BC Bio-medical) data obtained in 2017 include:

- Among the Staphylococcus aureus isolates tested in 2016, 21% were Methicillin Resistant Staphylococ-cus aureus (MRSA) – the susceptibility of MRSA was high for Tetracycline (87%) and Trimethoprim/Sul-famethoxazole (98%). However, 32% isolates were non-susceptible to Clindamycin, 79% to Erythromycin and 95% to Ciprofloxacin.
- In 2016, the susceptibility of Streptococcus pneu-moniae to Penicillin, Ampicillin, Cefuroxime and Cef-triaxone were approximately 99%. The non-suscepti-bility to Macrolides (Erythromycin and Azithromycin) was 23%, approximately 6% decrease from 2015.
- Group A Streptococcus (GAS) isolates were 100% susceptible to Penicillin, Ampicillin and Amoxicillin/ Clavulanate. The non-susceptibility to Macrolides (Erythromycin and Azithromycin) decreased a little since its highest peak in 2015.
- During 2011 to 2015 there was a down trend of non-susceptibility of Escherichia coli to Ciprofloxacin for both Lifelabs and BC Biomedical data, but in 2016 this has increased a little.

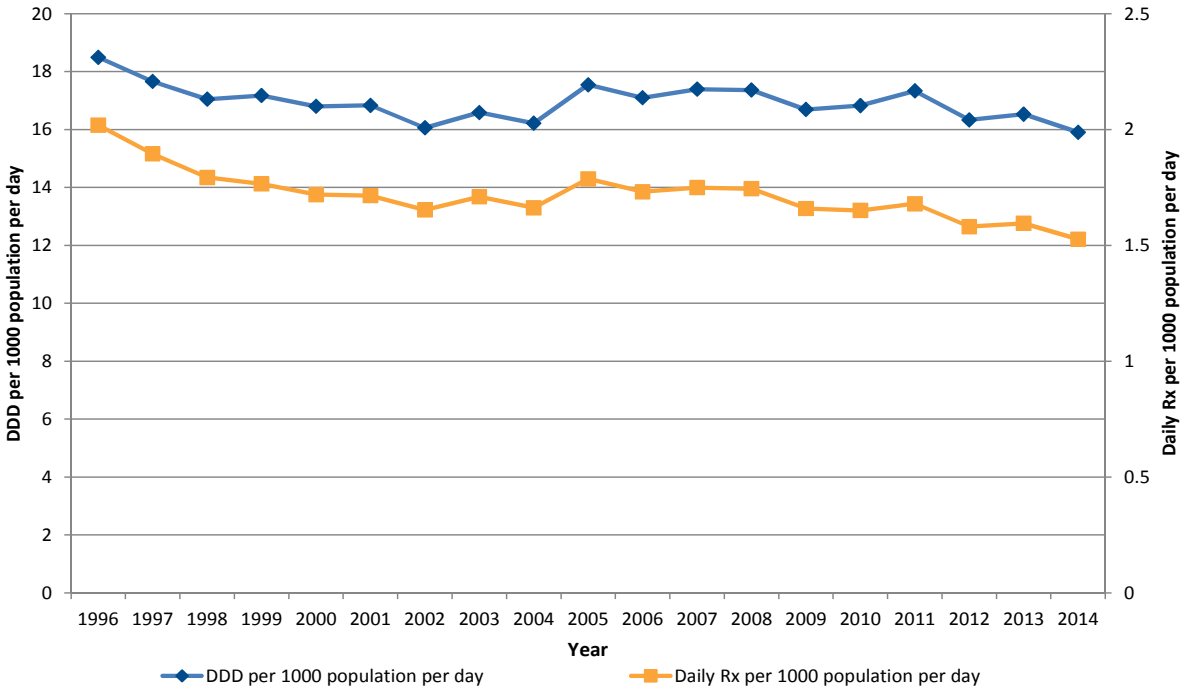
Data from 1996 – 2014 shows that overall, the rates of antimicrobial utilization and antimicrobial prescrip-tion continue to decline. In line with reductions in an-timicrobial utilization and antimicrobial prescriptions, total and PharmaCare costs from antimicrobials have also decreased since 2005. In absolute terms, total costs decreased by $53 million, and PharmaCare costs decreased by $25 million. The change in ad-justed PharmaCare costs was $15 million, represent-ing an 18.5% decrease from 2005 level.

Gender analysis among the residents of the long term care facilities showed a decreasing trend in utilization among female compared to male when comparison was made between 2007 and 2014, and in fact consumption by women was less than men, by 2014. These decreasing trends in prescribing practices may help mitigate the impending threat to emergent of new antibiotic resistant organisms and to reduce the scope of infections with antibiotic resistant organisms especially to the vulnerable populations both at the hospital and community level.

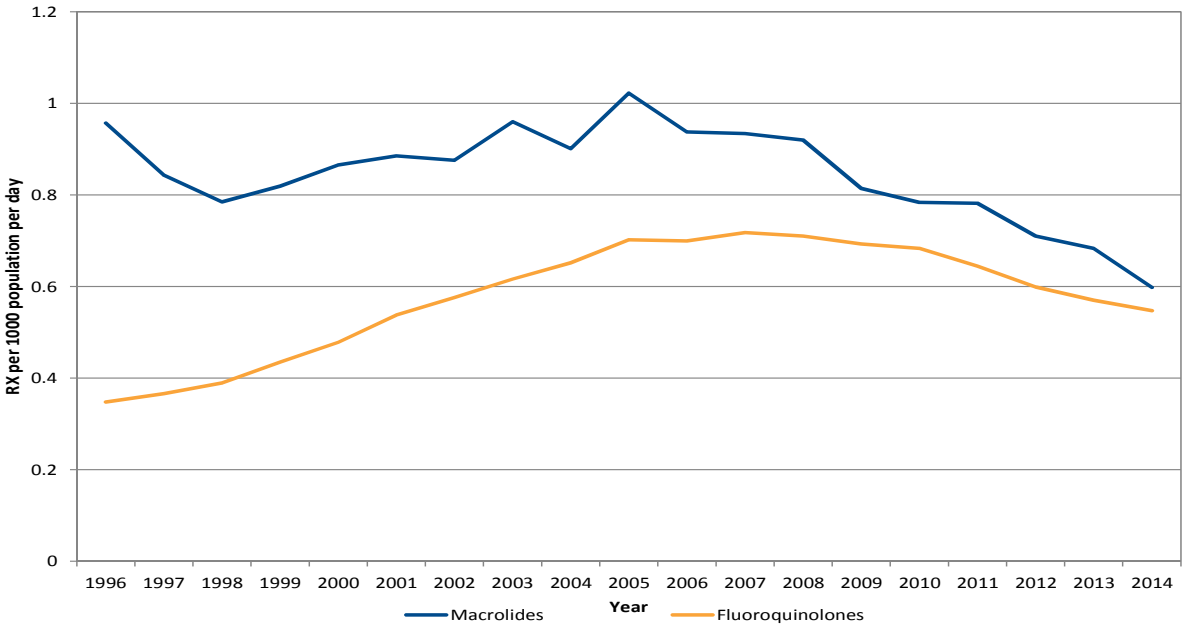
For healthcare-associated infections (e.g. MRSA, CPO, and *C. difficile*), please visit the Provincial In-fection Control Network of British Columbia (PICNet) at: at: https://www.picnet.ca/surveillance/latest-surveillance-reports/

Source: LifeLabs Laboratories

5.1 Antibiotics prescribing and utilization trend, 1996 - 2014



5.2 Utilization of antimicrobial classes, 1996-2014



*The Do Bugs Need Drugs program in BC was implemented in 2005

Source: BC Ministry of Health[creator] (2014): PharmaNet. BC Ministry of Health [publisher]. Data Extract. PharmaNet Committee (2009).

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 2016, 24 enteric disease outbreaks were investigated in BC (Table 6.1). The number of outbreaks was comparable with the previous 4 years, when 24 to 26 outbreaks were investigated each year (Figure 1). All health authorities reported outbreaks in 2016; Vancouver Coastal reported the most (45.8%).

Bacteria and viruses caused an similar proportion of outbreaks (Table 6.2). The pathogen was laboratory-confirmed in 19 (79.1%) outbreaks; this proportion is similar to previous years. Norovirus and *Salmonella* remained the two most frequently identified pathogens as in previous years. No E. *coli* or Shigella outbreaks were reported in 2016.

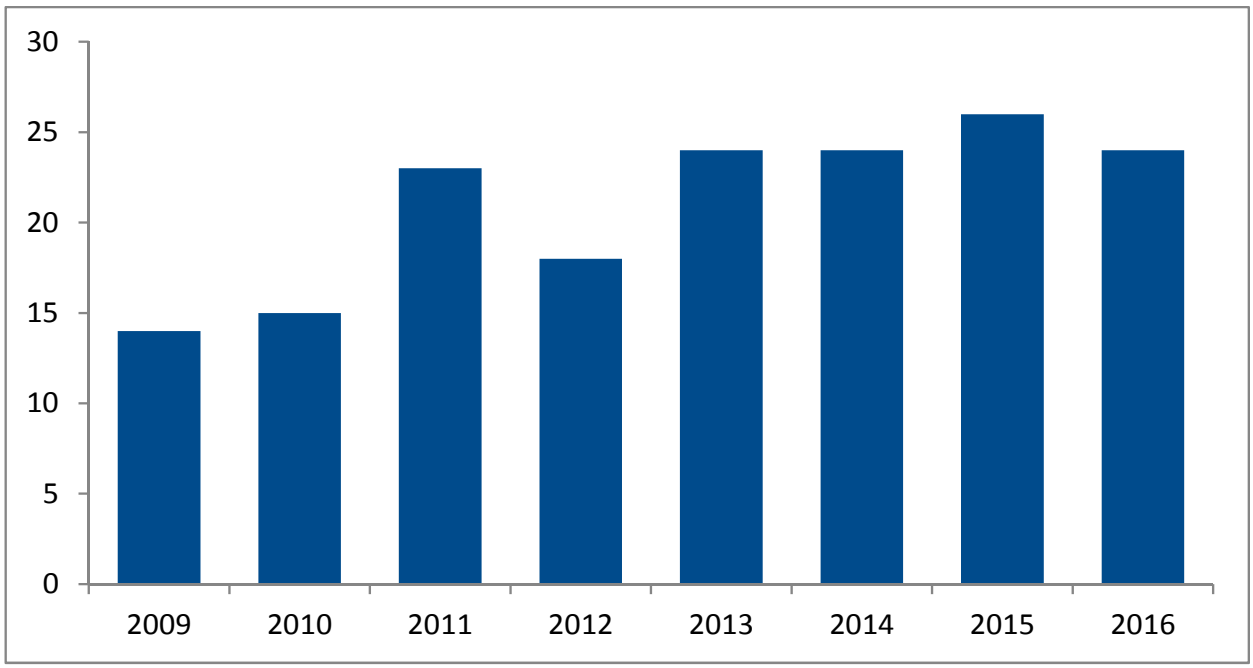
Outbreaks occurred in a variety of settings, most commonly food service establishments and private functions (Table 6.3). These settings were also the most common in 2015.

Similar to previous years, the most common mode of transmission was foodborne (Table 6.4). Among the 12 foodborne outbreak investigations, 9 (75.0%) identified a food source. Mixed foods and meat were the most commonly reported sources of infection in 2016 (Table 6.5); however, the meat-related outbreaks implicated different sources (chicken and other poultry, pork and multiple types). A food handler was identified as contributing to the contamination of a food source in three foodborne outbreaks, 2 caused by norovirus and 1 caused by *Salmonella*.

6.1 Enteric disease outbreaks by reporting organization, BC, 2016

Reporting Organization	Number of outbreaks
Fraser Health Authority	1
Interior Health Authority	7
Northern Health Authority	1
Vancouver Coastal Health	11
Vancouver Island Health Authority	2
BCCDC	2
Total	24

6.2 Number of Outbreaks By Year Investigation Started, BC, 2009-2016 (N=144)



6.3 Characteristics of Enteric Outbreaks by Pathogen Type, BC, 2016

	Bacterial (N=12)	**Viral (N=10)**	**Toxin/ Chemical Poison (N=1)**	**Unknown (N=2)**	**Total (N=24)**
Number of lab confirmed outbreaks	11	8	0	0	19
Total number of lab confirmed cases	67	23	0	0	90
Total number of clinical cases	49	340	4	12	405
Total number of hospitalizations	12	7	0	0	19
Total number of deaths	1	0	0	0	1
Median duration of outbreak (days)	11	7	NA	NA	7
Causative agent	*Salmonella* (9) *Clostridium* (1) Unknown (1)	Norovirus (10) Unknown (1)	Paralytic shellfish poisoning (1)		

6.4 Outbreak by Setting Type, BC, 2016

Outbreak setting	Number of outbreaks
Food service establishment	11 (45.8%)
Private Function	4 (16.7%)
Institutional - Residential	3 (12.5%)
Community	2 (8.3%)
Non-institutional Facility	2 (8.3%)
Other	2 (8.3%)
Total	26 (100%)

6.5 Outbreaks by Mode of Transmission, BC, 2016

Outbreak mode of transmission	Number of outbreaks
Foodborne	12 (50.0%)
Person-to-person	8 (33.3%)
Animal-to-person	2 (8.3%)
Waterborne	0 (0.0%)
Unknown	2 (8.3%)
Total	24 (100%)

6.6 Source of Foodborne Outbreaks by Pathogen, BC, 2016

	Clostridium	*Listeria*	*Norovirus*	*Salmonella*	Unknown	Total
Eggs	0	0	0	1	0	1
Meat	0	1	0	3	0	4
Mixed Foods	1	0	1	0	0	2
Seafood	0	0	1	0	1	2
Unknown	0	1	1	2	0	3
Total	1	1	3	6	1	12

Cyclosporiasis

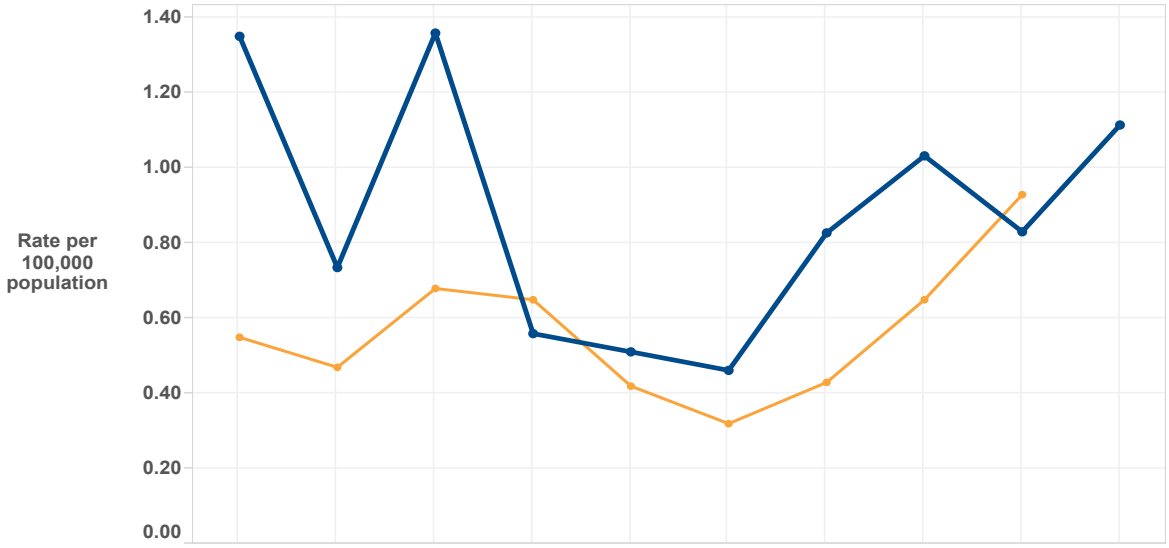
Cyclospora is not endemic in Canada. BC residents acquire infection during travel to endemic countries in South and Central America or Asia or from imported contaminated produce.

The incidence of cyclosporiasis has fluctuated slightly over the last decade. In 2016, 53 cases occured; most cases in 2016 (94.2%) traveled to endemic areas during their incubation period. One locally-acquired BC case was associated with a national outbreak occurring from May to July which remained unsolved. In 2013, 2014 and 2015, BC also experienced outbreaks likely associated with fresh imported produce.

As usual, the incidence was highest in adults and in the greater Vancouver area. The majority of cases were reported in the spring and summer, in accordance with the peak incidence in endemic countries.

interactive dashboard

7.1 Cyclosporiasis Rates by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	58	32	60	25	23	21	38	48	39	53
BC Rate	1.35	0.74	1.36	0.56	0.51	0.46	0.83	1.03	0.83	1.12
Canada Rate	0.55	0.47	0.68	0.65	0.42	0.32	0.43	0.65	0.93	

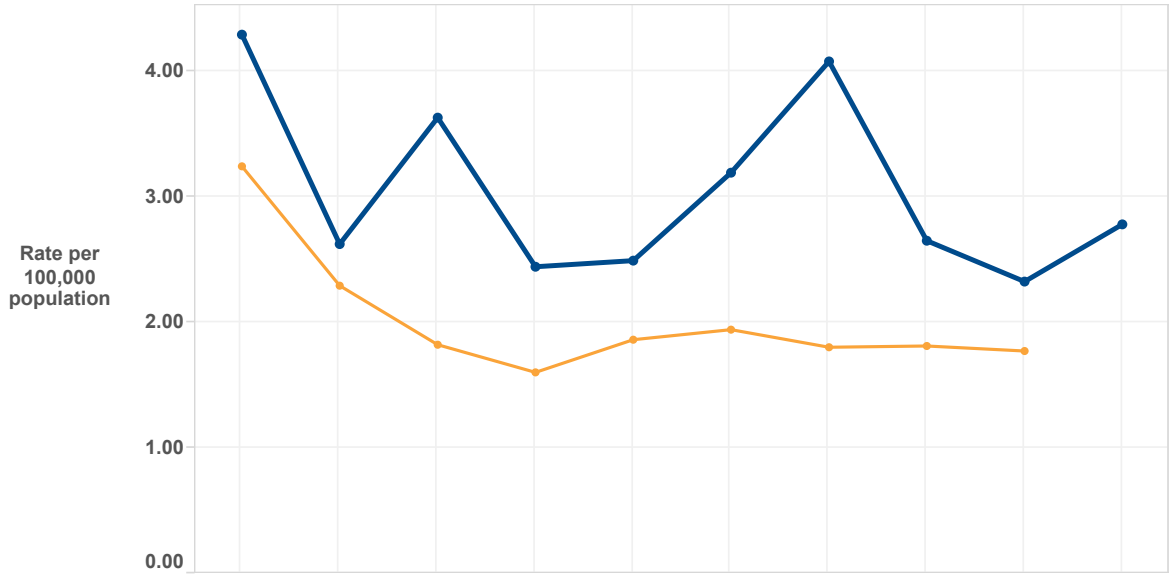
E.coli (shigatoxigenic)

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

In 2016, 132 cases of shigatoxigenic E. *coli* infection were reported; 19.0% were associated with international travel. The incidence rate (2.8/100,000) was a slight increase compared to 2015 and similar to the rate in 2014. Incidence rates were highest among children 1-4 years of age. This is similar to other enteric diseases and is likely due to lower immunity in young children as well as behaviours that increase the risk of infection (e.g. use of diapers). Residents of East Kootenay and North Vancouver Island had the highest rates. As in previous years, cases were reported throughout the year. No E. *coli* outbreaks were reported in 2016.

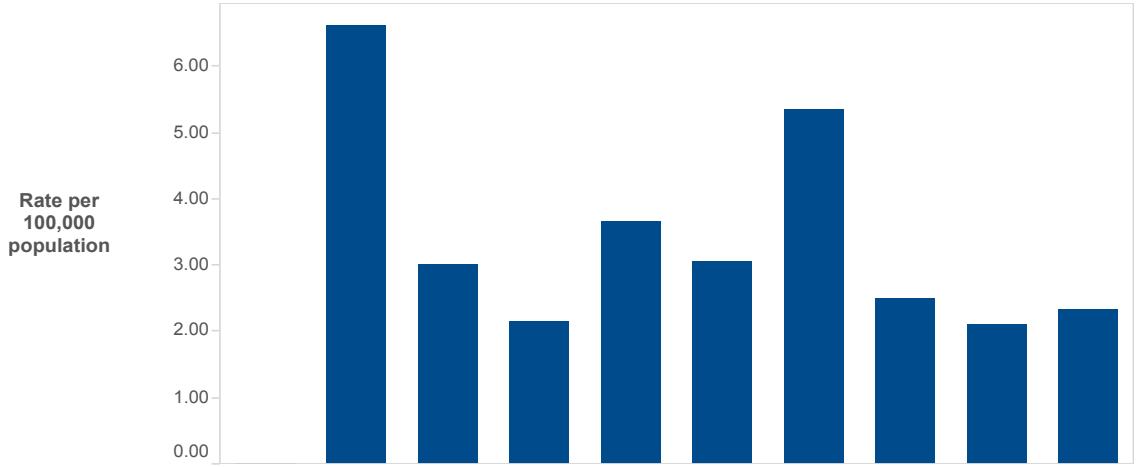
O157 continued to be the most common serogroup diagnosed in BC. The proportion of O157 cases increased slightly since 2014 and 2015. The proportion of samples diagnosed as shigatoxin-positive without isolation of a specific serogroup decreased in 2015 compared to previous years; the reasons for this are unknown.

8.1 Shigatoxigenic E. coli by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	184	114	160	109	112	145	187	123	109	132
BC Rate	4.29	2.62	3.63	2.44	2.49	3.19	4.07	2.65	2.32	2.78
Canada Rate	3.24	2.29	1.82	1.60	1.86	1.94	1.80	1.81	1.77	

8.2 Shigatoxigenic E. coli Rates by Age Group, 2016



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	5	4	2	6	6	9	8	17	17
	Male	0	7	3	3	4	4	8	8	11	10
	Total	0	12	7	5	10	10	17	16	28	27
BC Rate	Female	0.00	5.68	3.55	1.78	4.54	3.84	5.67	2.47	2.51	2.78
	Male	0.00	7.51	2.48	2.51	2.85	2.34	5.04	2.52	1.67	1.80
	Total	0.00	6.62	2.99	2.16	3.67	3.06	5.36	2.50	2.10	2.31

8.4 Shigatoxigenic E. coli Serogroup Distribution, 2016

Rank	Serogroup	Number of Isolates	Proportion
1	O157	48	49.0%
2	O26	9	9.2%
3	O121	8	8.2%
4	O117	7	7.1%
5	O103	4	4.1%
5	O111	3	3.1%
	Other	9	9.2%
	Shiga toxin positive only	10	10.2%
	Total	98	100.0%

Note: Serogroup distribution is based on BCCDC Public Health Laboratory (BCCDC PHL) data. Numbers may vary from those reported in Panorama.

Hepatitis A

In 2016, 22 cases of hepatitis A were reported in BC. There were 10 cases among females and 12 among males. These numbers continue an extended trend of decreasing hepatitis A reports, down from a high of over 1000 cases in 1992. Less than 40 hepatitis A cases have been reported each year since 2007 with the exception of 2011, when an outbreak occurred in Central Vancouver Island (105 cases).[1] This decline relates to improvements in hygiene and increasing uptake of an effective hepatitis A vaccine which is publicly available for high-risk groups and post-exposure prophylaxis. Most hepatitis A cases now seen in BC occur in unimmunized travelers to endemic countries. The vaccine is recommended for this group but is not publically funded.

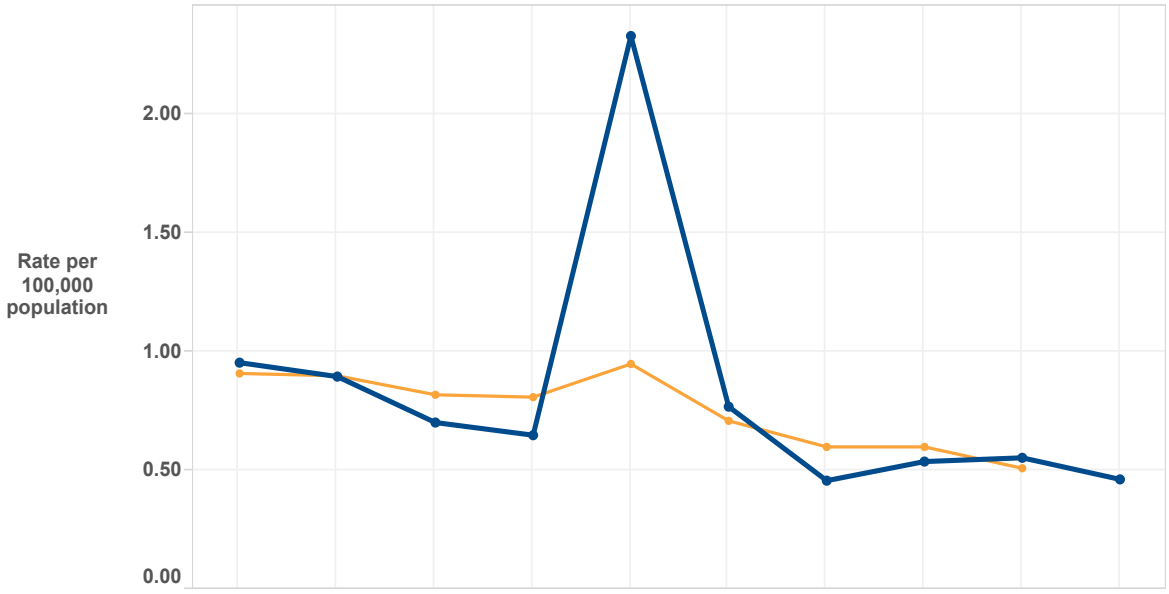
Current technology allows hepatitis A specimens to have their genomes typed, which enables public health authorities to identify clusters of cases with identical genotypes and thus helps in detecting sources of infection. For example, in 2012, a cluster of cases was connected with consumption of a frozen berry blend.[2] However, the number of reported hepatitis A cases likely underestimates the number of actual infections as many children and some adults have few to no symptoms and do not seek medical attention.

All Health Service Delivery Areas reported 4 or fewer cases in 2016, with Fraser South,Okanagan and Vancouver at 4 each. The highest rate of reported infection was in North East at 4.2/100,000, but the population of this HSDA is small, so the rate relates to only 3 reported cases.

1. Kuo M, Buxton J. Hepatitis A in British Columbia, 2010-2011. http://www.bccdc.ca/resource-gallery/Documents/Educational%20Materials/Epid/Other/HepatitisAUpdateBC2010-2011.pdf

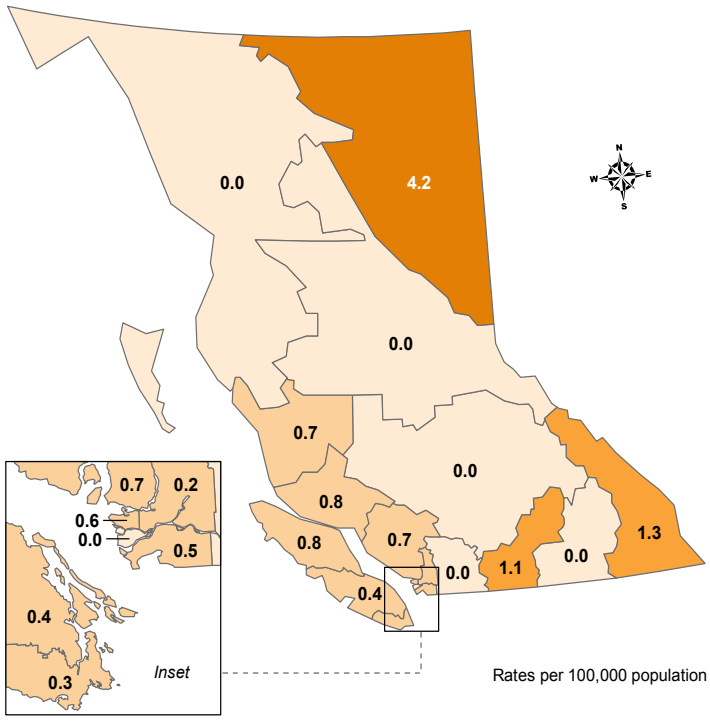
2. Swinkels H, Kuo M, Embree G, Stone J, Trerise S, Brisdon S, Louie K, Asplin R, Stiller A, Abraham T, Gill I, Rice G, Andonov A, Henry B, Buxton JA. Established surveillance, loyalty cards and collaboration allow early identification of a hepatitis A outbreak in British Columbia, Canada 2012. Eurosurveillance (2014) 19(18) http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20792

9.1 Hepatitis A Rates by Year, 2007-2016



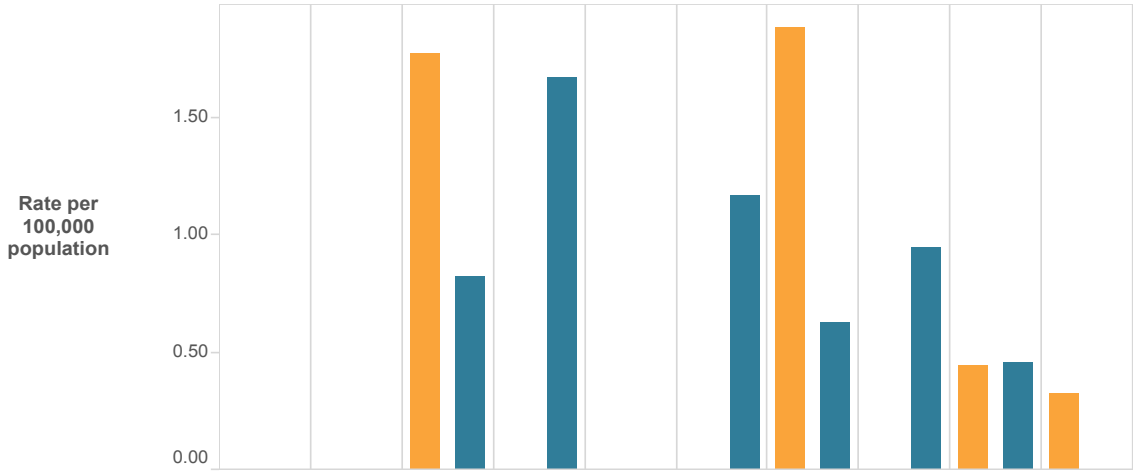
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	41	39	31	29	105	35	21	25	26	22
BC Rate	0.96	0.90	0.70	0.65	2.33	0.77	0.46	0.54	0.55	0.46
Canada Rate	0.91	0.90	0.82	0.81	0.95	0.71	0.60	0.60	0.51	

9.2 Hepatitis A Rates by HSDA, 2016



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	1	1.3
12	Kootenay Boundary	0	0.0
13	Okanagan	4	1.1
14	Thompson Cariboo Shuswap	0	0.0
21	Fraser East	0	0.0
22	Fraser North	1	0.2
23	Fraser South	4	0.5
31	Richmond	0	0.0
32	Vancouver	4	0.6
33	North Shore/Coast Garibaldi	2	0.7
41	South Vancouver Island	1	0.3
42	Central Vancouver Island	1	0.4
43	North Vancouver Island	1	0.8
51	Northwest	0	0.0
52	Northern Interior	0	0.0
53	Northeast	3	4.2

9.3 Hepatitis A Rates by Age Group and Sex, 2016

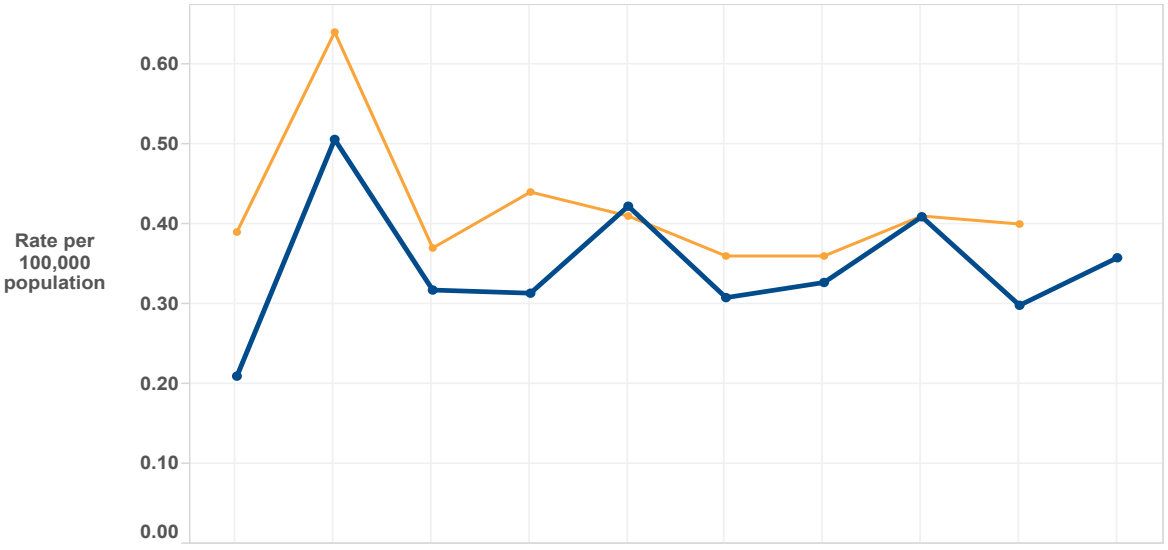


		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	2	0	0	0	3	0	3	2
	Male	0	0	1	2	0	2	1	3	3	0
	Total	0	0	3	2	0	2	4	3	6	2
BC Rate	Female	0.00	0.00	1.77	0.00	0.00	0.00	1.89	0.00	0.44	0.33
	Male	0.00	0.00	0.83	1.67	0.00	1.17	0.63	0.95	0.46	0.00
	Total	0.00	0.00	1.28	0.86	0.00	0.61	1.26	0.47	0.45	0.17

Listeriosis

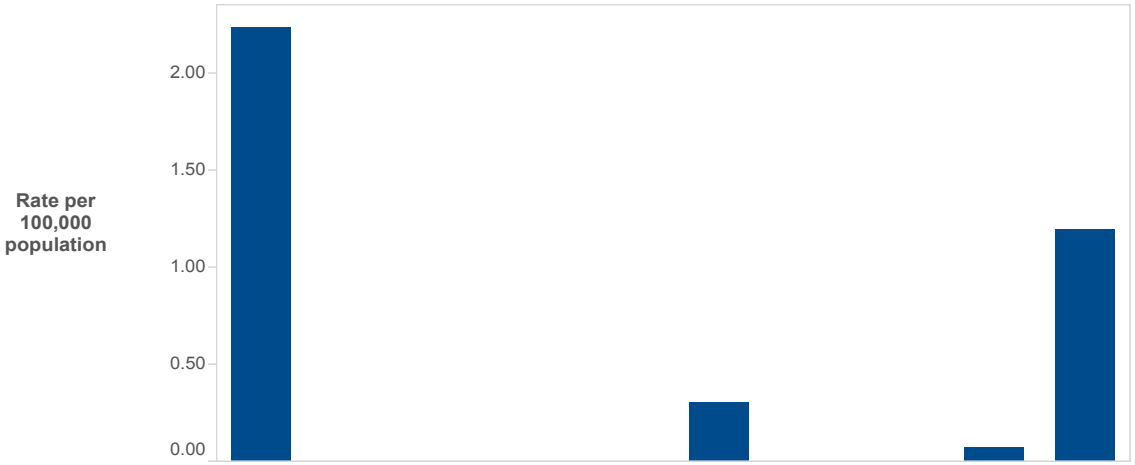
The incidence of invasive listeriosis has remained stable since 2009. Seventeen cases were reported in 2016; none were attributed to international travel. Rates were highest among adults aged sixty years and older and among those less than one year (where only a single case was reported). One outbreak was identified associated with a grocery store in Vancouver Coastal Health Authority.

10.1 Listeriosis Rates by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	9	22	14	14	19	14	15	19	14	17
BC Rate	0.21	0.51	0.32	0.31	0.42	0.31	0.33	0.41	0.30	0.36
Canada Rate	0.39	0.64	0.37	0.44	0.41	0.36	0.36	0.41	0.40	

10.2 Listeriosis Rates by Age Group, 2016



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	1	0	0	0	0	0	0	0	1	8
	Male	0	0	0	0	0	1	0	0	0	6
	Total	1	0	0	0	0	1	0	0	1	14
BC Rate	Female	4.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	1.31
	Male	0.00	0.00	0.00	0.00	0.00	0.59	0.00	0.00	0.00	1.08
	Total	2.24	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.07	1.20

Salmonellosis, Typhoid Fever and Paratyphoid Fever*

In 2016, 1,107 cases of salmonellosis (non-typhoidal) were reported (incidence rate 23.3/100,000); 20.7% were associated with international travel. Salmonella infection continues to be the second most commonly reported enteric disease in BC. Salmonella incidence in 2016 was similar to 2014 and 2015. BC rates in the last 3 years are the highest in over 20 years. This increase is mainly due to the ongoing *S.* Enteritidis outbreak.

Rates were highest in children under five years of age and among residents of Fraser East, Kootenay Boundary, North Shore/Coast Garibaldi and Northwest. As in previous years and similarly to other enteric diseases, cases were reported throughout the year with a peak in the summer.

The incidence rates of typhoid fever (0.4/100,000) and paratyphoid fever (0.4/100,000) have continued to decline or remain stable. Increased awareness and vaccination may have decreased the risk. The majority of these cases are associated with international travel, with South Asia being the most common travel location reported.

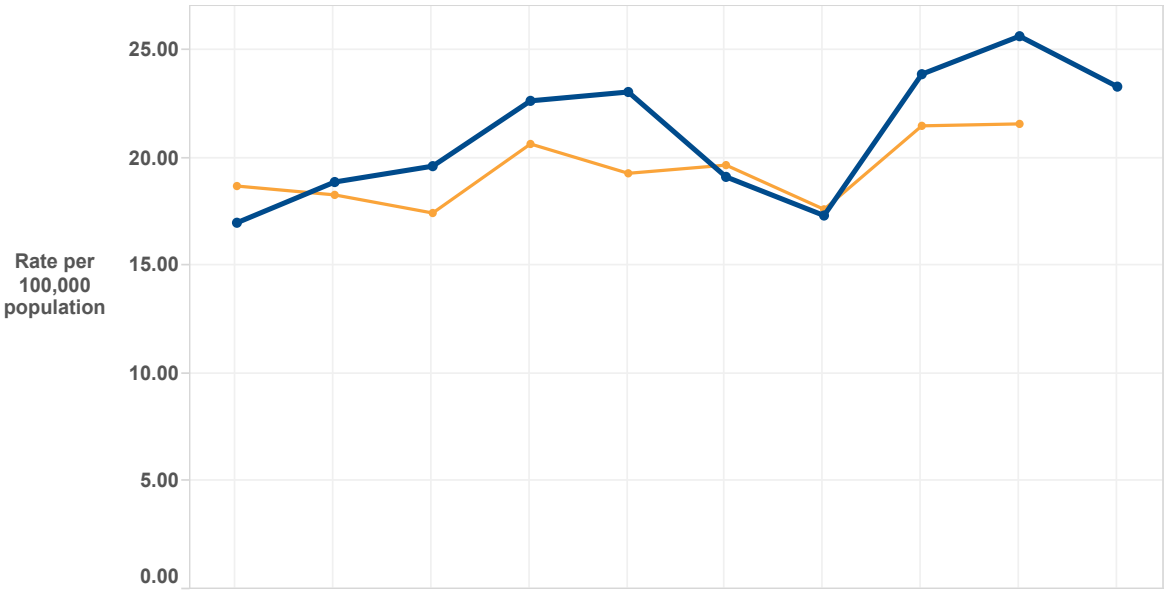
Typhoid and paratyphoid fever cases clustered in the first quarter of the year, a temporal reflection of the travel patterns of BC residents. Most cases (79%) were reported from Fraser Health Authority due to residents traveling to endemic countries. The highest incidence of typhoid fever and paratyphoid fever was in adults aged 25-39 years.

As in previous years, salmonellosis (non-typhoidal) cases were reported throughout the year with a peak in the summer, particularly in week 28.

S. Enteritidis, S. Typhimurium and S. Infantis were the most commonly reported Salmonella serotypes in 2016.. S. Enteritidis continued to account for more than half of the salmonellosis cases in BC, which has been true in the last decade. The top five serotypes in 2016 have typically been among the top 5 historically. There were six S. Enteritidis outbreak in 2016, four of them associated with a food service establishment. Eggs or chicken were identified as the most likely source in 5 of these. In 2016, an outbreak of Salmonella ssp I 4,5,12:i:- was linked to raw pet food. An investigation of S. Infantis started in 2015 and continued through 2016; fresh raw chicken was identified as the likely source.

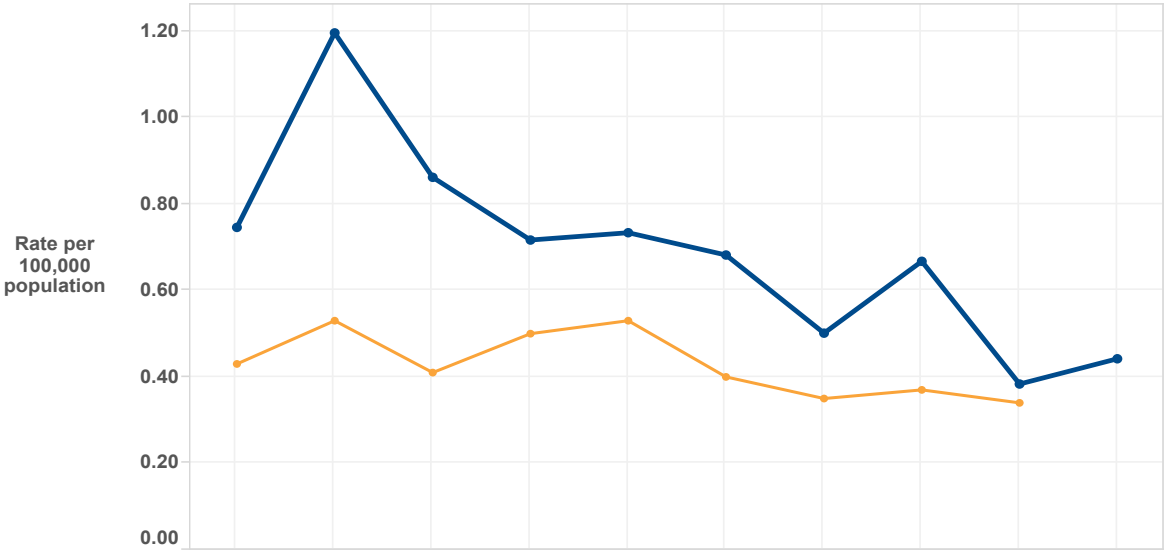
Additional analyses comparing human and food chain surveillance data are available through the BC Integrated Surveillance of Foodborne Pathogens program (www.bccdc.ca/integratedfoodchainsurveillance).

11.1 Salmonellosis (Non-Typhoidal) Rates by Year, 2007-2016



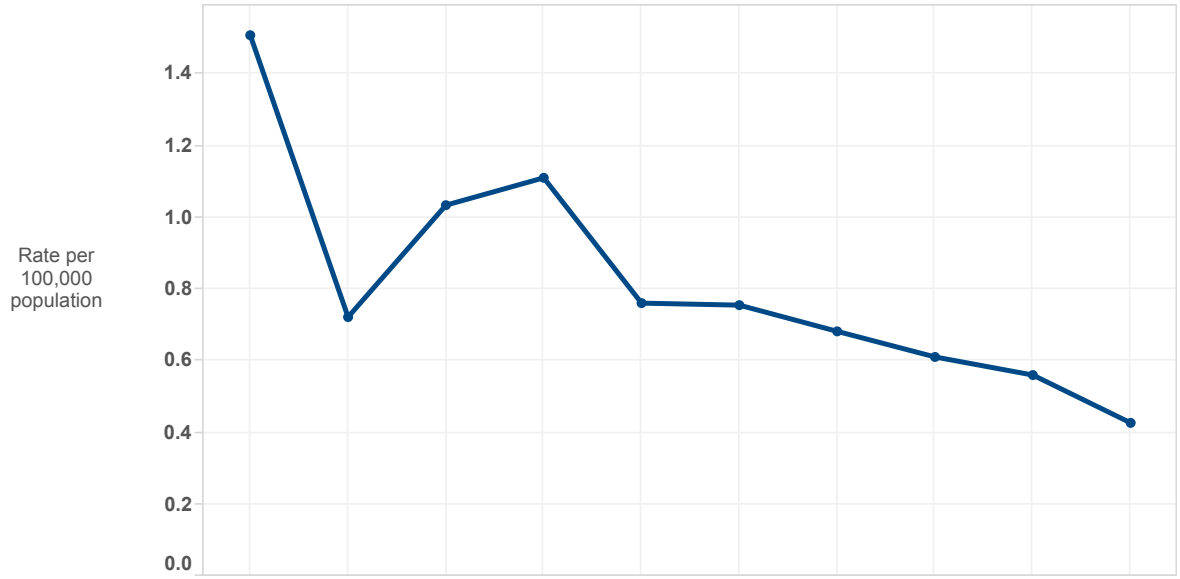
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	729	821	865	1,011	1,037	869	795	1,109	1,203	1,107
BC Rate	16.99	18.88	19.61	22.64	23.05	19.11	17.32	23.87	25.63	23.30
Canada Rate	18.69	18.28	17.44	20.64	19.28	19.66	17.61	21.48	21.57	

11.2 Salmonella Typhoid Fever Rates by Year, 2007-2016



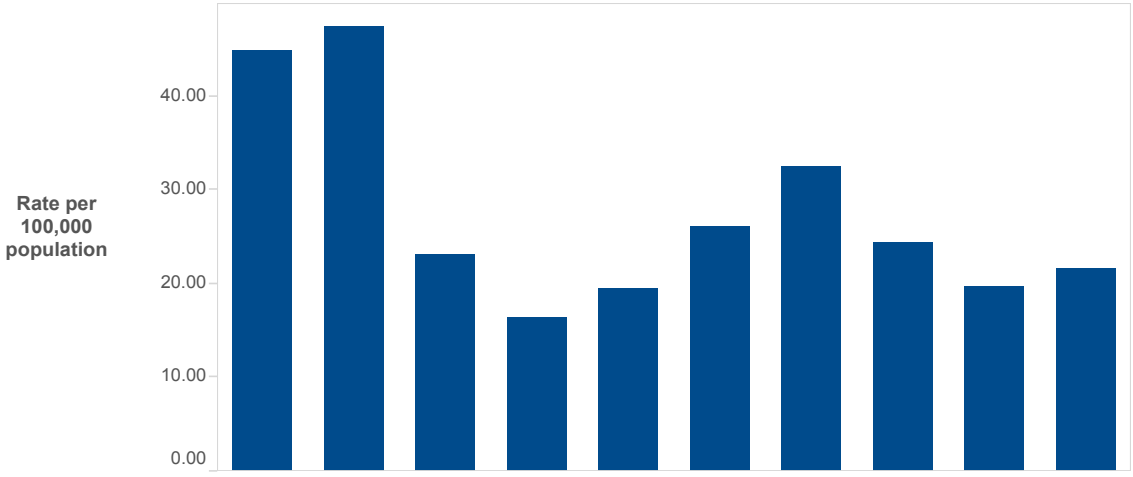
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	32	52	38	32	33	31	23	31	18	21
BC Rate	0.75	1.20	0.86	0.72	0.73	0.68	0.50	0.67	0.38	0.44
Canada Rate	0.43	0.53	0.41	0.50	0.53	0.40	0.35	0.37	0.34	

11.3 Salmonella Paratyphi (Paratyphoid fever) Rates by Year, 2007-2016



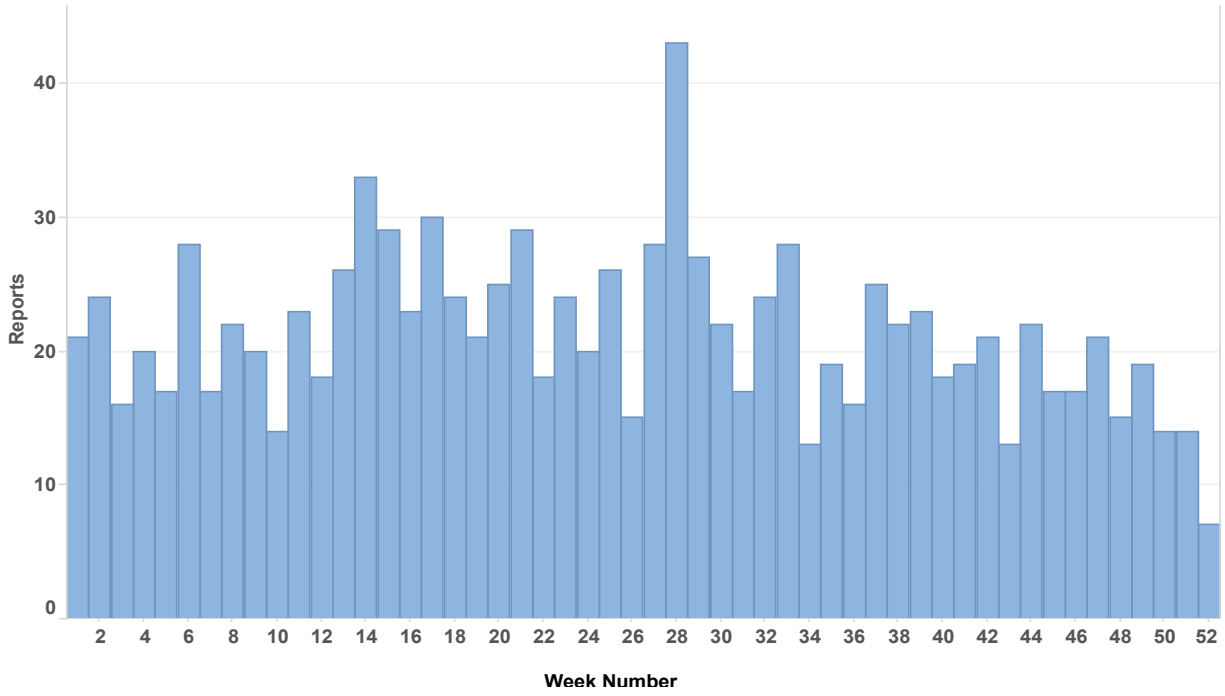
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Reports	64	31	45	49	34	34	31	28	26	20
BC Rate	1.51	0.72	1.03	1.11	0.76	0.76	0.68	0.61	0.56	0.43

11.4 Salmonellosis (Non-Typhoidal) Rates by Age Group, 2016



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	**Female**	4	39	25	9	26	46	46	77	149	128
	Male	16	47	29	29	27	39	57	79	112	123
	Total	20	86	54	38	53	85	103	156	261	251
BC Rate	**Female**	18.45	44.27	22.18	8.01	19.67	29.45	28.98	23.79	21.96	20.97
	Male	69.77	50.45	23.93	24.28	19.24	22.85	35.94	24.90	17.05	22.10
	Total	44.83	47.45	23.09	16.40	19.45	26.00	32.46	24.34	19.54	21.51

11.5 2016 Salmonellosis (Non-Typhoidal) Reports by Week



11.6 Salmonella Serotype Distribution, 2016

Rank	Serotype	Number of Cases	Proportion
1	Enteritidis	715	55.3%
2	Typhimurium	69	5.3%
3	Infantis	49	3.8%
4	*Salmonella* ssp I 4,5,12:i:	40	3.1%
5	Heidelberg	29	2.2%
6	Agona	25	1.9%
6	Newport	25	1.9%
8	Stanley	24	1.9%
9	Typhi	23	1.8%
10	Paratyphi A	21	1.6%
	Others	273	21.1%
	Total	1293	100.0%

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

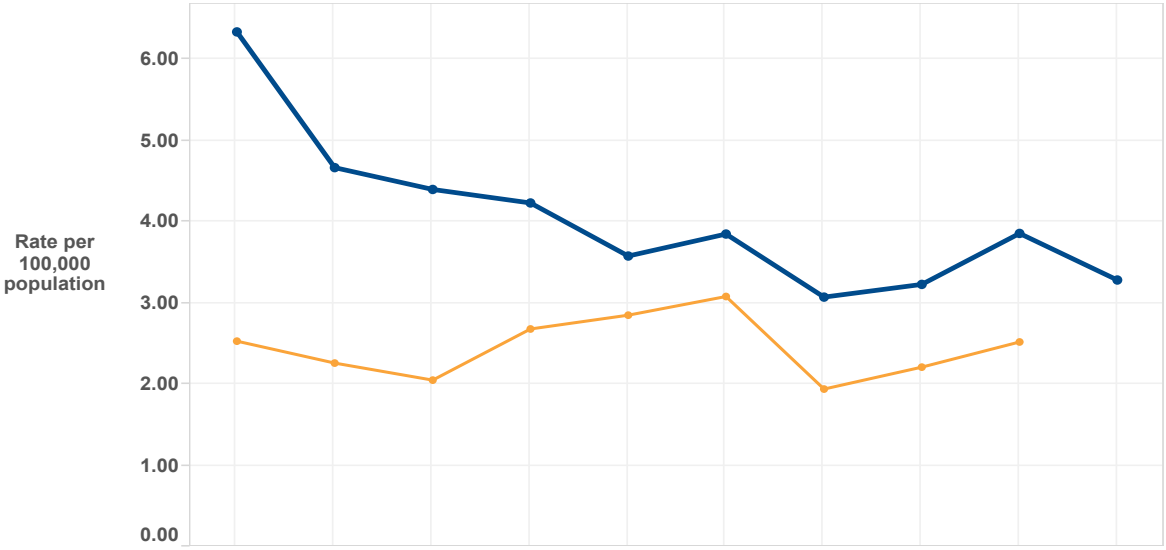
Shigellosis

In 2016, 156 cases of shigellosis were reported; 37.1% were associated with international travel. The 2016 incidence rate (3.3/100,000) was a slight decrease compared to 2015 and similar to 2013 and 2014. Incidence rates were highest in Vancouver and among males aged 25-59 years; this is the same as in previous years and is likely due to sexual transmission among males. Cases were reported throughout the year with an increase during the winter months.

In 2016, S. sonnei was the most common species reported, similar to 2015. Between 2009 and 2014, S. flexneri was the most common species.

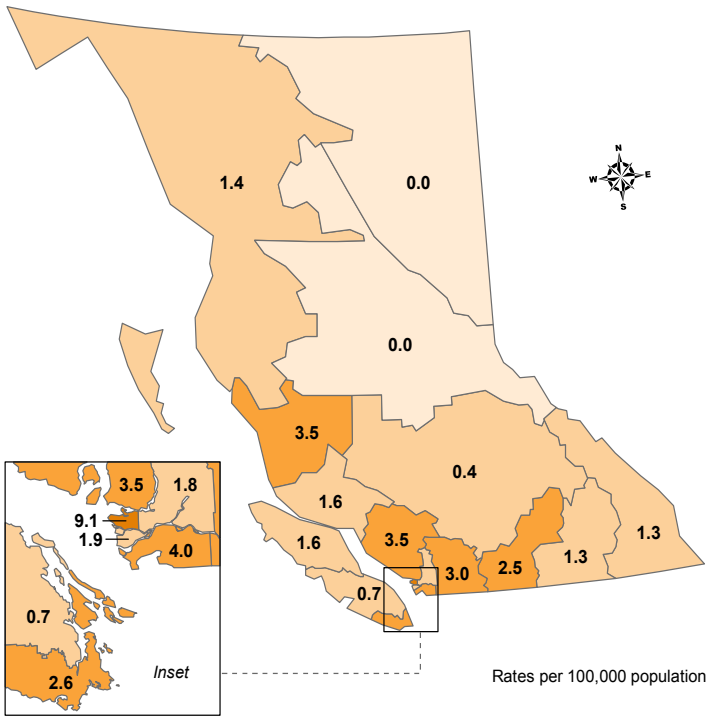
There were no Shigella outbreaks reported in 2016.

12.1 Shigellosis Rates by Year, 2007-2016



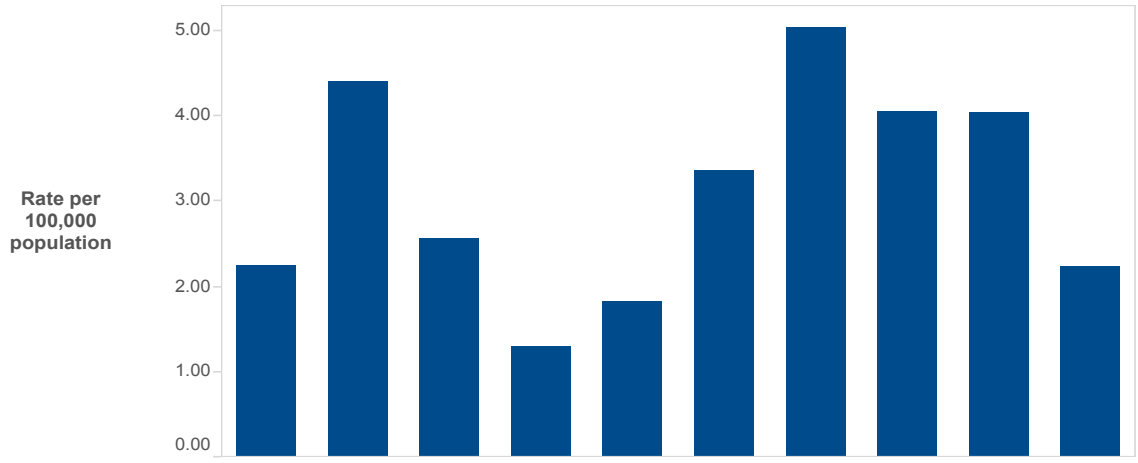
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	272	203	194	189	161	175	141	150	181	156
BC Rate	6.34	4.67	4.40	4.23	3.58	3.85	3.07	3.23	3.86	3.28
Canada Rate	2.53	2.26	2.05	2.68	2.85	3.08	1.94	2.21	2.52	

12.2 Shigellosis Rates by HSDA, 2016



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	1	1.3
12	Kootenay Boundary	1	1.3
13	Okanagan	9	2.5
14	Thompson Cariboo Shuswap	1	0.4
21	Fraser East	9	3.0
22	Fraser North	12	1.8
23	Fraser South	33	4.0
31	Richmond	4	1.9
32	Vancouver	61	9.1
33	North Shore/Coast Garibaldi	10	3.5
41	South Vancouver Island	10	2.6
42	Central Vancouver Island	2	0.7
43	North Vancouver Island	2	1.6
51	Northwest	1	1.4
52	Northern Interior	0	0.0
53	Northeast	0	0.0

12.3 Shigellosis Rates by Age Group, 2016



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	4	3	1	5	4	2	12	17	10
	Male	1	4	3	2	0	7	14	14	37	16
	Total	1	8	6	3	5	11	16	26	54	26
BC Rate	Female	0.00	4.54	2.66	0.89	3.78	2.56	1.26	3.71	2.51	1.64
	Male	4.36	4.29	2.48	1.67	0.00	4.10	8.83	4.41	5.63	2.88
	Total	2.24	4.41	2.57	1.29	1.83	3.37	5.04	4.06	4.04	2.23

12.4 Shigella Species Distribution, 2016

Rank	Species	Number of Cases	Proportion
1	*sonnei*	92	68.1%
2	*flexneri*	33	24.4%
3	*boydii*	5	3.7%
3	*dysenteriae*	2	1.5%
	Unknown/unspecified	3	2.2%
	Total	135	100.0%

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

Vibrio Infection

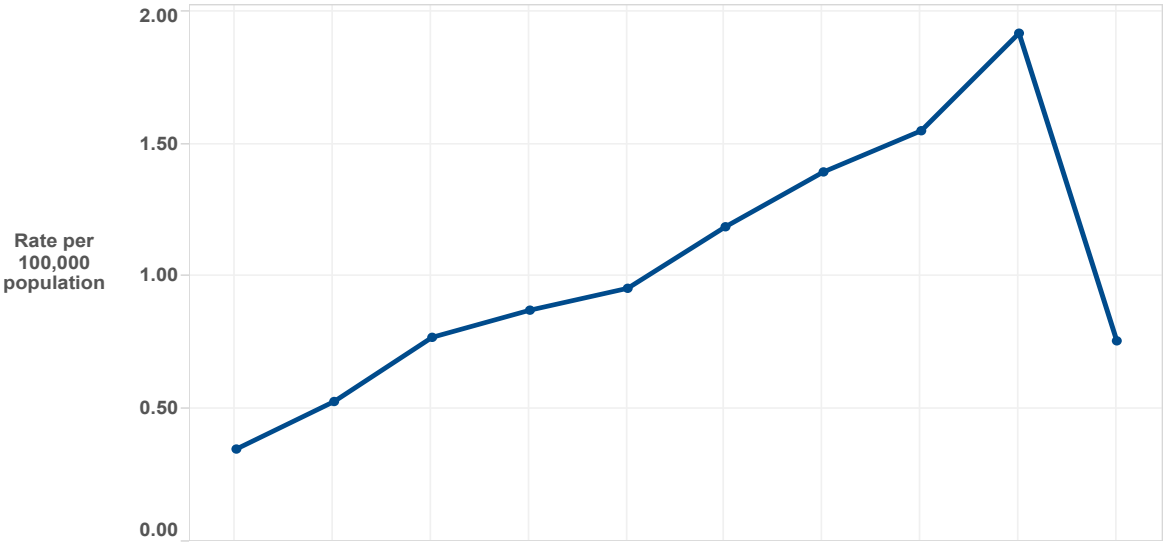
The incidence of *Vibrio* infections decreased in 2016 for the first time in a decade to 0.76/100,000. The decrease is attributable to *Vibrio parahaemolyticus* (Vp) which decreased from a high of 76 cases in 2015 to only 29 cases in 2016. Other *Vibrio* sp. rates remain low. Only 17.9% of cases were due to international travel. The reason for this decrease is unclear; it may be due to environmental changes (e.g. cooler ocean temperatures) or to improved awareness and industry practices following a large Vp outbreak in 2015.

In 2016, the highest number of cases was reported from Vancouver (8) and the highest incidence rates, from East Kootenay and North Shore/Coast Garibaldi.

Unlike previous years, the number of cases and rates reported from Island Health were very low; reasons for this are unknown. The majority of cases occurred in adults, with the highest incidence in males aged >40 years, consistent with demographic groups more likely to eat raw oysters.

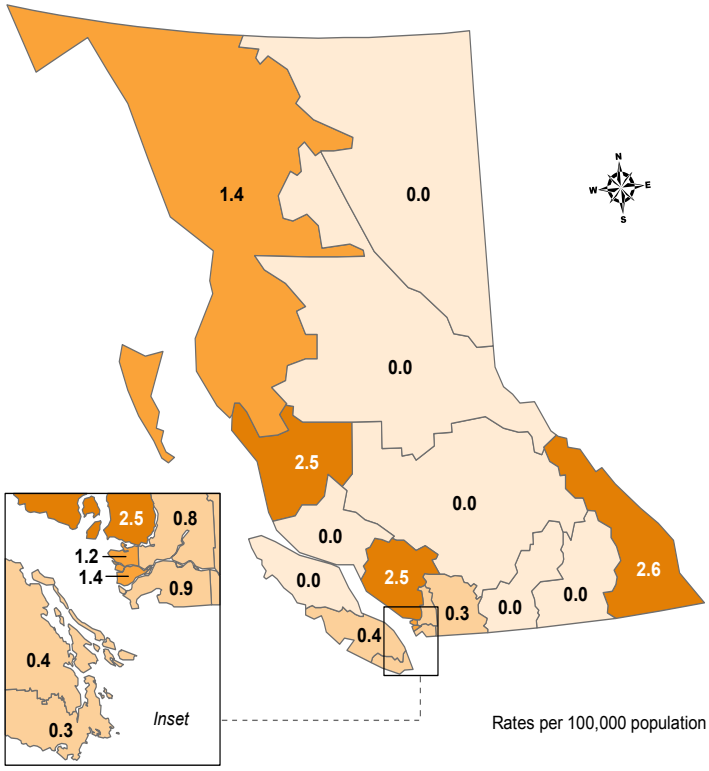
The majority of *V. parahaemolyticus* infections are caused by eating raw bivalve shellfish. Cases in children are rare and are often due to wound or ear infection following contact with ocean water.

13.1 Vibrio Infection Rates by Year, 2007-2016

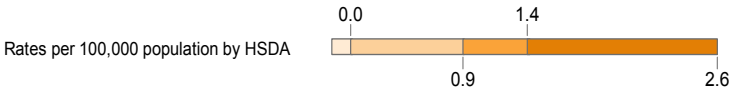


	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	15	23	34	39	43	54	64	72	90	36
BC Rate	0.35	0.53	0.77	0.87	0.96	1.19	1.39	1.55	1.92	0.76

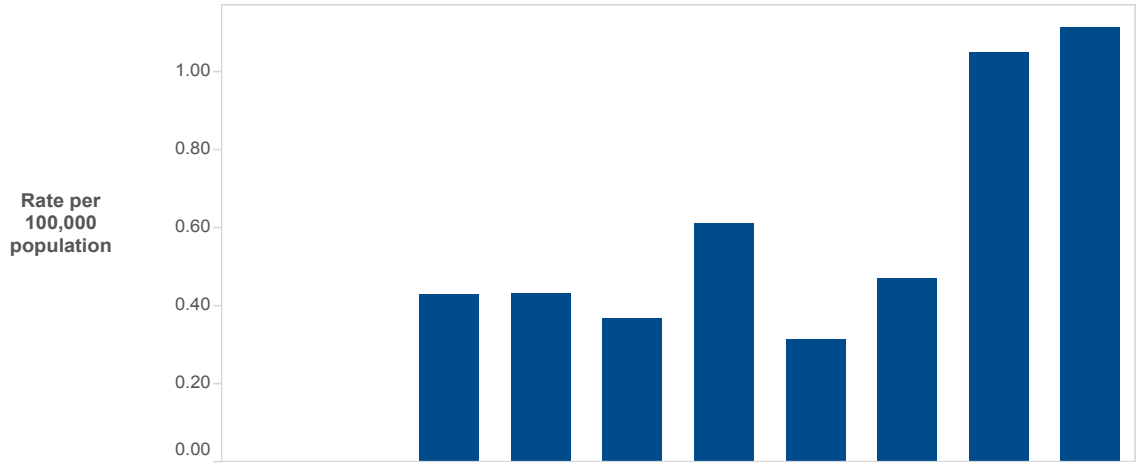
13.2 Vibrio Infection Rates by HSDA, 2016



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	2	2.6
12	Kootenay Boundary	0	0.0
13	Okanagan	0	0.0
14	Thompson Cariboo Shuswap	0	0.0
21	Fraser East	1	0.3
22	Fraser North	5	0.8
23	Fraser South	7	0.9
31	Richmond	3	1.4
32	Vancouver	8	1.2
33	North Shore/Coast Garibaldi	7	2.5
41	South Vancouver Island	1	0.3
42	Central Vancouver Island	1	0.4
43	North Vancouver Island	0	0.0
51	Northwest	1	1.4
52	Northern Interior	0	0.0
53	Northeast	0	0.0



13.3 Vibrio Infection Rates by Age Group, 2016



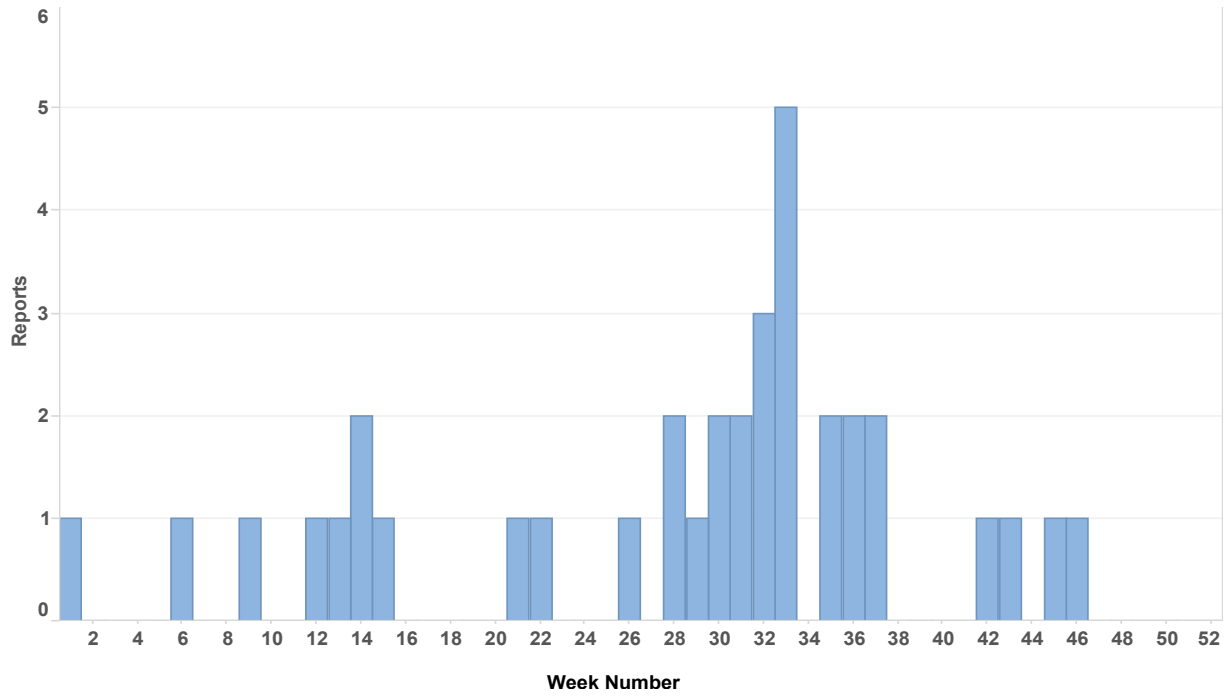
		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	1	1	0	2	0	0	4	5
	Male	0	0	0	0	1	0	1	3	10	8
	Total	0	0	1	1	1	2	1	3	14	13
BC Rate	Female	0.00	0.00	0.89	0.89	0.00	1.28	0.00	0.00	0.59	0.82
	Male	0.00	0.00	0.00	0.00	0.71	0.00	0.63	0.95	1.52	1.44
	Total	0.00	0.00	0.43	0.43	0.37	0.61	0.32	0.47	1.05	1.11

*13.4 Vibrio Species Distribution, 2016**

Rank	Species	Number of Cases	Proportion
1	*Parahaemolyticus*	29	80.6%
2	*Fluvialis*	4	11.1%
3	*Other/Unknown*	3	8.3%
	Total	36	100.0%

*Species distribution is based on Panorama data.

13.5 2016 Vibrio Infection by Week



Environmental Pathogens

Cryptococcus gattii
Legionellosis

Cryptococcus gattii Infection

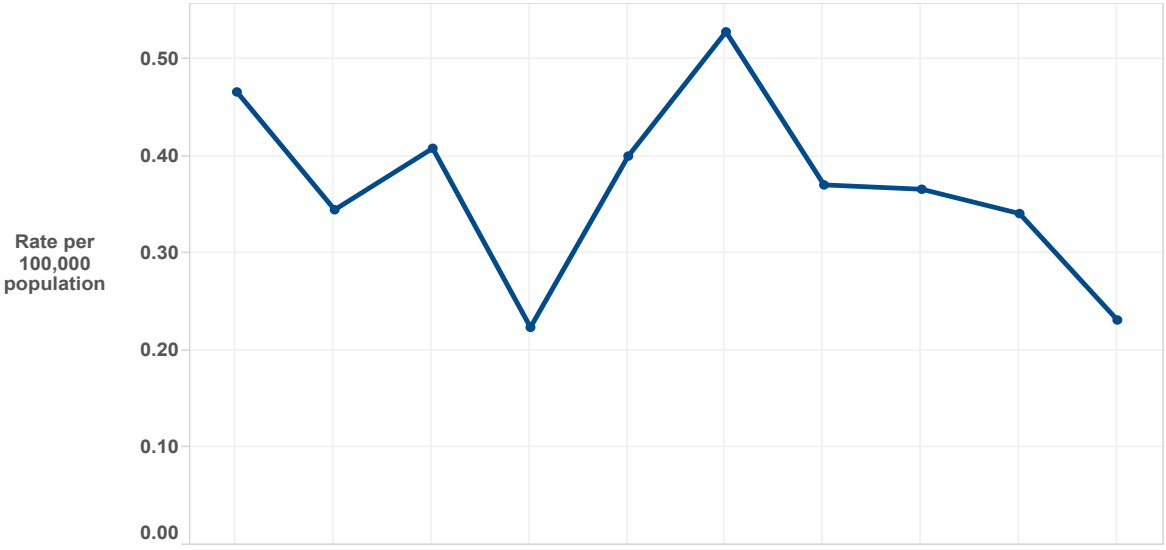
In 2016, 11 cases of *Cryptococcus gattii* infection were reported. The reason for the decrease in incidence since 2012 is unknown but may be due to a cyclical pattern in the incidence as a similar decrease was observed 5-7 years ago.

As usual, cases occurred in adults with the highest rate in those aged 60 years and over. Older age is one of the most important risk factors in *C. gattii* infection.

The central and southern east coast of Vancouver Island and the Lower Mainland are considered endemic areas. Although over half of the cases (6) were reported from the mainland in 2016, the highest rate was reported from Central Vancouver Island, as has been the case since this disease emerged in 1999.

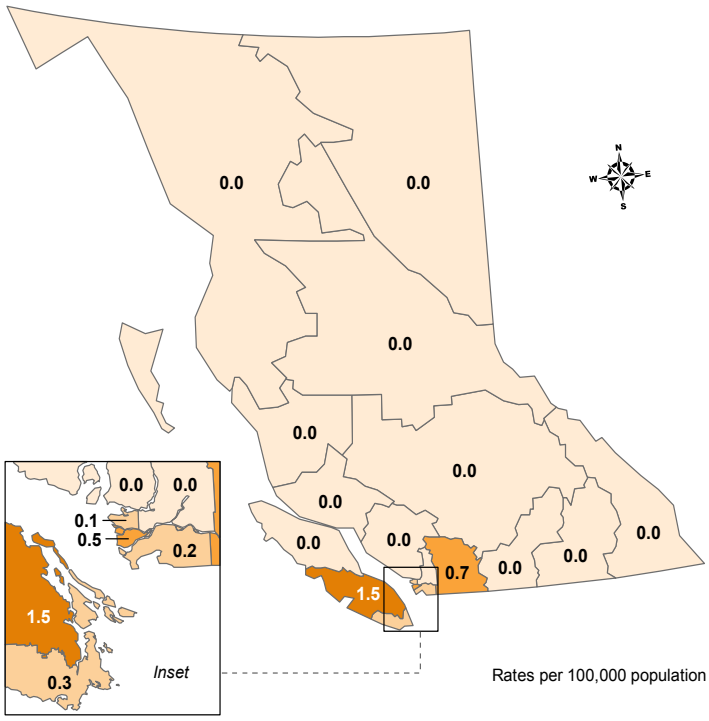
1. Mak S, Klinkenberg B, Bartlett K, Fyfe M. Ecological Niche Modelling of Crytptoccus gattii in British Columbia, Canada. Environ H Persp. 2010;118(5):653-8.

14.1 Crytococcus gattii Rates by Year, 2007-2016



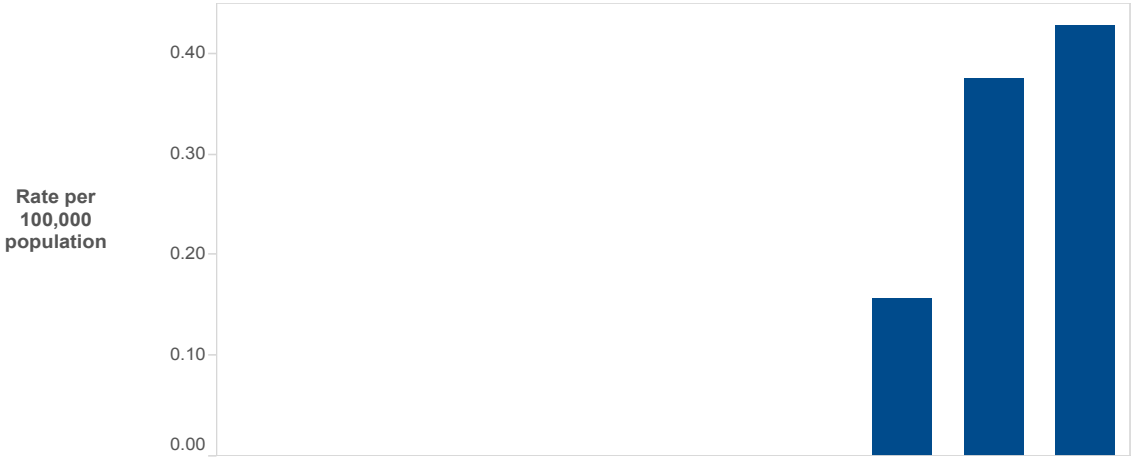
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	20	15	18	10	18	24	17	17	16	11
BC Rate	0.47	0.34	0.41	0.22	0.40	0.53	0.37	0.37	0.34	0.23

14.2 *Crytococcus gattii Rates by HSDA, 2016*



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	0	0.0
13	Okanagan	0	0.0
14	Thompson Cariboo Shuswap	0	0.0
21	Fraser East	2	0.7
22	Fraser North	0	0.0
23	Fraser South	2	0.2
31	Richmond	1	0.5
32	Vancouver	1	0.1
33	North Shore/Coast Garibaldi	0	0.0
41	South Vancouver Island	1	0.3
42	Central Vancouver Island	4	1.5
43	North Vancouver Island	0	0.0
51	Northwest	0	0.0
52	Northern Interior	0	0.0
53	Northeast	0	0.0

14.3 *Crytococcus gattii Rates by Age Group, 2016*



		<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	3	2
	Male	0	0	0	0	0	0	0	0	2	3
	Total	0	0	0	0	0	0	0	1	5	5
BC Rate	Female	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.44	0.33
	Male	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.54
	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.37	0.43

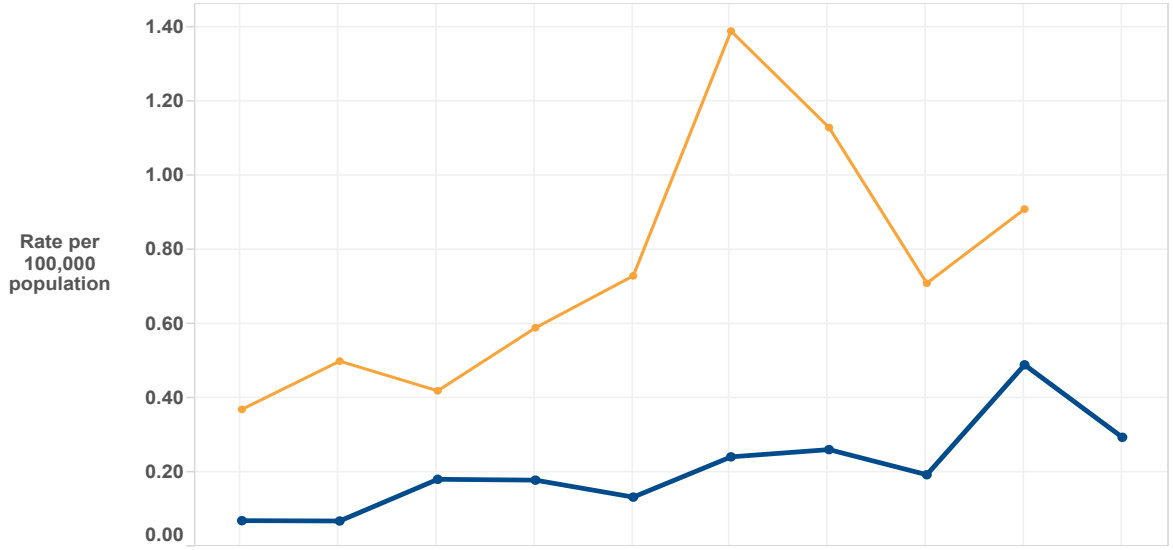
Legionellosis

In 2016, the incidence of legionellosis dropped slightly to 0.29/100,000 as compared to 2015 but continues to show an increasing trend over the last decade. This may be related to increasing use of urine antigen testing in the last few years.[1] The BC incidence rate has remained lower than the national rate during the whole decade; the reasons for this are unclear.

No outbreaks were identified in 2016. The majority of cases were once again reported from Fraser Health (n=8). This is likely due to the region's higher usage of urine antigen testing. All reported cases were in adults. The highest rates were observed in adults >40 years; older age and comorbidities are risk factors for infection. Cases were reported throughout the year, although, as in previous years, a higher proportion of cases occurred in the fall and early winter. This may be due to a true seasonal pattern or increased detection due to respiratory illness testing.

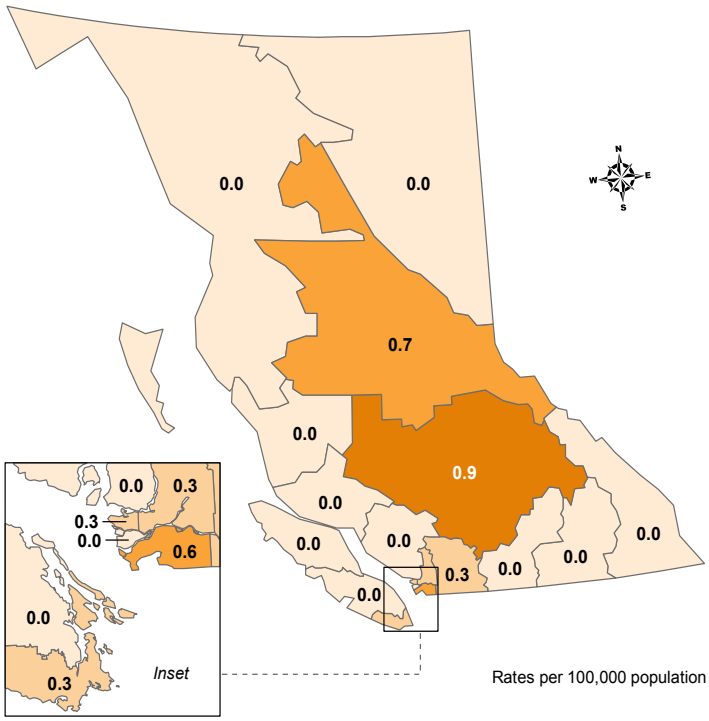
1. Morshed M, Chang Y, Hoang L. Diagnostic testing for Legionnaires' Disease: Trends in BC. BCMJ. 2016;57(10):452-3.

15.1 Legionellosis Rates by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	3	3	8	8	6	11	12	9	23	14
BC Rate	0.07	0.07	0.18	0.18	0.13	0.24	0.26	0.19	0.49	0.29
Canada Rate	0.37	0.50	0.42	0.59	0.73	1.39	1.13	0.71	0.91	

15.2 Legionellosis Rates by HSDA, 2016



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	0	0.0
13	Okanagan	0	0.0
14	Thompson Cariboo Shuswap	2	0.9
21	Fraser East	1	0.3
22	Fraser North	2	0.3
23	Fraser South	5	0.6
31	Richmond	0	0.0
32	Vancouver	2	0.3
33	North Shore/Coast Garibaldi	0	0.0
41	South Vancouver Island	1	0.3
42	Central Vancouver Island	0	0.0
43	North Vancouver Island	0	0.0
51	Northwest	0	0.0
52	Northern Interior	1	0.7
53	Northeast	0	0.0

15.3 Legionellosis Rates by Age Group, 2016

		<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	2	0
	Male	0	0	0	0	0	0	1	2	4	5
	Total	0	0	0	0	0	0	1	2	6	5
BC Rate	Female	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00
	Male	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.63	0.61	0.90
	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.31	0.45	0.43

Disease Transmitted by Respiratory Routes

Enterovirus D68 (EV-D68)
Streptococcal Disease Group A (invasive)
Tuberculosis

Enterovirus D68 (EV-D68)

Enterovirus D68 (EV-D68) is a non-polio enterovirus that causes mild to severe respiratory illness. People with asthma and other lung conditions may be at higher risk of more serious respiratory complications. Although most EV-D68 cases present with mild respiratory illness, EV-D68 infection has also been associated with neurological features characterized by acute flaccid paralysis in a small subset of cases.

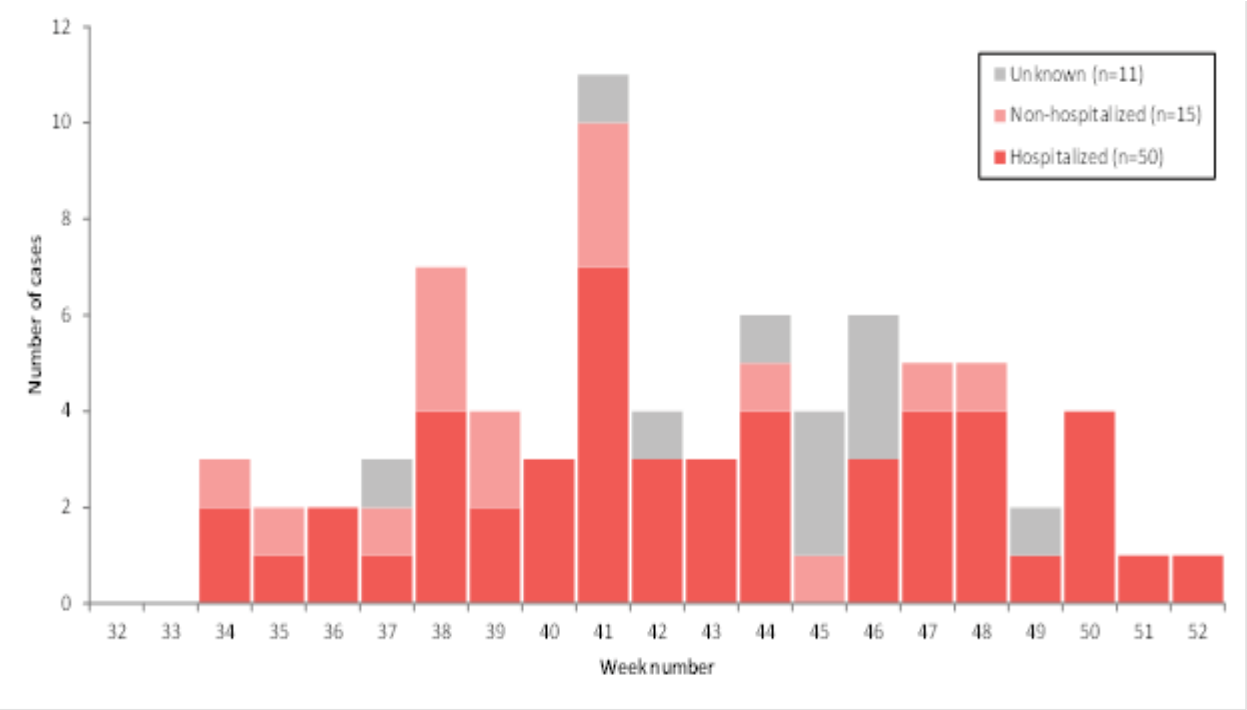
The BCCDC Public Health Laboratory (PHL) is the only site provincially to provide confirmatory EV-D68 diagnosis. Between mid-August and December 2016, the BCCDC PHL performed EV-D68 testing on all specimens specifically referred for that testing and also on a subset of routine laboratory submissions. Routine EV-D68 testing was pursued on respiratory specimens collected from patients ≤20 years old, hospitalized patients of any age, patients involved in residential care facility outbreaks or those attending designated community-based sentinel sites. EV-D68 diagnosis by the BCCDC PHL triggered enhanced surveillance and report of associated epidemiological features by local health authorities to the BCCDC.

During this period, 76 cases of EV-D68 infection were reported to the BCCDC,[1] of which at least 50 were severe cases requiring hospitalization; hospitalization status was unknown for 11 reported cases. EV-D68 detections in BC peaked in mid-October 2016 (week 41) (figure 16.1). The median age of cases, both overall and among those requiring hospitalization, was 2 years (range: <1 to 90-95 years and <1 to 65-69 years, respectively). More than three-quarters of cases overall and among those hospitalized (60/76; 79% and 41/50; 82%, respectively) were children <10 years of age, while about half (32/76; 42% and 23/50; 46%, respectively) were infants/toddlers <2 years of age. Males were over-represented among detections overall (49/76; 64%), including among those known to have been hospitalized (35/50; 70%). Two children experienced neurologic illness associated with EV-D68 infection; both cases were <2 years old and presented with arm paralysis. However, it remains unclear to what extent EV-D68 infection caused or contributed to these severe manifestations.

The last nationwide outbreak of EV-D68 occurred in 2014, as described in Euro Surveillance for the enhanced surveillance period spanning end-August to end-October 2014 available from: www.eurosurveillance.org/ViewArticle.aspx?ArticleId=21283 . Of note, despite systematic testing of over 700 respiratory specimens at the BCCDC PHL for EV-D68 during August and September 2015, no EV-D68 cases were detected in BC during the fall 2015, consistent with an expected 2-3 year periodicity. The 2014 epidemic, compared to 2016, included more reports associated with neurological features (5 vs. 2) or fatal outcome (3 vs. 0) but a smaller proportion of cases involving children <2 years of age (17% among cases overall and hospitalized in 2014).

1. An additional 3 laboratory-confirmed EV-D68 cases were detected at the BCCDC PHL for which enhanced surveillance information was unavailable.

16.1 Number of laboratory-confirmed enterovirus D68 (EV-D68) cases by hospitalization status and week of specimen collection, British Columbia, August to December, 2016*



* Counts are based on number of cases/patients; where multiple specimens per patient were collected, the earlier collection date was used if specimens were collected on different days.

Streptococcal Disease Group A (invasive) - iGAS

Information about Streptococcal Disease Group A (invasive) can be found in the “Noteworthy Disease and Condtion in 2016” section.

Tuberculosis

In 2016 there were 225 cases of reported tuberculosis in British Columbia, for a rate of 4.7 per 100,000, a 18% decrease in the number and 19% decrease in the rate of reported cases compared to 2015*.

Rates for Health Regions vary across the province. The Vancouver, Fraser South, Richmond and Fraser North health service delivery areas have rates exceeding the provincial rate (4.7/ 100,000 population). The highest incidence was reported from Vancouver and Fraser South (9.5 and 7.8/ 100,000 population respectively) while the lowest was in Kootenay Boundary and South Vancouver Island (none and 0.8/ 100,000 population respectively).

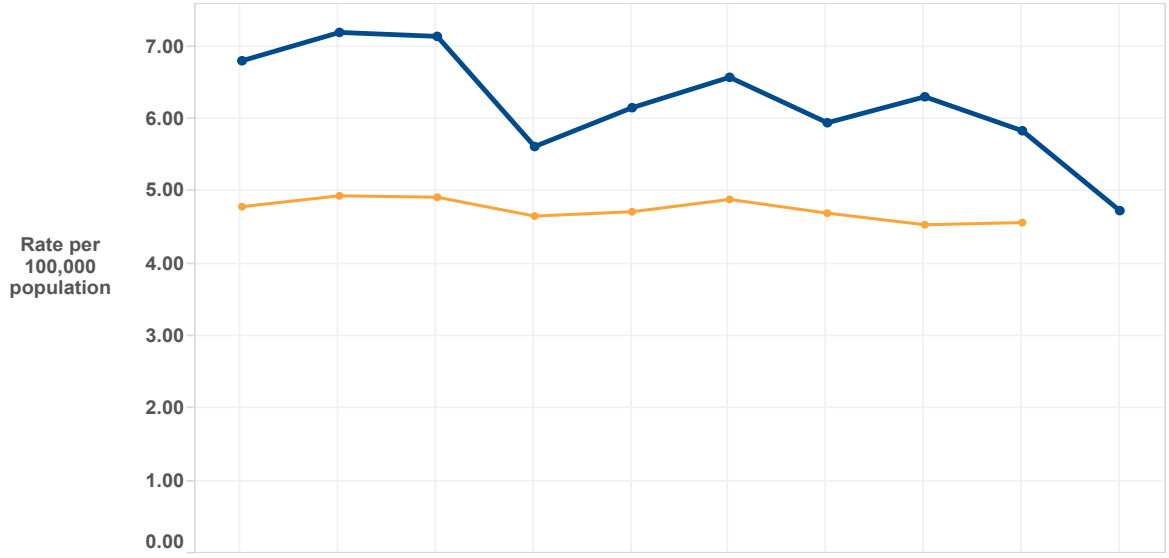
Compared to 2015, the rate of tuberculosis increased in Northeast, Thompson Cariboo Shuswap, Fraser South and North Shore/Coast Garibaldi with Northeast showing the largest increase in rate of tuberculosis (from 1.4 to 2.8/ 100,000 population). In East Kootenay the rate remained the same. In Northwest, Richmond, Vancouver, North Vancouver Island, Northern Interior and Fraser East the rate of tuberculosis decreased with Northwest and Richmond showing the largest decrease in rate of tuberculosis (from 8.4 to 1.4 and from 11.4 to 5.6/ 100,000 population, respectively).

This trend of decreasing incidence mirrors that seen for Canada as a whole, however, active TB incidence in BC remains higher than the Canadian rate. The large number of foreign born individuals entering the province from high-incidence countries may be a contributing factor.

The age specific rates are shown in figure 17.3. Overall, the tuberculosis rate was higher in men than in women (5.2 vs 4.3 per 100,000). For the age group < 40 years the rate of tuberculosis in women was higher than in men (4.0 vs 2.4). In those >= 40 years old, the rate of tuberculosis in men was higher than that in women (7.7 vs 4.6 per 100,000).

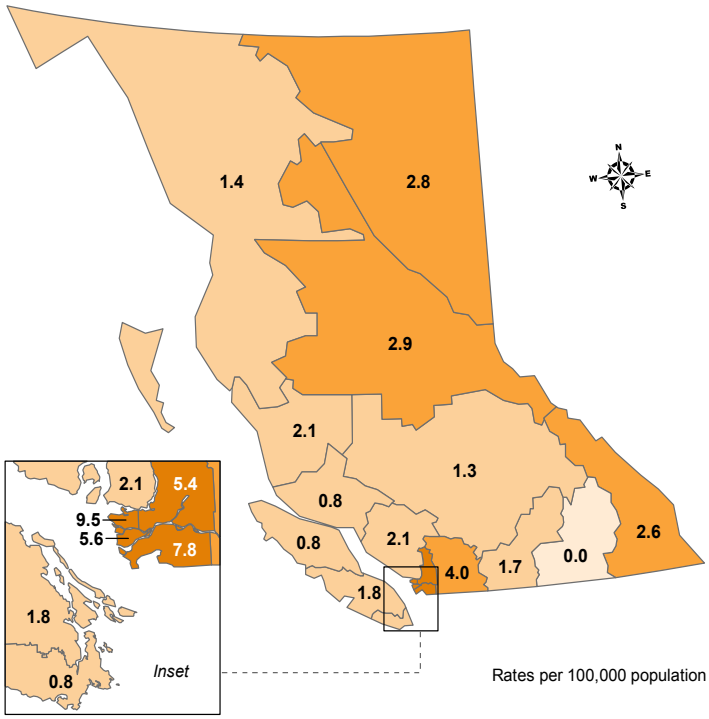
* Note that the data provided here represents a preliminary snapshot of TB data as of Mar-April 2017. Final case totals are refined over time and 2016 values may continue to shift with the accumulation of additional data. Please see the BCCDC TB Annual Reports for final numbers.

17.1 Tuberculosis Rates by Year, 2007-2016

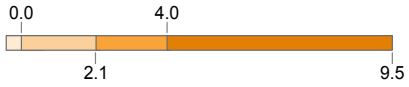


	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	292	313	315	251	277	299	273	293	274	225
BC Rate	6.80	7.20	7.14	5.62	6.16	6.58	5.95	6.31	5.84	4.74
Canada Rate	4.79	4.94	4.92	4.66	4.72	4.89	4.70	4.54	4.57	

*17.2 Tuberculosis Rates by HSDA, 2016***



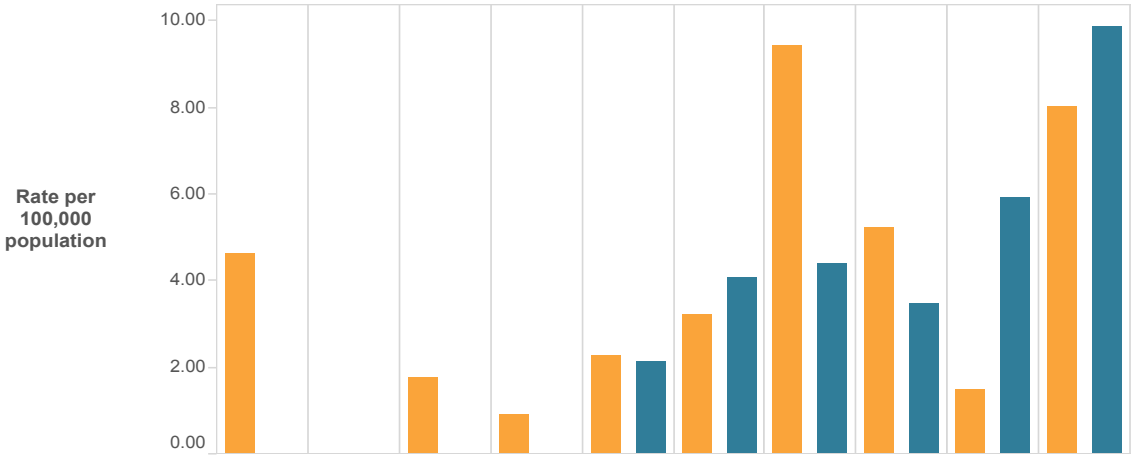
ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	2	2.6
12	Kootenay Boundary	0	0.0
13	Okanagan	6	1.7
14	Thompson Cariboo Shuswap	3	1.3
21	Fraser East	12	4.0
22	Fraser North	36	5.4
23	Fraser South	64	7.8
31	Richmond	12	5.6
32	Vancouver	64	9.5
33	North Shore/Coast Garibaldi	6	2.1
41	South Vancouver Island	3	0.8
42	Central Vancouver Island	5	1.8
43	North Vancouver Island	1	0.8
51	Northwest	1	1.4
52	Northern Interior	4	2.9
53	Northeast	2	2.8



Rates per 100,000 population by HSDA

** Note that 4 Tuberculosis case are missing HSDA information and are not reported in the map.

17.3 Tuberculosis Rates by Age Group and Sex, 2016



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	1	0	2	1	3	5	15	17	10	49
	Male	0	0	0	0	3	7	7	11	39	55
	Total	1	0	2	1	6	12	22	28	49	104
BC Rate	Female	4.61	0.00	1.77	0.89	2.27	3.20	9.45	5.25	1.47	8.03
	Male	0.00	0.00	0.00	0.00	2.14	4.10	4.41	3.47	5.94	9.88
	Total	2.24	0.00	0.86	0.43	2.20	3.67	6.93	4.37	3.67	8.91

Sexually Transmitted and Bloodborne Pathogens

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

Chlamydia (genital)

Genital chlamydia is the most common reportable infection in BC. As the majority of chlamydia infections are asymptomatic, the reported number of chlamydia infections is only a fraction of the total population burden. If untreated, genital chlamydia may lead to complications such as pelvic inflammatory disease (a major cause of infertility, ectopic pregnancy, and chronic pain) in women and epidymo-orchitis in men.

Mirroring the national trend, genital chlamydia rates have been steadily increasing since the late 1990s. There are multiple reasons thought to be responsible for this increase, some of which are related to surveillance such as the increases in the sensitivity of laboratory tests and uptake of testing (e.g. greater acceptability of urine-based tests among men). Changes in behaviour, such as decreased condom use, may also be contributing to increasing chlamydia incidence.

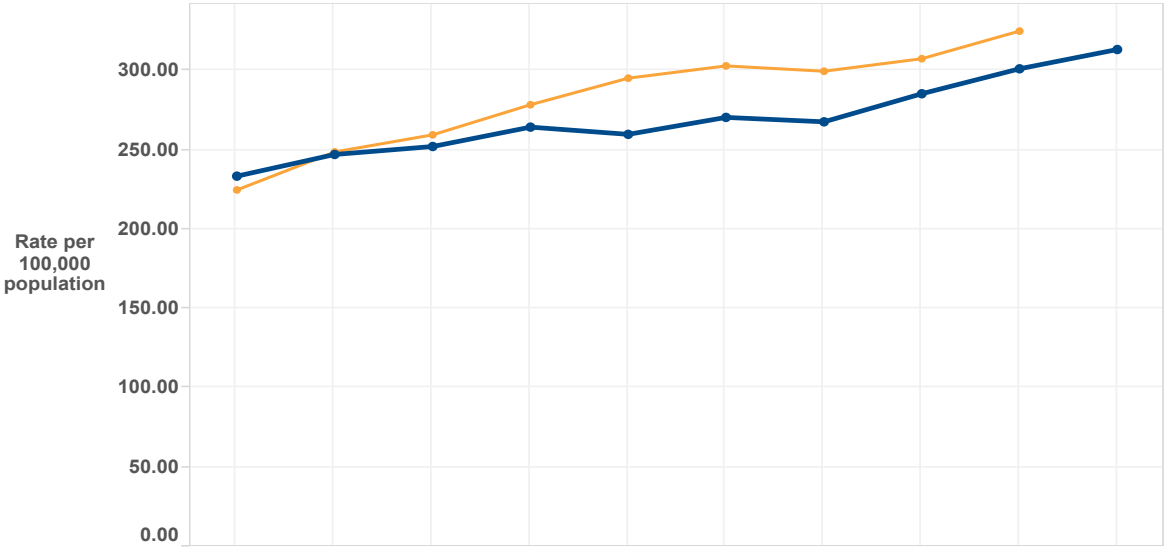
Females are more likely to be diagnosed with chlamydia compared to males. The greater number of infections among females is partially due to routine screening performed at the time of visits that were for other reasons (e.g. pap testing or contraception counselling).

Of concern is the rising number of lymphogranuloma venereum (LGV) reported. LGV is caused by three specific serovars of chlamydia (L1, L2, and L3). The clinical presentation of LGV includes genital papules, ulcers, inguinal lymphadenopathy and hemorrhagic proctitis. If left untreated, LGV can cause serious sequelae such as lymphatic obstruction or anogenital ulcerations. LGV was first reported in Canada in 2003 and in BC in 2004. A provincial enhanced surveillance program for LGV was initiated in 2004. Since 2011, positive rectal chlamydia samples are routinely sent to the National Microbiology Laboratory for LGV serovar testing.

For more information on chlamydia and LGV, please see the STI Annual Report.

interactive dashboard

18.1 Genital Chlamydia Rates by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	10,020	10,751	11,124	11,809	11,692	12,300	12,288	13,261	14,135	14,889
BC Rate	233.51	247.18	252.21	264.42	259.87	270.55	267.77	285.47	301.20	313.35
Canada Rate	224.82	248.78	259.56	278.54	295.28	303.02	299.66	307.55	324.97	

Gonorrhea (genital)

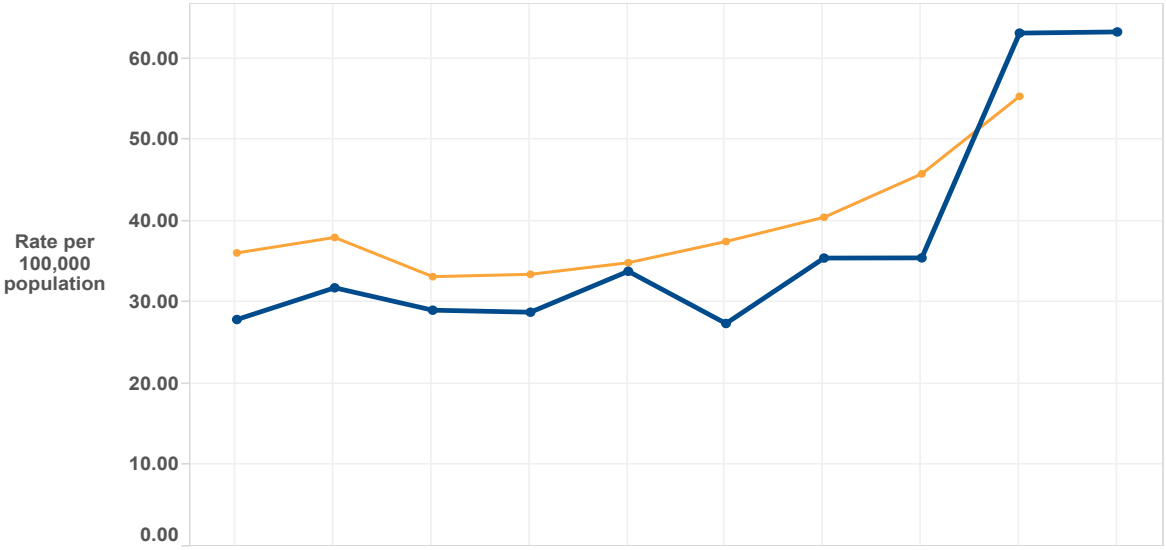
As is the case for genital chlamydia infection, only a portion of genital gonorrhea infections are asymptomatic and as a result, the infection is under-diagnosed and under-reported. If untreated, genital gonorrhea may lead to complications such as pelvic inflammatory disease (a major cause of infertility, ectopic pregnancy, and chronic pain) in women and epididymitis and prostatitis in men.

Rates of genital gonorrhea have been increasing since the late 1990s across Canada. However, from 2014 to 2015, there was a 70% increase in the rate of gonorrhea in British Columbia resulting in the highest number of cases reported in over a decade. The number of gonorrhea cases reached an all-time high in 2016, yet remains effectively unchanged since 2015. In 2016, 20-24 year olds had the highest rates among females, with 25-29 years old having the highest rates in males. The diagnosis rate of gonorrhea among men is approximately twice that among females which is partially due to the greater likelihood that males infected with gonorrhea will have symptoms. Gonorrhea is also more likely to be concentrated in sexually active networks; higher rates of gonorrhea among gay, bisexual and other men who have sex with men contribute, in part, to higher overall rates in males. While provincial surveillance data do not permit identification of cases among gay, bisexual, and other men who have sex with men, this has been observed in other jurisdictions.

Reasons for the overall gonorrhea increase are being investigated, but could include changes to both testing frequency and testing methods or be due to differences in the prevalent gonorrhea strain. The BCCDC is collaborating with the provincial laboratory and the National Microbiology Laboratory (NML) to investigate reasons for the dramatic increase in gonorrhea cases.

For more information on gonorrhea, please see the STI Annual Report.

19.1 Genital Gonorrhea Rates by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	1,198	1,384	1,282	1,287	1,523	1,247	1,628	1,649	2,963	3,007
BC Rate	27.92	31.82	29.07	28.82	33.85	27.43	35.48	35.50	63.14	63.28
Canada Rate	36.11	38.01	33.19	33.48	34.90	37.51	40.49	45.83	55.36	

Hepatitis B

Hepatitis B infections are either acute or chronic in nature. Acute infections are new infections and often symptomatic in adults. Chronic infections are those where the hepatitis B surface antigen (HBsAg) is detectable for more than six months. When it is not known whether a reported case of hepatitis B is acute or chronic and no follow up is available, the case is usually chronic but may be classified as undetermined. Most hepatitis B infections reported in BC are chronic infections that occur in people who have immigrated from regions with high hepatitis B prevalence such as East Asia and South Asia.

Since many chronic infections are asymptomatic, often they're only detected in the course of testing for example for insurance medicals or for people in high risk groups such as people who use intravenous drugs. Pregnant women are also routinely tested as hepatitis B can pass from mother to child; the transmission risk is reduced by giving newborns born to mothers with hepatitis B infection both hepatitis B vaccine and hepatitis B immuno-globulin soon after birth.

Hepatitis B - Chronic and Undetermined

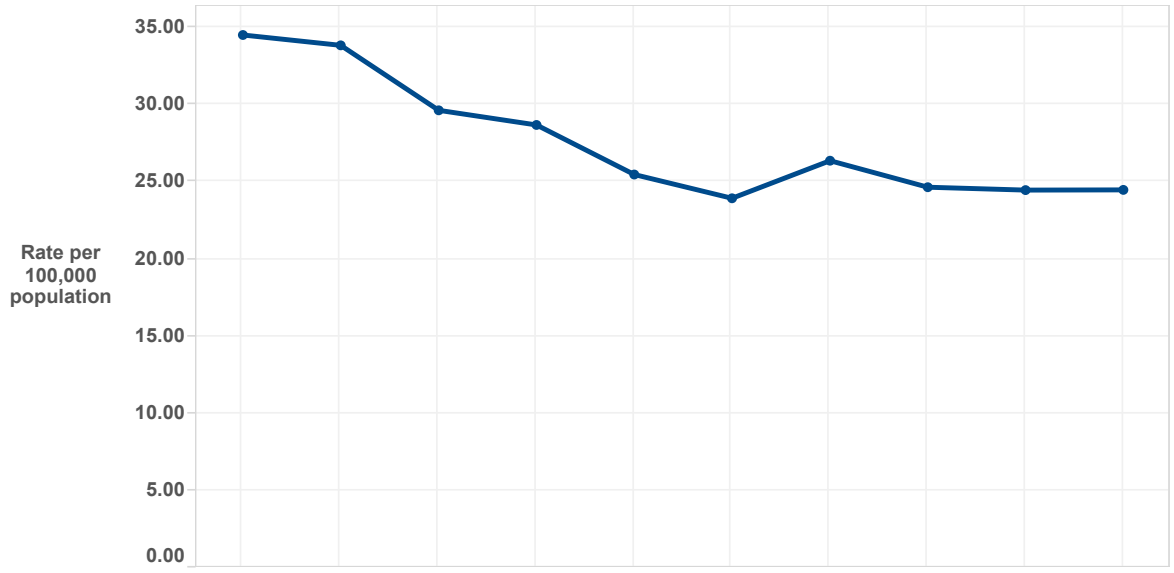
In 2016, 1,163 cases of chronic hepatitis B were reported in BC, a slight increase from 2015 but consistent with several years of generally stable numbers. However, the 2016 numbers represent a significant decline from historic highs of more than 3,000 cases reported in 1990. As in previous years, the vast majority of reported cases were identified in areas with high immigrant populations from endemic areas i.e. 87% of cases occurred within Vancouver, Richmond, Fraser South, Fraser East, and Fraser North HSDAs. Most cases occur in adults with more males in all age groups except 15 – 19 and 25 – 39 years. The period of female predominance may be associated with routine prenatal testing. The lack of reported cases in young children and infants reflects the effectiveness of the public vaccination program in BC and elsewhere.

Please note as provincial standards for tracking hepatitis B vary, it is not possible to compare BC rates of infection to Canadian rates.

Hepatitis B - Acute

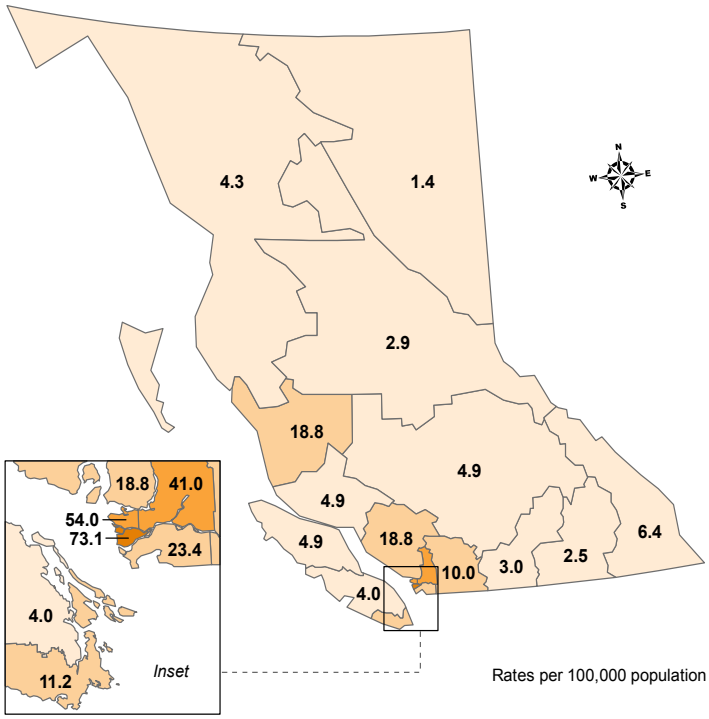
In 2016, only five cases of acute hepatitis B were reported in BC. This is the fewest ever reported and represents a considerable decline from 39 cases reported in 2007. Four cases were male and one was female, all occurred in individuals over 30 years of age, and all but one occurred in Vancouver. The rate of reported infection was less than 1.0/100,000 in all HSDAs. This historically small number of cases reflects the success of hepatitis B immunization in BC, which was introduced in 1992 for grade 6 children and an infant program was introduced in 2001.

20.1 Chronic and Undetermined Hepatitis B Rates by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	1,481	1,472	1,307	1,281	1,146	1,088	1,210	1,145	1,148	1,163
BC Rate	34.51	33.84	29.63	28.68	25.47	23.93	26.37	24.65	24.46	24.48

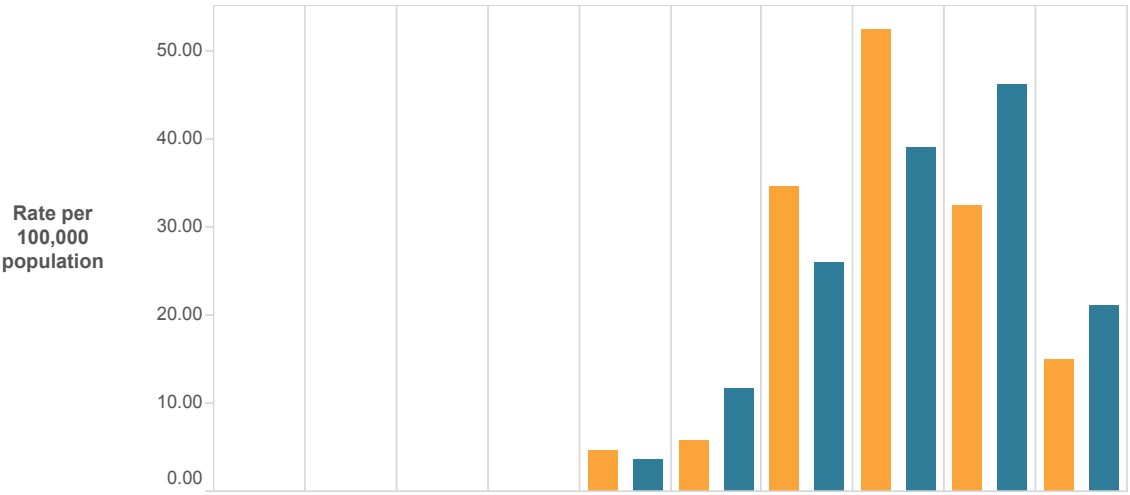
*20.2 Chronic and Undetermined Hepatitis B Rates by HSDA, 2016***



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	5	6.4
12	Kootenay Boundary	2	2.5
13	Okanagan	11	3.0
14	Thompson Cariboo Shuswap	11	4.9
21	Fraser East	30	10.0
22	Fraser North	272	41.0
23	Fraser South	191	23.4
31	Richmond	156	73.1
32	Vancouver	363	54.0
33	North Shore/Coast Garibaldi	53	18.8
41	South Vancouver Island	43	11.2
42	Central Vancouver Island	11	4.0
43	North Vancouver Island	6	4.9
51	Northwest	3	4.3
52	Northern Interior	4	2.9
53	Northeast	1	1.4

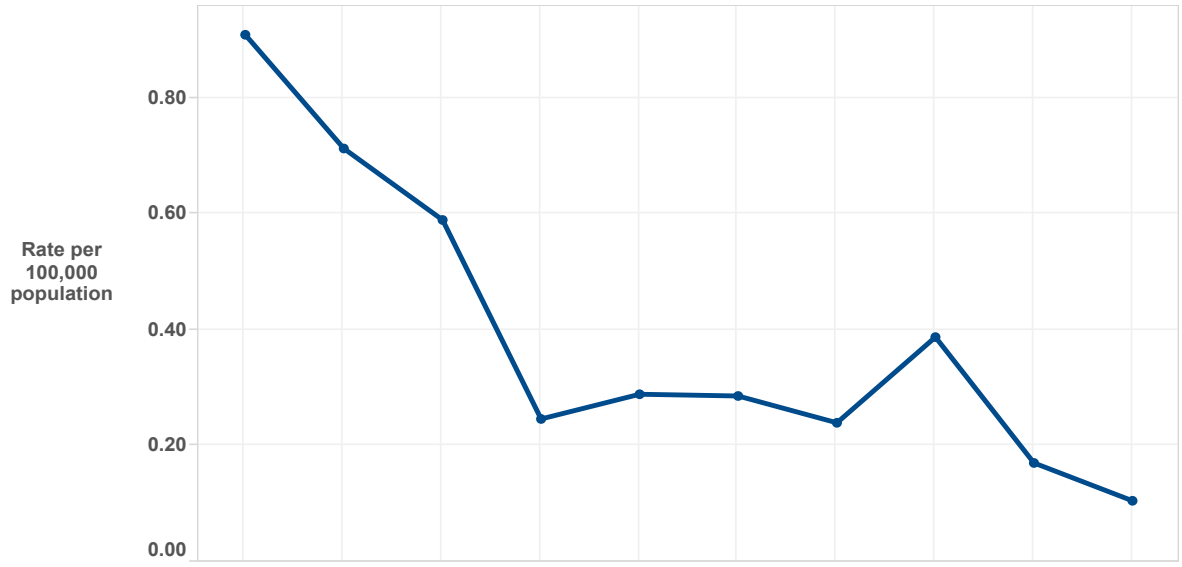
** Note that 1 Hepatitis B chronic case is missing HSDA information and is not reported in the map.

20.3 Chronic and Undetermined Hepatitis B Rates by Age Group and Sex, 2016



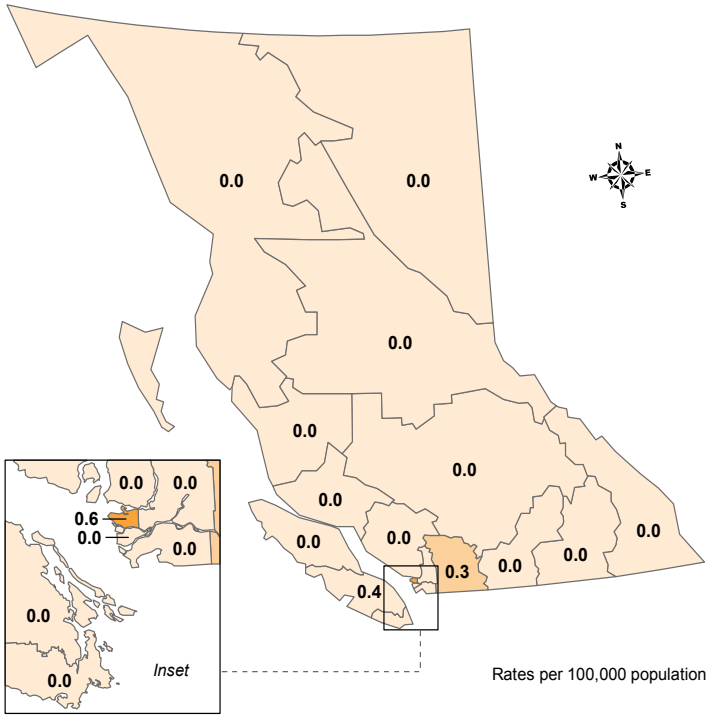
		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	0	0	0	6	9	55	170	220	92
	Male	0	0	0	0	5	20	41	124	303	118
	Total	0	0	0	0	11	29	96	294	523	210
BC Rate	Female	0.00	0.00	0.00	0.00	4.54	5.76	34.65	52.52	32.43	15.07
	Male	0.00	0.00	0.00	0.00	3.56	11.72	25.85	39.09	46.12	21.21
	Total	0.00	0.00	0.00	0.00	4.04	8.87	30.25	45.87	39.16	18.00

20.4 Acute Hepatitis B Rates by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	39	31	26	11	13	13	11	18	8	5
BC Rate	0.91	0.71	0.59	0.25	0.29	0.29	0.24	0.39	0.17	0.11

20.5 Acute Hepatitis B Rates by HSDA, 2016



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	0	0.0
13	Okanagan	0	0.0
14	Thompson Cariboo Shuswap	0	0.0
21	Fraser East	1	0.3
22	Fraser North	0	0.0
23	Fraser South	0	0.0
31	Richmond	0	0.0
32	Vancouver	4	0.6
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	0	0.0
51	Northwest	0	0.0
52	Northern Interior	0	0.0
53	Northeast	0	0.0

Rates per 100,000 population by HSDA

20.6 Acute Hepatitis B Rates by Age Group and Sex, 2016

		<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	1	0
	Male	0	0	0	0	0	0	0	1	2	1
	Total	0	0	0	0	0	0	0	1	3	1
BC Rate	Female	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00
	Male	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.30	0.18
	Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.22	0.09

Hepatitis C

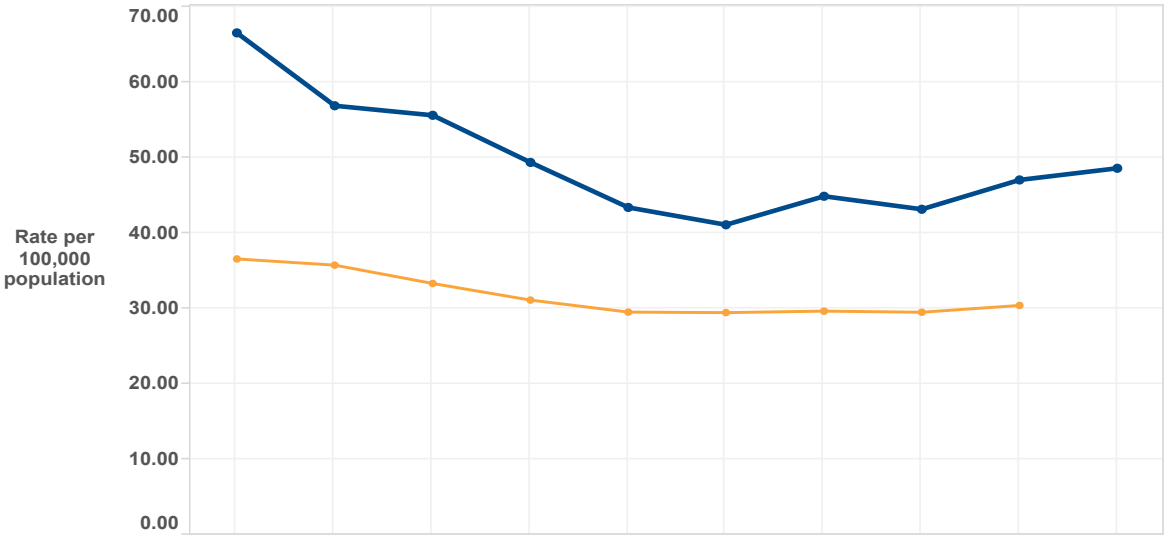
In 2016, 2,307 cases of hepatitis C were reported in BC. This is a slight increase from 2015 and continues the gradual increase since 2012. The increase in hepatitis C case identification is likely due to higher rates of testing. Testing rates have increased for several reasons, most notably: (i) the US Centres for Disease Control's 2012 recommendation to test "baby boomers", (ii) the BC Generation Hepatitis program, and (iii) the increasing availability and awareness of effective treatments for hepatitis C. [1, 2]

Vancouver had the most reported cases with 406, but the highest rate of reported infection was in Fraser East (74.2/100,000). All HSDA's except for Richmond had a rate greater than 25/100,000. The majority of reported cases were adults, with slightly more females reported aged less than 25, and more males aged 25 and above. The occurrence of hepatitis C in infants and children reflects vertical transmission (mother to baby) and the lack of a hepatitis C vaccine.

1. Recommendations for the Identification of Chronic Hepatitis C Virus Infection Among Persons Born During 1945–1965. MMWR (2012) 61(4)

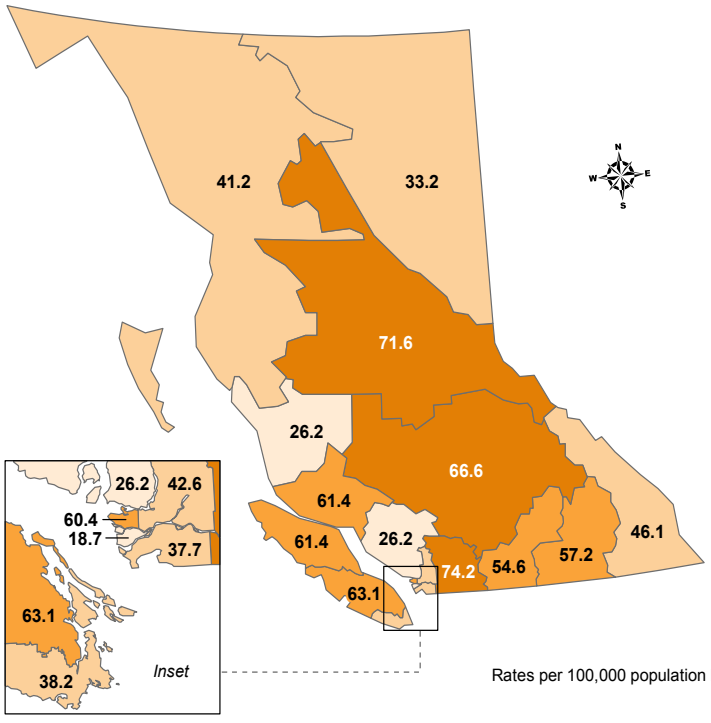
2. Generation Hep. Generation Hep.com.

21.1 Hepatitis C Rates by Year, 2007-2016

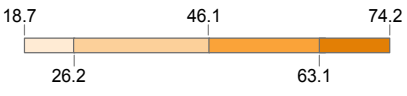


	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	2,853	2,472	2,451	2,203	1,951	1,867	2,058	2,003	2,206	2,307
BC Rate	66.49	56.84	55.57	49.33	43.36	41.07	44.85	43.12	47.01	48.55
Canada Rate	36.54	35.72	33.29	31.09	29.50	29.43	29.63	29.48	30.38	

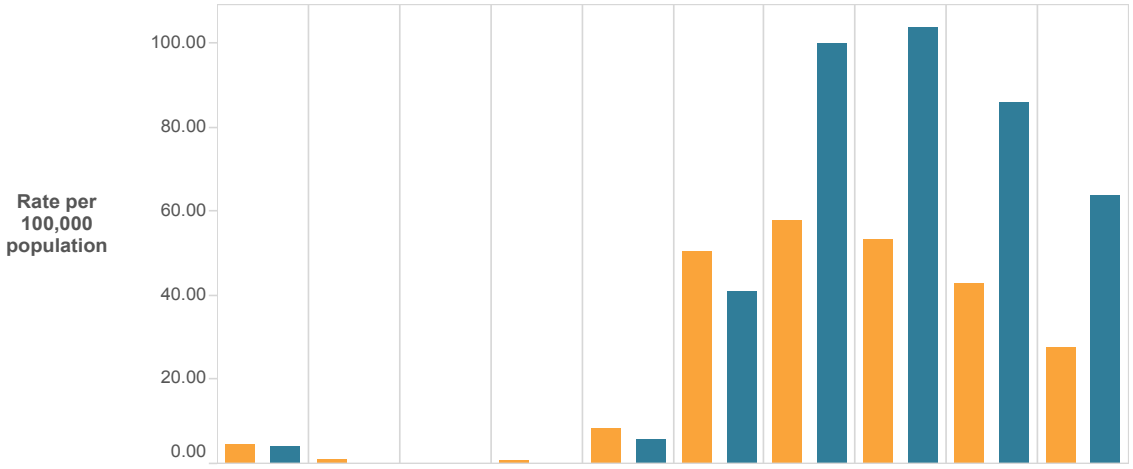
21.2 Hepatitis C Rates by HSDA, 2016



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	36	46.1
12	Kootenay Boundary	45	57.2
13	Okanagan	198	54.6
14	Thompson Cariboo Shuswap	149	66.6
21	Fraser East	223	74.2
22	Fraser North	283	42.6
23	Fraser South	308	37.7
31	Richmond	40	18.7
32	Vancouver	406	60.4
33	North Shore/Coast Garibaldi	74	26.2
41	South Vancouver Island	146	38.2
42	Central Vancouver Island	172	63.1
43	North Vancouver Island	75	61.4
51	Northwest	29	41.2
52	Northern Interior	99	71.6
53	Northeast	24	33.2



21.3 Hepatitis C Rates by Age Group and Sex, 2016



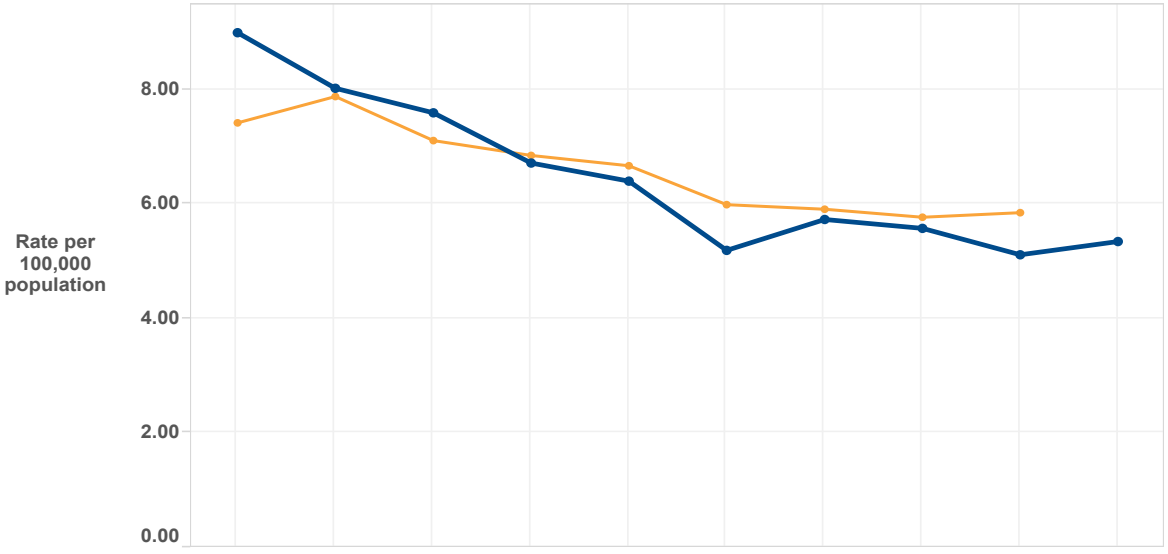
		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	1	1	0	1	11	79	92	173	291	170
	Male	1	0	0	0	8	70	159	330	564	356
	Total	2	1	0	1	19	149	251	503	855	526
BC Rate	Female	4.61	1.14	0.00	0.89	8.32	50.58	57.95	53.44	42.89	27.85
	Male	4.36	0.00	0.00	0.00	5.70	41.01	100.26	104.03	85.86	63.97
	Total	4.48	0.55	0.00	0.43	6.97	45.58	79.09	78.48	64.03	45.07

HIV and AIDS

HIV has been a reportable infection since 2003. The rate of HIV diagnoses has been declining over the past decade, primarily driven by decreases in HIV diagnoses among people who use injection drugs. However, over half of all HIV diagnoses are among gay, bisexual, and other men who have sex with men. The number of new HIV diagnoses in this group of individuals has not changed in the last decade. The highest rate of new HIV diagnoses is in the Vancouver Health Service Delivery Area, likely due to the greater concentration of gay, bisexual, and other men who have sex with men living in this area. For more information on the epidemiology of HIV in BC, please see the HIV Annual Report.

It should be noted that because an individual may be living with HIV for years or decades before being diagnosed, we typically report on HIV diagnoses rather than HIV incidence. However, the Public Health Agency of Canada (PHAC) uses models and multiple data sources to estimate the number of new (incidence) HIV infections and prevalent cases of HIV (i.e. number of people living with HIV). In BC, an estimated 305 (range 210-400) persons were newly infected with HIV in 2014. At the end of 2014, there were an estimated 12,100 (range 9,700-14,500) persons living with HIV in BC. More information on these estimates can be found at the PHAC website. PHAC website.

22.1 HIV Rates by Year, 2007-2016



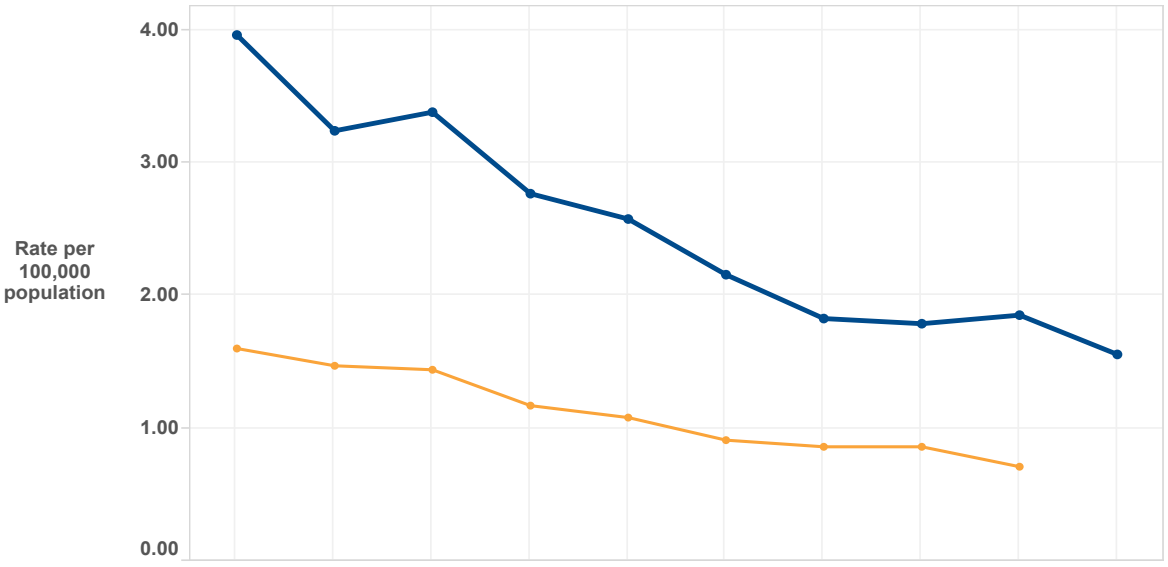
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	386	349	335	300	288	236	263	259	240	254
BC Rate	9.00	8.02	7.60	6.72	6.40	5.19	5.73	5.58	5.11	5.35
Canada Rate	7.42	7.88	7.11	6.85	6.67	5.99	5.91	5.77	5.85	

The AIDS surveillance system is a passive system and relies on clinicians reporting a case to the BC-CDC. In BC, the majority of AIDS cases are reported through the Provincial HIV Treatment Program at the BC Centre for Excellence in HIV/AIDS which has comprehensive clinical data on all individuals accessing antiretroviral therapy in BC. For this reason, AIDS cases presented here are from the previous year.

The rate of AIDS in BC has been decreasing since 1993, due primarily to advances in HIV treatment and more individuals living with HIV accessing treatment earlier. More information on AIDS is available in the HIV Annual Report HIV Annual Report.

interactive dashboard

22.2 AIDS Rates by Year, 2007-2015



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Reports	168	139	147	122	115	97	83	82	86	73
BC Rate	3.96	3.24	3.38	2.77	2.58	2.16	1.83	1.79	1.85	1.56
Canada Rate	1.60	1.47	1.44	1.17	1.08	0.91	0.86	0.86	0.71	

Syphilis

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

Syphilis is a sexually transmitted infection (STI) caused by the spirochete bacterium *Treponema pallidum*. Its natural history is well-described and consists of multiple infectious stages, followed by a latent period during which the bacterium is present but there are little to no symptoms. The primary stage of syphilis typically presents as a painless ulcer, known as a chancre. The secondary stage of syphilis presents with systemic symptoms, such as a rash over the trunk. The asymptomatic latent stage of syphilis is separated into early latent (about one year after infection) and late latent (one year or more after infection). Only the primary, secondary, and early latent stages of syphilis are considered infectious and are reported here.

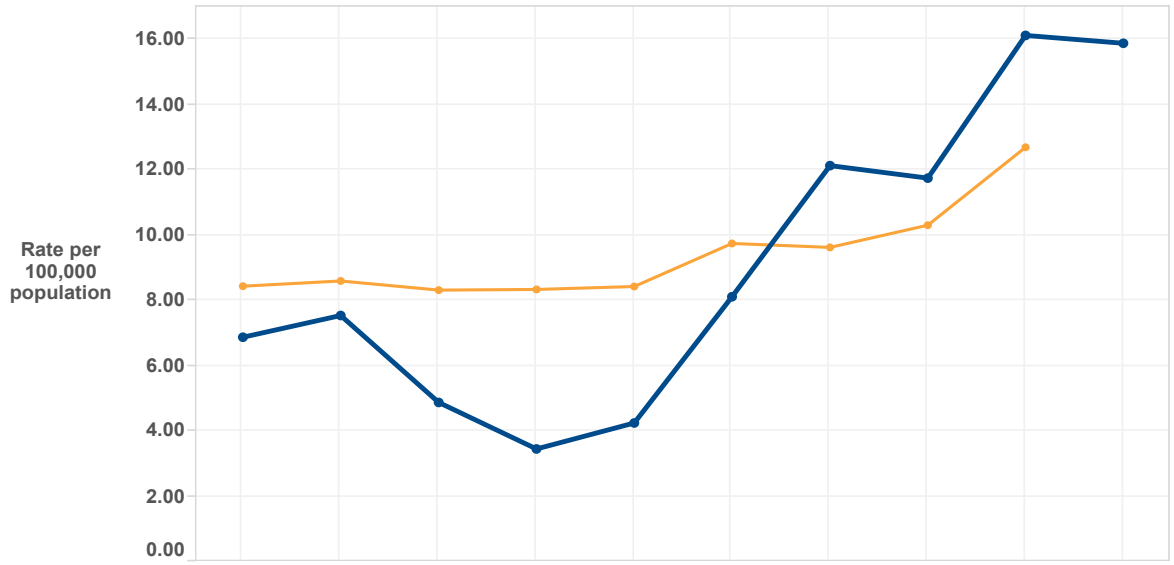
Untreated, up to one third of individuals will go on to develop late complications, which may lead to end-organ disease in the brain, peripheral nerves, eyes and cardiovascular system. If the infectious stages of syphilis are concurrent with pregnancy, the child is at risk of developing congenital syphilis, a serious and potentially fatal condition. In those co-infected with HIV, the clinical manifestations of syphilis may be unusual and difficult to diagnose. In addition, syphilis infection itself not only enhances the transmission of HIV but also one's susceptibility to HIV infection.

Following a decline in rates in BC in the early 1990s, infectious syphilis began to re-emerge in BC starting in 1997. Rates of syphilis increased dramatically between 2010 and 2015 and remained high in 2016. Over 90% of infectious syphilis cases are in males, primarily driven by cases who self-identify as gay, bisexual, or other men who have sex with men.

From 2010 to 2016, the highest rates of infectious syphilis were in the Vancouver Coastal Health Authority. The majority of cases were among men 40-59 years old. However, since 2014, the greatest rate of increase appears to be in men 20-29 years old. There has also been a steady increase in the proportion of cases diagnosed in the early latent stage (i.e. the stage without symptoms) from about 50% in 2005 to almost 65% in 2016, suggesting that an increasing proportion of cases are being detected by screening.

The recent changes in syphilis epidemiology prompted the BC Centre for Disease Control (BCCDC) to develop a multi-pronged strategy with the regional health authorities, First Nations Health Authority, the BCCDC Public Health Laboratory, Perinatal Services BC, and the Office of the Provincial Health Officer to address this increase. Goals of this strategy include increasing 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.

23.1 Syphilis Rates by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	295	328	215	154	191	369	557	546	757	755
BC Rate	6.87	7.54	4.87	3.45	4.25	8.12	12.14	11.75	16.13	15.89
Canada Rate	8.44	8.60	8.32	8.34	8.43	9.75	9.63	10.31	12.70	

Vaccine Preventable Diseases

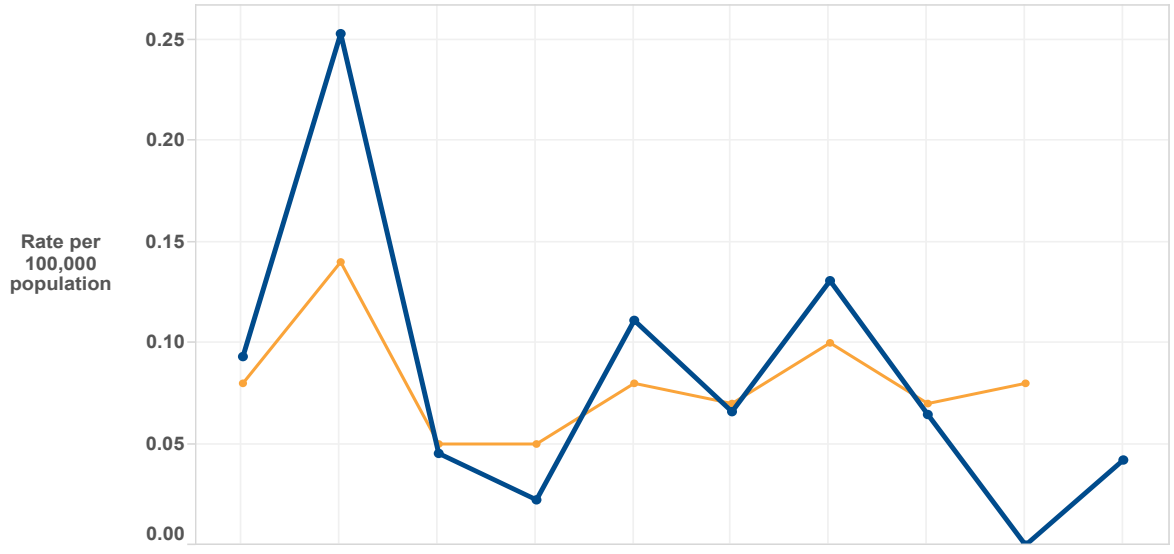
Haemophilus influenzae type b (invasive) - Hib
Influenza
Measles
Meningococcal Disease (invasive)
Mumps
Pertussis
Pneumococcal Disease (invasive)
Rubella and Congenital Rubella Syndrome

Haemophilus influenzae type b (invasive) - Hib

Two cases of invasive *Haemophilus influenzae* type b (Hib) disease were reported in 2016. Both cases were unimmunized children under five years of age but old enough to be fully protected by vaccine, and were hospitalized with meningitis. No direct linkages were identified between these two cases, however, both were residents of a community with a high rate of objection to vaccination. One case recovered with no sequelae, and the other recovered with permanent neurological sequelae. These are the first pediatric Hib cases reported in BC since 2009.

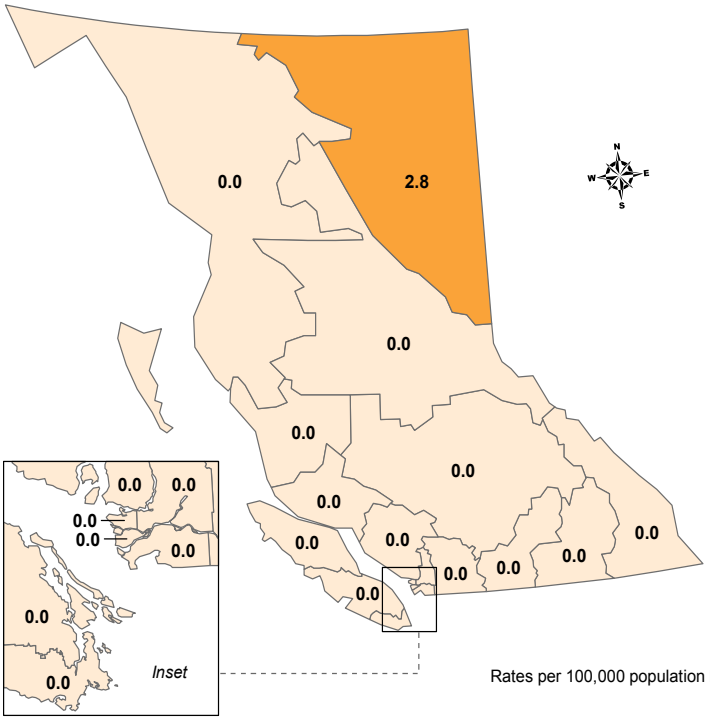
interactive dashboard

24.1 Haemophilus influenzae type b (invasive) Rates by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	4	11	2	1	5	3	6	3	0	2
BC Rate	0.09	0.25	0.05	0.02	0.11	0.07	0.13	0.06	0.00	0.04
Canada Rate	0.08	0.14	0.05	0.05	0.08	0.07	0.10	0.07	0.08	

24.2 Haemophilus influenzae type b (invasive) Rates by HSDA, 2016



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	0	0.0
13	Okanagan	0	0.0
14	Thompson Cariboo Shuswap	0	0.0
21	Fraser East	0	0.0
22	Fraser North	0	0.0
23	Fraser South	0	0.0
31	Richmond	0	0.0
32	Vancouver	0	0.0
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	0	0.0
51	Northwest	0	0.0
52	Northern Interior	0	0.0
53	Northeast	2	2.8

Influenza

Influenza surveillance is conducted year-round in BC, with renewed annual monitoring typically commencing the first week of October (week 40) and ongoing through the end of September (week 39). This report summarizes surveillance data for the 2016-17 influenza season, spanning week 40 (starting October 2, 2016) through week 17 (ending April 29, 2017).

Influenza surveillance in BC consists of monitoring major 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) Medical Service Plan (MSP) visits with a clinical diagnosis of influenza illness; (3) facility and school outbreak notifications; (4) provincial influenza laboratory diagnosis by the BCCDC Public Health Laboratory (PHL) and BC Children's and Women's Health Centre Laboratory; and (5) 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), with additional phenotypic and genetic characterization of circulating viruses to inform VE analysis and interpretation.

Detailed surveillance bulletins are issued throughout the season, distributed weekly during the influenza season and periodically during inter-seasonal months, and are available from:

http://www.bccdc.ca/health-professionals/data-reports/influenza-surveillance-reports.

SUMMARY

The 2016-17 influenza season in BC was characterized by intense and dominant A(H3N2) activity, with low-level, late-season circulation of influenza B viruses. During periods of peak activity, most influenza-like illness (ILI) surveillance indicators were above historical averages compared to prior recent seasons. Community ILI activity during the 2016-17 season increased beginning around late December (weeks 50-52), peaked in January (weeks 3-5) and then declined gradually thereafter. At the BCCDC Public Health Laboratory (PHL), influenza positivity exceeded 40% during a 4-week period from weeks 52-3, with influenza A(H3N2) viruses comprising >95% of influenza detections during this peak period. Starting in week 10, influenza B became the dominant influenza virus detected at the BCCDC PHL, albeit at lower levels than peak A(H3N2) activity. As in 2014-15, the last dominant A(H3N2) season, a record number of influenza outbreaks in long-term care facilities (LTCF) were reported this season. The cumulative tally of LTCF influenza outbreaks reported this season (n=198, weeks 40-17) exceeded the prior historic record in 2014-15 (n=165, weeks 40-17). In both seasons, most reported outbreaks were associated with influenza A(H3N2). Elderly adults ≥65 years old comprised the majority of influenza detections, related in part to the dominant A(H3N2) activity and record number of facility outbreaks this season. Younger age groups were also represented, notably among influenza B detections. In mid-season analysis from the BCCDC-led national Sentinel Practitioner Surveillance Network (SPSN), interim estimates of vaccine effectiveness (VE) were 42% (95% confidence interval (CI): 18-59%) against outpatient medically attended, laboratory-confirmed A(H3N2) illness, which is consistent with vaccine protection typically expected for A(H3N2)-dominant seasons and is higher than in 2014-15 when no vaccine protection was found.

1. Sentinel physician reporting of ILI

During the 2016-17 season (week 40 to week 17), 30 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, 85% (range=63-97%) of sites reported data each week. The proportion of patient visits due to ILI seen by these sentinel sites was generally consistent with expected historical ranges throughout the influenza season, except during weeks 3-5 when rates were significantly above the 10-year historical average (Figure 25.2).

2. MSP visits with an influenza diagnosis

BC MSP general practitioner service claims with a clinical diagnosis of influenza illness (ICD-9 code 487), as a proportion of all submitted MSP claims, increased sharply beginning in week 51, peaked in weeks 3-4 and gradually declined thereafter (Figure 25.3), Overall, provincial MSP rates exceeded historical 10-year

75th percentiles during this peak period. Some expected regional variation in the timing and intensity of influenza illness activity was observed across health authorities, notably in NHA where no discernable peak occurred during the 2016-17 season.

3. Facility outbreak notifications

Residential facilities, such as long-term care facilities (LTCFs), are asked to notify their local health unit when 2 or more cases of ILI occur within their setting within a 7-day period. Influenza outbreaks 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 BCCDC is at the discretion of the local health authority and varies regionally, with less consistent reporting for school ILI outbreaks and facility outbreaks where non-influenza respiratory viruses were detected.

During the 2016-17 season (week 40 to week 17), 208 laboratory-confirmed influenza outbreaks in healthcare facilities were reported to BCCDC, including 198 from LTCFs, 6 from acute care facilities, and 4 from other facility types. Of the 198 LTCF outbreaks reported, 172 had influenza A detected, 25 had influenza B detected, and one outbreak had co-detection of both influenza A and B (Figure 25.4). Of the 99 out of 172 influenza A outbreaks where subtype information was available, all were influenza A(H3N2). Three additional LTCF outbreaks associated with influenza A(H3N2) had onset in weeks 37-39 and 2 outbreaks associated with influenza B had onset in week 20 and are not shown in Figure 25.4. No outbreaks associated with influenza A(H1N1)pdm09 were reported this season.

The cumulative tally of LTCF outbreaks for the 2016-17 season (n=198) exceeds the total number of LTCF outbreaks reported during the last A(H3N2)-dominant season in 2014-15 (n=165, weeks 40-17), which had previously been associated with the highest number of LTCF outbreaks recorded in the past decade (Figure 25.5) In both seasons, most reported outbreaks were associated with influenza A(H3N2). No discernable relationship exists between resident or staff influenza vaccine coverage and the number of outbreaks reported in a given season.

In addition to facility outbreak reports, 26 ILI outbreaks without etiologic agent identified were reported from schools during the 2016-17 influenza season (week 40 to week 17). Two additional school ILI outbreaks were reported in weeks 37 and 19. However, it should be noted that school ILI outbreaks are not consistently reported to the BCCDC from all health authorities in the province.

4. Laboratory diagnosis

a. BCCDC Public Health Laboratory [1]

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.

During the 2016-17 season (week 40 to week 17), the BCCDC PHL tested 12,737 patients for respiratory viruses. Of these, 3,948 (31%) were positive for influenza, including 3,433 (87%) patients with influenza A [3,320 A(H3N2), 41 A(H1N1)pdm09, and 72 influenza A unsubtyped], 512 (13%) with influenza B, and 3 (<1%) patients who had both influenza A(H3N2) and B detected during the season.

Overall, the 2016-17 season was characterized by dominant influenza A(H3N2) activity. Influenza positivity at the BCCDC PHL began to increase in week 50, peaking around weeks 52-3 when positivity rates ex¬ceeded 40% (Figure 25.3), Influenza A(H3N2) viruses comprised >95% of influenza detections during this peak period. Low-level influenza B activity was

1. Counts may differ from previously published surveillance reports due to historical data reconciliation and updates to surveillance report parameters.

was observed near the tail-end of the season starting around week 6, with the number of influenza B detections surpassing influenza A detections as of week 10.

Elderly adults ≥65 years old were disproportionately represented among influenza detections during the 2016-17 season, related in part to the dominant A(H3N2) activity and substantial number of LTCF outbreaks, although younger age groups were also affected (Figure 25.7 and 25.8). Children 1-19 years old and adults 20-64 years old comprised a larger proportion of influenza B detections.

Among other respiratory viruses, RSV co-circulated with influenza viruses, with RSV positivity exceeding 10% for an extended period of time from mid-December (starting week 49) to mid-March (ending week 11). Entero/rhinoviruses were detected throughout the season, most notably at the beginning of the season (weeks 40-48) before influenza activity began to increase. Among entero/rhinovirus detections, 76 cases of enterovirus D68 (EV-D68) were reported to BCCDC as part of enhanced laboratory testing from August to December 2016 (see Enterovirus D68 section for details).

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

During the 2016-17 season (week 40 to week 17), the BC Children's and Women's Health Centre Laboratory conducted 2,898 tests for influenza A and B. Of these, 170 (6%) were positive for influenza A and 65 (2%) were positive for influenza B. As with laboratory surveillance at the BCCDC PHL, influenza A activity peaked in weeks 2-3 with influenza A positivity around 20% (Figure 25.9). Low-level, late-season influenza B activity was observed beginning in week 9, with influenza B positivity peaking in week 11 at >10%.

RSV was the dominant respiratory virus detected at the BC Children's and Women's Health Centre Laboratory during the 2016-17 season with 559 out of 2898 (19%) tests positive cumulatively during the season. RSV positivity was at or exceeded 20% from weeks 45 to 7.

c. Strain characterization by the National Microbiology Laboratory

Select influenza isolates are routinely sent by the BCCDC PHL to the NML for strain characterization by haemagglutination inhibition (HI) assay. From September 1, 2016 to April 27, 2017, 44 BC isolates were sent to the NML for strain characterization, including 40 influenza A(H3N2) and 4 influenza B.

Of the 40 influenza A(H3N2) viruses submitted to NML, none had sufficient haemagglutination titre for antigenic characterization by HI assay. Genetic characterization by sequencing was performed to infer antigenic properties on the A(H3N2) viruses that did not grow to sufficient haemagglutination titre for HI assay. All 40 of the A(H3N2) viruses genetically characterized were reported to belong to a genetic group in which most viruses were antigenically related to A/Hong Kong/4801/2014, the WHO-recommended A(H3N2) component for the 2016-17 northern hemisphere influenza vaccine.

Of the 4 influenza B viruses submitted to NML, 1 (25%) was characterized as B/Brisbane/60/2008-like, the WHO-recommended influenza B component belonging to the Victoria lineage for the 2016-17 northern hemisphere trivalent influenza vaccine (TIV), while 3 (75%) were characterized as B/Phuket/3073/2013-like, the recommended influenza B component belonging to the Yamagata lineage for the 2016-17 northern hemisphere quadrivalent influenza vaccine (QIV) containing two influenza B components.

For context, the WHO-recommended components for the 2016-17 and upcoming 2017-18 northern hemi¬sphere TIV are listed below. The 2016-17 northern hemisphere QIV contained the below three viruses and a B/Phuket/3073/2013-like virus belonging to the Yamagata lineage. The same influenza B(Yamaga¬ta) strain is recommended for the 2017-18 northern hemisphere QIV.

25.1

2016-17*	2017-18**
A/California/7/2009(H1N1) pdm09-like virus†	A/Michigan/45/2015(H1N1) pdm09-like virus††
A/Hong Kong/4801/2014(H3N2)-like virus‡	A/Hong Kong/4801/2014(H3N2)-like virus
B/Brisbane/60/2008(Victoria)-like virus§	B/Brisbane/60/2008(Victoria)-like virus

* Recommended strains represent a change for two of the three components used for the 2015-16 northern hemisphere vaccines.

† Recommended strain has been retained as the A(H1N1) component since the 2009 pandemic and has been included in the northern hemisphere vaccine since 2010-11.

‡ Recommended strain for the A(H3N2) component represents a phylogenetic clade-level change from a clade 3C.3a virus to a clade 3C.2a virus.

§ Recommended strain for the influenza B component represents a lineage-level change from a Yamagata-lineage virus to a Victoria-lineage virus.

** These recommended strains are the same as those recommended for the 2017 southern hemisphere TIV and represent a change for one of the three components used for the 2016-17 northern hemisphere TIV and 2016 southern hemisphere TIV.

†† Recommended strain represents a change from an A/California/7/2009-like virus, which had been retained as the A(H1N1)pdm09 component since the 2009 pandemic, to an A/Michigan/45/2015-like virus belonging to the emerging phylogenetic subclade 6B.1.

d. Antiviral resistance assessment by the National Microbiology Laboratory

The NML routinely tests selected influenza isolates for susceptibility to antiviral drugs recommended for treatment of influenza. From September 1, 2016 to April 27, 2017, 23 influenza A(H3N2) viruses from BC were tested against amantadine and all were resistant; 30 influenza viruses [26 A(H3N2) and 4 influenza B] from BC were tested against oseltamivir and all were sensitive; and 30 influenza viruses [26 A(H3N2) and 4 influenza B] from BC were tested against zanamivir and all were sensitive.

Nationally, 2 A(H3N2) viruses (both from Ontario) out of 719 tested A(H3N2) viruses were resistant to oseltamivir.

5. Sentinel influenza vaccine effectiveness (VE) monitoring

Interim estimates of 2016-17 vaccine effectiveness (VE) against influenza A(H3N2) illness were derived in January 2017 using respiratory specimens and epidemiological information collected from patients presenting with ILI to sentinel sites participating in the BCCDC-led Canadian Sentinel Practitioner Surveillance Network (SPSN) in BC, Alberta, Ontario and Quebec.

VE against medically attended, laboratory-confirmed A(H3N2) illness was 42% (95% confidence interval (CI): 18-59%). This finding is very similar to the A(H3N2) VE estimate of 43% (95%CI: 29-54%) reported by the US CDC in mid-season analysis and indicates that, compared to unvaccinated people, the risk of A(H3N2) illness in vaccinated people was reduced by about 40%. This VE estimate is consistent with vaccine protection typically expected for A(H3N2)-dominant seasons and is higher than in the last A(H3N2)-dominant 2014-15 season when no vaccine protection was found.

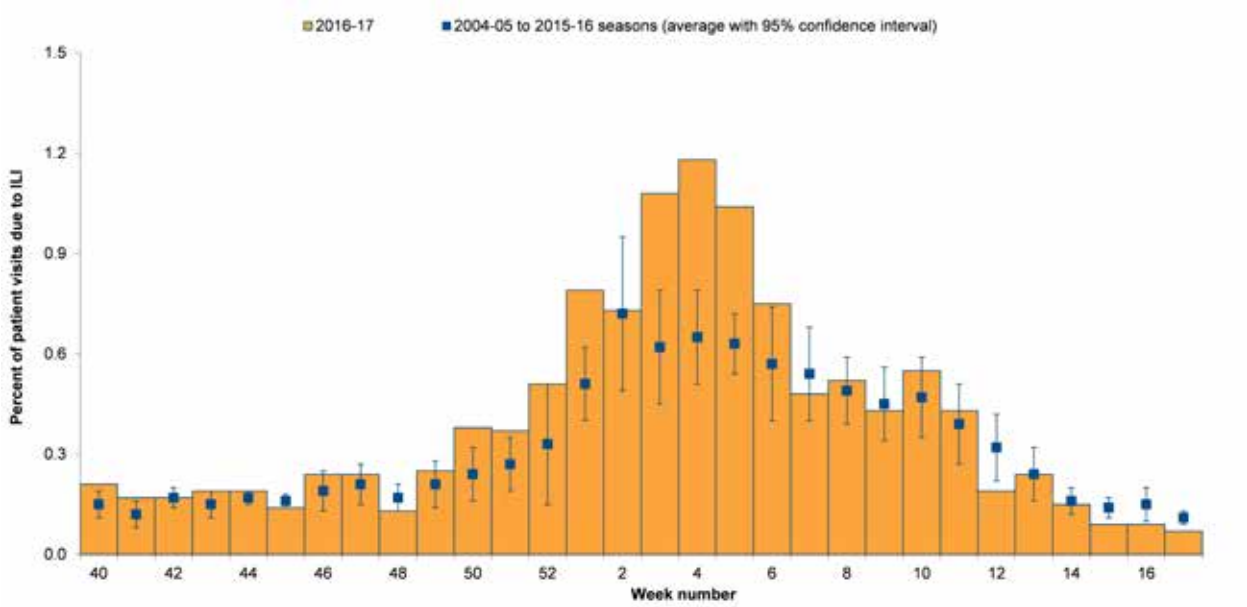
Antigenic characterization of the relatedness (i.e. match) between the clade 3C.2a vaccine component and circulating viruses could not be reliably interpreted for the majority of A(H3N2) detections this season. However, sequence analysis among patient specimens collected by the SPSN revealed continuing genetic evolution in circulating viruses, with about 80% of viruses belonging to a newly emerging clade known as 3C.2a1. SPSN investigators also found differences in the mix of A(H3N2) genetic variants across provinces and over time, with associated variation in VE that will be explored further in end-of-season analyses.

As in the past several years, these findings were submitted to the WHO in February 2017 to inform their selection of the vaccine components for the 2017-18 northern hemisphere influenza vaccine. VE estimates for other types, subtypes and variants (such as influenza B) will also be explored in end-of-season analyses.

Mid-season findings by the Canadian SPSN were published in EuroSurveillance, an open-access peer-reviewed journal, on February 9, 2017: www.eurosurveillance.org/ViewArticle.aspx?ArticleId=22714.

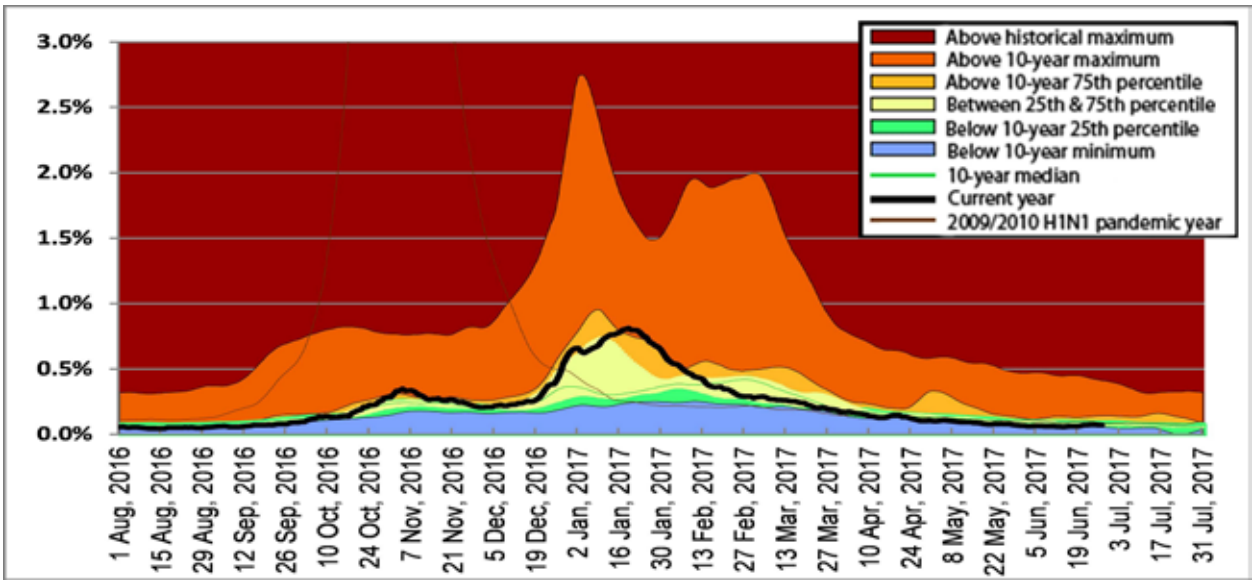
Mid-season findings by the US Flu VE network were published in MMWR on February 17, 2017: https://www.cdc.gov/mmwr/volumes/66/wr/mm6606a3.htm.

25.2 Percent of Patient Visits to Sentinel Practitioners Due to Influenza-Like Illness (ILI) per Week Compared to Historical 10-Season Average, British Columbia, 2016-17 Season



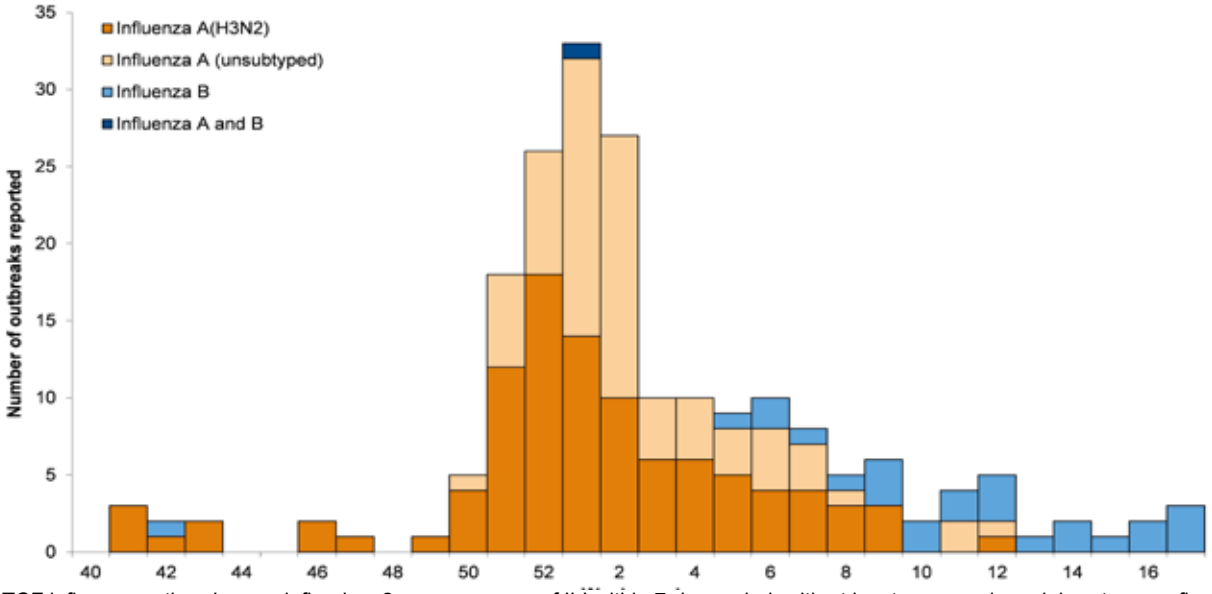
Surveillance period includes week 40 (starting October 2, 2016) to week 17 (ending April 29, 2017), inclusive. Ten-year historical average includes 2004-05 to 2015-16 seasons, excluding 2008-09 and 2009-10 seasons due to atypical seasonality. One hospital ER site that reported ILI rates ≥5% was excluded from the graph.

25.3 BC MSP General Practitioner Service Claims for Influenza Illness (II) as a Proportion of All Submitted Service Claims (7-day Moving Average), British Columbia, 2016-17 Season*



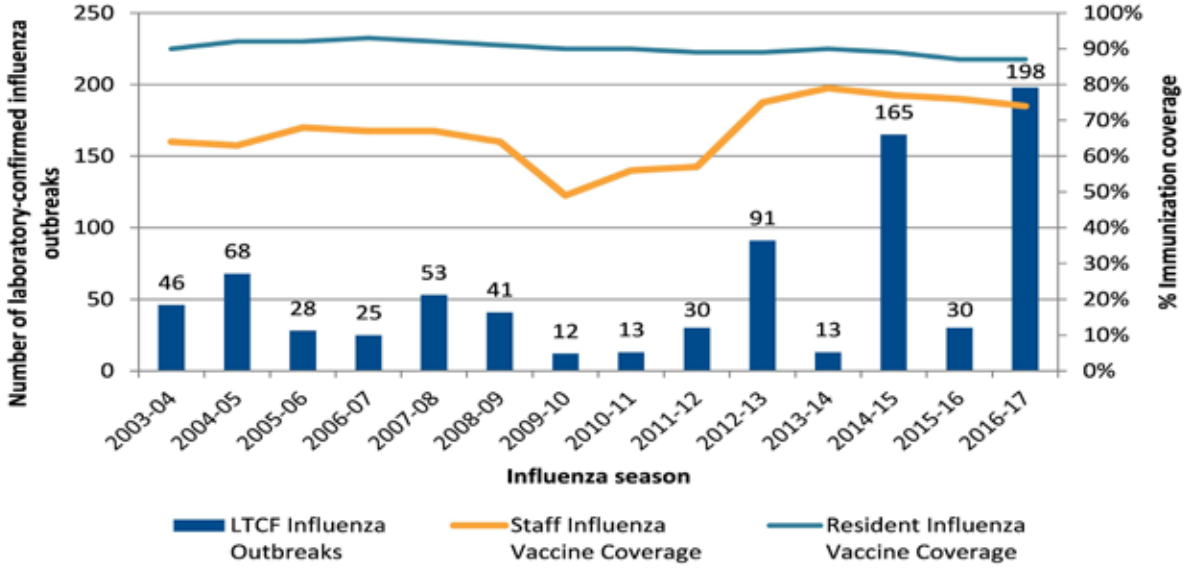
Influenza illness is tracked as the percent of all submitted MSP service claims for selected general practitioner services with a diagnosis of influenza (ICD-9 code 487). Data are provided by Population Health Surveillance and Epidemiology, BC Ministry of Health Services. Data for the period August 1, 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.

25.4 Number of Lab-Confirmed Influenza Outbreaks in Long-term Care Facilities (LTCF) Reported to BCCDC per Week, British Columbia, 2016-17 Season



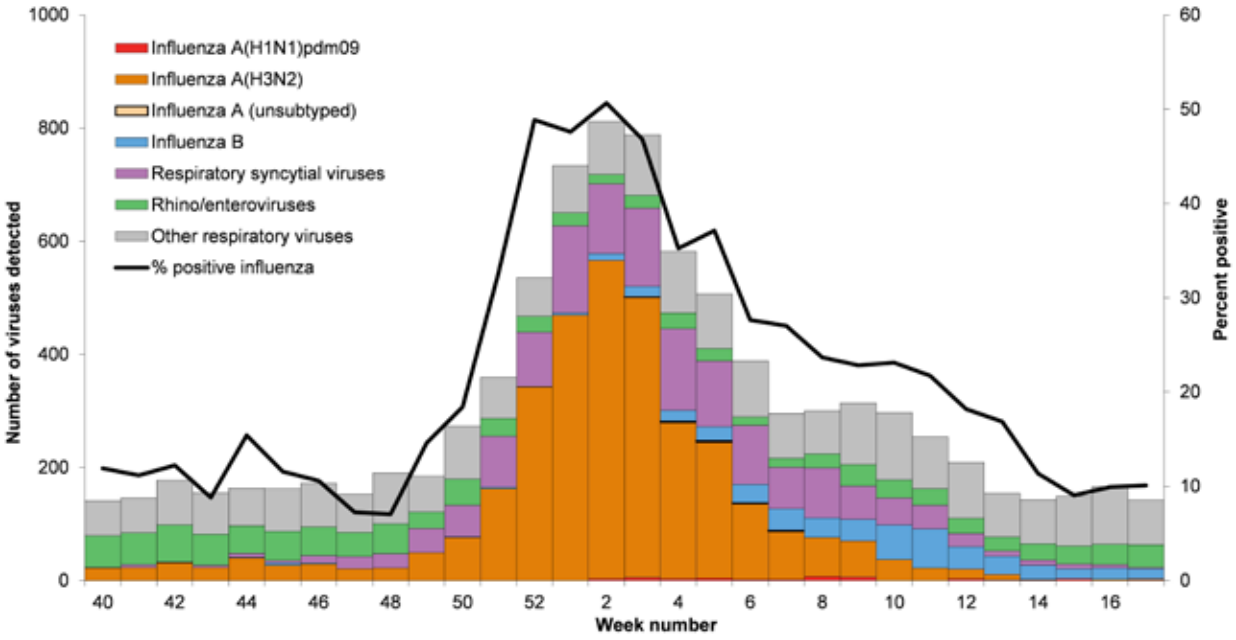
LTCF influenza outbreaks are defined as 2 or more cases of ILI within 7-day period, with at least one specimen laboratory-confirmed as influenza.

25.5 Number of Laboratory-Confirmed Influenza Outbreaks in Long-Term Care Facilities (LTCF) reported to BCCDC per season, British Columbia, 2003-04 - 2016-17 Season



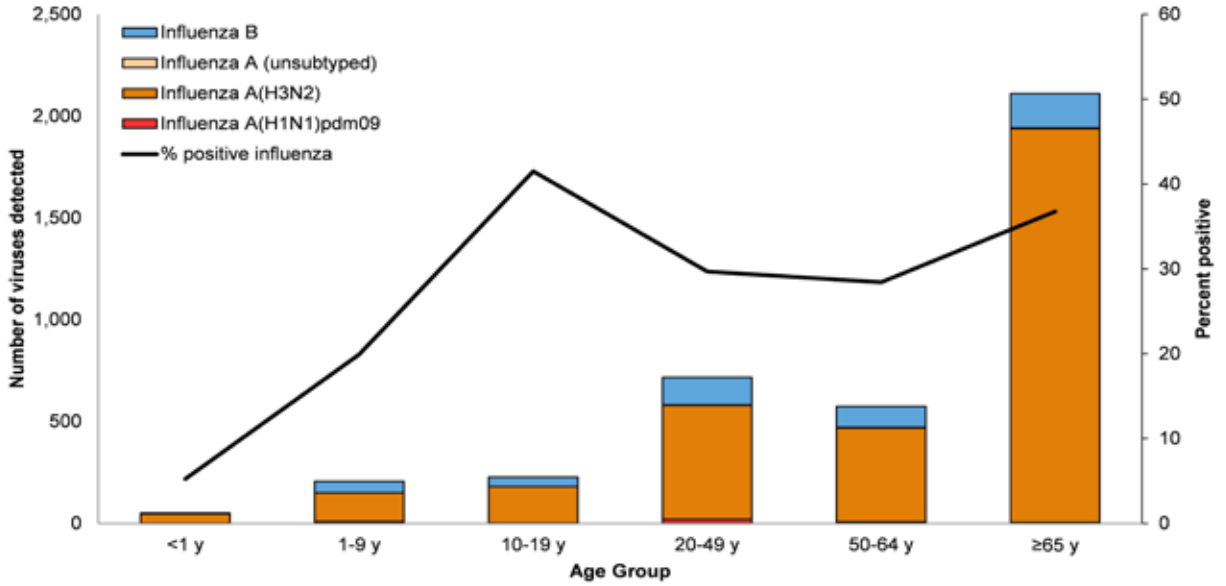
The 2014-15 season's outbreak tally includes one laboratory-confirmed influenza outbreak reported in an assisted living facility. Influenza vaccination coverage among care facility residents and staff adapted from: http://www.bccdc.ca/health-info/immunization-vaccines/immunization-coverage. Estimates for 2016-17 have not yet been posted. Historic outbreak tallies are from the BC Annual Summary of Reportable Diseases: http://www.bccdc.ca/resource-gallery/Documents/Statistics%20and%20Research/Statistics%20and%20Reports/Epid/Annual%20Reports/2015CDAnnualReportFinal.pdf. 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: https://www.canada.ca/en/public-health/services/diseases/flu-influenza/influenza-surveillance/influenza-definitions.html#b.

25.6 Influenza and Other Respiratory Virus Detections Among Respiratory specimens Submitted to the BCCDC Public Health Laboratory, Bristish Columbia, 2016-17 Season



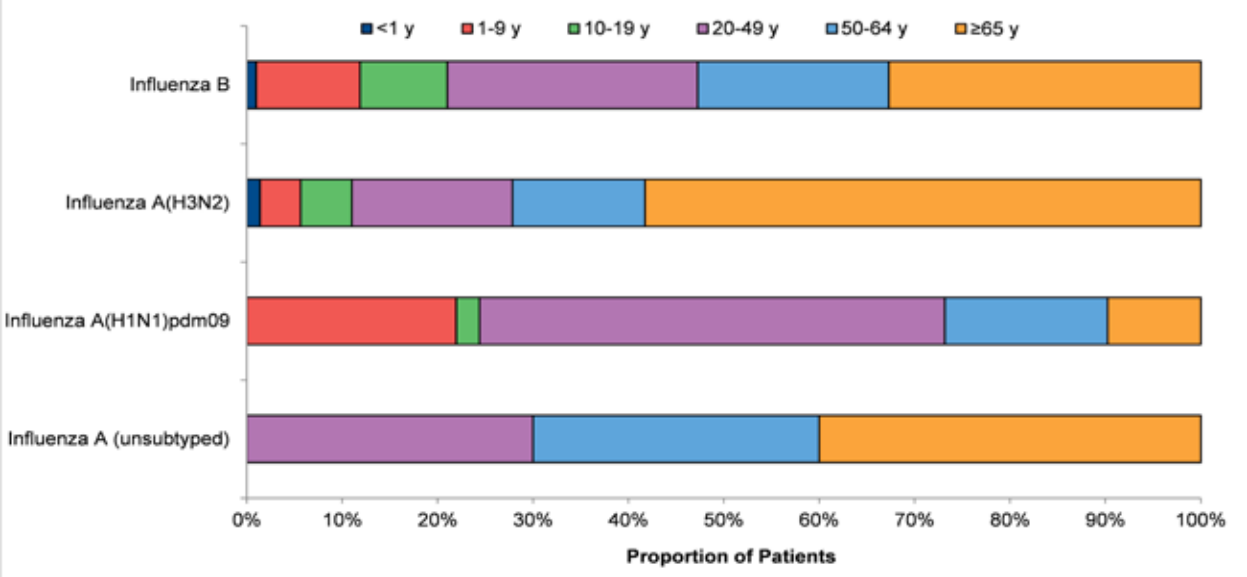
Data are current to June 14, 2017.

25.7 Age Distribution of Influenza Detections (Cumulative since Week 40) by Type/Subtype, BCCDC Public Laboratory, 2016-16



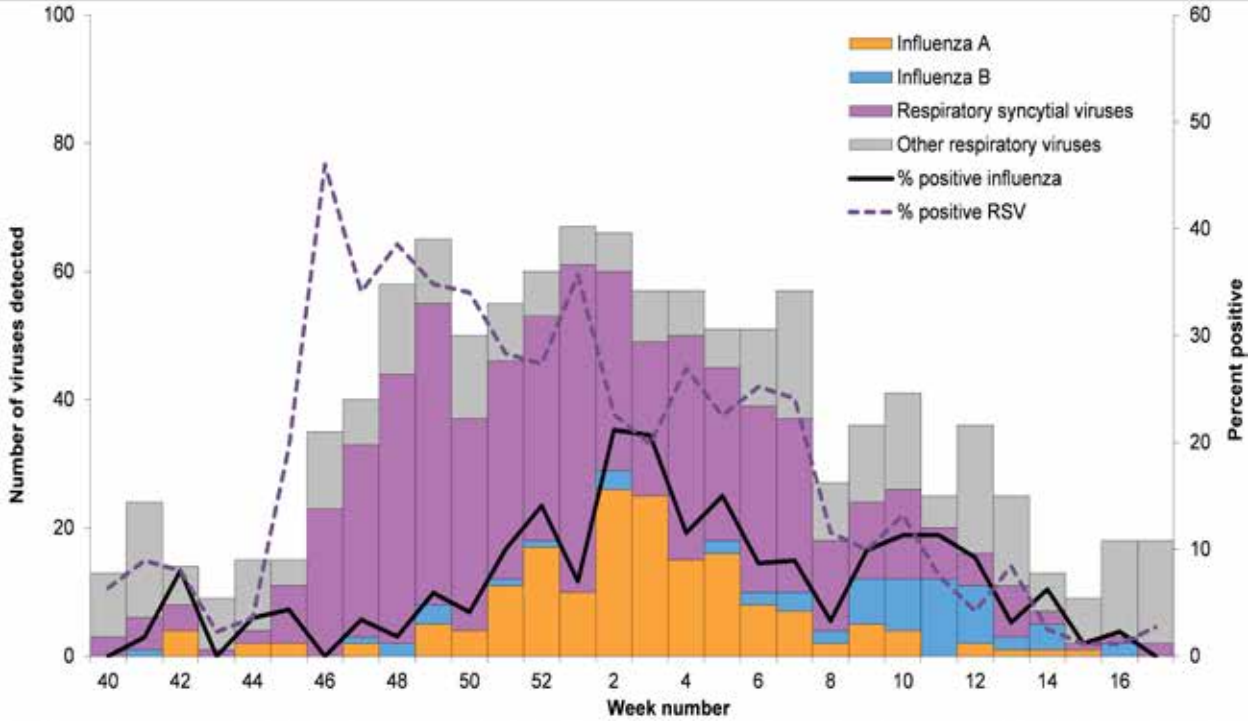
Data are current to June 14, 2017; figure includes cumulative influenza detections for specimens collected from weeks 40-17.

25.8 Age Distribution of Influenza Detections by Type/Subtype, BCCDC Public Laboratory, 2016-17 Season



Data are current to June 14, 2017; figure includes cumulative influenza detections for specimens collected from weeks 40-17.

25.9 Influenza and Other Respiratory Virus Detections Among Respiratory Specimens Submitted to the BC Children's and Women's Health Centre Laboratory, British Columbia, 2016-17 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 2016, 2 confirmed measles cases were reported among BC residents (0.04 per 100,000 population). Both were reported by Vancouver Coastal Health and had history of travel compatible with exposure abroad.

One case was under 6 months of age, too young to be vaccinated against measles. One case was aged 40-49 years, and had unknown vaccination status. Both cases were male.

One case was hospitalized. Both cases recovered fully, and no complications were reported.

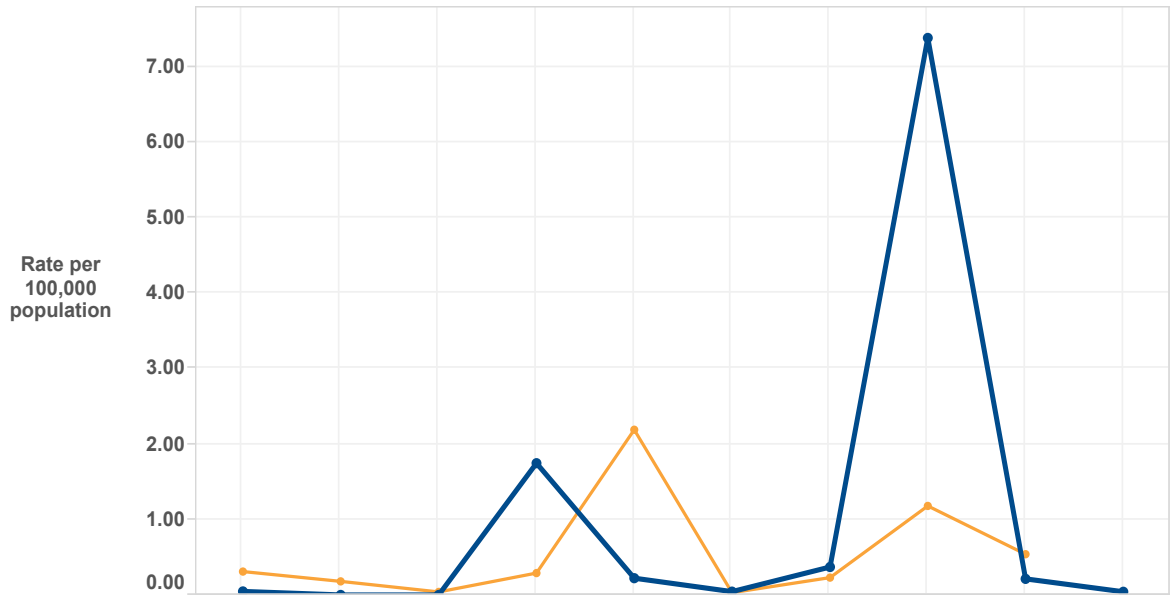
Both cases were PCR confirmed. The case with travel history to Hong Kong and Singapore had a genotype D8 virus identical to the Mvi/Hulu Langat.MYS/26.11 sequence variant. The case with travel history to Pakistan had genotype B3 virus, not identical to a named strain.

Global distribution of measles genotypes is available here. http://www.who.int/immunization/monitoring_surveillance/burden/vpd/surveillance_type/active/measles_monthlydata/en/index1.html

Measles elimination status was achieved in Canada in 1998, however, importations and subsequent transmission arise periodically, largely driven by measles activity globally and travel patterns of British Columbians.

interactive dashboard

26.1 Measles Rates by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	2	0	0	78	10	2	17	343	10	2
BC Rate	0.05	0.00	0.00	1.75	0.22	0.04	0.37	7.38	0.21	0.04
Canada Rate	0.31	0.18	0.04	0.29	2.19	0.03	0.23	1.18	0.54	

Meningococcal Disease (invasive)

Nine sporadic cases of invasive meningococcal disease (IMD) were reported in 2016, with no fatal outcomes reported. There were five cases of serogroup Y, and two cases each of serogroup B and W disease.

The median age of cases was 63 years and two-thirds of cases were over 40 years of age. The highest incidence rate was in males aged 15-19 years. The three cases under 20 years of age were all different serogroups (one each of serogroup B, W and Y).

None of the 2016 cases reported being immunized against the serogroup that caused their disease. Three of the serogroup Y cases reported underlying risk factors of malignancies/cancer treatment, however, these are not currently recommended indications for quadrivalent meningococcal vaccine. None of the other cases in 2016 reported underlying medical conditions.

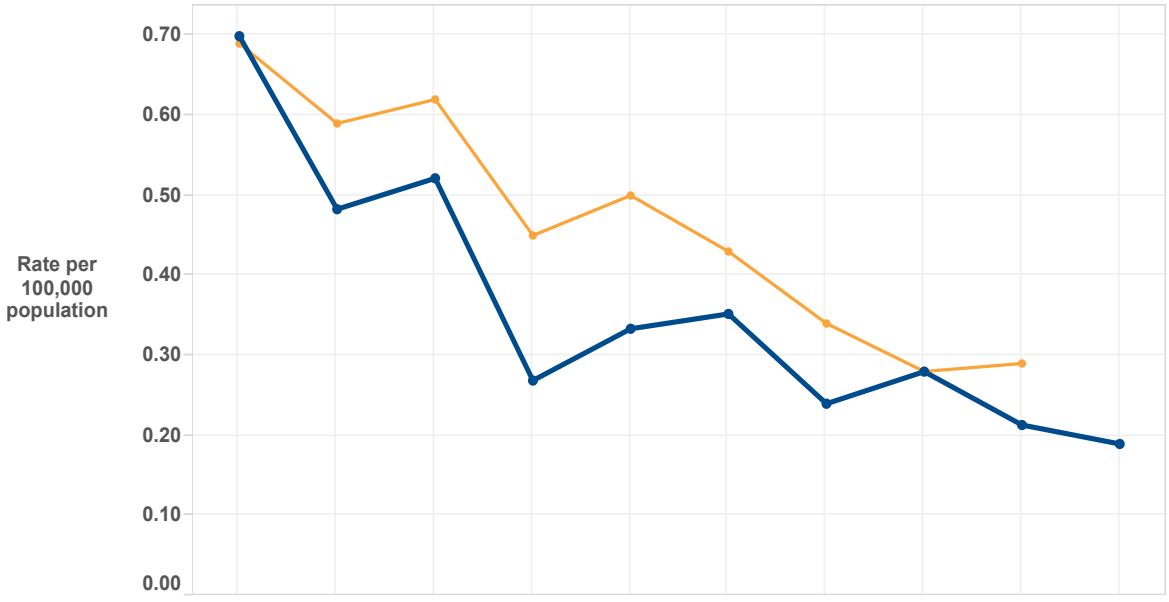
The incidence of IMD has decreased from 0.7 cases per 100,000 population in 2007 to 0.2 cases per 100,000 population in 2016. This is partly due to a decline in serogroup C disease from 0.2 to 0 cases per 100,000 population from 2007 to 2016, reflecting the impact of the infant and school-age meningococcal C conjugate immunization programs.

With declining incidence of serogroup C disease, serogroup B had become the most commonly reported serogroup with incidence rates fluctuating between 0.09 to 0.4 cases per 100,000 population per year between 2007 and 2015. However, in 2016, there were only 2 cases of serogroup B disease (0.04 cases per 100,000 population).

The most common serogroup in 2016 was serogroup Y (0.1 cases per 100,000 population). Between 2007 and 2015, incidence rates of serogroup Y disease fluctuated between 0.04 and 0.2 cases per 100,000 population. A quadrivalent conjugate meningococcal vaccine was introduced for grade 9 students starting school year 2016/7 to provide protection against serogroup Y in late adolescence.

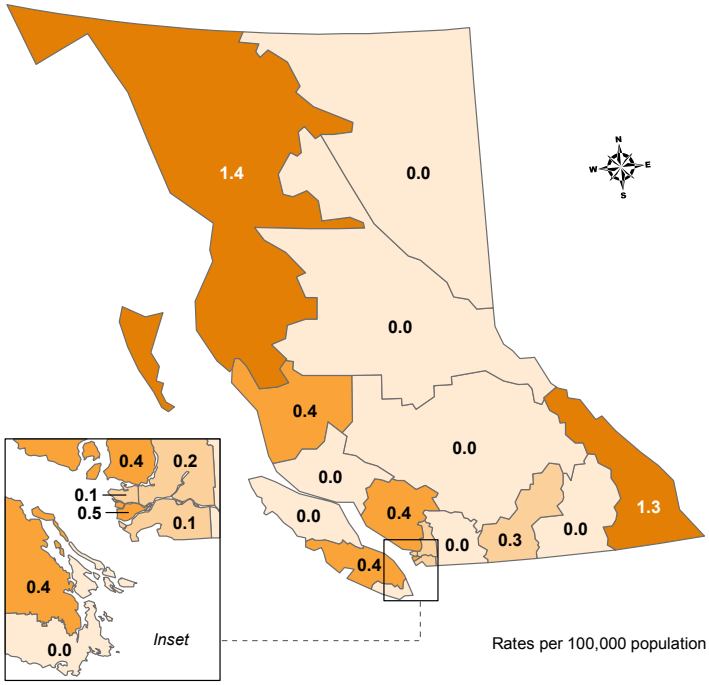
interactive dashboard

27.1 Meningococcal Disease (invasive) Rates by Year, 2007-2016

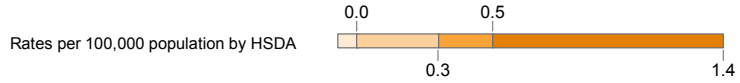


	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	30	21	23	12	15	16	11	13	10	9
BC Rate	0.70	0.48	0.52	0.27	0.33	0.35	0.24	0.28	0.21	0.19
Canada Rate	0.69	0.59	0.62	0.45	0.50	0.43	0.34	0.28	0.29	

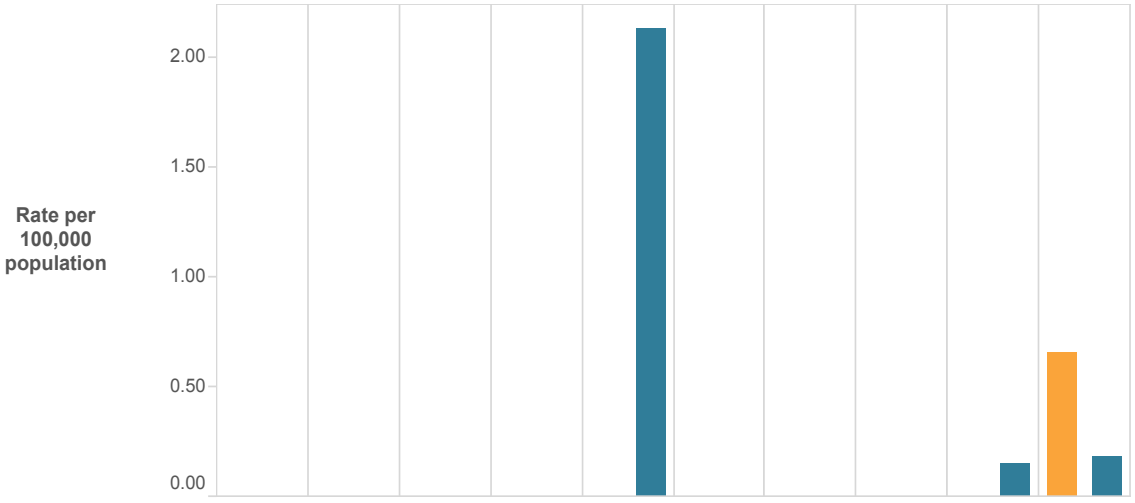
27.2 Meningococcal Disease (invasive) Rates by HSDA, 2016



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	1	1.3
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	1	0.2
23	Fraser South	1	0.1
31	Richmond	1	0.5
32	Vancouver	1	0.1
33	North Shore/Coast Garibaldi	1	0.4
41	South Vancouver Island	0	0.0
42	Central Vancouver Island	1	0.4
43	North Vancouver Island	0	0.0
51	Northwest	1	1.4
52	Northern Interior	0	0.0
53	Northeast	0	0.0

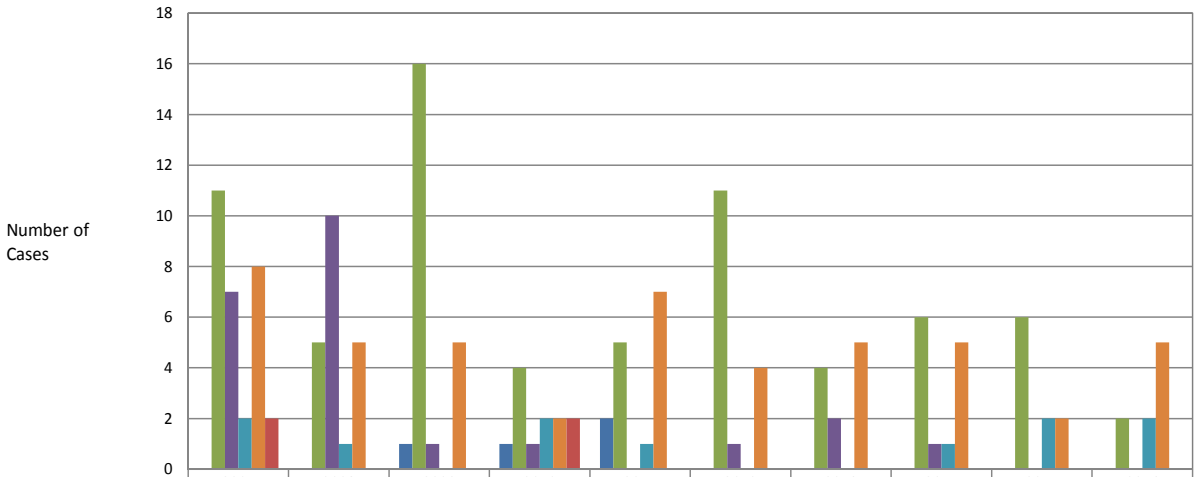


27.3 Meningococcal Disease (invasive) Rates by Age Group and Sex, 2016



		<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	4
	Male	0	0	0	0	3	0	0	0	1	1
	Total	0	0	0	0	3	0	0	0	1	5
BC Rate	Female	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66
	Male	0.00	0.00	0.00	0.00	2.14	0.00	0.00	0.00	0.15	0.18
	Total	0.00	0.00	0.00	0.00	1.10	0.00	0.00	0.00	0.07	0.43

27.4 Meningococcal Disease (invasive) Cases by Serotype and Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
29E	0	0	1	1	2	0	0	0	0	0
B	11	5	16	4	5	11	4	6	6	2
C	7	10	1	1	0	1	2	1	0	0
W-135	2	1	0	2	1	0	0	1	2	2
Y	8	5	5	2	7	4	5	5	2	5
Nontypable/Unknown	2	0	0	2	0	0	0	0	0	0

Mumps

Information about mumps can be found in the “Noteworthy Diseases and Conditions in 2016” section.

Pertussis

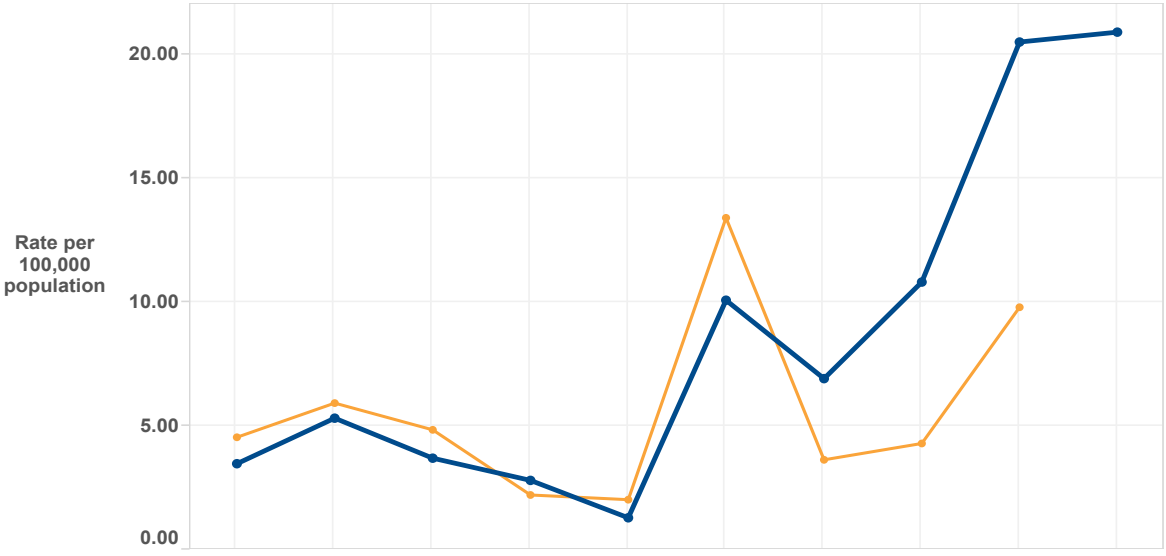
As elsewhere, pertussis remains an endemic disease in BC, with cyclical peaks occurring every 3-5 years. Since 2012, there has been a gradual increase in overall pertussis activity in BC. This recent increase follows a period of trough activity levels from 2004 to 2011 and is driven by asynchronous cyclical peaks in certain regions. The reasons for this increase are likely multifactorial but may reflect changes in population-level immunity due in part to recent periods of historically low-level activity in some regions of BC and waning of immunity from acellular vaccine.

In 2016, pertussis showed cyclical peak activity in BC (Figure 28.1). Overall provincial incidence rates of confirmed pertussis exceeded 20 cases per 100,000, with rates approaching levels previously experienced during epidemics in the late 1990s and early 2000s when pertussis incidence ranged from 20 to 40 per 100,000. Incidence rates were highest in Vancouver Island Health Authority, as well as parts of Interior Health Authority, driven by pockets of regional activity notably in Central Vancouver Island, North Vancouver Island and Kootenay Boundary HSDAs (Figure 28.2).

The highest age-specific incidence rates in 2016 were in infants <1 year old followed by pre-teens/teens (10-14 years old) (Figure 28.3). Lower incidence was observed in pre-school-aged children (1-4 years old) and younger school-aged children (5-9 years old). Age-specific incidence was also lower in older teens (15-19 years old) following the Grade 9 booster dose and in adults ≥20 years old. This current age distribution is consistent with prior cyclical peaks emphasizing risk in young infants and pre-teens/teens.

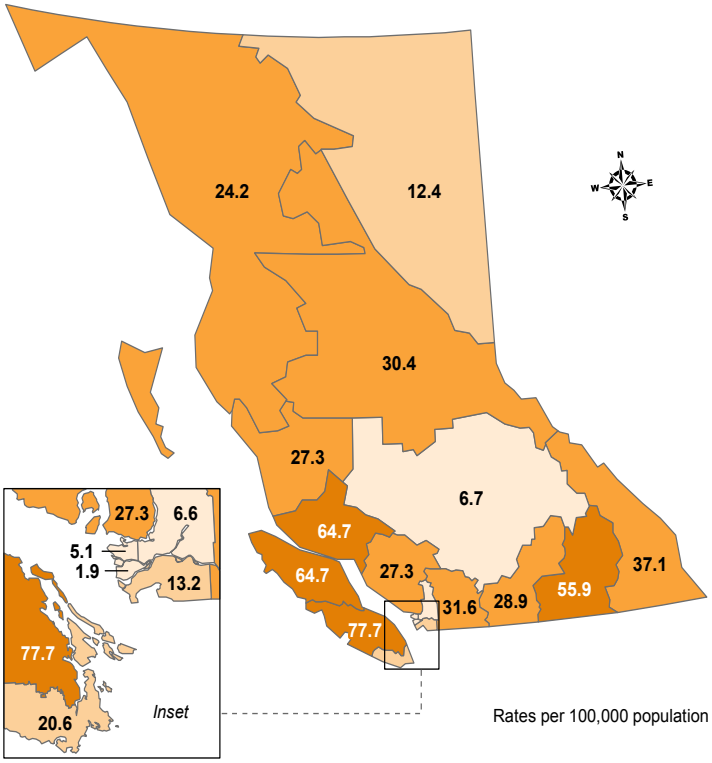
interactive dashboard

28.1 Pertussis Rates by Year, 2007-2016



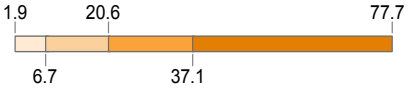
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	149	231	163	125	58	458	317	502	962	993
BC Rate	3.47	5.31	3.70	2.80	1.29	10.07	6.91	10.81	20.50	20.90
Canada Rate	4.54	5.92	4.84	2.21	2.02	13.40	3.63	4.29	9.79	

28.2 Pertussis Rates by HSDA 2016

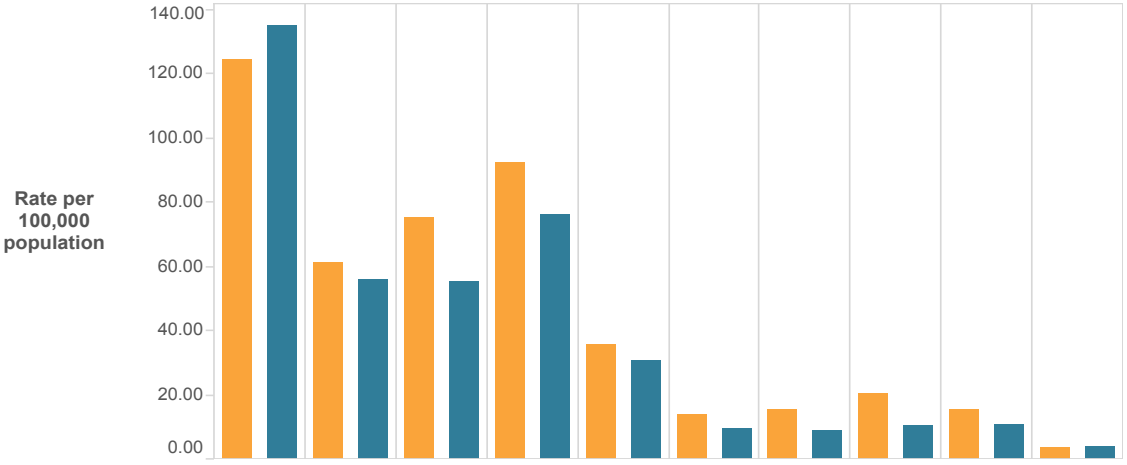


ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	29	37.1
12	Kootenay Boundary	44	55.9
13	Okanagan	105	28.9
14	Thompson Cariboo Shuswap	15	6.7
21	Fraser East	95	31.6
22	Fraser North	44	6.6
23	Fraser South	108	13.2
31	Richmond	4	1.9
32	Vancouver	34	5.1
33	North Shore/Coast Garibaldi	77	27.3
41	South Vancouver Island	79	20.6
42	Central Vancouver Island	212	77.7
43	North Vancouver Island	79	64.7
51	Northwest	17	24.2
52	Northern Interior	42	30.4
53	Northeast	9	12.5

Rates per 100,000 population by HSDA



28.3 Pertussis Rates by Age Group and Sex, 2016



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	27	54	85	104	47	22	24	65	104	22
	Male	31	52	67	91	43	16	14	33	70	22
	Total	58	106	152	195	90	38	38	98	174	44
BC Rate	Female	124.54	61.30	75.40	92.59	35.55	14.08	15.12	20.08	15.33	3.60
	Male	135.17	55.82	55.29	76.20	30.64	9.37	8.83	10.40	10.66	3.95
	Total	130.00	58.48	64.98	84.14	33.02	11.62	11.97	15.29	13.03	3.77

Pneumococcal Disease (invasive)

In 2016, 480 cases of invasive pneumococcal disease (IPD) were reported in BC (10.1 per 100,000 population), higher than the observed BC rates from 2008 to 2015. Serotype/subtype (henceforth termed serotype) results were available for 410 (85%) cases. Among cases 65 years of age and older with results available, 66% (90/136) were due to serotypes covered by the pneumococcal polysaccharide 23-valent vaccine (PPV-23).

Rates were highest among infants under 1 year of age (26.9 per 100,000 population), higher than the rate observed in 2015 for this age group (15.9 cases per 100,000 population).

Fifty-three pediatric (≤16 years of age) cases were reported, including 34 cases ≤5 years of age. Nine percent (5/53) of pediatric cases presented with meningitis. Three fatal pediatric cases were reported, with 2 of these in children ≤5 years of age.

Serotype/subtype results were available for 91% (31/34) of cases among children ≤5 years of age. Of these 31 cases, 23 (74%) were due to serotypes not covered by conjugate vaccines and 8 (26%) were due to serotypes covered by pneumococcal conjugate 13-valent vaccine (PCV-13).

The serotypes, age, 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 ≤ 5 years of age.

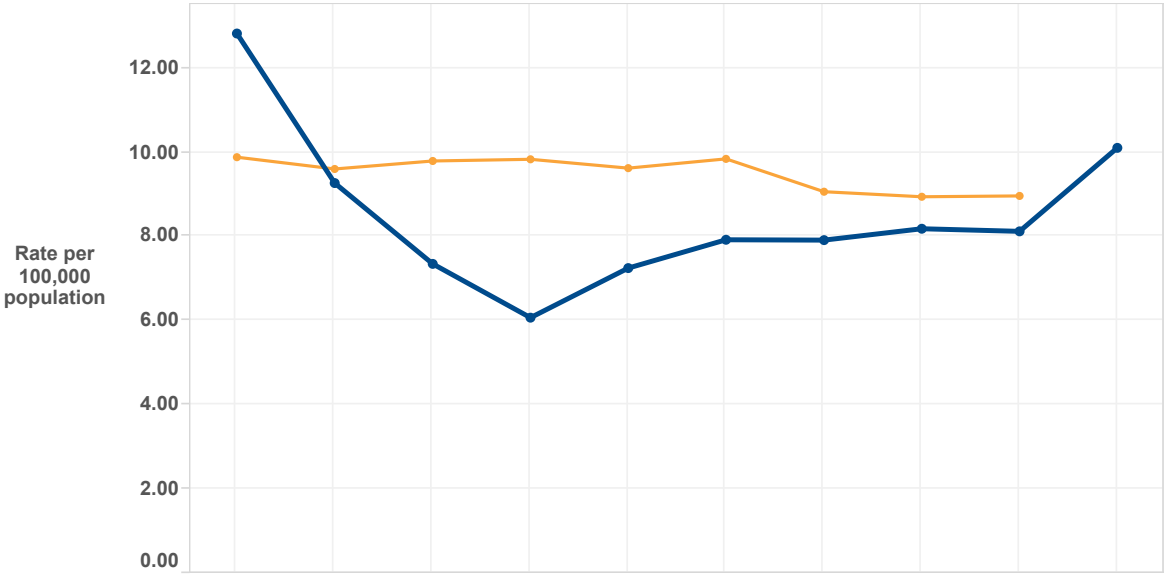
Twenty-five cases were not preventable:

- Twenty cases were due to serotypes not covered by PCV-13
- Two cases due to serotype 3 were vaccine failures in children fully immunized with PCV-13
- Two cases occurred in infants too young to have been immunized
- One case due to a PCV-13 preventable serotype occurred in an unimmunized child with documented parental refusal to immunization.

Six cases were preventable and are considered program failures:

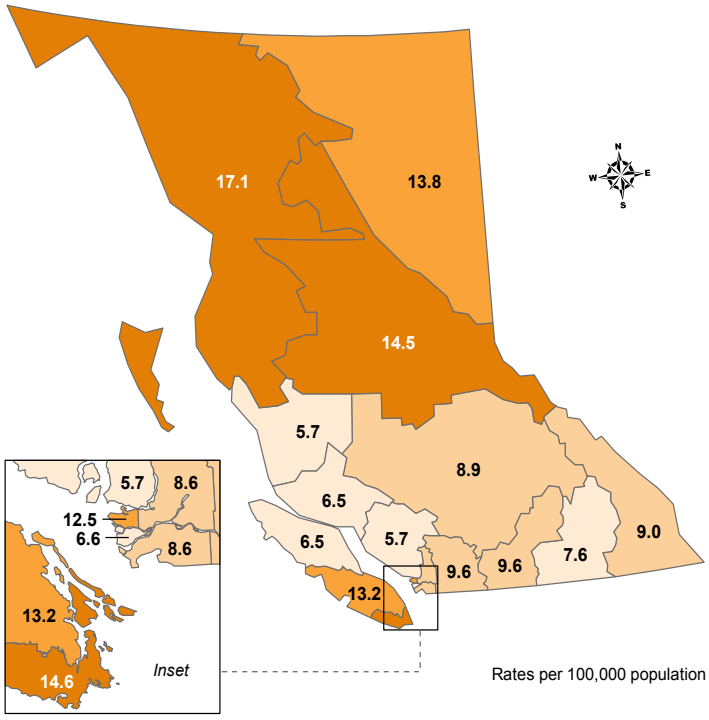
- Two cases were in unimmunized children due to serotypes covered by PCV-13 (3 and 19A) with no exemptions or medical contraindications to pneumococcal vaccine recorded
- Three cases due to PPV-23 preventable serotypes (8, 22F, 33F) were reported in medically high-risk children older than 2 years of age who had not received a dose of PPV-23 vaccine and without exemptions or medical contraindications to pneumococcal vaccine recorded
- One case due to serotype 19F was reported in a medically high-risk child who received a 2+1 series of PCV-13, but had not received an additional dose of PCV-13 at 6 months of age nor a dose of PPV-23

29.1 Pneumococcal Disease (invasive) Rates by Year, 2007-2016



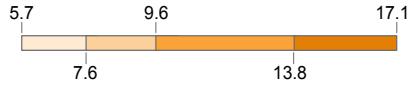
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	550	403	324	271	326	360	363	380	381	480
BC Rate	12.82	9.27	7.35	6.07	7.25	7.92	7.91	8.18	8.12	10.10
Canada Rate	9.88	9.60	9.79	9.83	9.62	9.84	9.06	8.94	8.96	

29.2 Pneumococcal Disease (invasive) Rates by HSDA, 2016

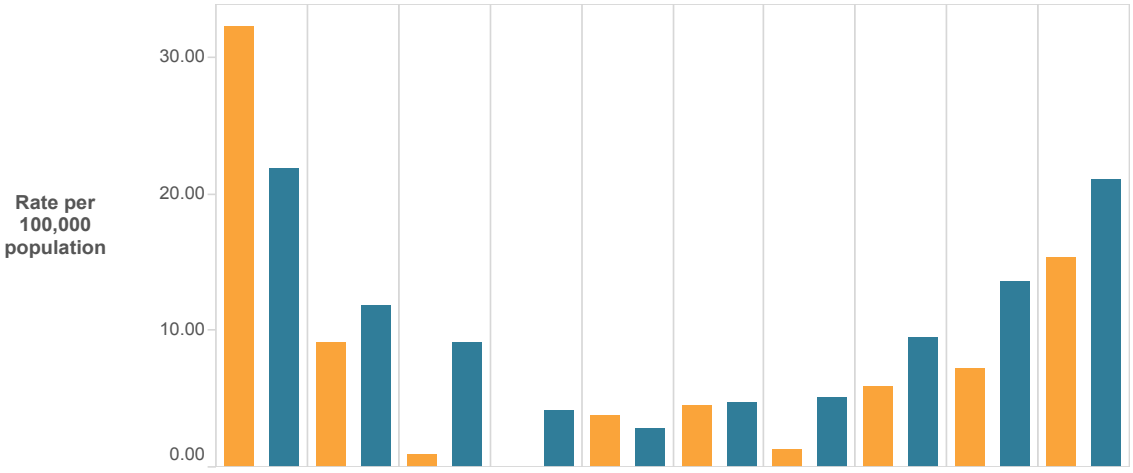


ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	7	9.0
12	Kootenay Boundary	6	7.6
13	Okanagan	35	9.6
14	Thompson Cariboo Shuswap	20	8.9
21	Fraser East	29	9.6
22	Fraser North	57	8.6
23	Fraser South	70	8.6
31	Richmond	14	6.6
32	Vancouver	84	12.5
33	North Shore/Coast Garibaldi	16	5.7
41	South Vancouver Island	56	14.6
42	Central Vancouver Island	36	13.2
43	North Vancouver Island	8	6.5
51	Northwest	12	17.1
52	Northern Interior	20	14.5
53	Northeast	10	13.8

Rates per 100,000 population by HSDA



29.3 Pneumococcal Disease (invasive) Rates by Age Group and Sex, 2016



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	7	8	1	0	5	7	2	19	49	94
	Male	5	11	11	5	4	8	8	30	89	117
	Total	12	19	12	5	9	15	10	49	138	211
BC Rate	Female	32.29	9.08	0.89	0.00	3.78	4.48	1.26	5.87	7.22	15.40
	Male	21.80	11.81	9.08	4.19	2.85	4.69	5.04	9.46	13.55	21.03
	Total	26.90	10.48	5.13	2.16	3.30	4.59	3.15	7.65	10.33	18.08

Rubella and Congenital Rubella Syndrome

In 2016, 1 confirmed rubella case was reported in a BC resident (0.02 per 100,000 population). The case was reported by Vancouver Coastal Health, and had a history compatible with exposure during travel in Southeast Asia.

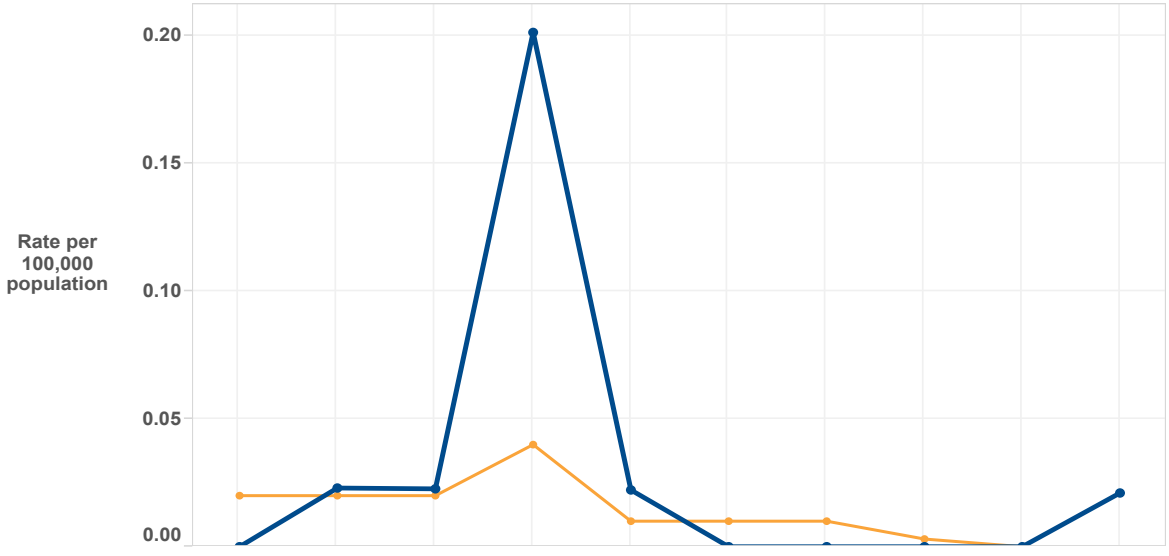
The case was male, 40-49 years old and had undocumented history of one dose of rubella-containing vaccine. The case was not hospitalized and no complications were reported.

No cases of congenital rubella syndrome (CRS) have been reported in BC since case reports in each of 2004 and 2002.

Readers are referred to the relevant year's Annual Summary of Reportable Diseases for additional detail.

interactive dashboard

30.1 Rubella Rates by Year, 2007-2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	0	1	1	9	1	0	0	0	0	1
BC Rate	0.00	0.02	0.02	0.20	0.02	0.00	0.00	0.00	0.00	0.02
Canada Rate	0.02	0.02	0.02	0.04	0.01	0.01	0.01	0.00	0.00	

Vectorborne and Zoonotic Diseases

Lyme Disease
Rabies Exposure
Reportable Zoonoses in Animals

Lyme Disease

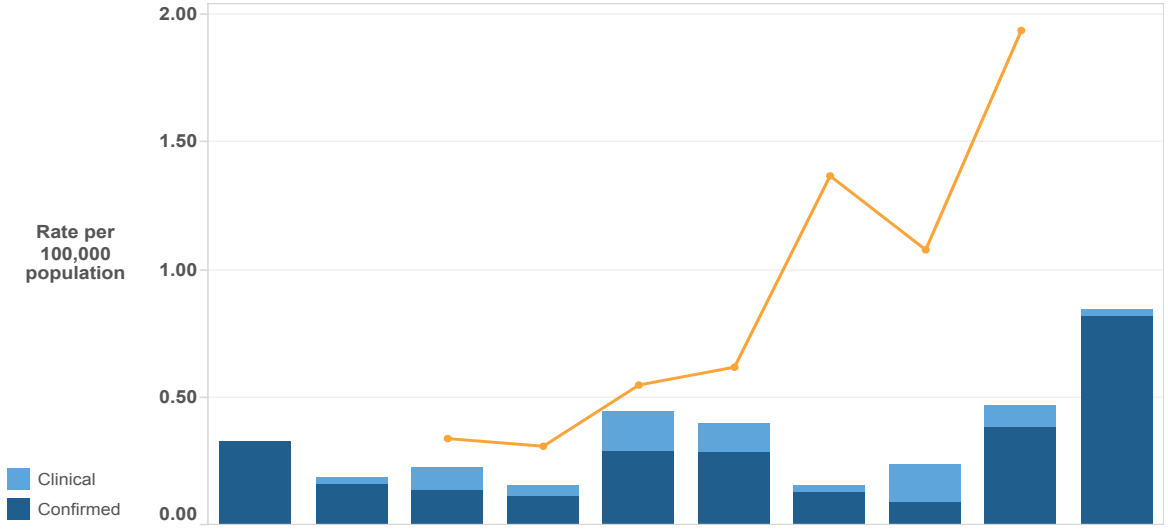
There was an increase in the reported incidence of Lyme disease in 2016 with 40 cases reported. This increase is a result of 1) new diagnostic tests implemented at the BC Centre for Disease Control Public Health Laboratory (BCCDC PHL) and the National Microbiology Laboratory (NML) that are more sensitive at detecting various Lyme disease strains and 2) a higher testing volume likely due to greater awareness about Lyme.

Thirty-nine of the reported cases were lab-confirmed and one was clinically-diagnosed. Twenty-seven cases (67.5%) were infected by a European strain of the Lyme bacterium. This is higher than in previous years and is likely due to the new diagnostic tests. These people were very likely infected outside BC.

Most cases were reported in the summer and fall months, consistent with tick season. Incidence was highest among adults between the ages of 25-29. The highest incidence was reported from Northwest HSDA and North Shore/Coast Garibaldi but the highest number of cases was reported in Vancouver. Lyme disease risk areas are found throughout southern BC: http://www.bccdc.ca/resource-gallery/Documents/Statistics%20and%20Research/Statistics%20and%20Reports/Epid/Vector-bourne/Lyme_Disease_Risk_Areas_Map_BC_June_2013.pdf

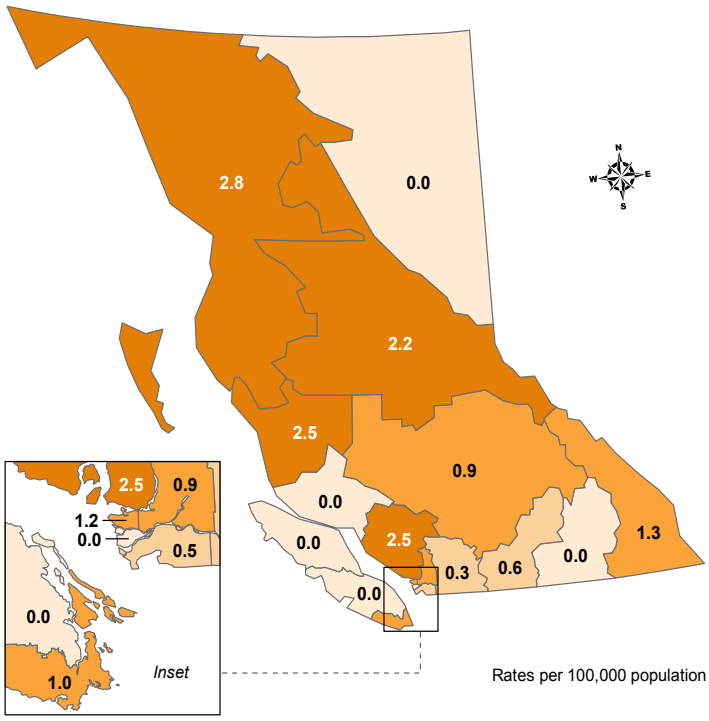
interactive dashboard

31.1 Lyme Disease Rates by Year, 2007-2016



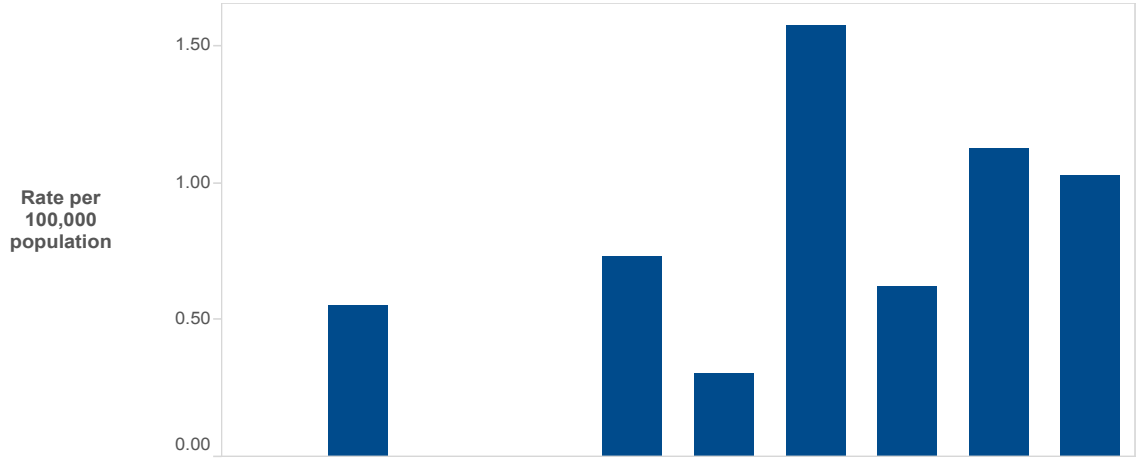
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports	14	8	10	7	20	18	7	11	22	40
BC Rate	0.33	0.18	0.23	0.16	0.44	0.40	0.15	0.24	0.47	0.84
Canada Rate			0.34	0.31	0.55	0.62	1.37	1.08	1.94	

31.2 Lyme Disease Rates by HSDA, 2016



ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	1	1.3
12	Kootenay Boundary	0	0.0
13	Okanagan	2	0.6
14	Thompson Cariboo Shuswap	2	0.9
21	Fraser East	1	0.3
22	Fraser North	6	0.9
23	Fraser South	4	0.5
31	Richmond	0	0.0
32	Vancouver	8	1.2
33	North Shore/Coast Garibaldi	7	2.5
41	South Vancouver Island	4	1.0
42	Central Vancouver Island	0	0.0
43	North Vancouver Island	0	0.0
51	Northwest	2	2.8
52	Northern Interior	3	2.2
53	Northeast	0	0.0

31.3 Lyme Disease Rates by Age Group and Sex, 2016



		<1	1-4	5-9	10-14	15-19	20-24	25-29	30-39	40-59	60+
Reports	Female	0	1	0	0	1	0	3	3	11	4
	Male	0	0	0	0	1	1	2	1	4	8
	Total	0	1	0	0	2	1	5	4	15	12
BC Rate	Female	0.00	1.14	0.00	0.00	0.76	0.00	1.89	0.93	1.62	0.66
	Male	0.00	0.00	0.00	0.00	0.71	0.59	1.26	0.32	0.61	1.44
	Total	0.00	0.55	0.00	0.00	0.73	0.31	1.58	0.62	1.12	1.03

Rabies Exposures*

There were no human rabies cases in 2016. The last case reported in BC occurred in 2003. Only bats carry 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 in BC has remained constant since 2012 with 178 exposures or 3.8/100,000 in 2016 (Figure 32.1).It dropped in 2009 following a change in the provincial recommendations whereby individuals finding a bat in their bedroom or nearby no longer receive post exposure prophylaxis. The transition from CFIA to provincial rabies management in 2014 did not impact the provincial incidence. In 2016, 95 (53.4%) of the reported exposures occurred in BC or Canada; this proportion is similar to 2015.

The majority (82%) of exposures occurring in BC/Canada involved bats, the only rabies reservoir in BC (Figure 32.2). Dogs, cats and monkeys accounted for 82% of international exposures. A smaller proportion (54.5%) of exposures than in previous years was due to bites; more were due to scratches and unknown exposures (Figure 32.3).

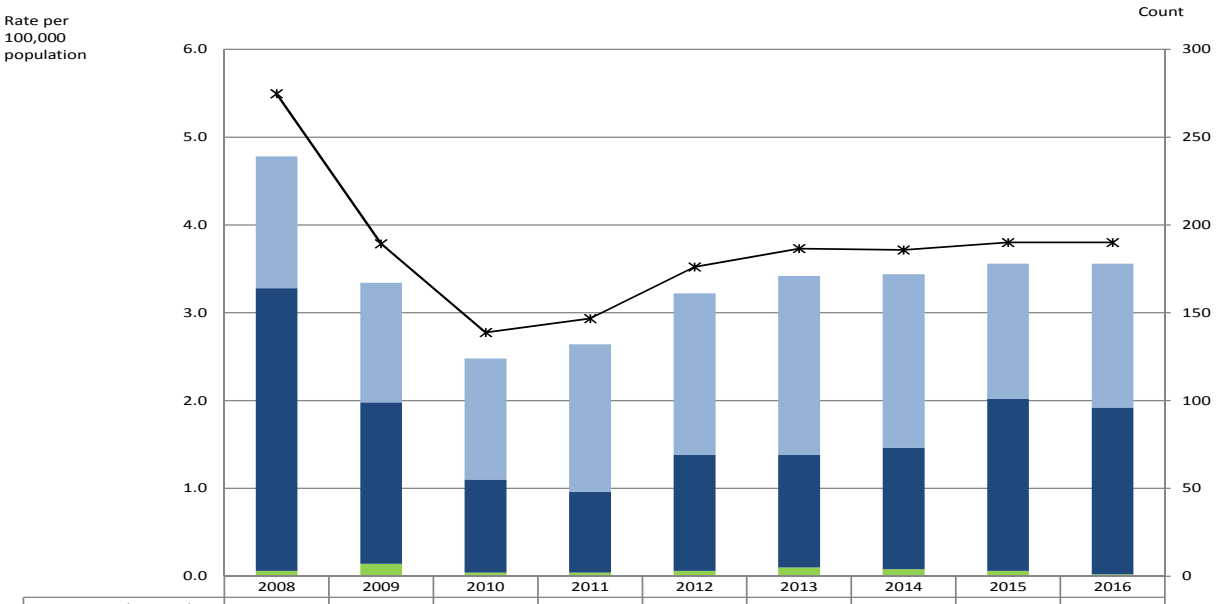
Fraser North reported the highest number of rabies exposures (N=39), with a notable increase compared to previous years (Figure 32.4). No particular exposure events were noted. The highest rate of exposure was once again reported in Interior Health HSDAs where the majority of exposures (67.2%) occur within BC/Canada. South Vancouver Island also reported a high exposure rate in 2016 with 85.7% occurring within BC/Canada. This was in part explained by a group of 5 people requiring RPEP following a single local bat exposure.

As usual, the highest rates of exposure were reported in children and young adults, with children mainly exposed in BC and young adults mainly exposed international (Figure 32.5).

Most BC/Canada exposures were reported between July and August when bats are active (Figure 32.6).In April, 4 individuals in CVI received RPEP after being exposed to a bat in BC. International exposures occurred throughout the year with a slightly higher number in the late winter and spring, likely associated with the travel patterns of BC residents.

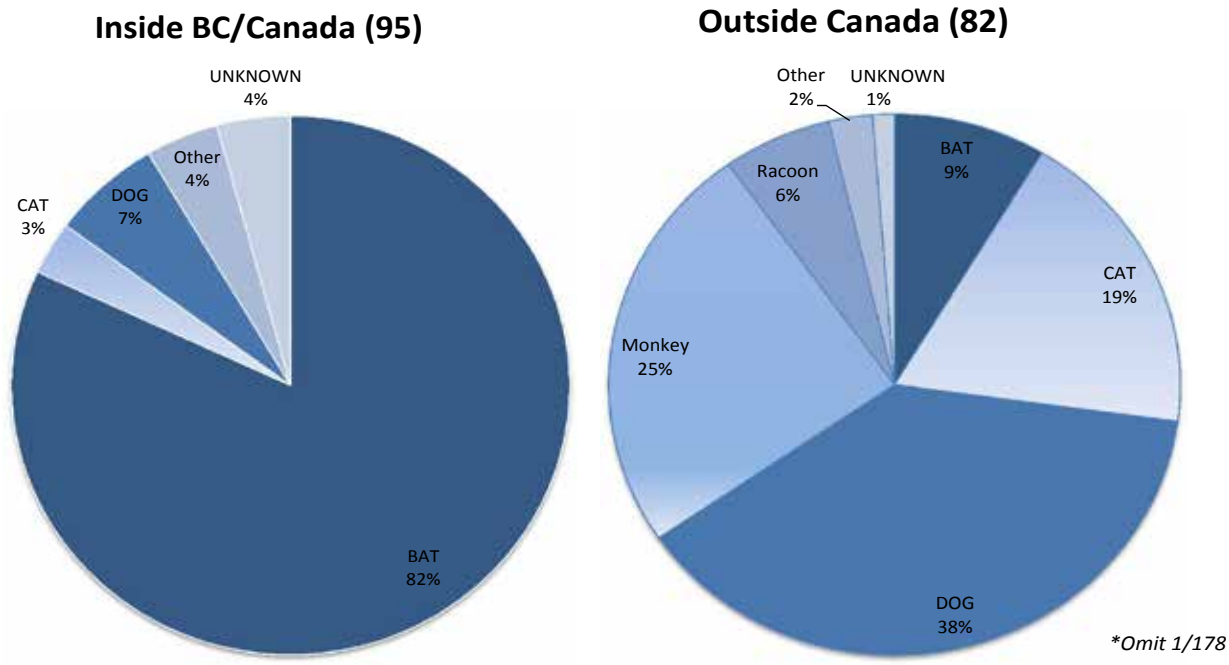
*The term “exposure” denotes a report of an individual exposed to an animal which presents a risk of rabies infection. Rabies exposures were defined in Panorama as “confirmed exposure” AND “MHO recommends RPEP”.

32.1 Rabies Exposures Rates by Year, 2008-2016



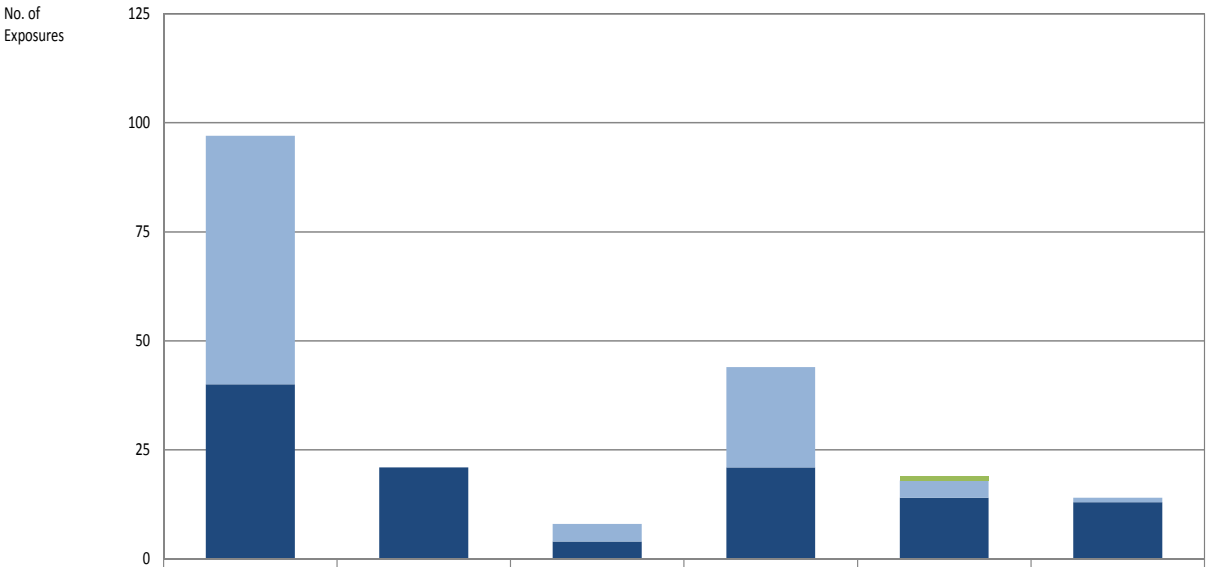
	2008	2009	2010	2011	2012	2013	2014	2015	2016
Outside Canada	75	68	69	84	92	102	99	77	82
Inside BC/Canada	161	92	53	46	66	64	69	98	95
Unknown	3	7	2	2	3	5	4	3	1
Rates per 100,000	5.5	3.8	2.8	2.9	3.5	3.7	3.7	3.8	3.8
Total Exposures	239	167	124	132	160	171	172	178	178

32.2 Rabies Exposures by Animal Species Involved, 2016



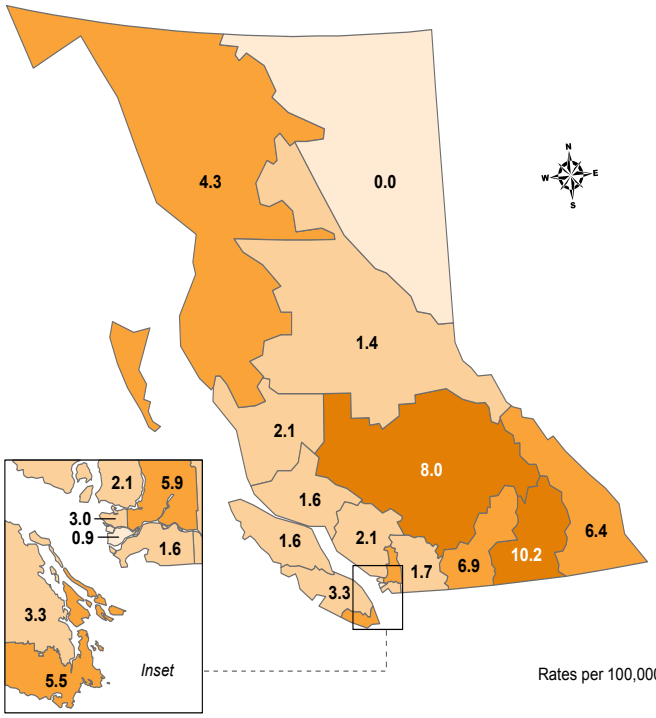
*Omit 1/178

32.3 Rabies Exposures by Type of Exposure, 2016



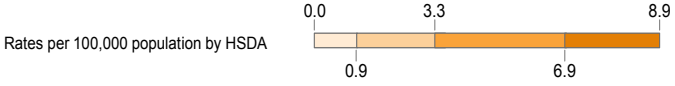
	BITE	HAHDLING	SALIVA	SCRATCH	Other*	UNKNOWN
Unknown					1	
Outside Canada	57		4	23	4	1
Inside BC/Canada	40	21	4	21	14	13

32.4 Rabies Exposure Rates by HSDA, 2016**



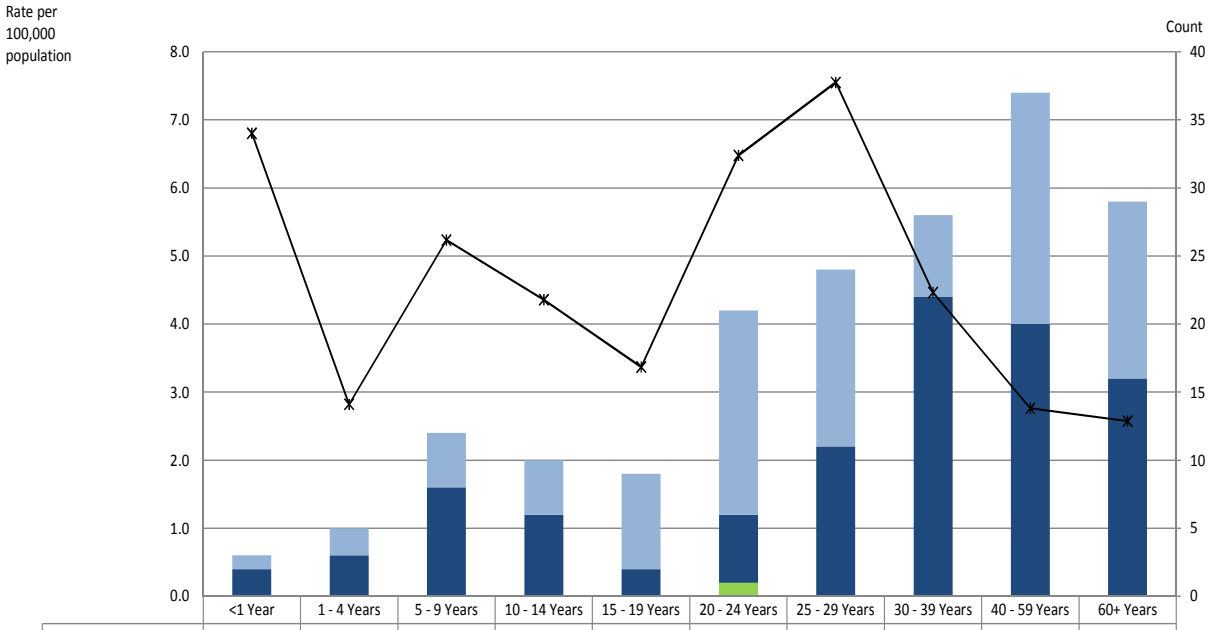
ID	Health Service Delivery Area	Exps.	Rate	BC/Can. Exps.	Int'l Exps.
11	East Kootenay	5	6.4	3	2
12	Kootenay Boundary	7	8.9	5	2
13	Okanagan	25	6.9	17	8
14	Thompson Cariboo Shuswap	18	8.0	12	6
21	Fraser East	5	1.7	1	4
22	Fraser North	*39	5.9	17	21
23	Fraser South	13	1.6	1	12
31	Richmond	2	0.9	0	2
32	Vancouver	^20	3.0	6	14
33	North Shore/Coast Garibaldi	^6	2.1	2	4
41	South Vancouver Island	^21	5.5	18	3
42	Central Vancouver Island	9	3.3	7	2
43	North Vancouver Island	2	1.6	1	1
51	Northwest	3	4.3	3	0
52	Northern Interior	2	1.4	2	0
53	Northeast	0	0.0	0	0

Notes: *The location of 1 exposure in FN was not reported.
^The HSDA of 1 exposure in VCHA was not reported.



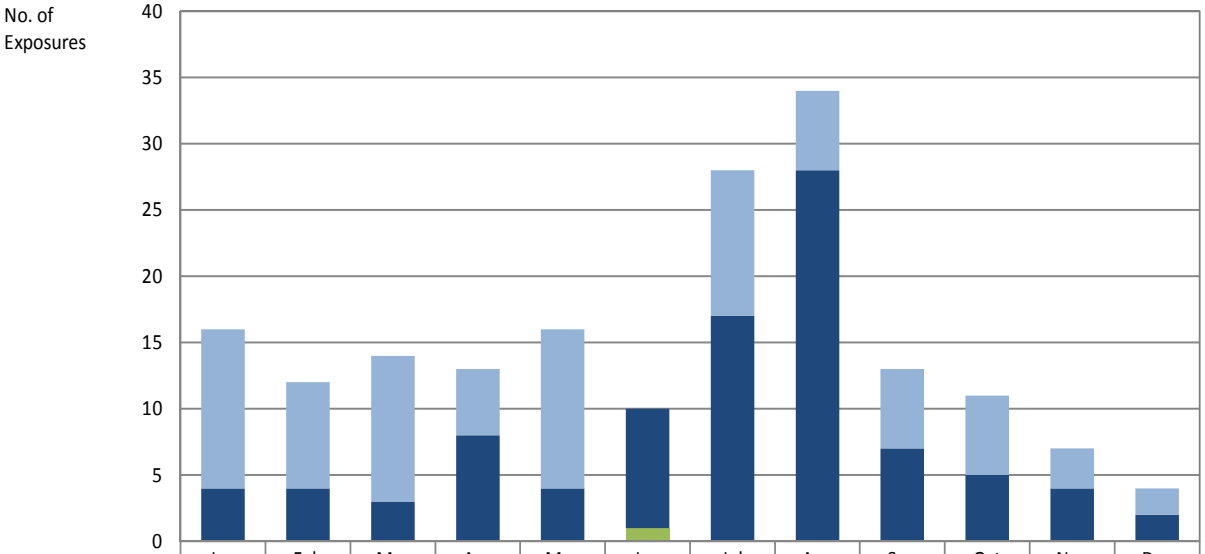
** Note that 1 Rabies exposure case is missing HSDA information in VCHA and is not reported in the map.

32.5 Rabies Exposures by Age Group, 2016



	<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	1	2	4	4	7	15	13	6	17	13
Inside BC/Canada	2	3	8	6	2	5	11	22	20	16
Unknown						1				
Rate per 100,000	6.8	2.8	5.2	4.4	3.4	6.5	7.6	4.5	2.8	2.6

32.6 Rabies Exposures by Month, 2016



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Outside Canada	12	8	11	5	12		11	6	6	6	3	2
Inside BC/Canada	4	4	3	8	4	9	17	28	7	5	4	2
Unknown						1						

Reportable Zoonoses in Animals

Since 2015, the British Columbia Chief Veterinary Officer shares reports of certain zoonotic diseases in animals with the Provincial Health Officer or delegate (i.e. BCCDC). Fourteen zoonotic diseases in animals plus new or unusual diseases or clusters with potential public health significance are reported to public health authorities to consider and possibly initiate a public health response. 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, 16 cases of reportable zoonoses in animals were reported to public health in 2016. Diseases included influenza, Q fever (Coxiella burnetii infection), *Mycobacterium genavense* infection and West Nile virus (WNv). IInvestigation of 2 of the WNv horse cases (1 in FHA and 1 in IHA) revealed that they may have been infected outside of BC. All of the other cases of zoonotic disease were believed to have been acquired in BC. The animal species affected included livestock, pets and wildlife. The affected animals resided in three Health Authorities.

For rabies, many suspect animal cases are identified each year. A total of 148 samples were submitted from BC to the Canadian Food Inspection Agency laboratory for rabies testing in 2016[4]. Eighteen bats were positive for rabies virus. At least one rabies positive bat was detected within the boundaries of each Health Authority in BC.

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/Documents/BC%20Rabies%20Guidance%20for%20Veterinarians_July%202017%20EF.pdf
http://www.bccdc.ca/resource-gallery/Documents/Guidelines%20and%20Forms/Guidelines%20and%20Manuals/Epid/CD%20Manual/Chapter%201%20-%20CDC/BCRabiesGuidelines.pdf
4. http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/rabies/rabies-in-canada/

33.1 Reportable Zoonoses reported in BC in 2016.

Disease	Month	Species	Health Authority
Low pathogenic avian influenza	February	Wild duck	Fraser Health
Influenza (pH1N1)	April	Skunk	Fraser Health
Q fever	April	Goat	Fraser Health
Mycobacterium genavense	June	Parrot	Island Health
West Nile virus	November	Horses (1)	Fraser Health
West Nile virus	August	Horses (9)	Interior Health
West Nile virus	August	Crows (2)	Interior Health
Rabies (18 cases)	Various	Bat	All

Counts and Rates for All Reportable Diseases

2016 BC Reportable Disease CASE REPORTS by Health Service Delivery Area

	BC TOTAL	INTERIOR					FRASER			
	Provincial Total	East Kootenay	Kootenay Boundary	Okanagan	Thompson Cariboo	**Interior Total**	Fraser East	Fraser North	Fraser South	**Fraser Total**
2016 Population Estimate	**4681960**	**76776**	**77371**	**361856**	**220709**	**736712**	**295842**	**653734**	**792355**	**1741931**
AIDS (2015)*	**73**	2	1	2	0	**5**	3	5	11	**19**
Amebiasis	**419**	2	2	7	8	**19**	19	44	79	**142**
Campylobacteriosis	**1,606**	29	29	102	76	**236**	101	244	260	**605**
Chlamydia (genital)	**14,889**	202	148	1,052	865	**2,267**	596	1693	1690	**3979**
Cholera serogroup non-O1/O139	**2**	0	0	2	0	**2**	0	0	0	**0**
Cryptococcus gattii	**11**	0	0	0	0	**0**	2	0	2	**4**
Cryptosporidiosis	**112**	5	6	2	12	**25**	10	9	27	**46**
Cyclosporiasis	**53**	0	0	0	1	**1**	7	9	12	**28**
E. coli (shigatoxigenic)	**132**	8	3	13	9	**33**	4	11	20	**35**
Giardiasis	**542**	8	13	24	25	**70**	36	54	89	**179**
Gonorrhea (genital)	**3,007**	4	12	72	178	**266**	173	313	419	**905**
Haemophilus influenzae non-type b (invasive)	**76**	1	3	2	3	**9**	13	9	18	**40**
Haemophilus influenzae type b (invasive)	**2**	0	0	0	0	**0**	0	0	0	**0**
Hepatitis A	**22**	1	0	4	0	**5**	0	1	4	**5**
Hepatitis B: Acute	**5**	0	0	0	0	**0**	1	0	0	**1**
Hepatitis B: Chronic & Undetermined	**1,163**	5	2	11	11	**29**	30	272	191	**493**
Hepatitis C	**2,307**	36	45	198	149	**428**	223	283	308	**814**
Hepatitis D	**4**	0	0	0	0	**0**	0	1	1	**2**
Hepatitis E	**2**	0	0	0	0	**0**	0	1	0	**1**
HIV	**254**	0	2	7	6	**15**	8	30	33	**71**
Legionellosis	**14**	0	0	0	2	**2**	1	2	5	**8**
Leptospirosis	**4**	0	0	0	0	**0**	0	0	0	**0**
Listeriosis	**17**	0	0	0	1	**1**	1	1	1	**3**
Lyme Disease	**40**	1	0	2	2	**5**	1	6	4	**11**
Malaria	**28**	1	0	0	4	**5**	0	3	4	**7**
Measles	**2**	0	0	0	0	**0**	0	0	0	**0**
Meningococcal Disease (invasive)	**9**	1	0	1	0	**2**	0	1	1	**2**
Mumps	**148**	0	0	2	0	**2**	0	13	23	**36**
Paratyphoid Fever	**19**	0	0	0	1	**1**	1	2	9	**12**
Pertussis	**993**	29	44	105	15	**193**	95	44	108	**247**
Pneumococcal Disease (invasive)	**480**	7	6	35	20	**68**	29	57	70	**156**
Rabies Exposure	**178**	5	7	25	18	**55**	5	39	13	**57**
Rubella	**1**	0	0	0	0	**0**	0	0	0	**0**
Salmonella (non-typhoidal)	**1,107**	17	30	77	48	**172**	124	149	205	**478**
Shigellosis	**156**	1	1	9	1	**12**	9	12	33	**54**
Streptococcal Disease group A (invasive)	**303**	7	5	15	25	**52**	21	22	43	**86**
Streptococcal Disease group B (neonatal)	**10**	0	1	1	0	**2**	0	3	0	**3**
Syphilis (Infectious)	**755**	3	5	23	8	**39**	14	84	72	**170**
Toxoplasmosis	**1**	0	0	0	0	**0**	0	0	1	**1**
Tuberculosis	**225**	2	0	6	3	**11**	12	36	64	**112**
Typhoid Fever	**21**	0	0	1	0	**1**	3	1	11	**15**
Vibrio Infection	**36**	2	0	0	0	**2**	1	5	7	**13**
West Nile Virus	**1**	0	0	0	0	**0**	0	0	0	**0**
Yersiniosis	**734**	5	6	32	17	**60**	32	119	112	**263**
Zika Virus	**44**	0	0	2	1	**3**	3	6	10	**19**

*Reportable diseases with no cases are not included

VANCOUVER COASTAL				VANCOUVER ISLAND				NORTHERN			
Richmond	Vancouver	North Shore Coast Garibaldi	**Vancouver Coastal Total**	South Vancouver Island	Central Vancouver Island	North Vancouver Island	**Vancouver Island Total**	Northwest	Northern Interior	Northeast	**Northern Total**
207734	**666821**	**281440**	**1155995**	**377668**	**267833**	**121416**	**766917**	**72301**	**138479**	**69625**	**280405**
3	17	2	**22**	1	3	1	**5**	1	2	0	**3**
9	160	38	**207**	35	7	8	**50**	0	1	0	**1**
72	289	172	**533**	108	70	22	**200**	17	10	5	**32**
548	3648	795	**4991**	1271	948	305	**2524**	324	594	210	**1128**
0	0	0	**0**	0	0	0	**0**	0	0	0	**0**
1	1	0	**2**	1	4	0	**5**	0	0	0	**0**
1	15	11	**27**	5	5	1	**11**	0	3	0	**3**
5	10	6	**21**	3	0	0	**3**	0	0	0	**0**
9	18	8	**35**	6	8	11	**25**	0	4	0	**4**
13	109	70	**192**	49	26	12	**87**	7	6	1	**14**
51	1062	124	**1237**	184	92	17	**293**	80	193	33	**306**
1	6	1	**8**	2	9	2	**13**	2	3	1	**6**
0	0	0	**0**	0	0	0	**0**	0	0	2	**2**
0	4	2	**6**	1	1	1	**3**	0	0	3	**3**
0	4	0	**4**	0	0	0	**0**	0	0	0	**0**
156	363	53	**572**	43	11	6	**60**	3	4	1	**8**
40	406	74	**520**	146	172	75	**393**	29	99	24	**152**
0	2	0	**2**	0	0	0	**0**	0	0	0	**0**
0	0	1	**1**	0	0	0	**0**	0	0	0	**0**
7	111	9	**127**	18	9	2	**29**	4	8	0	**12**
0	2	0	**2**	1	0	0	**1**	0	1	0	**1**
0	3	1	**4**	0	0	0	**0**	0	0	0	**0**
5	5	3	**13**	0	0	0	**0**	0	0	0	**0**
0	8	7	**15**	4	0	0	**4**	2	3	0	**5**
1	8	1	**10**	1	2	1	**4**	1	0	1	**2**
1	1	0	**2**	0	0	0	**0**	0	0	0	**0**
1	1	1	**3**	0	1	0	**1**	1	0	0	**1**
1	37	42	**80**	25	2	0	**27**	3	0	0	**3**
0	3	1	**4**	1	0	0	**1**	0	0	1	**1**
4	34	77	**115**	79	212	79	**370**	17	42	9	**68**
14	84	16	**114**	56	36	8	**100**	12	20	10	**42**
2	20	6	**28**	21	9	2	**32**	3	2	0	**5**
0	1	0	**1**	0	0	0	**0**	0	0	0	**0**
50	145	102	**297**	31	47	15	**93**	24	35	8	**67**
4	61	10	**75**	10	2	2	**14**	1	0	0	**1**
6	84	14	**104**	27	15	2	**44**	3	9	5	**17**
0	3	0	**3**	0	1	0	**1**	0	1	0	**1**
16	427	16	**459**	58	13	8	**79**	2	5	1	**8**
0	0	0	**0**	0	0	0	**0**	0	0	0	**0**
12	64	6	**82**	3	5	1	**9**	1	4	2	**7**
2	3	0	**5**	0	0	0	**0**	0	0	0	**0**
3	8	7	**18**	1	1	0	**2**	1	0	0	**1**
0	1	0	**1**	0	0	0	**0**	0	0	0	**0**
45	147	100	**292**	54	30	11	**95**	8	14	2	**24**
0	11	2	**13**	4	2	1	**7**	1	1	0	**2**

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

2016 BC Reportable Disease CASE RATES (per 100,000 population) by Health Service Delivery Area

	BC TOTAL	INTERIOR					FRASER			
	Provincial Total	East Kootenay	Kootenay Boundary	Okanagan	Thompson Cariboo	**Interior Total**	Fraser East	Fraser North	Fraser South	**Fraser Total**
2016 Population Estimate	**4681960**	**76776**	**77371**	**361856**	**220709**	**736712**	**295842**	**653734**	**792355**	**1741931**
AIDS (2015)*	**1.56**	2.57	1.27	0.56	0.00	**0.68**	1.01	0.77	1.38	**1.09**
Amebiasis	**8.82**	2.56	2.54	1.93	3.57	**2.56**	6.32	6.63	9.67	**7.97**
Campylobacteriosis	**33.80**	37.13	36.86	28.11	33.96	**31.74**	33.59	36.75	31.83	**33.96**
Chlamydia (genital)	**313.35**	258.63	188.11	289.91	386.47	**304.92**	198.19	255.00	206.87	**223.34**
Cholera serogroup non-O1/O139	**0.04**	0.00	0.00	0.55	0.00	**0.27**	0.00	0.00	0.00	**0.00**
Cryptococcus gattii	**0.23**	0.00	0.00	0.00	0.00	**0.00**	0.67	0.00	0.24	**0.22**
Cryptosporidiosis	**2.36**	6.40	7.63	0.55	5.36	**3.36**	3.33	1.36	3.31	**2.58**
Cyclosporiasis	**1.12**	0.00	0.00	0.00	0.45	**0.13**	2.33	1.36	1.47	**1.57**
E. coli (shigatoxigenic)	**2.78**	10.24	3.81	3.58	4.02	**4.44**	1.33	1.66	2.45	**1.96**
Giardiasis	**11.41**	10.24	16.52	6.61	11.17	**9.42**	11.97	8.13	10.89	**10.05**
Gonorrhea (genital)	**63.28**	5.12	15.25	19.84	79.53	**35.78**	57.53	47.14	51.29	**50.80**
Haemophilus influenzae non-type b (invasive)	**1.60**	1.28	3.81	0.55	1.34	**1.21**	4.32	1.36	2.20	**2.25**
Haemophilus influenzae type b (invasive)	**0.04**	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
Hepatitis A	**0.46**	1.28	0.00	1.10	0.00	**0.67**	0.00	0.15	0.49	**0.28**
Hepatitis B: Acute	**0.11**	0.00	0.00	0.00	0.00	**0.00**	0.33	0.00	0.00	**0.06**
Hepatitis B: Chronic & Undetermined	**24.48**	6.40	2.54	3.03	4.91	**3.90**	9.98	40.97	23.38	**27.67**
Hepatitis C	**48.55**	46.09	57.19	54.57	66.57	**57.57**	74.15	42.63	37.70	**45.69**
Hepatitis D	**0.08**	0.00	0.00	0.00	0.00	**0.00**	0.00	0.15	0.12	**0.11**
Hepatitis E	**0.04**	0.00	0.00	0.00	0.00	**0.00**	0.00	0.15	0.00	**0.06**
HIV	**5.35**	0.00	2.54	1.93	2.68	**2.02**	2.66	4.52	4.04	**3.99**
Legionellosis	**0.29**	0.00	0.00	0.00	0.89	**0.27**	0.33	0.30	0.61	**0.45**
Leptospirosis	**0.08**	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
Listeriosis	**0.36**	0.00	0.00	0.00	0.45	**0.13**	0.33	0.15	0.12	**0.17**
Lyme Disease	**0.84**	1.28	0.00	0.55	0.89	**0.67**	0.33	0.90	0.49	**0.62**
Malaria	**0.59**	1.28	0.00	0.00	1.79	**0.67**	0.00	0.45	0.49	**0.39**
Measles	**0.04**	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
Meningococcal Disease (invasive)	**0.19**	1.28	0.00	0.28	0.00	**0.27**	0.00	0.15	0.12	**0.11**
Mumps	**3.11**	0.00	0.00	0.55	0.00	**0.27**	0.00	1.96	2.82	**2.02**
Paratyphoid Fever	**0.40**	0.00	0.00	0.00	0.45	**0.13**	0.33	0.30	1.10	**0.67**
Pertussis	**20.90**	37.13	55.92	28.94	6.70	**25.96**	31.59	6.63	13.22	**13.86**
Pneumococcal Disease (invasive)	**10.10**	8.96	7.63	9.65	8.94	**9.15**	9.64	8.59	8.57	**8.76**
Rabies Exposure	**3.75**	6.40	8.90	6.89	8.04	**7.40**	1.66	5.87	1.59	**3.20**
Rubella	**0.02**	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
Salmonella (non-typhoidal)	**23.30**	21.77	38.13	21.22	21.45	**23.13**	41.23	22.44	25.09	**26.83**
Shigellosis	**3.28**	1.28	1.27	2.48	0.45	**1.61**	2.99	1.81	4.04	**3.03**
Streptococcal Disease group A (invasive)	**6.38**	8.96	6.35	4.13	11.17	**6.99**	6.98	3.31	5.26	**4.83**
Streptococcal Disease group B (neonatal)	**22.41**	0.00	168.07	34.97	0.00	**32.69**	0.00	42.16	0.00	**15.53**
Syphilis (Infectious)	**15.89**	3.84	6.35	6.34	3.57	**5.25**	4.66	12.65	8.81	**9.54**
Toxoplasmosis	**0.02**	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.12	**0.06**
Tuberculosis	**4.74**	2.56	0.00	1.65	1.34	**1.48**	3.99	5.42	7.83	**6.29**
Typhoid Fever	**0.44**	0.00	0.00	0.28	0.00	**0.13**	1.00	0.15	1.35	**0.84**
Vibrio Infection	**0.76**	2.56	0.00	0.00	0.00	**0.27**	0.33	0.75	0.86	**0.73**
West Nile Virus	**0.02**	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
Yersiniosis	**15.45**	6.40	7.63	8.82	7.60	**8.07**	10.64	17.92	13.71	**14.76**
Zika Virus	**0.93**	0.00	0.00	0.55	0.45	**0.40**	1.00	0.90	1.22	**1.07**

*Reportable diseases with no cases are not included

VANCOUVER COASTAL				VANCOUVER ISLAND				NORTHERN			
Richmond	Vancouver	North Shore Coast Garibaldi	**Vancouver Coastal Total**	South Vancouver Island	Central Vancouver Island	North Vancouver Island	**Vancouver Island Total**	Northwest	Northern Interior	Northeast	**Northern Total**
207734	**666821**	**281440**	**1155995**	**377668**	**267833**	**121416**	**766917**	**72301**	**138479**	**69625**	**280405**
1.43	2.55	0.71	**1.90**	0.26	1.12	0.82	**0.65**	1.40	1.43	0.00	**1.06**
4.22	23.80	13.46	**17.72**	9.15	2.57	6.55	**6.43**	0.00	0.72	0.00	**0.36**
33.74	42.98	60.92	**45.63**	28.22	25.66	18.01	**25.72**	24.16	7.23	6.92	**11.39**
256.80	542.59	281.60	**427.29**	332.16	347.57	249.67	**324.61**	460.45	429.38	290.61	**401.47**
0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
0.47	0.15	0.00	**0.17**	0.26	1.47	0.00	**0.64**	0.00	0.00	0.00	**0.00**
0.47	2.23	3.90	**2.31**	1.31	1.83	0.82	**1.41**	0.00	2.17	0.00	**1.07**
2.34	1.49	2.13	**1.80**	0.78	0.00	0.00	**0.39**	0.00	0.00	0.00	**0.00**
4.22	2.68	2.83	**3.00**	1.57	2.93	9.00	**3.22**	0.00	2.89	0.00	**1.42**
6.09	16.21	24.79	**16.44**	12.81	9.53	9.82	**11.19**	9.95	4.34	1.38	**4.98**
23.90	157.96	43.92	**105.90**	48.09	33.73	13.92	**37.68**	113.69	139.51	45.67	**108.91**
0.47	0.89	0.35	**0.68**	0.52	3.30	1.64	**1.67**	2.84	2.17	1.38	**2.14**
0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	2.77	**0.71**
0.00	0.59	0.71	**0.51**	0.26	0.37	0.82	**0.39**	0.00	0.00	4.15	**1.07**
0.00	0.59	0.00	**0.34**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
73.10	53.99	18.77	**48.97**	11.24	4.03	4.91	**7.72**	4.26	2.89	1.38	**2.85**
18.74	60.39	26.21	**44.52**	38.16	63.06	61.39	**50.54**	41.21	71.56	33.21	**54.10**
0.00	0.30	0.00	**0.17**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
0.00	0.00	0.35	**0.09**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
3.28	16.51	3.19	**10.87**	4.70	3.30	1.64	**3.73**	5.68	5.78	0.00	**4.27**
0.00	0.30	0.00	**0.17**	0.26	0.00	0.00	**0.13**	0.00	0.72	0.00	**0.36**
0.00	0.45	0.35	**0.34**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
2.34	0.74	1.06	**1.11**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
0.00	1.19	2.48	**1.28**	1.05	0.00	0.00	**0.51**	2.84	2.17	0.00	**1.78**
0.47	1.19	0.35	**0.86**	0.26	0.73	0.82	**0.51**	1.42	0.00	1.38	**0.71**
0.47	0.15	0.00	**0.17**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
0.47	0.15	0.35	**0.26**	0.00	0.37	0.00	**0.13**	1.42	0.00	0.00	**0.36**
0.47	5.50	14.88	**6.85**	6.53	0.73	0.00	**3.47**	4.26	0.00	0.00	**1.07**
0.00	0.45	0.35	**0.34**	0.26	0.00	0.00	**0.13**	0.00	0.00	1.38	**0.36**
1.87	5.06	27.27	**9.85**	20.65	77.73	64.67	**47.58**	24.16	30.36	12.45	**24.20**
6.56	12.49	5.67	**9.76**	14.63	13.20	6.55	**12.86**	17.05	14.46	13.84	**14.95**
0.94	2.97	2.13	**2.40**	5.49	3.30	1.64	**4.12**	4.26	1.45	0.00	**1.78**
0.00	0.15	0.00	**0.09**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
23.43	21.57	36.13	**25.43**	8.10	17.23	12.28	**11.96**	34.11	25.30	11.07	**23.85**
1.87	9.07	3.54	**6.42**	2.61	0.73	1.64	**1.80**	1.42	0.00	0.00	**0.36**
2.81	12.49	4.96	**8.90**	7.06	5.50	1.64	**5.66**	4.26	6.51	6.92	**6.05**
0.00	56.02	0.00	**31.91**	0.00	45.27	0.00	**15.51**	0.00	70.03	0.00	**30.01**
7.50	63.51	5.67	**39.30**	15.16	4.77	6.55	**10.16**	2.84	3.61	1.38	**2.85**
0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
5.62	9.52	2.13	**7.02**	0.78	1.83	0.82	**1.16**	1.42	2.89	2.77	**2.49**
0.94	0.45	0.00	**0.43**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
1.41	1.19	2.48	**1.54**	0.26	0.37	0.00	**0.26**	1.42	0.00	0.00	**0.36**
0.00	0.15	0.00	**0.09**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**
21.09	21.86	35.42	**25.00**	14.11	11.00	9.00	**12.22**	11.37	10.12	2.77	**8.54**
0.00	1.64	0.71	**1.11**	1.05	0.73	0.82	**0.90**	1.42	0.72	0.00	**0.71**

Sources and Explanatory Remarks

1. Clinical and confirmed case reports are collected from the health regions in British Columbia through Panorama. Starting in 2005, 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.

2. Numbers in this report were generated in June 26, 2107 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.

3. Summary reports contained herein for some diseases are based on surveillance databases maintained at BCCDC which are sourced from reporting by BC Health Authorities using forms specifically designed for that disease, and reconciliation of laboratory data. These may not always correspond to Panorama reports, including by case classification (i.e., confirmed and clinical status).

4. All data for influenza, invasive meningococcal disease, invasive group A streptococcal disease, *Cryptococcus gattii* infection, MRSA and VRE, as well as 2011 through 2016 data for measles, mumps, and rubella, are collected through surveillance databases. Data for invasive pneumococcal disease are collected through both Panorama (all age groups) and through surveillance databases (pediatric cases ≤16 years of age). Invasive meningococcal disease and invasive group A streptococcal disease are reported using episode date. Measles, mumps, and rubella are reported using reported date for 2005 through 2010 and episode date for 2011 through 2016. *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.

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 July 11, 2017. Viral outbreaks in residential facilities are excluded.

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

7. 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 2015. The 2016 AIDS statistics will be available in our next report due to a delay associated with AIDS data collection. The BC total numbers for AIDS, chlamydia (genital), gonorrhea (genital), HIV and syphilis (infectious) include cases of non-BC residents and cases of unknown residency and thus may exceed the sum of cases in the five health authorities. 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.

8. All active TB case data is extracted from the Integrated Public Health Information System (iPHIS). Population estimates come from BC Stats (http://www.bcstats.gov.bc.ca/Home.aspx).

9. For information on Antimicrobial Resistant Organ-

ism (ARO) Surveillance in BC, please refer to: Antimicrobial Resistance Trends in the Province of British Columbia - 2012. Epidemiology Services, British Columbia Centre for Disease Control. Available at www.bccdc.ca/prevention/AntibioticResistance

10. 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 2016.

11. 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).

12. Health Service Delivery Area boundaries are taken from BC STATS; BC STATS is the central statistical agency of the Province of British Columbia.

13. 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. 2016 national rates are unavailable currently until data updates are finalized.

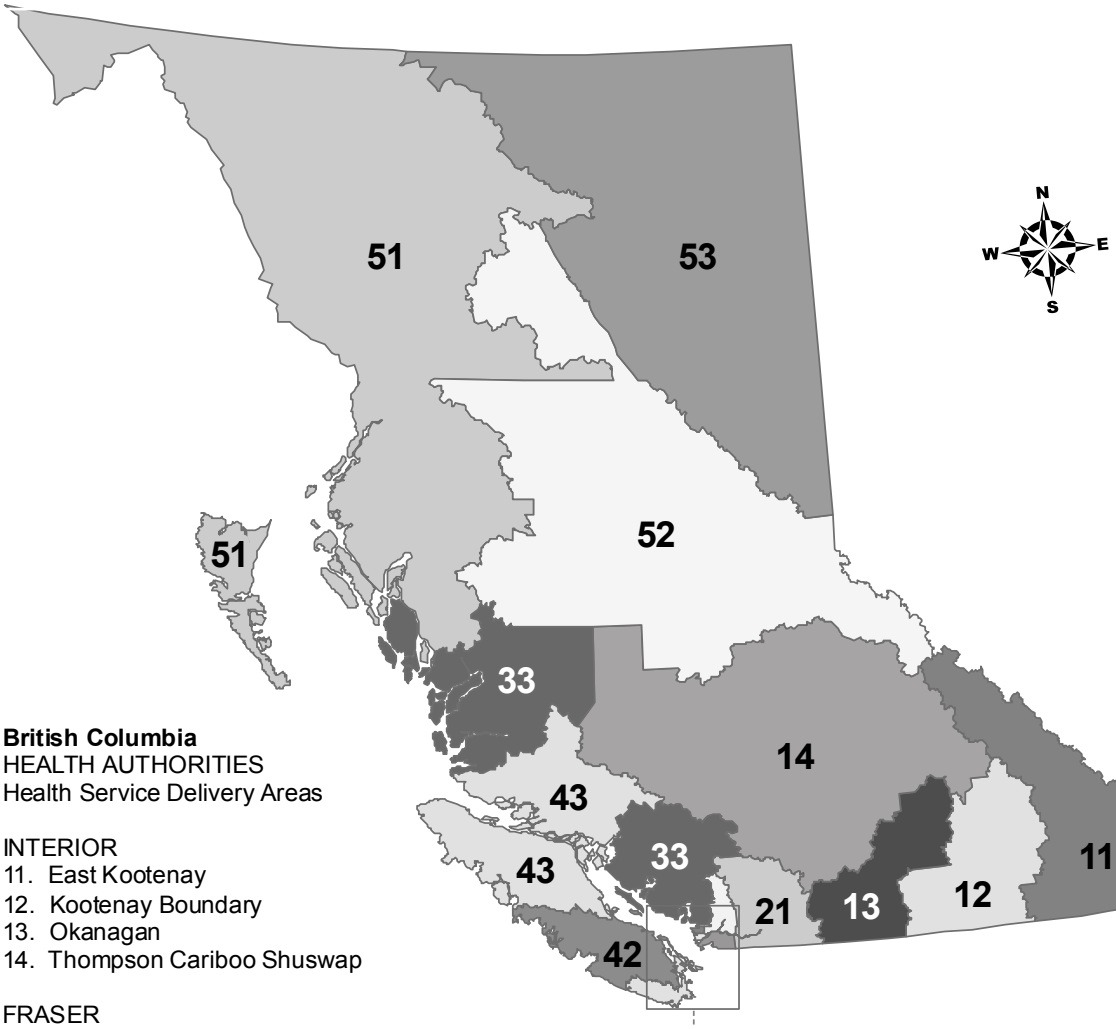
14. Population estimates come from BC Stats (http://www.bcstats.gov.bc.ca/Home.aspx). Please note for the 2010 BC Annual Summary of Reportable Diseases and previous years' reports, population estimates were taken from P.E.O.P.L.E. Projection (Population Extrapolation for Organizational Planning with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

15. In 2016, there were no reported cases of Anthrax, Brucella infection, Cholera, toxigenic diphtheria, Viral Hemorrhagic Fevers, Hepatitis D, Leprosy, Leptospira Infection, Methicillin Resistant Staphylococcal aureus (MRSA) Infection, Plague, Poliomyelitis,Q Fever, Rabies, Severe Acute Respiratory Syndrome, Subacute Sclerosing Panencephalitis, Trichinosis, Tularaemia, Vancomycin Resistant Enterococcus (VRE) Infection, Vancomycin Resistant Staphylococcus aureus (VRSA) Infection or West Nile.

16. The rates for neonatal group B Streptococcal infection under 2016 BC Reportable Disease Case Rates by HSDA (pages 114-115) are calculated based on the population under 12 months of age, instead of the entire BC population.

17. 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 2016 in British Columbia, please contact epidserv@bccdc.ca.

British Columbia Health Service Delivery Areas



British Columbia
HEALTH AUTHORITIES
Health Service Delivery Areas

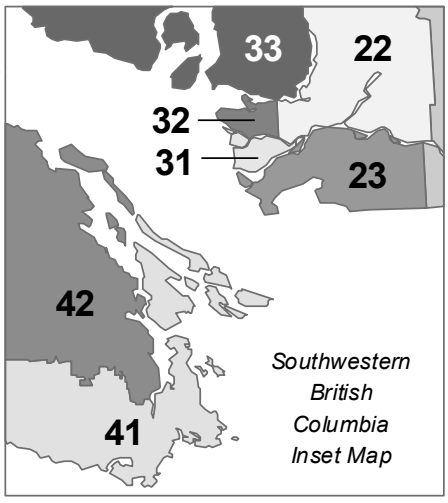
INTERIOR
11. East Kootenay
12. Kootenay Boundary
13. Okanagan
14. Thompson Cariboo Shuswap

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:
    Hemophilus
    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

As per Health Act Communicable Disease Regulation includes amendments up to B.C. Reg. 380/2012, March 18, 2013
http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/12_4_83#section2

Contributors

Jane Buxton, Physician Epidemiologist
Catharine Chambers, Epidemiologist
Theodora Consolacion, Epidemiologist
Michael Coss, Coordinator
Samara David, Epidemiologist
Eleni Galanis,Physician Epidemiologist
Fay Hutton, Surveillance Analyst
Lisan Kwindt, Research and Surveillance Assistant
Jannie Leung, Epidemiologist
Sophie Li, Surveillance Analyst
Lauren MacDonald, Epidemiologist
Sunny Mak, Senior Medical Geographer
Melissa McLaws, Public Health Veterinarian
Monika Naus, Medical Director
Alex Nunn, Epidemiologist
David Patrick, Physician Epidemiologist
David Roth, Epidemiologist
Venessa Ryan, Epidemiologist
Danuta Skowronski, Physician Epidemiologist
Wrency Tang, Surveillance Analyst
Chelsea Treloar, Epidemiologist
Alice Wong, Surveillance Analyst
Elsie Wong , Federal Field Surveillance Officer
Jason Wong, Physician Epidemiologist