BC Centre for Disease Control
AN AGENCY OF THE PROVINCIAL HEALTH SERVICES AUTHORITY

STI

Annual Report 2016

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2016

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Summary of Trends

Genital Chlamydia

In 2016, the rate of genital chlamydia increased to 317.6 per 100,000 population, continuing the overall provincial trend of a steady increase since 1998.

- The highest rates were in Vancouver, Northwest, and Northern Interior Health Service Delivery Areas.
- Females continue to have higher rates of genital chlamydia infection compared to males.
- The highest rates were among young adults aged 20-24 years followed by both adults aged 25-29 years and adolescents aged 15-19 years.
- In 2016, there were 196 extra-genital infections identified and 1 perinatally-acquired infection.
- The number of LGV cases remains higher than historic levels. In 2016, there were 40 LGV cases, most were among men who have sex with men, and many of whom are co-infected with HIV.

Genital Gonorrhea

In 2016, the provincial rate of genital gonorrhea increased to 68.8 per 100,000 population, continuing an overall steady increase since 1998.

- The highest rates were in Vancouver, Northern Interior, and Northwest Health Service Delivery Areas.
- Males have higher rates of infection compared to females and in 2016, rates among both males and females increased to the highest rates in over 20 years.
- The highest rates of infection were among males aged 25-29 years and among females aged 20-24 years.
- In 2016, there were 640 extra-genital infections identified and no perinatally-acquired infection.
- Analysis of recent gonorrhea antimicrobial resistance trends in BC demonstrates a reduction in the proportion of isolates with reduced susceptibility to ceftriaxone in 2011-2016 and to cefixime in 2011-2015 which then increased slightly in 2016.

Pelvic Inflammatory Disease and Ectopic Pregnancy

In 2015, the rate of physician billings and hospital admissions for women related to pelvic inflammatory disease was stable or decreased which is consistent with the overall decline in this potential complication of chlamydia or gonorrhea infection over the past two decades. While hospitalizations of women related to ectopic pregnancy have shown a similar trend, the number of physician billings has shown a small but steady increase since 2003 in BC.

Infectious Syphilis

In 2016, the provincial rate of infectious syphilis remained stable at 16.0 per 100,000 population.

- The highest rates of infection were in Vancouver and South Vancouver Island Health Service Delivery Areas.
- In 2016, over 95% of cases were male, with highest rates observed in males aged 25-29 years. A slight increase in female cases was identified in 2016.
- The majority of cases in 2016 were among people identified as Caucasian (45%).
- Men who have sex with men (MSM) continue to comprise the greatest number of new infectious syphilis cases in BC (86% in 2016). Among MSM cases where HIV status is known, 43% were co-infected with HIV.

Chlamydia

Genital Chlamydia by Region, Gender, and Age

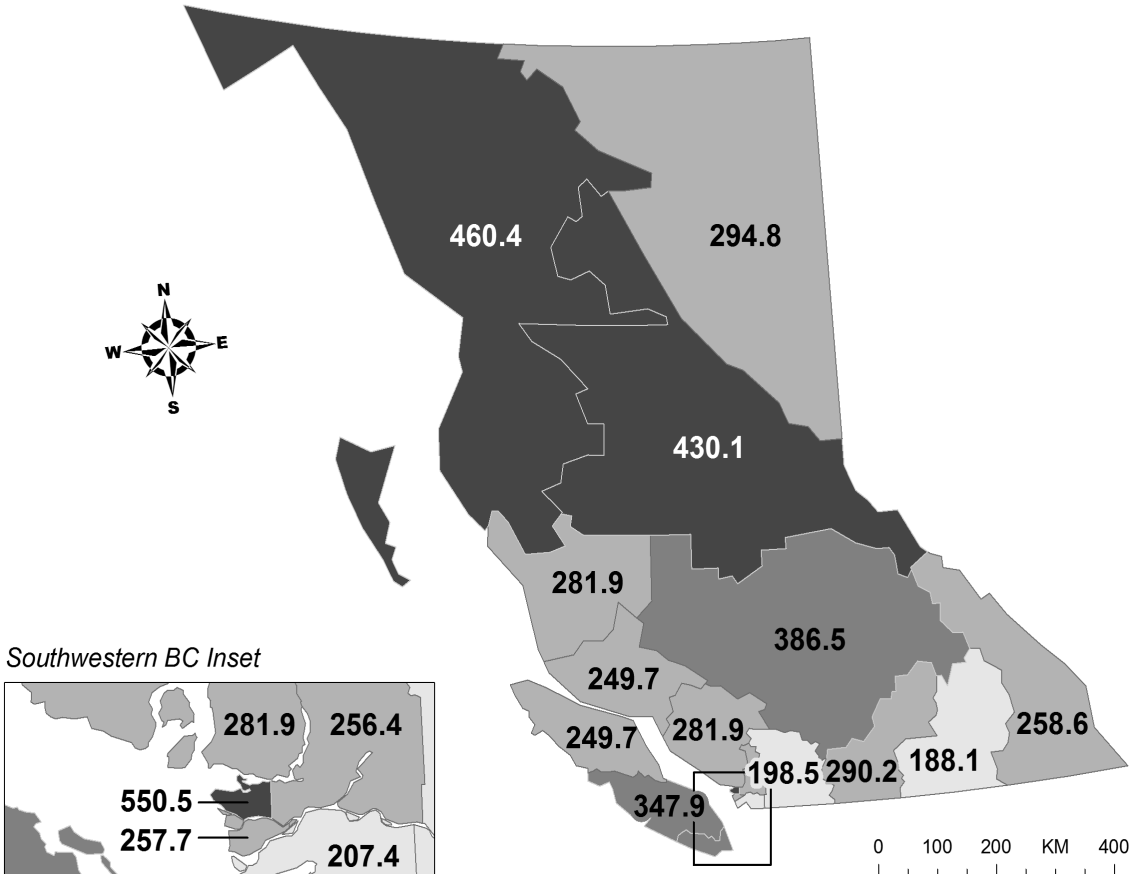
Genital chlamydia is the most commonly reported sexually transmitted infection in BC. As the majority of chlamydia infections are asymptomatic, the reported number of chlamydia infections is only a portion of the total population burden. If untreated, genital chlamydia may lead to complications such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

Mirroring the national trend, chlamydia (both genital and extra-genital) rates have steadily increased from 1998 to 2016 following a decline in the early 1990s (Figure 2). In 2016, the rate of genital chlamydia for BC increased to 317.6 (15,057 cases) from 304.6 (14,271 cases) per 100,000 population in 2015. The highest rates of genital chlamydia were in Vancouver Coastal and Northern Health Authorities (Figure 3). Rates among Health Service Delivery Areas varied with the highest rates in Vancouver, Northwest and Northern Interior, and the lowest rates in Kootenay Boundary, Fraser East and Fraser South (Figure 1).

Similar increases in chlamydia infections have been observed in high income countries around the world.[1, 2] There are multiple reasons for this increase, including increases in the sensitivity of laboratory tests and uptake of testing (e.g., the greater acceptability of urine-based tests among men) as well as provider screening practices. There may also be a paradoxical effect in which improvements in early screening and treatment for chlamydia over the past decades have resulted in individuals being less likely to develop full immunity thus consequently more susceptible to re-infection (known as the "arrested immunity" hypothesis[3, 4]). While data on population trends in sexual behaviour is not available for BC, it is possible that changes in behaviour, such as decreased condom use, may also be contributing to increasing chlamydia incidence.

Females continue to have approximately 1.5 times the diagnosis rate compared to males. The rate for females in 2016 increased to 378.4 (9,040 cases) from 370.9 (8,750 cases) per 100,000 population in 2015 (Figure 4). 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). In 2016, the highest rates of chlamydia were among young adults aged 20-24 years followed by both adults aged 25-29 years and adolescents aged 15-19 years (Figure 6), driven primarily by the high rates of infection among young females (Figure 7). Males aged 20-29 years had the highest chlamydia rates in 2016 compared with other age groups (Figure 8).

1. Genital chlamydia case reports in BC by health service delivery area, 2016



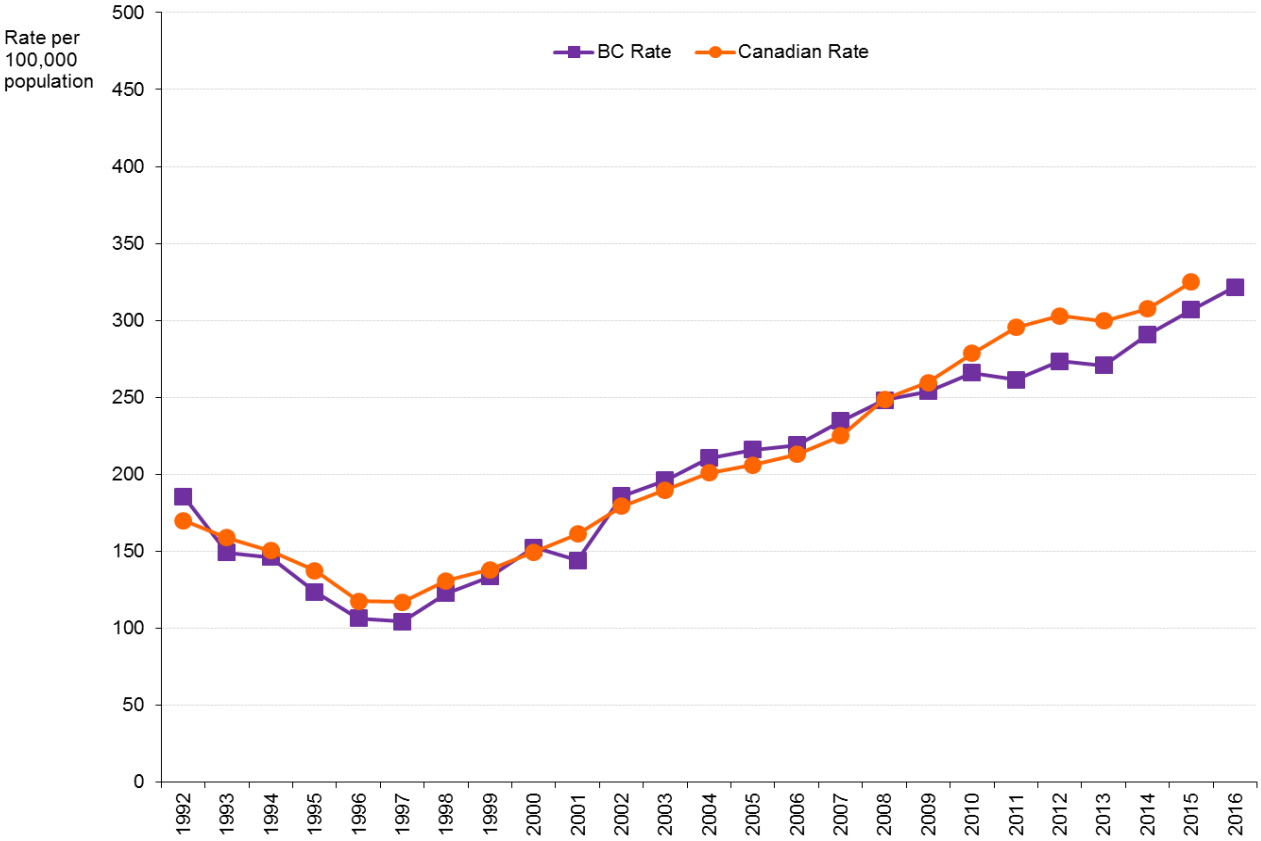
ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	202	258.6
12	Kootenay Boundary	148	188.1
13	Okanagan	1053	290.2
14	Thompson Cariboo Shuswap	865	386.5
21	Fraser East	597	198.5
22	Fraser North	1702	256.4
23	Fraser South	1694	207.4
31	Richmond	550	257.7
32	Vancouver	3701	550.5
33	North Shore/Coast Garibaldi	796	281.9
41	South Vancouver Island	1289	336.9
42	Central Vancouver Island	949	347.9
43	North Vancouver Island	305	249.7
51	Northwest	324	460.4
52	Northern Interior	595	430.1
53	Northeast	213	294.8

Rate per 100,000 population by HSDA

- 188.1 - 207.4
- 249.7 - 294.8
- 315.3 - 386.5
- 430.1 - 550.5

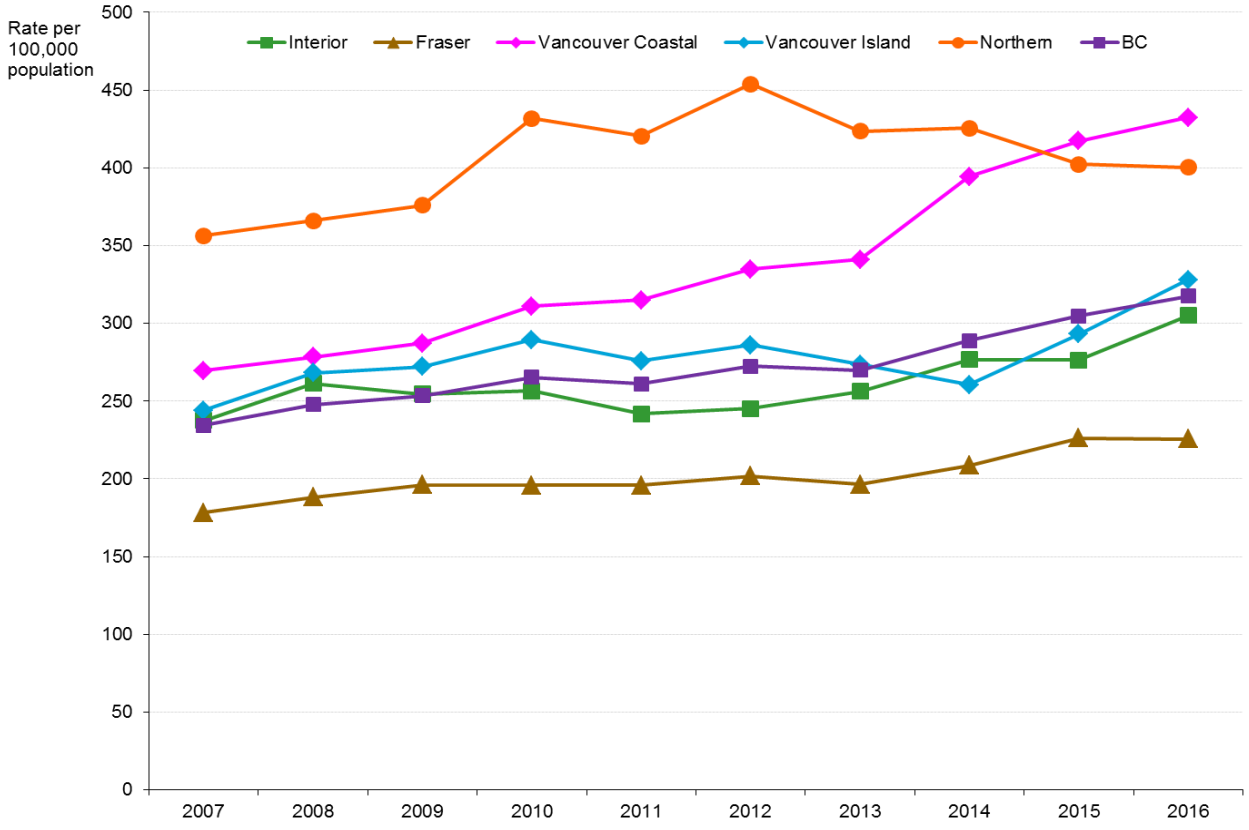
Rates calculated with population estimates released by BC Stats

2. Genital and extra-genital chlamydia case reports in BC and Canada, 1992 to 2016*

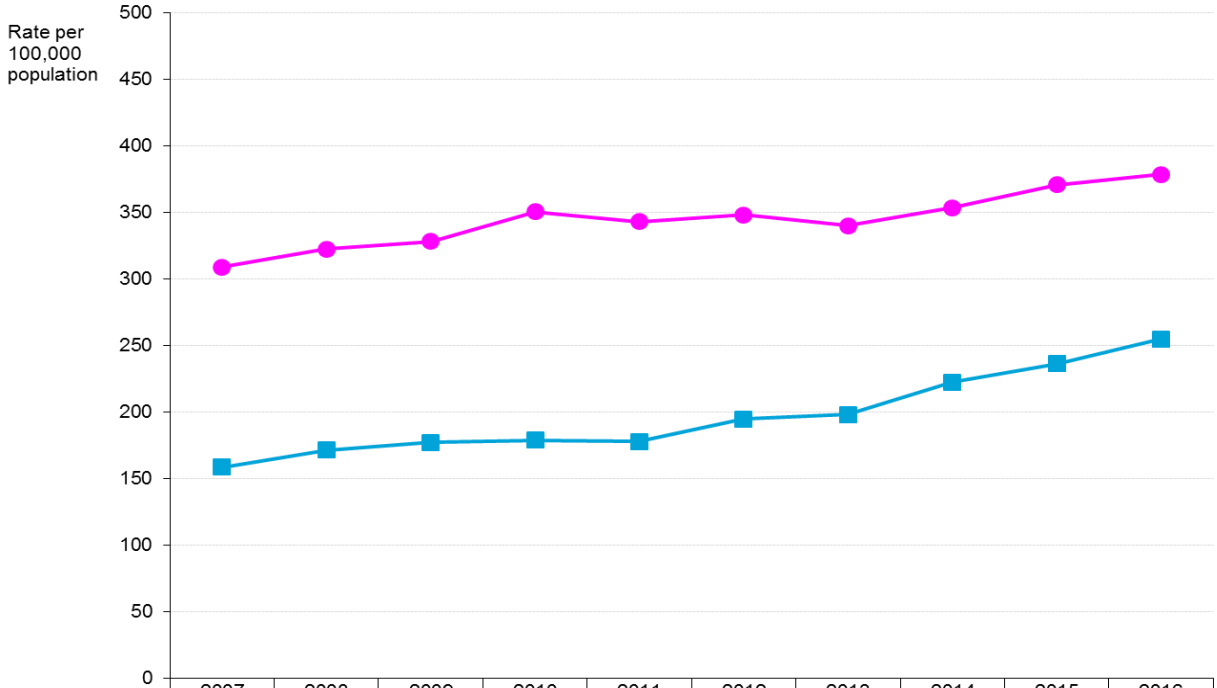


* 2016 Canadian rate was not available at time of publicaton

3. Genital chlamydia case reports in BC by health authority, 2007 to 2016



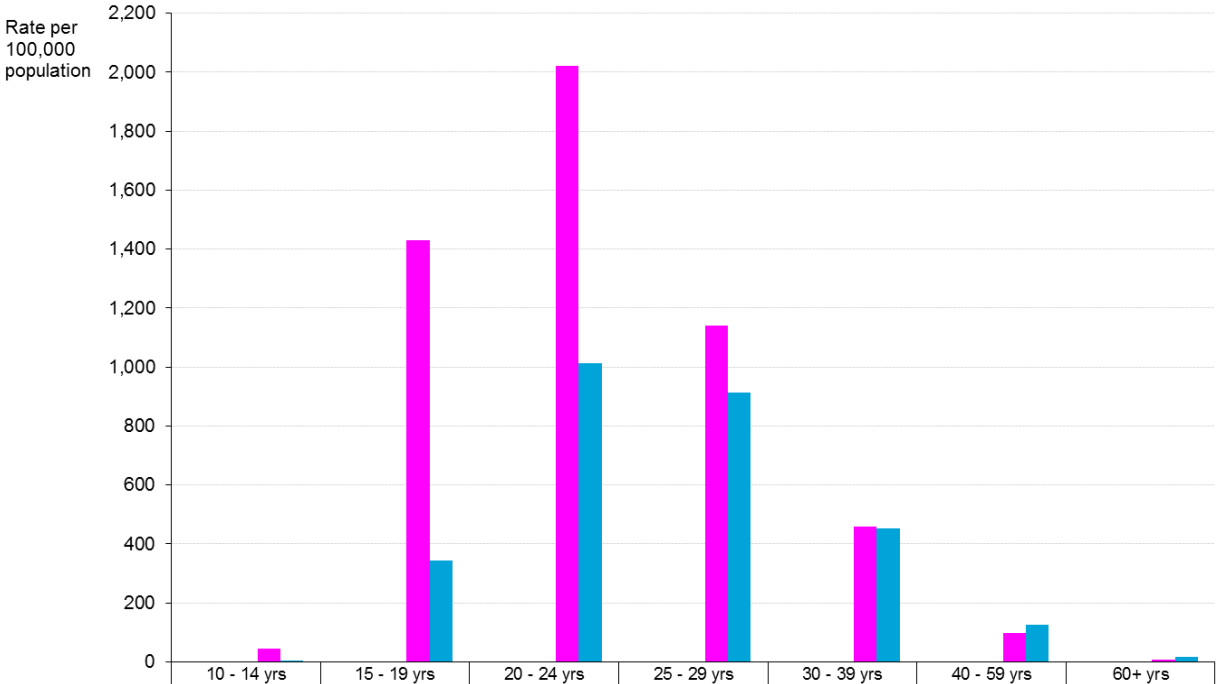
4. Genital chlamydia case reports in BC by gender, 2007 to 2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports - Female	6,683	7,068	7,287	7,870	7,761	7,956	7,839	8,247	8,750	9,040
Reports - Male	3,373	3,703	3,881	3,971	3,980	4,400	4,512	5,115	5,498	5,994
Reports - Other *	4	6	9	5	7	12	11	13	23	23
Rate - Female	308.9	322.6	328.3	350.4	343.0	348.2	339.9	353.7	370.9	378.4
Rate - Male	158.5	171.5	177.1	178.9	177.9	194.9	198.2	222.4	236.3	254.9

* Other - transgender and gender unknown

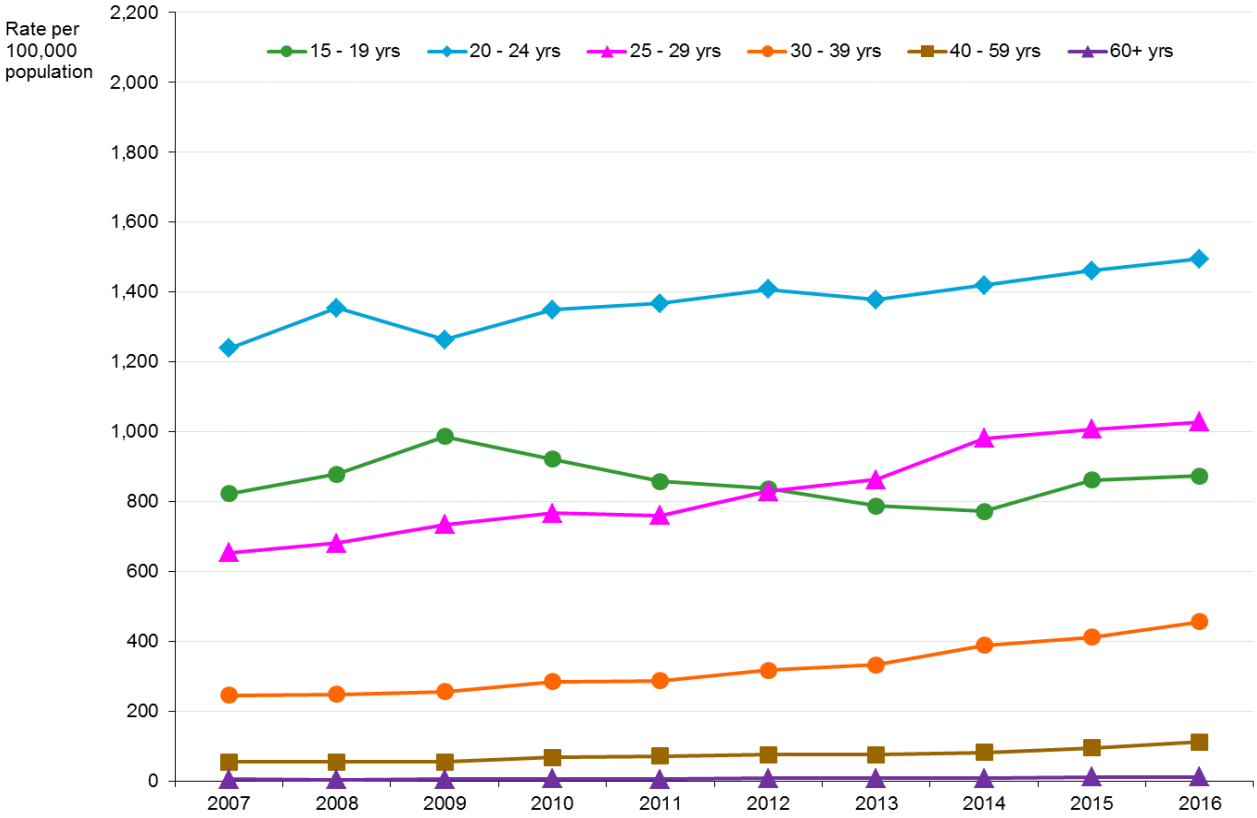
5. Genital chlamydia case reports in BC by age group and gender, 2016



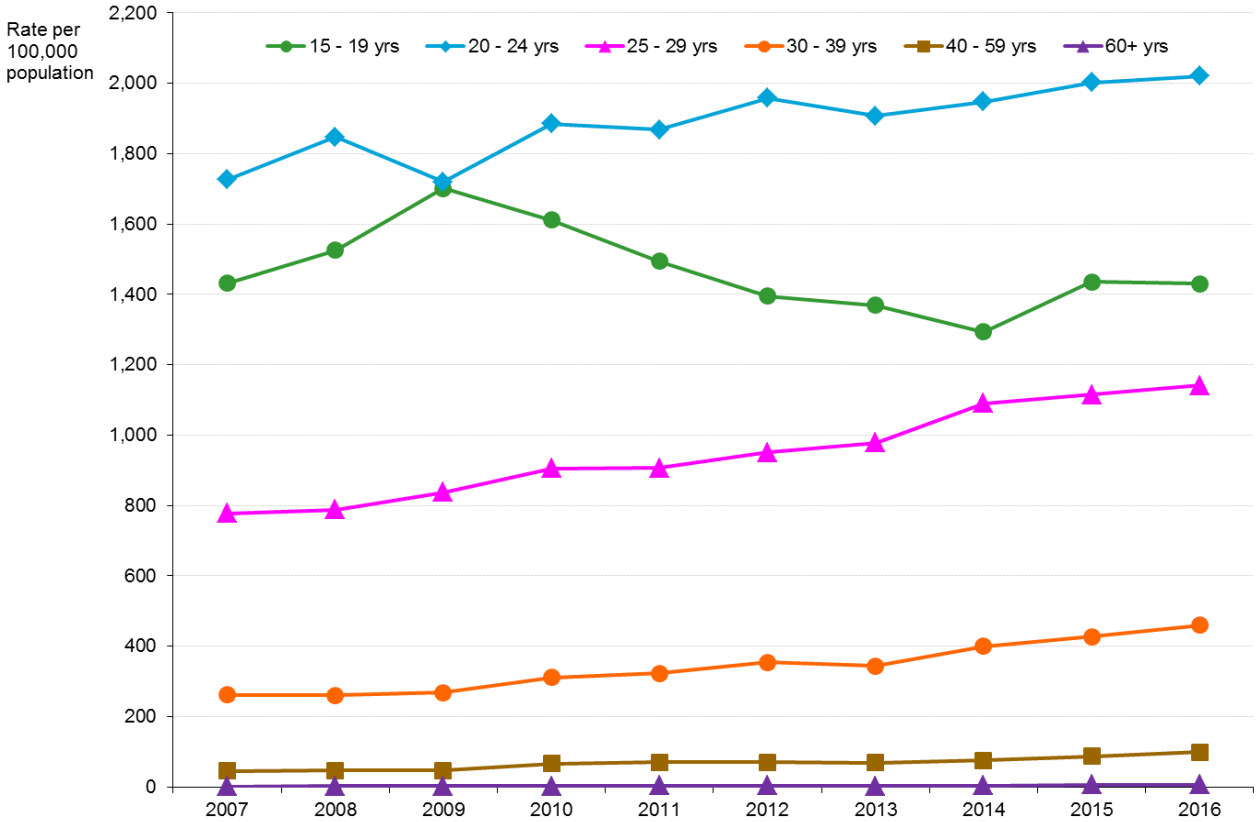
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	51	1,825	3,160	1,814	1,482	665	36
Reports - Male	2	466	1,730	1,455	1,429	820	90
Reports - Other *	0	5	3	8	1	5	1
Rate - Female	45.7	1430.1	2020.1	1140.4	459.5	97.9	5.9
Rate - Male	1.7	344.2	1011.8	911.8	452.8	124.8	16.1

* Other - transgender and gender unknown

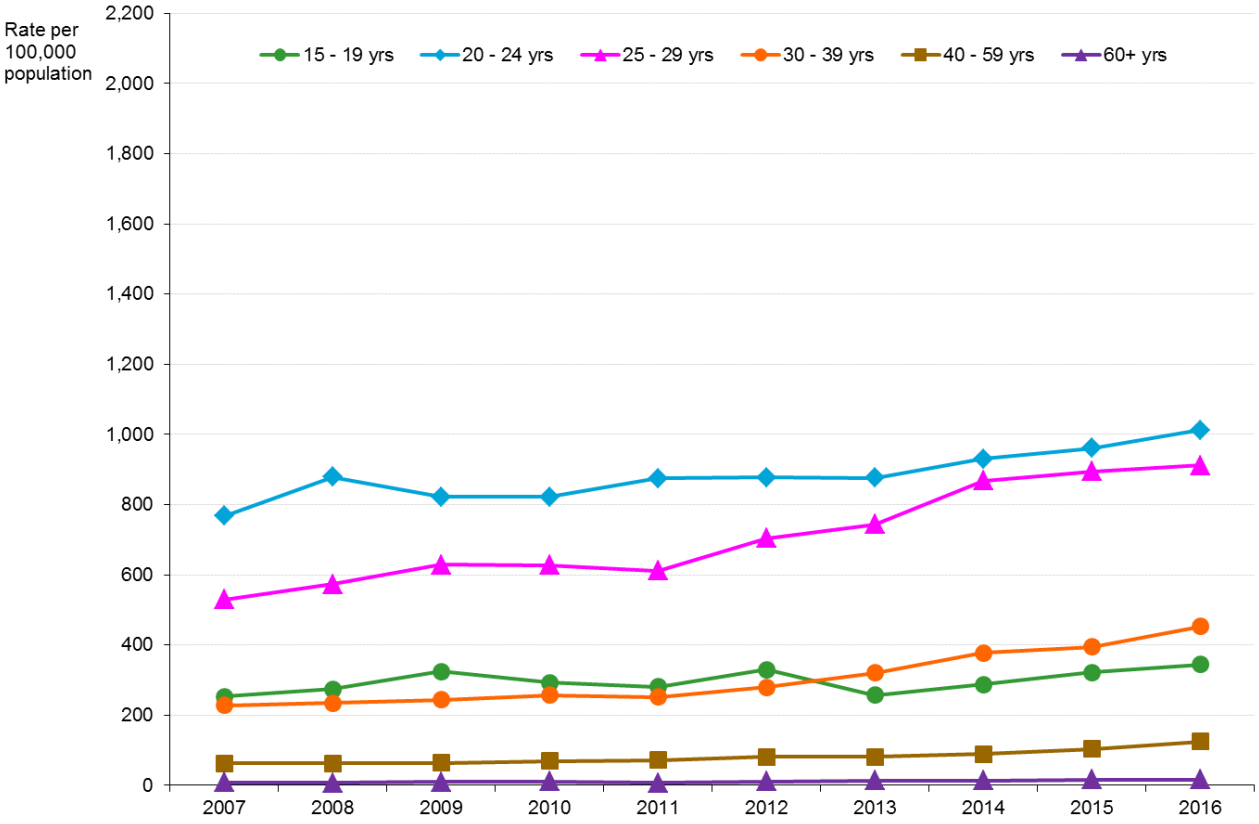
6. Genital chlamydia case reports in BC by age group - total, 2007 to 2016



7. Genital chlamydia case reports in BC by age group - female, 2007 to 2016



8. Genital chlamydia case reports in BC by age group - male, 2007 to 2016



Extra-genital Chlamydia

In 2016, 196 extra-genital cases were identified (60 females, 132 males) which is an increase from 166 cases in 2015 (41 females and 122 males). As screening for chlamydia infections at extra-genital sites is not routine practice, these findings are strongly influenced by provider testing practices. Much of the increase observed since 2012 is likely due to increase awareness and testing for chlamydia in extra-genital sites. From 2007 to 2016, 686 infections were identified in specimens collected from the following sites: throat (542 cases, 79.0%), eye (89 cases, 13.0%), lung (1 case, 0.1%), and other sites (54 cases, 7.9%) (Table 9).

9. Extra-genital chlamydia case reports in BC by site/culture, 2007 to 2016

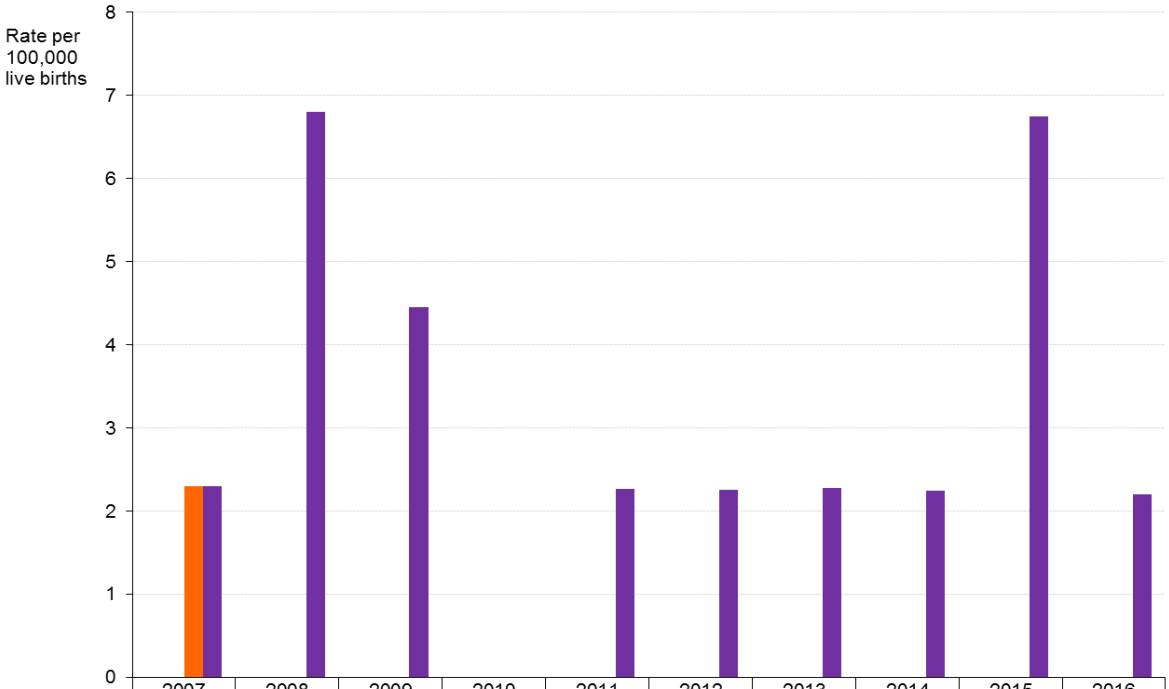
Gender	Site	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Female	Throat	2	0	0	0	0	6	5	9	30	56
	Eye	3	3	6	3	3	2	2	6	5	3
	Lung	0	0	0	0	0	0	0	0	0	0
	Other *	1	1	5	5	2	1	4	11	6	1
	Total	6	4	11	8	5	9	11	26	41	60
Male	Throat	1	6	2	7	1	52	42	80	108	127
	Eye	5	5	5	5	5	3	2	8	11	4
	Lung	1	0	0	0	0	0	0	0	0	0
	Other *	0	2	0	1	4	2	2	4	3	1
	Total	7	13	7	13	10	57	46	92	122	132
BC	Throat	3	6	2	7	1	59	47	89	141	187
	Eye	8	8	11	8	8	5	4	14	16	7
	Lung	1	0	0	0	0	0	0	0	0	0
	Other *	1	3	5	6	6	2	6	14	9	2
	Total	13	17	18	21	15	66	57	117	166	196

* Other - nasopharyngeal washing, lesion, fluid from groin mass lesion, pelvic fluid, and other
Total reports for BC is the sum of the following genders: female, male, transgender, and gender unknown

Perinatally-acquired Chlamydia

Genital chlamydia can be passed by pregnant women to their infants during delivery which can lead to opthalmia neonatorum and pneumonia. One case of perinatally-acquired chlamydia infection was found in a conjunctival specimen in 2016. From 2007 to 2016, the majority of perinatal cases are from conjunctival specimens (14/15 cases, 93.3%) while one case (6.7%) was identified in a respiratory specimen (Figure 10).

10. Perinatally-acquired chlamydia case reports in BC by site, 2007 to 2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports - Respiratory	1	0	0	0	0	0	0	0	0	0
Reports - Conjunctival	1	3	2	0	1	1	1	1	3	1
Rate - Respiratory	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rate - Conjunctival	2.3	6.8	4.5	0.0	2.3	2.3	2.3	2.2	6.8	2.2

Lymphogranuloma Venereum

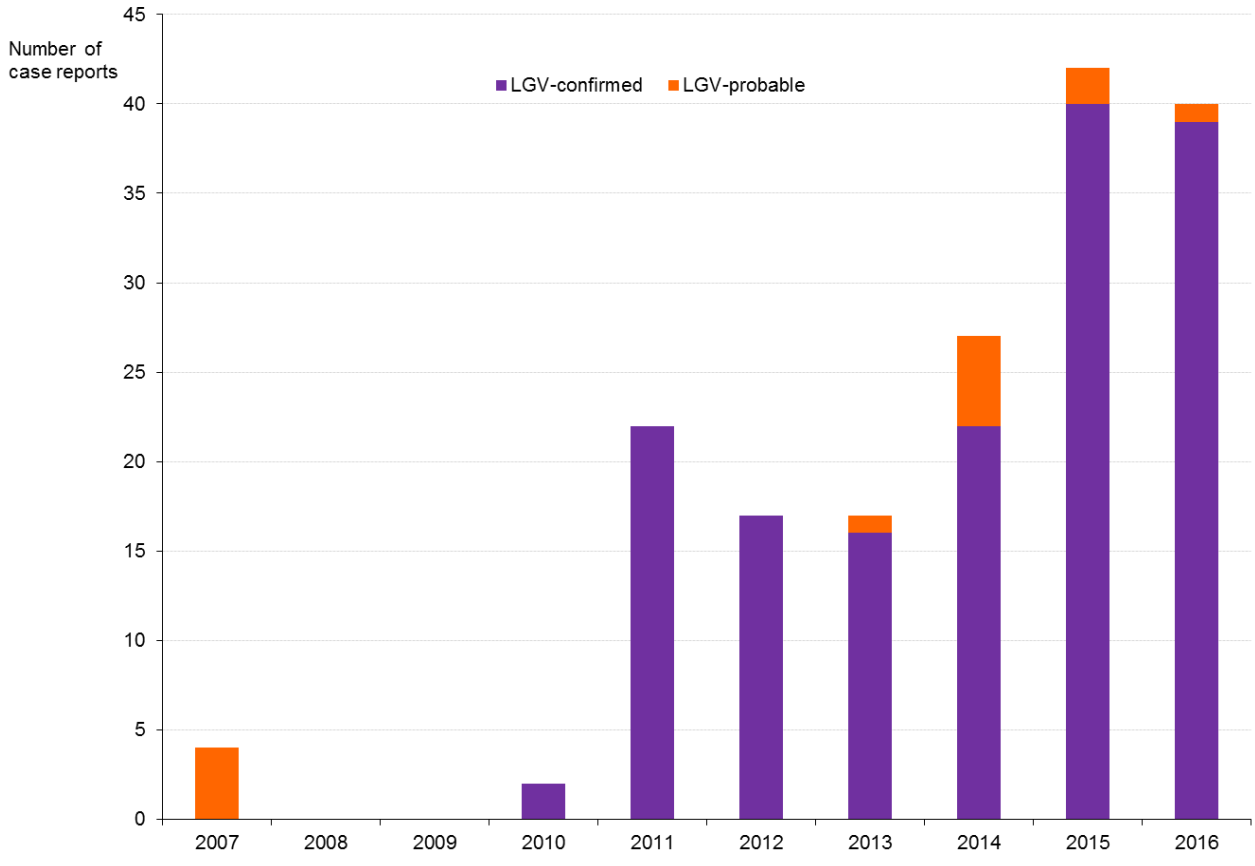
Lymphogranuloma venereum (LGV) is a sexually transmitted infection caused by *Chlamydia trachomatis* serovars L1, L2, and L3. The clinical presentation of LGV includes genital papules, ulcers, inguinal lymphadenopathy, and hemorrhagic proctitis. If left untreated, LGV can cause serious sequelae such as lymphatic obstruction or anogenital ulcerations. LGV can easily be misdiagnosed as other sexually transmitted infections or gastrointestinal disease.

LGV was first reported in Canada in 2003 and in BC in 2004. With increasing cases of LGV among gay, bisexual, and other men who have sex with men (MSM) in Europe and the US, provincial LGV surveillance commenced in 2004. Occurring in tandem with reports of increased transmission in the US[5] and Europe[6], an increase of LGV cases was observed in 2011 in BC, in part due to routine testing of rectal chlamydia specimens for LGV and augmented case-finding. In 2016, the number of LGV cases in BC decreased slightly to 40 cases (39 confirmed, 1 probable) from 42 cases (40 confirmed, 2 probable) in 2015 (Figure 11).

From 2007 to 2016, 171 cases of LGV (158 confirmed, 13 probable) were reported in BC. Most cases (166 cases, 97.1%) were among MSM and diagnosed in Vancouver (135 cases, 78.9%). Of those with known HIV status, 64.2% (106/165 cases) were co-infected with HIV. Most cases (120/148 cases, 81.1%) presented with symptoms of proctitis.

Of the 40 LGV cases (39 confirmed, 1 probable) reported in 2016, 92.5% (37 cases) were among males, 5.0% (2 cases) among females, and 2.5% (1 case) among transgender individuals. In 2016, the rate of LGV in BC was 1.6 (37 cases) per 100,000 population among males (36 MSM cases, 1 heterosexual case). Of the 36 MSM cases, the mean age was 38.3 years (range 20-60 years), and 55.6% (20 cases) identified as Caucasian, 19.4% (7 cases) Hispanic, and 11.1% (4 cases) Asian.[7, 8]

11. Lymphogranuloma venereum case reports in BC, 2007 to 2016



Gonorrhea

Genital Gonorrhea by Region, Gender, and Age

Gonorrhea infections may be asymptomatic or the symptoms may be mild, and as a result, the reports of diagnosed infections are only a portion of the total population burden. As with chlamydia, genital gonorrhea if untreated can lead to pelvic inflammatory disease (and associated complications) in females. An individual infected with gonorrhea is also at increased risk of acquiring HIV.[9, 10]

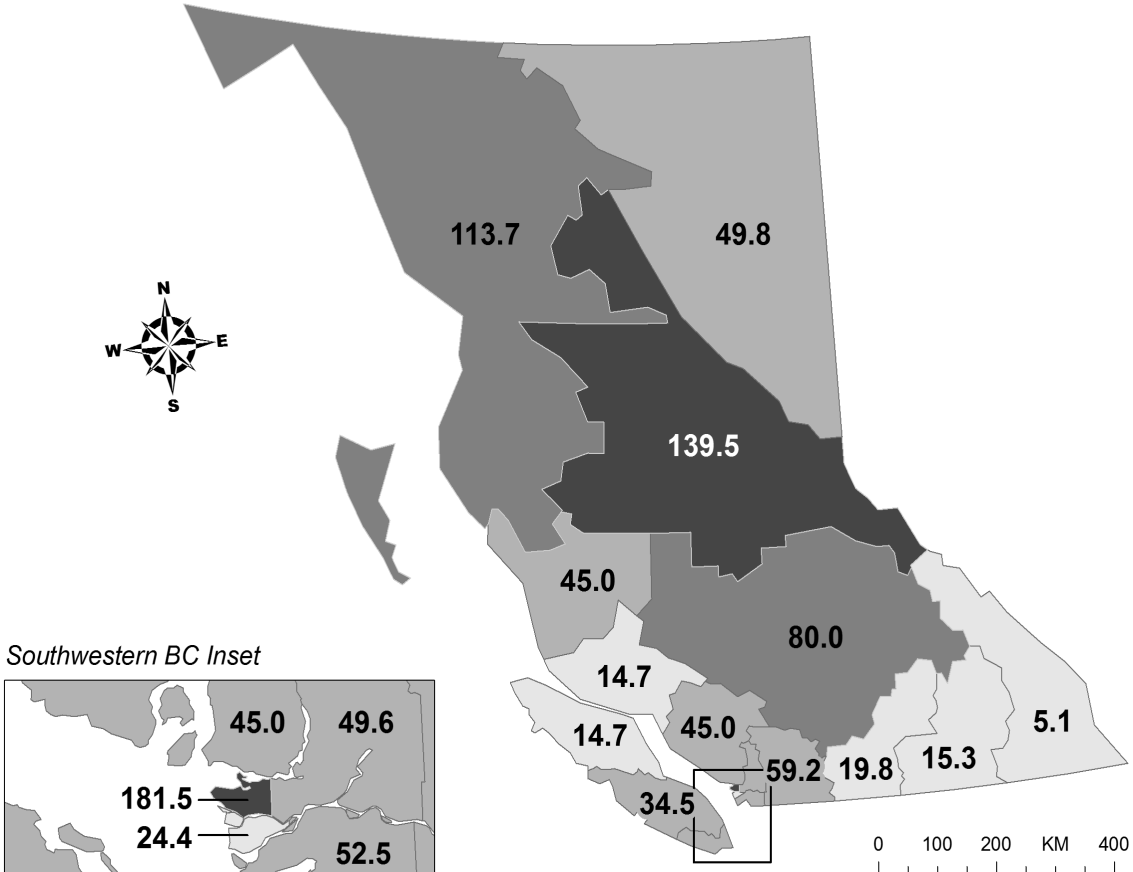
Overall since 1998, the provincial gonorrhea (both genital and extra-genital) rate in BC has increased steadily, consistent with national rates (Figure 13). However, the genital gonorrhea rate in BC increased to 68.8 (3,260 cases) in 2016 from 67.5 (3,163 cases) per 100,000 population in 2015. The highest rates of genital gonorrhea were in Vancouver Coastal and Northern Health Authorities (Figure 14). Rates among Health Service Delivery Areas vary with the highest rates in Vancouver, Northern Interior and Northwest, and the lowest rates in East Kootenay, North Vancouver Island and Kootenay Boundary (Figure 12). Reasons for the increase in gonorrhea rates in both 2015 and 2016 are still under investigation. Preliminary findings suggest that a shift in strain-type may account for some of this increase, as well as increased testing. The BCCDC is working in partnership with the BCCDC Public Health Laboratory (BCCDC PHL), National Microbiology Laboratory (NML) and Public Health Agency of Canada (PHAC) to understand the epidemiology of gonorrhea.

Males continue to have a rate about two times greater than females (Figure 15). Since 2007, male and female gonorrhea rates have been steadily increasing. In 2016, the rates among both males and females increased to a 25-year high of 90.4 (2,126 cases) among males and 47.2 (1,127 cases) among females per 100,000 population.

Similar to trends from 2007 to 2015, in 2016, the highest rates of gonorrhea were among those aged 20-29 years (Figure 17). In 2016, the highest rates among males were in those aged 25-29 years (419 cases, 262.6 per 100,000 population) and among females in those aged 20-24 years (281 cases, 179.6 per 100,000 population) (Figure 16).

Gonorrhea is more likely to be concentrated in sexually active networks and it is likely that the higher rates of gonorrhea in males is, in part, due to higher rates of gonorrhea among gay, bisexual, and other men who have sex with men (MSM). While provincial surveillance data does not permit identification of MSM cases, this has been observed in other jurisdictions.[11, 12]

12. Genital gonorrhea case reports in BC by health service delivery area, 2016



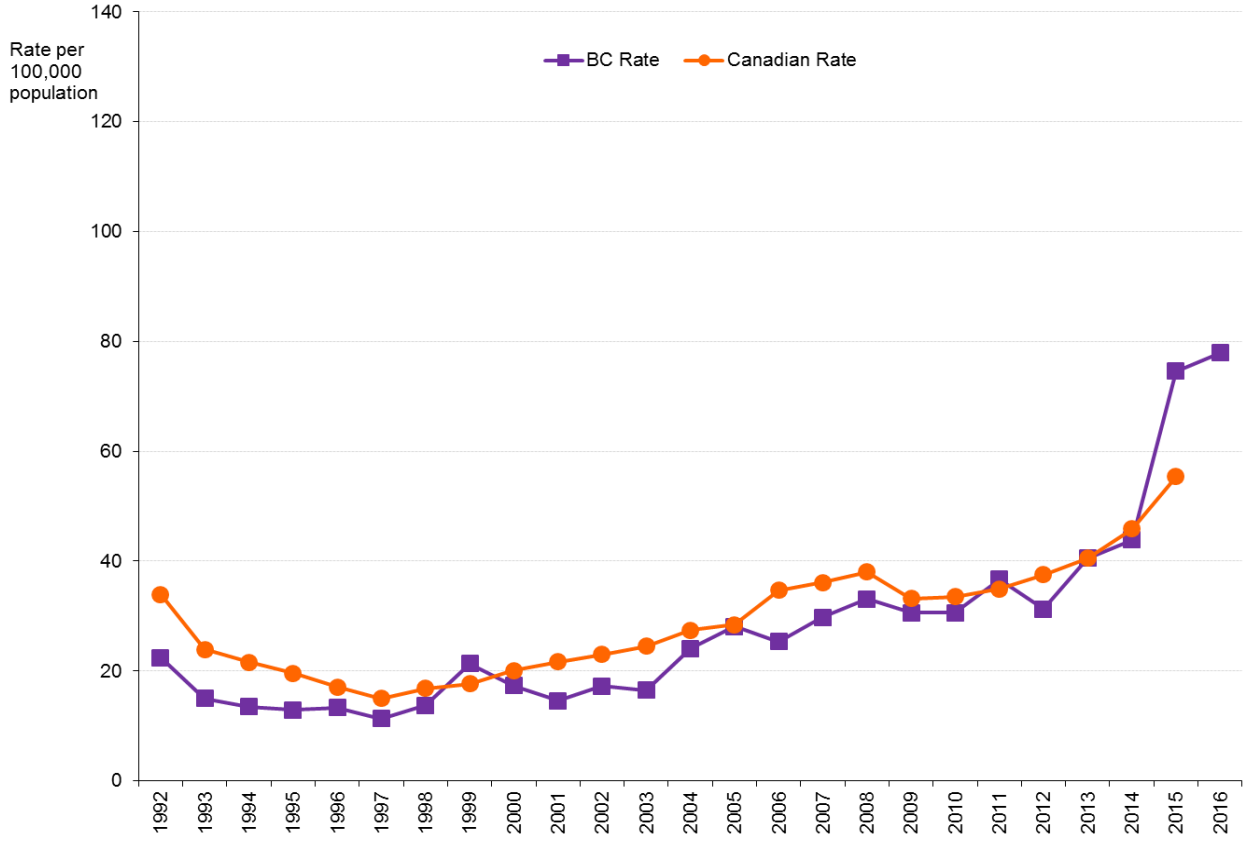
Rate per 100,000 population by HSDA

- 5.1 - 24.4
- 34.5 - 59.2
- 80.0 - 113.7
- 139.5 - 181.5

ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	4	5.1
12	Kootenay Boundary	12	15.3
13	Okanagan	72	19.8
14	Thompson Cariboo Shuswap	179	80.0
21	Fraser East	178	59.2
22	Fraser North	329	49.6
23	Fraser South	429	52.5
31	Richmond	52	24.4
32	Vancouver	1220	181.5
33	North Shore/Coast Garibaldi	127	45.0
41	South Vancouver Island	204	53.3
42	Central Vancouver Island	94	34.5
43	North Vancouver Island	18	14.7
51	Northwest	80	113.7
52	Northern Interior	193	139.5
53	Northeast	36	49.8

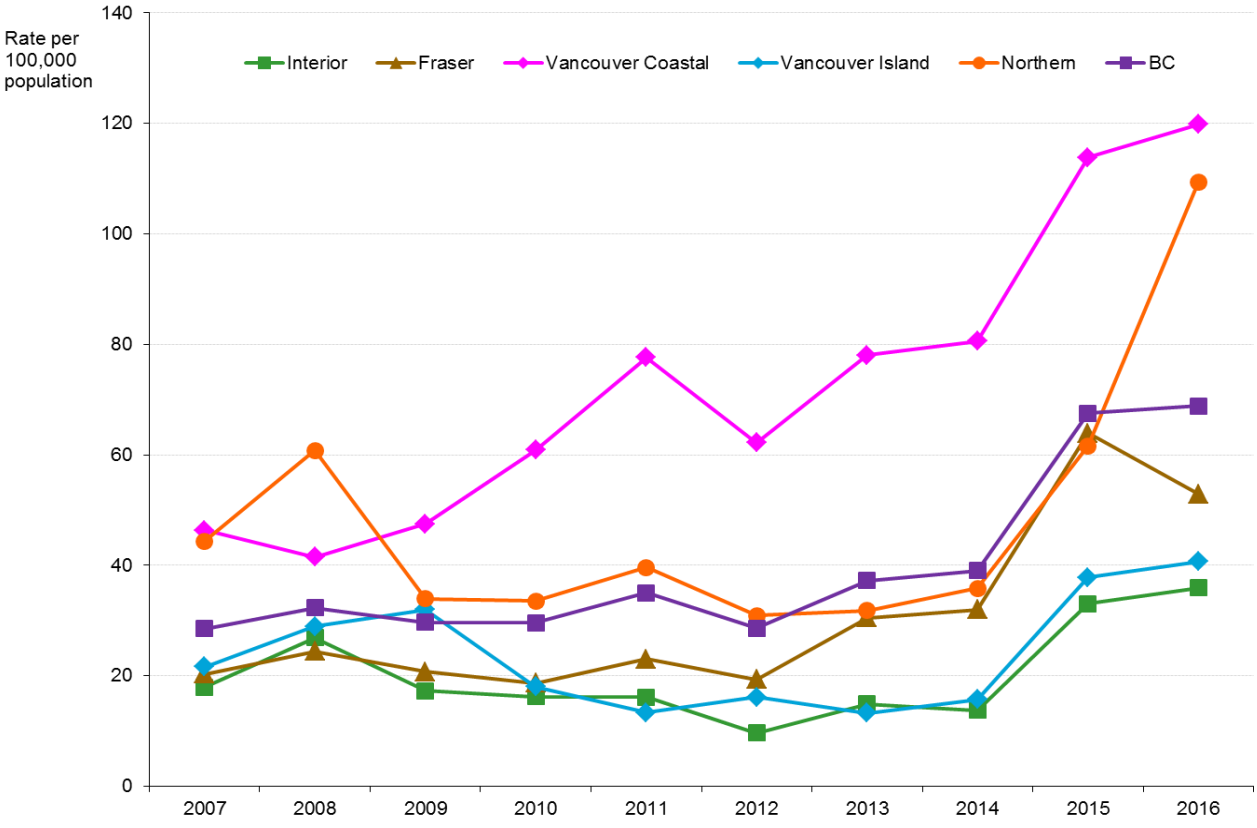
Rates calculated with population estimates released by BC Stats

13. Genital and extra-genital gonorrhea case reports in BC and Canada, 1992 to 2016

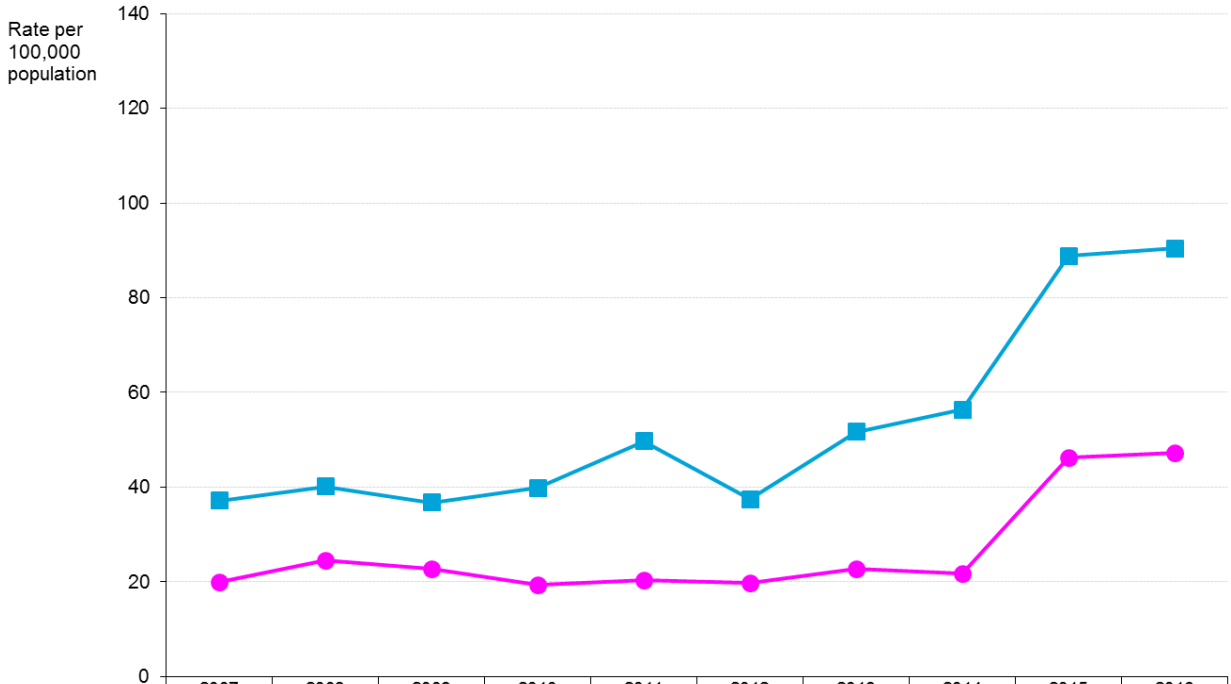


* 2016 Canadian rate was not available at time of publication

14. Genital gonorrhea case reports in BC by health authority, 2007 to 2016



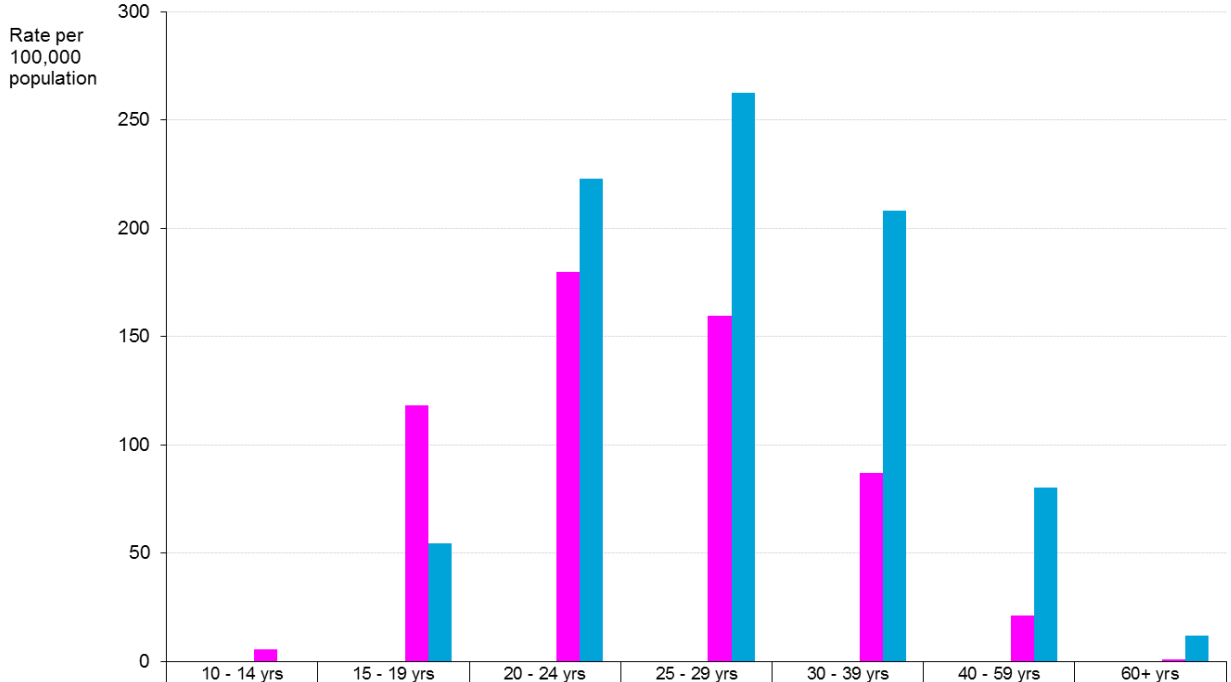
15. Genital gonorrhea case reports in BC by gender, 2007 to 2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports - Female	430	537	503	434	459	450	523	506	1,091	1,127
Reports - Male	792	866	806	884	1,111	845	1,178	1,298	2,066	2,126
Reports - Other *	2	2	1	3	4	3	4	4	6	6
Rate - Female	19.9	24.5	22.7	19.3	20.3	19.7	22.7	21.7	46.2	47.2
Rate - Male	37.2	40.1	36.8	39.8	49.7	37.4	51.7	56.4	88.8	90.4

* Other - transgender and gender unknown

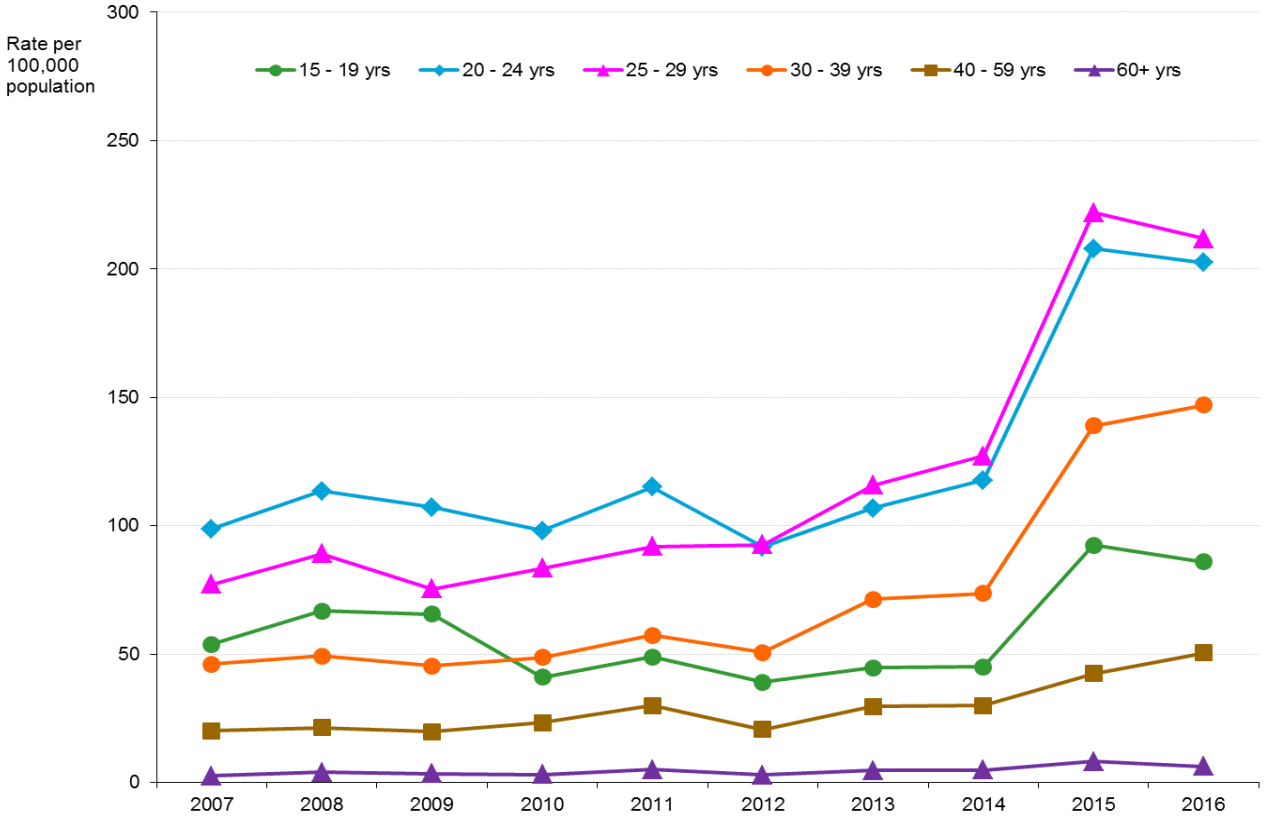
16. Genital gonorrhea case reports in BC by age group and gender, 2016



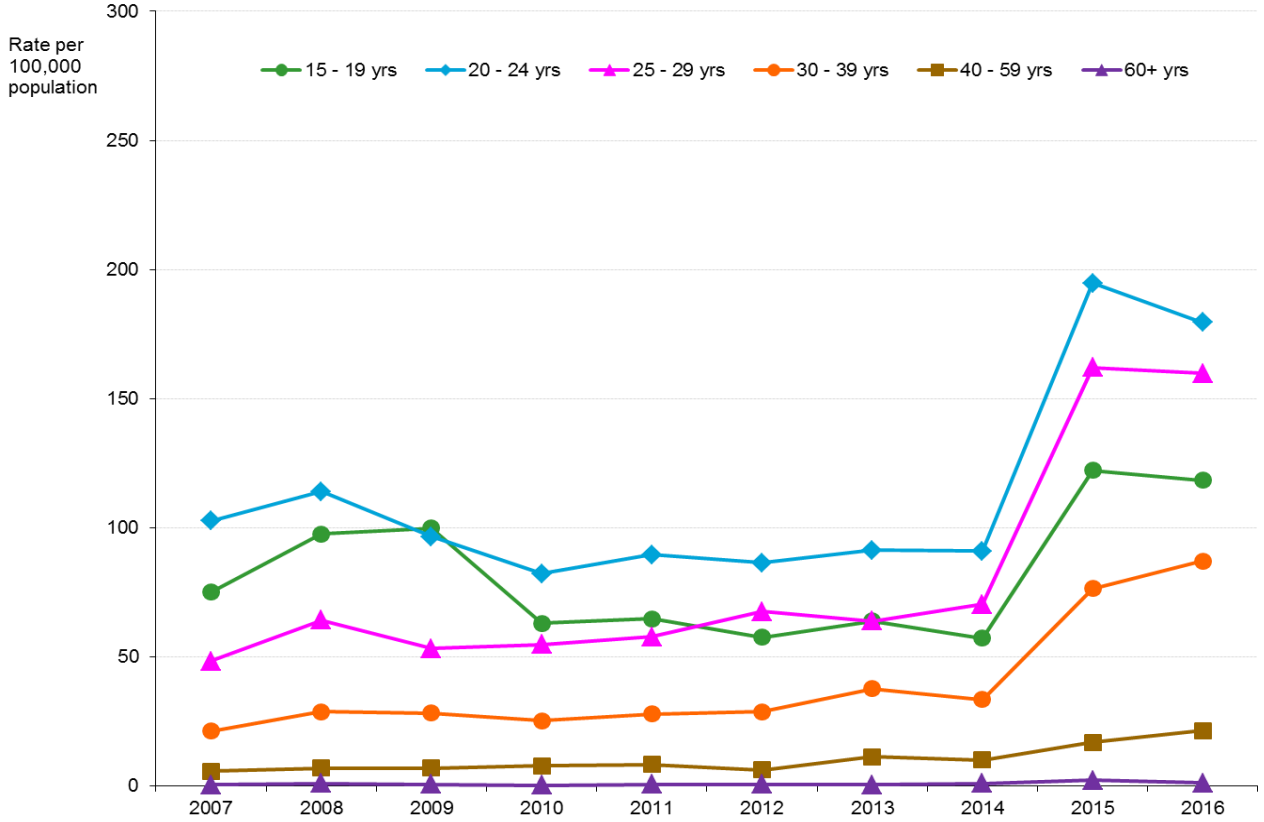
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	6	151	281	254	281	145	7
Reports - Male	0	74	381	419	657	528	67
Reports - Other *	0	1	1	2	0	0	0
Rate - Female	5.4	118.3	179.6	159.7	87.1	21.4	1.1
Rate - Male	0.0	54.7	222.8	262.6	208.2	80.4	12.0

* Other - transgender and gender unknown

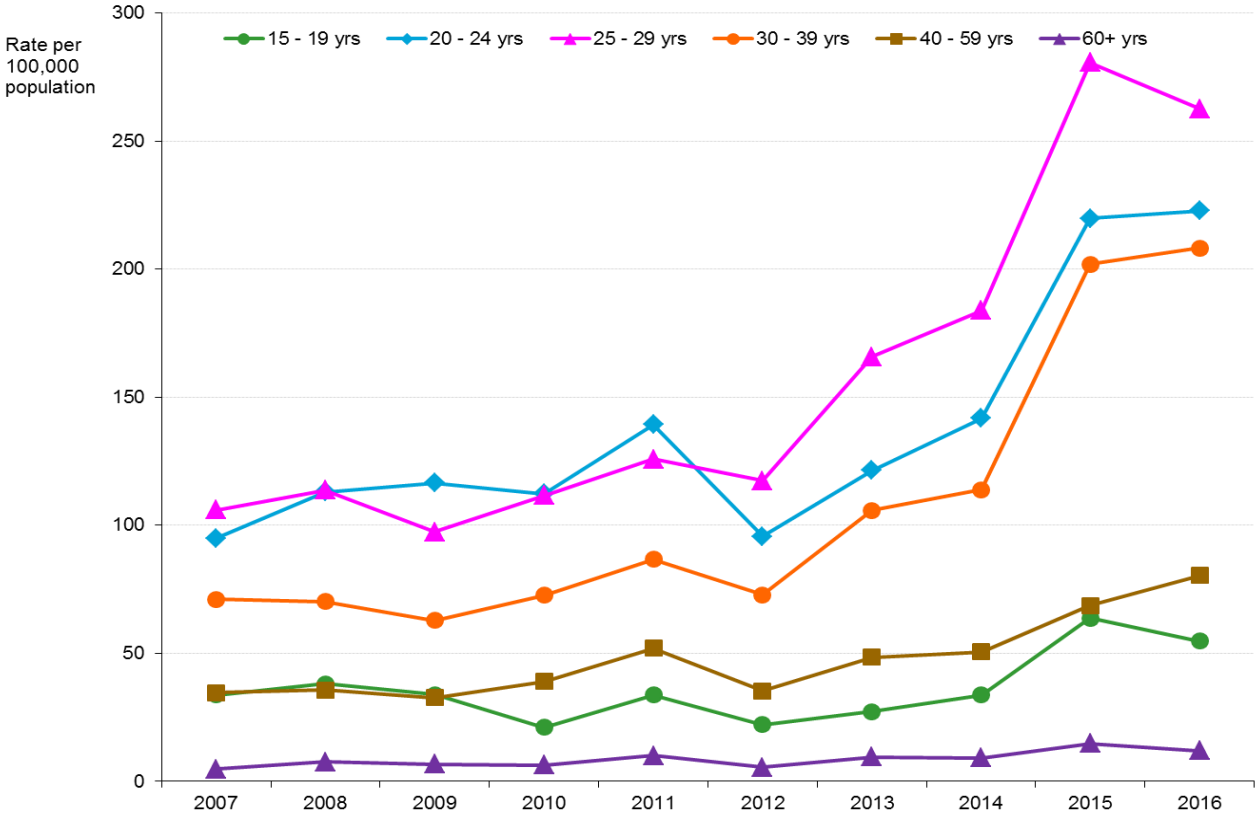
17. Genital gonorrhea case reports in BC by age group - total, 2007 to 2016



18. Genital gonorrhea case reports in BC by age group - female, 2007 to 2016



19. Genital gonorrhea case reports in BC by age group - male, 2007 to 2016



Extra-genital Gonorrhea

In 2016, 640 cases were identified (60 females, 577 males) which was an increase from 504 cases (41 females, 463 males) in 2015. As screening for gonorrhea infections at extra-genital sites is not routine practice, these findings are strongly influenced by provider testing practices, including increases in screening in the past few years. Of the 2,259 cases diagnosed from 2007 to 2016, cases were identified in the throat (2,172 cases, 96.1%), eye (45 cases, 2.0%), and other sites (35 cases, 1.5%). A small number of the diagnosed cases represented disseminated gonococcal infection (7 cases, 0.3%) (Table 20).

20. Extra-genital gonorrhea case reports in BC by site/culture, 2007 to 2016

Gender	Site	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Female	Throat	15	3	7	8	12	8	26	19	37	53
	Eye	1	1	0	1	0	0	1	1	4	2
	Other *	4	0	0	1	0	0	1	2	0	4
	DGI **	0	1	0	0	0	1	1	0	0	1
	Total	20	5	7	10	12	9	29	22	41	60
Male	Throat	46	41	43	56	95	155	184	334	452	568
	Eye	1	1	5	4	0	1	2	6	7	7
	Other *	0	0	2	3	4	3	1	4	4	2
	DGI **	0	1	1	0	0	1	0	0	0	0
	Total	47	43	51	63	99	160	187	344	463	577
BC	Throat	61	44	52	64	107	165	213	353	489	624
	Eye	2	2	5	5	0	1	3	7	11	9
	Other *	4	0	2	4	4	3	2	6	4	6
	DGI **	0	2	1	0	0	2	1	0	0	1
	Total	67	48	60	73	111	171	219	366	504	640

* Other - superficial wound, sternoclavicular synovium, synovium joint fluid, abscess, blood, and elbow

** DGI - disseminated gnococcal infection

Total reports for BC is the sum of the following genders: female, male, transgender, and gender unknown

Perinatally-acquired Gonorrhea

In 2016, there were no reports of perinatally-acquired gonorrhea. From 2007 to 2016, four perinatal cases have been identified.

Gonorrhea Antimicrobial Resistance

Treatment of gonorrhea has long been challenged by the bacterium's ability to acquire resistance to multiple classes of antibiotics. Effective antibiotics – penicillin, doxycycline, and ciprofloxacin – can no longer be used successfully against gonorrhea, leaving few remaining options. BC treatment guidelines currently recommend third-generation cephalosporins for the treatment of gonorrhea: injectable ceftriaxone (250 mg) or oral cefixime (800 mg), co-treated with 1 g of azithromycin.[13] Recent international surveillance data and case reports however, suggest that susceptibility of gonorrhea to these current first-line treatments is also now threatened.[14, 15] In this context, local surveillance is critical.

The BCCDC Public Health Laboratory (PHL) routinely tests *Neisseria gonorrhoeae* isolates for susceptibility to a panel of antimicrobial drugs, including cefixime, ceftriaxone, and azithromycin. Data presented here summarize the minimum inhibitory concentration (MIC) of these drugs among isolates from BC. The MIC is the lowest amount of antibiotic required to inhibit growth of the bacterium; a higher MIC means the bacterium is less susceptible to the antibiotic.

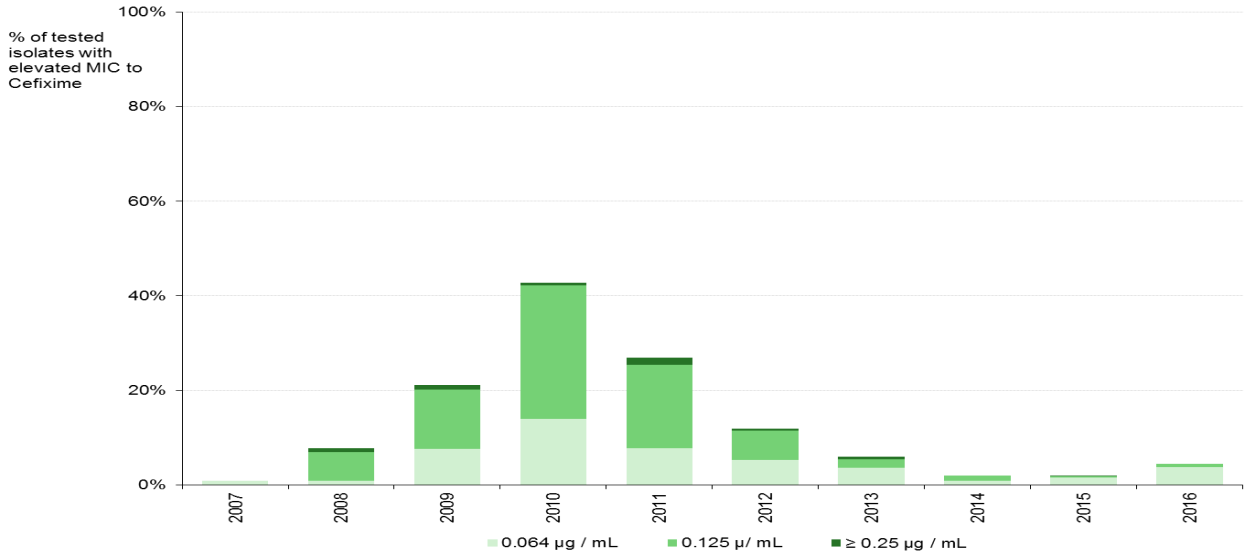
A total of 4,072 isolates were tested between 2007 and 2016, representing 20.8% (4,072/19,582) of all gonorrhea cases reported in the province. Forty-eight percent (1,937/4,072) of isolates tested for drug susceptibility were sampled from the urethra, 23.7% (967/4,072) from the rectum, 12.5% (509/4,072) from the cervix, and 12.2% (495/4,072) from the throat.

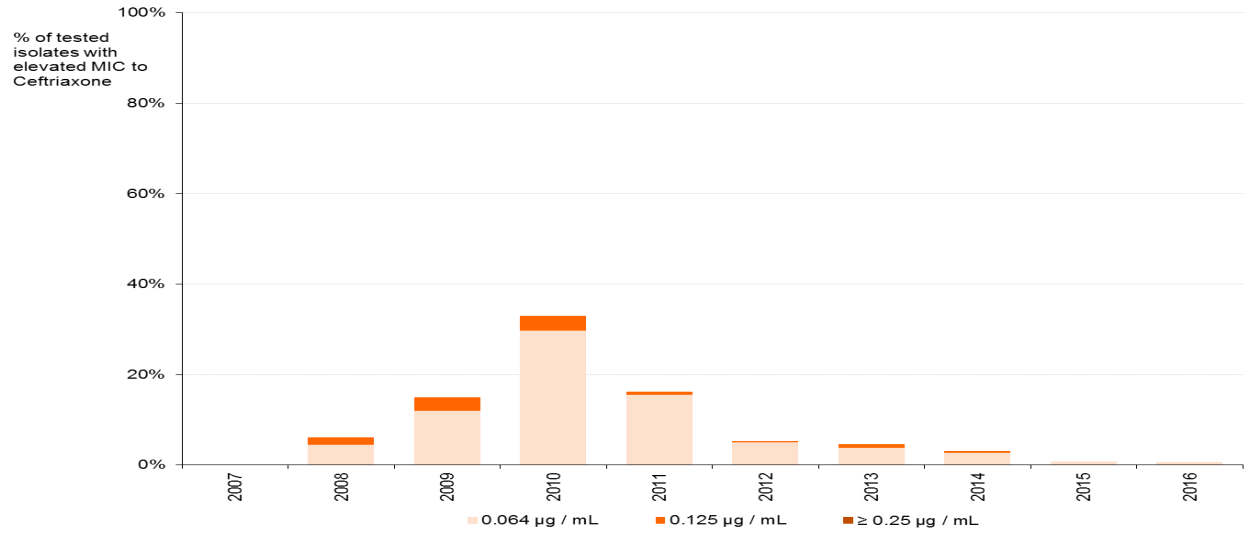
Since 2007, 0.5% (20/4,072) of isolates showed an MIC ≥0.25 µg/mL to cefixime. Fortunately, no isolate was fully resistant to cefixime or ceftriaxone[16] and no treatment failures were reported in BC during this period (Figure 21). The increasing trend in percentage of isolates with elevated MIC (i.e., reduced susceptibility) to cefixime or ceftriaxone observed in 2007-2010 reversed in 2011-2016 for ceftriaxone, and in 2011-2015 for cefixime which then increased slightly in 2016. Similarly, the increasing trend in percentage of isolates with elevated MIC to azithromycin[17] in 2007-2011 reversed in 2012-2016.

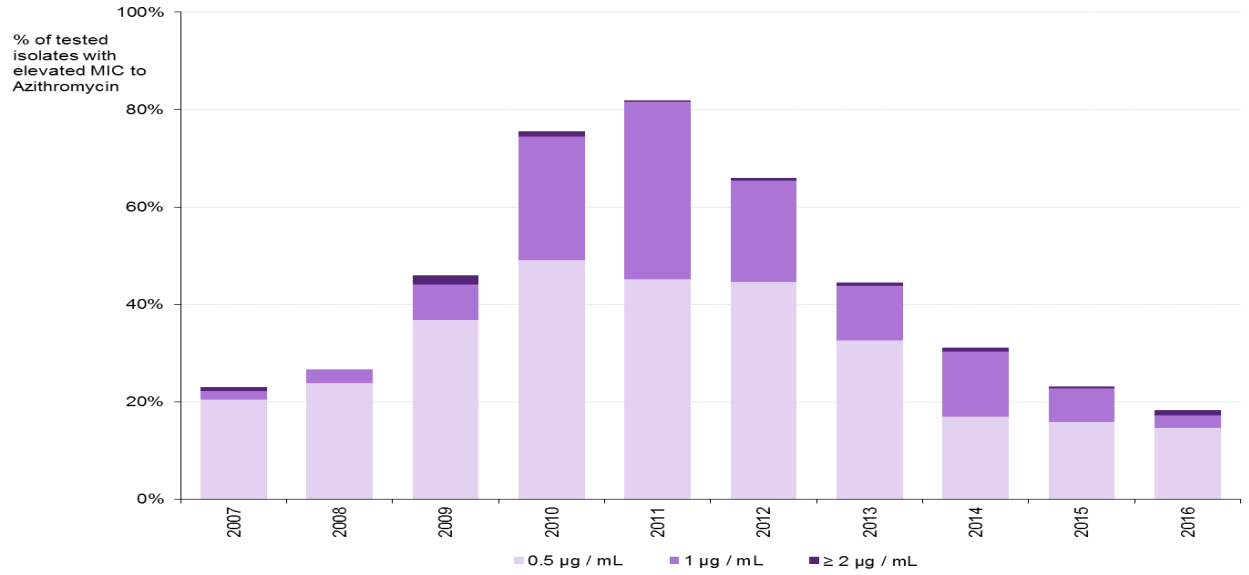
The decline observed from 2011 onward for reduced susceptibility to cefixime or ceftriaxone among tested isolates is encouraging and, may in part be due to changes in the Canadian and provincial gonorrhea treatment guidelines to more effective regimens (i.e., increased cefixime dosage or improved medication adherence due to single dosage). These trends will be closely monitored in order to inform the future evolution of gonorrhea treatment recommendations. The continued threat of emerging resistance reinforces the need for STI prevention and control measures such as increased testing for gonorrhea, partner testing and treatment of gonorrhea, and tests of cure, as well as the need for antibiotic stewardship to ensure effective treatments for bacterial infections.

21. Percentage of tested *N. gonorrhoeae* isolates with elevated minimum inhibitory concentrations (MIC) to Cefixime, Ceftriaxone, and Azithromycin in BC, 2007 to 2016

Elevated MIC defined here as ≥0.064 µg/mL for cefixime/ceftriaxone and ≥0.5 µg/mL for azithromycin







Pelvic Inflammatory Disease and Ectopic Pregnancy

Pelvic inflammatory disease (PID) and ectopic pregnancy (EP) are medical conditions in women that can be caused by chlamydia or gonorrhea infection. Examination of the rates of these conditions can provide an indication of the complications of chlamydia and gonorrhea infections. Included in this report are data of physician billings (representing inpatient and outpatient treatment) and hospital discharges (representing inpatient treatment) provided by the BC Ministry of Health.

In BC, steady declines in physician billings and hospital discharges related to PID have been observed over time. Rates in hospital discharges for EP have shown a similar trend although physician billings for EP have increased slightly in recent years. Despite increasing rates of chlamydia and gonorrhea infections, PID has been declining. This paradoxical trend may be a result of targeted screening programs that have led to earlier diagnosis and treatment of chlamydia and gonorrhea that may reduce the probability of complications such as PID and EP.

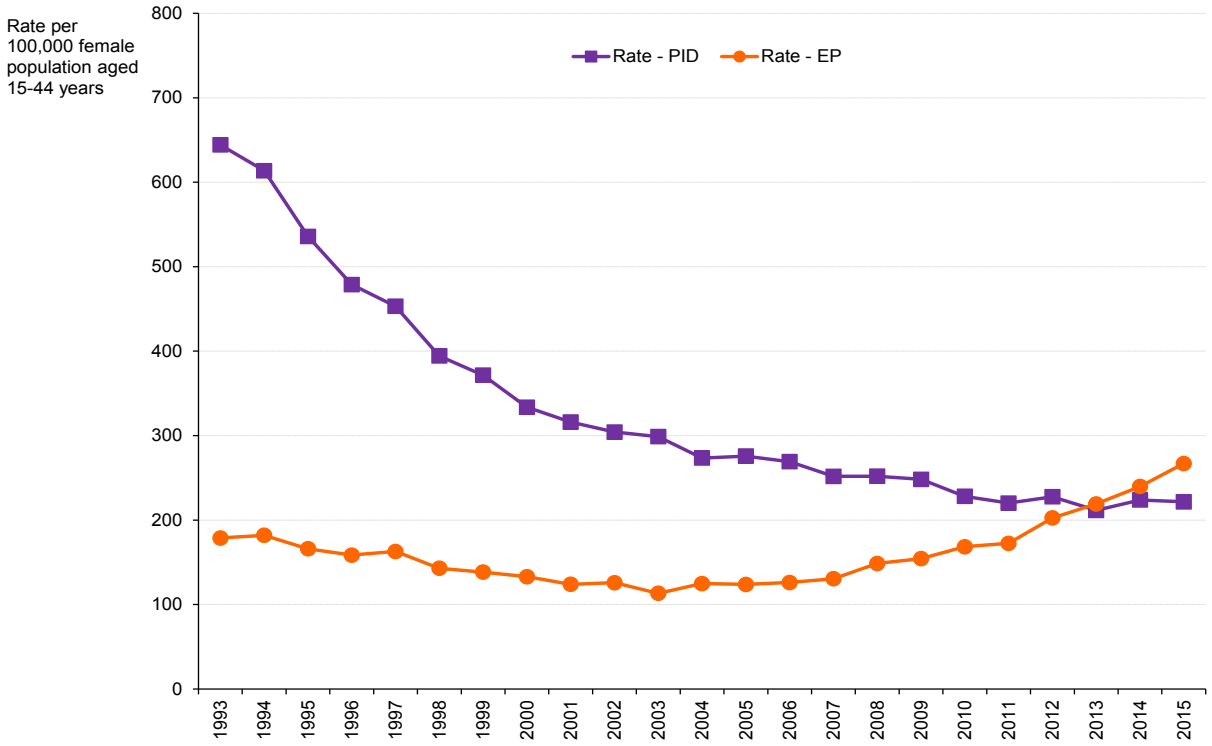
Pelvic Inflammatory Disease

In 2015, the rate of physician billings related to PID decreased slightly to 221.7 (2,031 physician billings) from 223.8 (2,043 physician billings) per 100,000 women aged 15-44 years in 2014 (Figure 22). Rate of hospital discharges related to PID also show a decrease to 25.1 (230 hospital discharges) in 2015 from 29.8 (272 hospital discharges) per 100,000 women aged 15-44 years in 2014 (Figure 23).

Ectopic Pregnancy

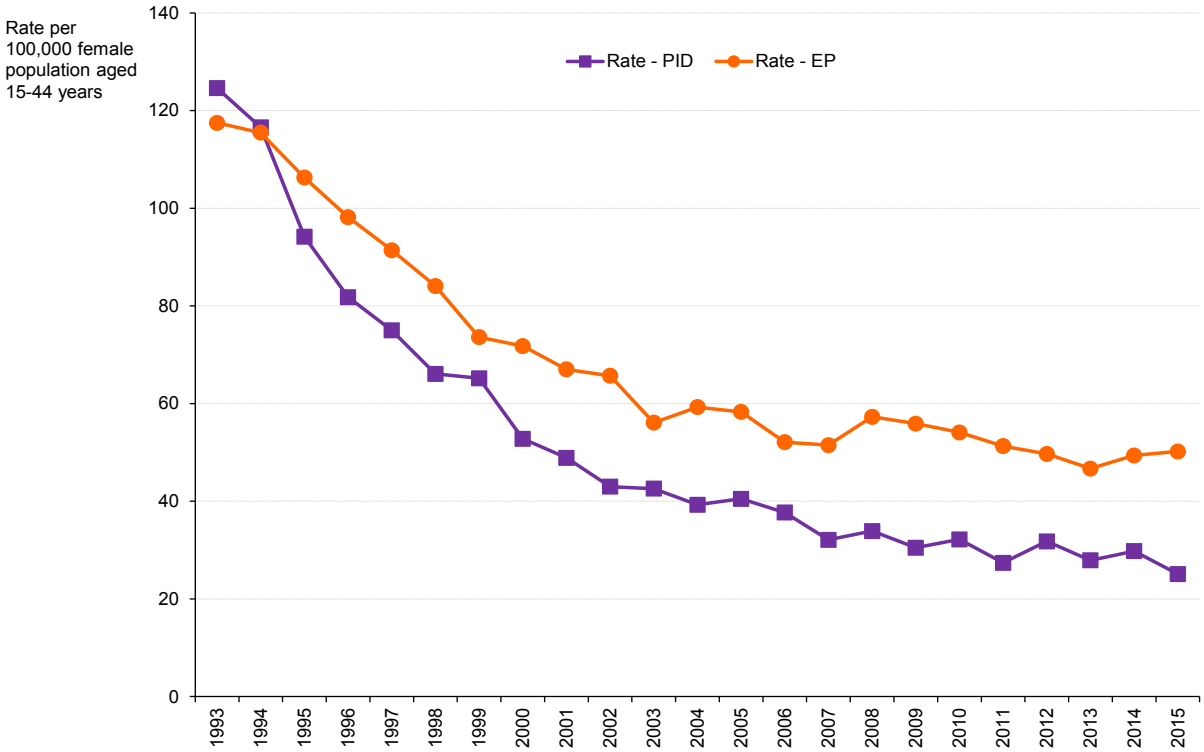
The rate of physician billings related to EP increased to 267.0 (2,446 physician billings) in 2015 from 239.7 (2,188 physician billings) per 100,000 women aged 15-44 years in 2014 (Figure 22). Rate of hospital discharges related to EP have remained the same in 2015 at 50.2 (460 hospital discharges) as in 2014 at 49.4 (451 hospital discharges) per 100,000 women aged 15-44 years (Figure 23).

22. Case reports of women aged 15-44 years with a physician billing related to pelvic inflammatory disease or ectopic pregnancy in BC, 1993 to 2015



PID - pelvic inflammatory disease
EP - ectopic pregnancy

23. Case reports of women aged 15-44 years with a hospital discharge related to pelvic inflammatory disease or ectopic pregnancy in BC, 1993 to 2015



PID - pelvic inflammatory disease
EP - ectopic pregnancy

Infectious Syphilis

Infectious Syphilis by Region, Gender, and Age

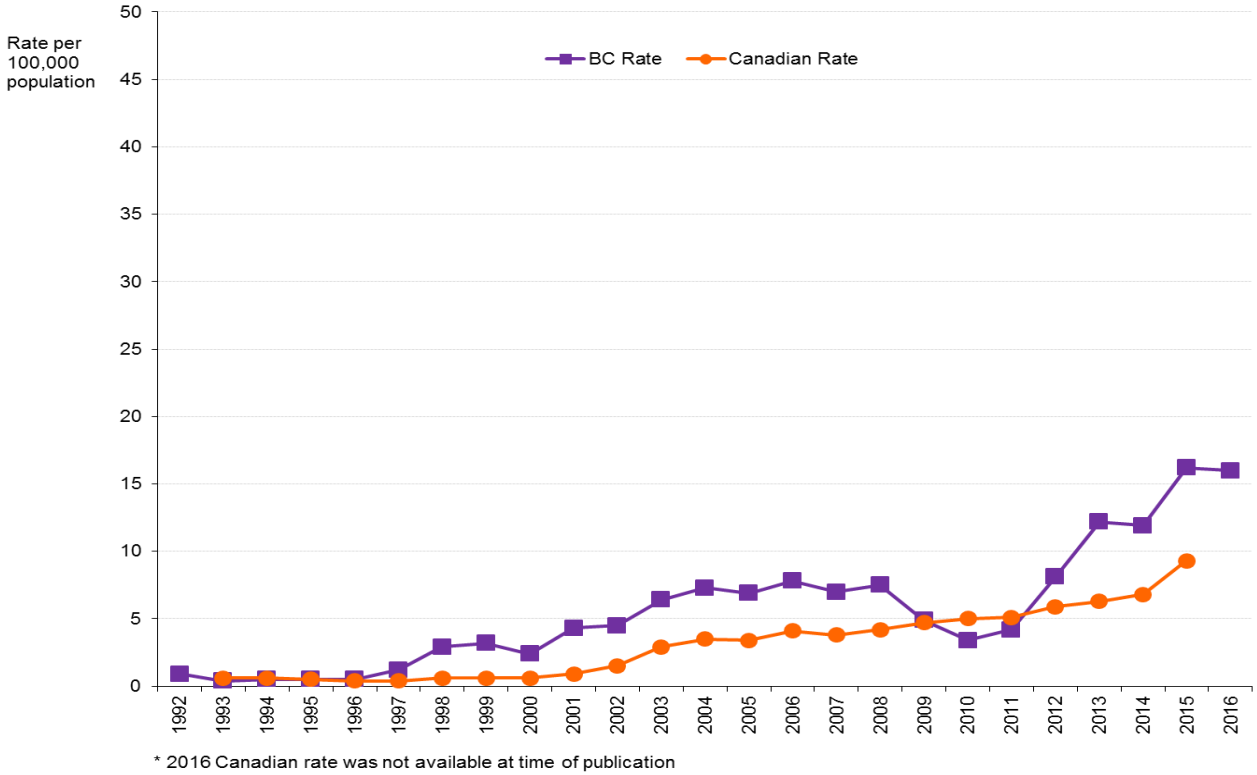
Syphilis infections are divided into several stages: primary, secondary, early latent, and late latent. The initial symptoms of syphilis may not always be recognized and without treatment individuals generally enter a prolonged asymptomatic phase. Individuals can still however, be infectious despite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

Following a decline in rates in BC in the early 1990's, infectious syphilis (i.e., primary, secondary, and early latent stages) began to re-emerge in BC starting in 1997, corresponding to a series of outbreaks in different populations. While provincial trends had been decreasing in 2009-2010, infectious syphilis rates began to increase in 2011 and this became more evident in 2012-2013. In BC, the rate of infectious syphilis remained stable in 2016 at 16.0 (759 cases) when compared to 16.2 (760 cases) per 100,000 population in 2015 (Figure 24). The highest rate of infectious syphilis was in the Vancouver Coastal Health Authority (Figure 26). Across Health Service Delivery Areas, the highest rates were in Vancouver and South Vancouver Island (Figure 25).

The majority of infectious syphilis cases in BC are male (Figure 27). Although male infectious syphilis rates decreased in 2009-2010, male infectious syphilis rates have since risen to 30.8 (725 cases) per 100,000 population in 2016. The rate of infectious syphilis among males aged 15-29 years has been increasing steadily since 2014 (Figure 31). In 2016, the rate of infectious syphilis among females was 1.4 (33 cases), a slight increase from 1.2 (28 cases) per 100,000 population in 2015 (Figure 27).

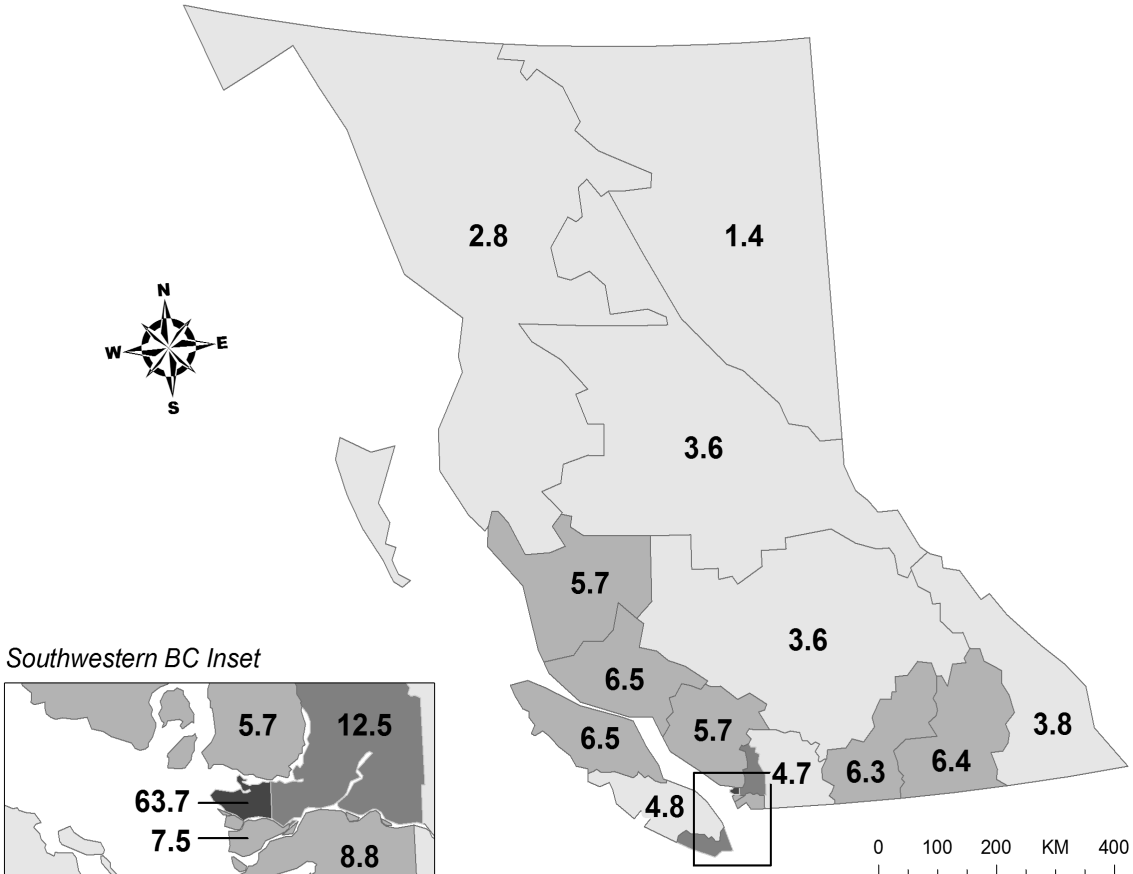
In 2016, 645 cases (85.0% of all cases) reported sexual (including anonymous) partners while the remaining cases (114 cases, 15.0%) provided no information regarding their sexual partners or were lost to follow-up. Of these 645 cases, 612 cases (94.9%) reported 4,424 sexual partners (notifiable and anonymous); 227 cases (35.2%) reported at least one anonymous partner.

24. Infectious syphilis case reports in BC and Canada, 1992 to 2016*



* 2016 Canadian rate was not available at time of publication

25. Infectious syphilis case reports in BC by health service delivery area, 2016



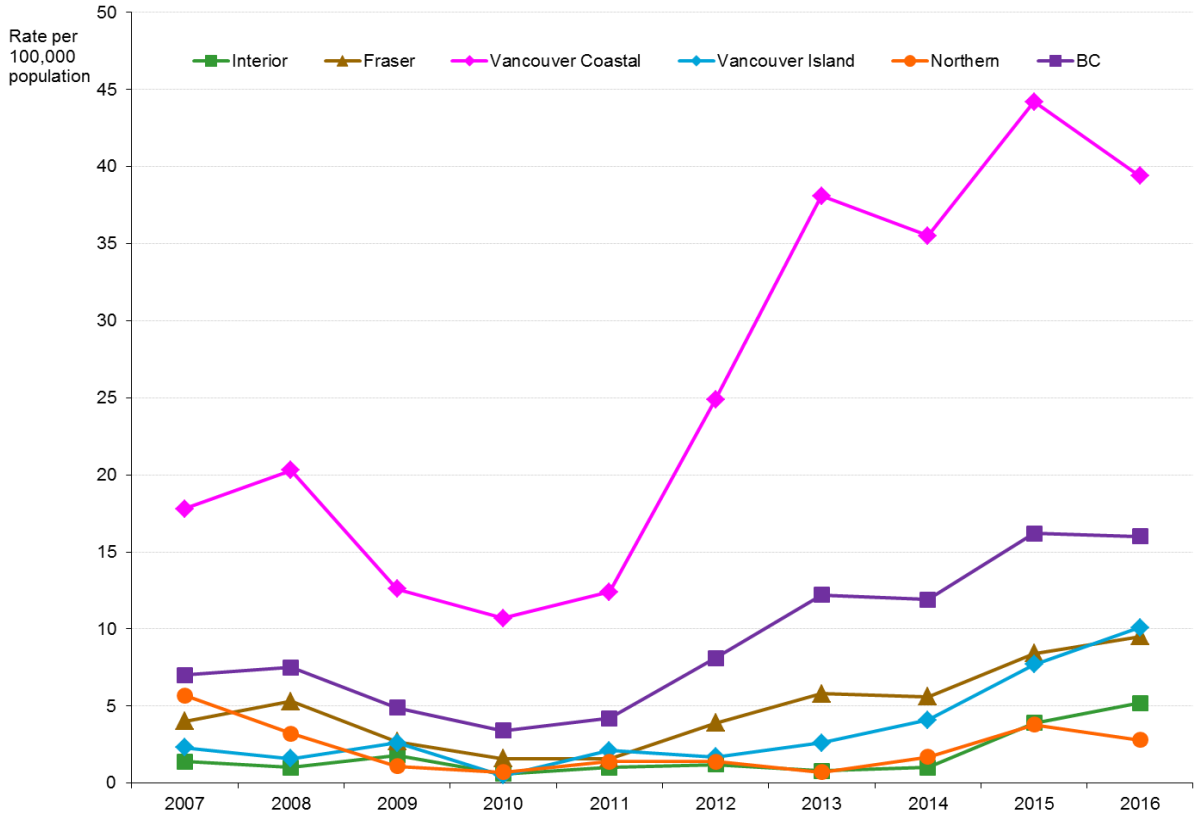
ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	3	3.8
12	Kootenay Boundary	5	6.4
13	Okanagan	23	6.3
14	Thompson Cariboo Shuswap	8	3.6
21	Fraser East	14	4.7
22	Fraser North	83	12.5
23	Fraser South	72	8.8
31	Richmond	16	7.5
32	Vancouver	428	63.7
33	North Shore/Coast Garibaldi	16	5.7
41	South Vancouver Island	57	14.9
42	Central Vancouver Island	13	4.8
43	North Vancouver Island	8	6.5
51	Northwest	2	2.8
52	Northern Interior	5	3.6
53	Northeast	1	1.4

Rate per 100,000 population by HSDA

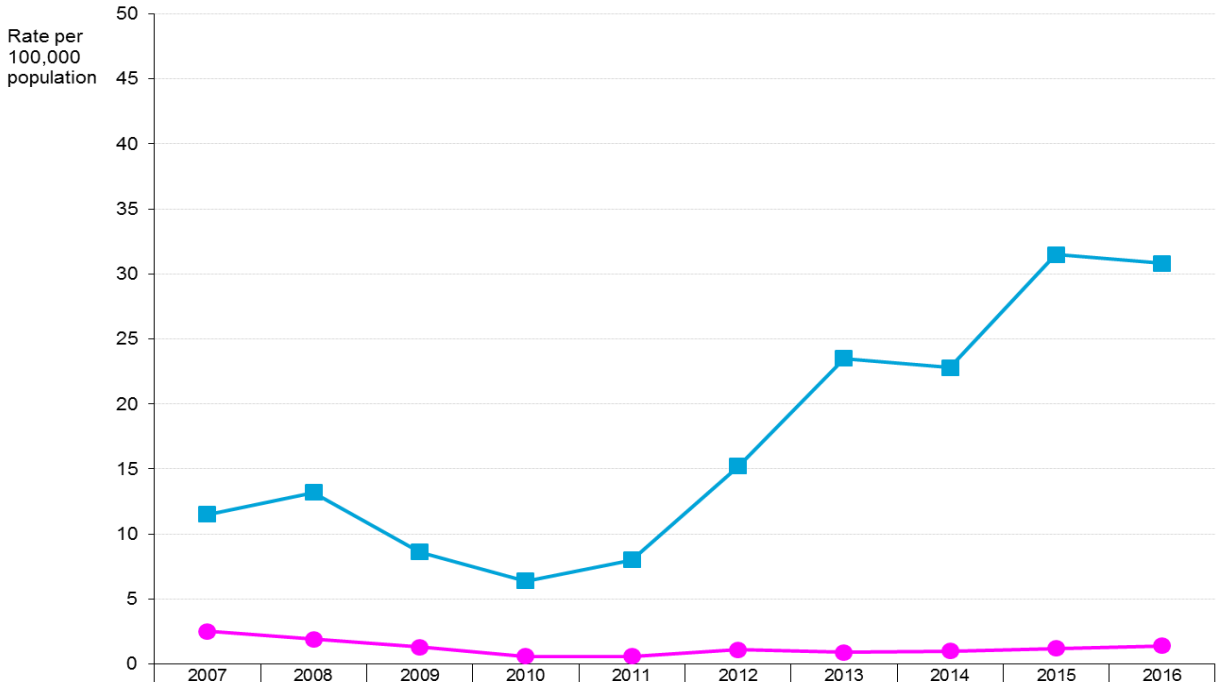
- 1.4 - 4.8
- 5.7 - 8.8
- 12.5 - 14.9
- 63.7

Rates calculated with population estimates released by BC Stats

26. Infectious syphilis case reports in BC by health authority, 2007 to 2016



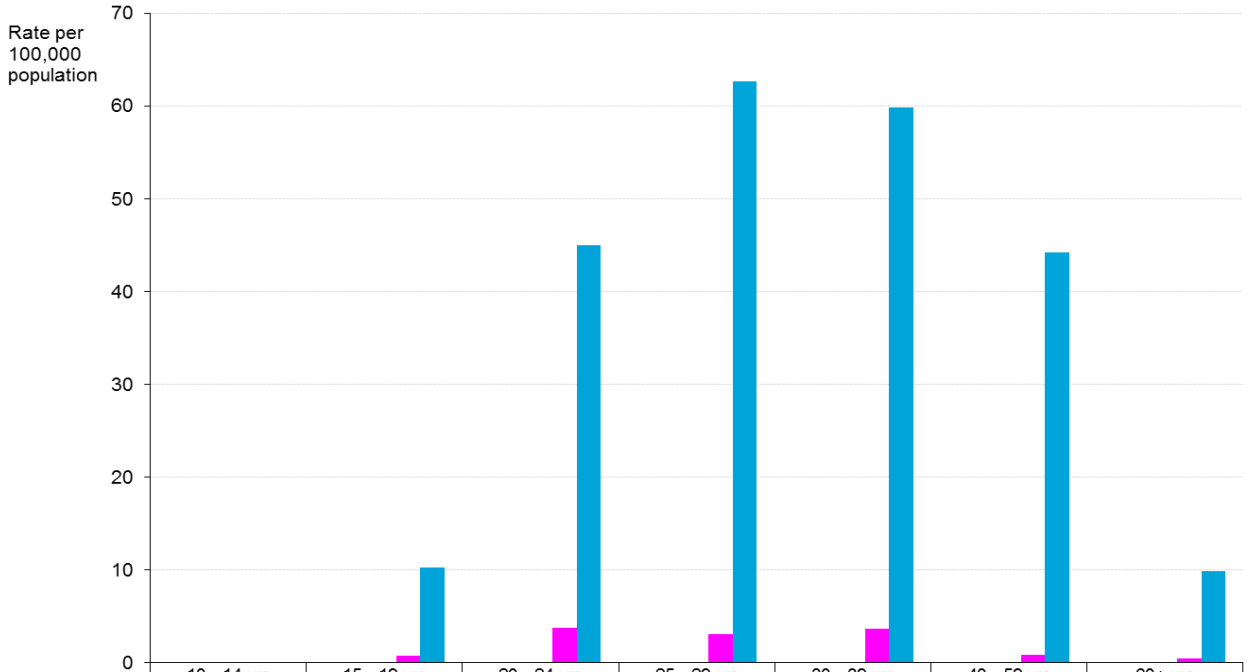
27. Infectious syphilis case reports in BC by gender, 2007 to 2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports - Female	55	41	28	13	13	24	20	24	28	33
Reports - Male	245	286	188	141	178	344	536	524	732	725
Reports - Other *	1	1	1	0	0	1	2	1	0	1
Rate - Female	2.5	1.9	1.3	0.6	0.6	1.1	0.9	1.0	1.2	1.4
Rate - Male	11.5	13.2	8.6	6.4	8.0	15.2	23.5	22.8	31.5	30.8

* Other - transgender and gender unknown

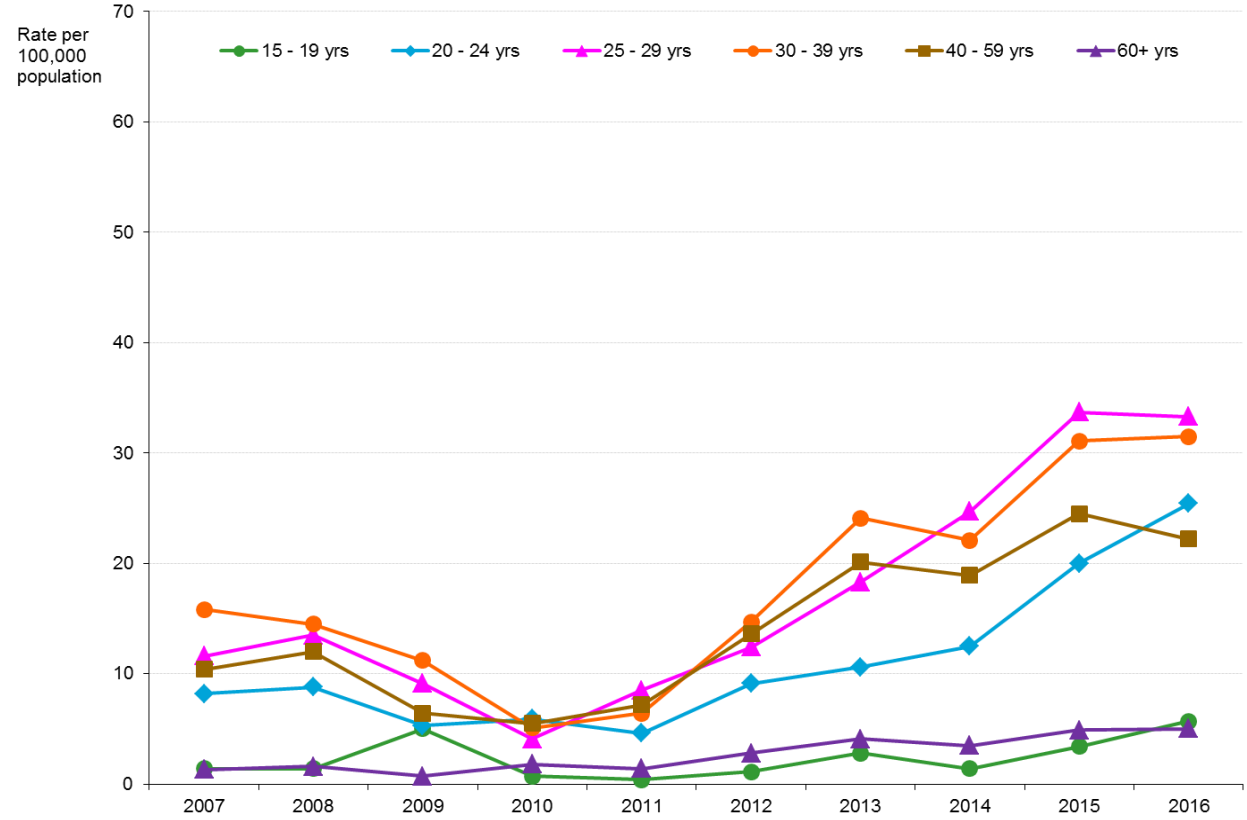
28. Infectious syphilis case reports in BC by age group and gender, 2016



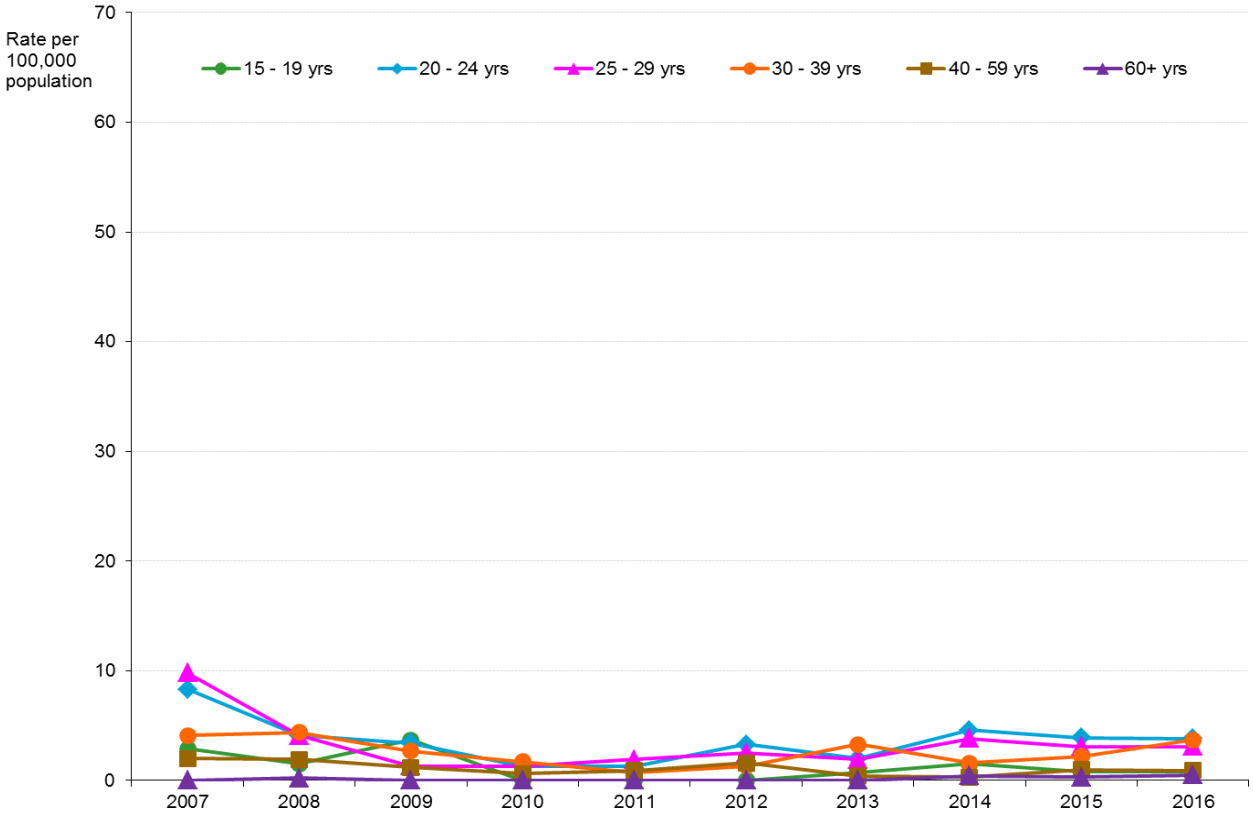
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	0	1	6	5	12	6	3
Reports - Male	0	14	77	100	189	290	55
Reports - Other *	0	0	0	1	0	0	0
Rate - Female	0.0	0.8	3.8	3.1	3.7	0.9	0.5
Rate - Male	0.0	10.3	45.0	62.7	59.9	44.2	9.9

* Other - transgender and gender unknown

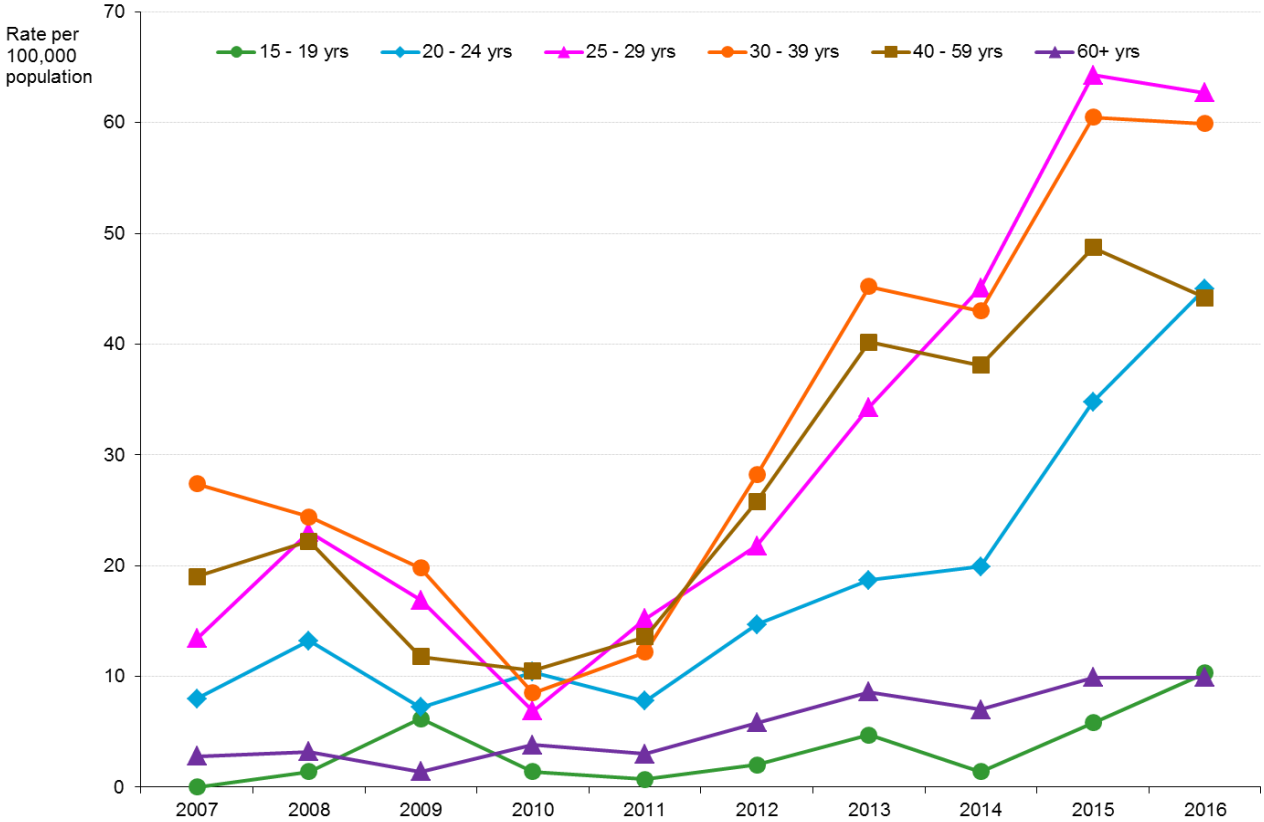
29. Infectious syphilis case reports in BC by age group - total, 2007 to 2016



30. Infectious syphilis case reports in BC by age group - female, 2007 to 2016



31. Infectious syphilis case reports in BC by age group - male, 2007 to 2016



Infectious Syphilis by Ethnicity

In males, almost half of cases (338 cases; 46.6%) in 2016 were among people who identified as Caucasian (Table 34). In comparison, most females in 2016 identified as either Caucasian (5 cases, 15.2%) or Asian (5 cases, 15.2%) however, the trends are highly variable due to the small number of female cases each year (33 cases in 2016) (Table 33).

32. Percentage of infectious syphilis case reports in BC by ethnicity - total, 2007 to 2016

Ethnicity	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
No. Diagnoses	*301*	*328*	*217*	*154*	*191*	*369*	*558*	*549*	*760*	*759*
Caucasian	64.5	66.2	65.0	70.1	65.4	61.5	56.8	53.6	50.4	45.3
Indigenous	10.6	8.8	7.8	3.9	3.7	5.7	3.9	3.1	3.4	2.5
Asian	8.6	10.7	6.9	12.3	9.9	10.6	12.2	13.5	9.1	7.5
South Asian	4.0	4.3	1.4	3.2	6.8	4.1	3.6	2.6	2.2	2.6
Hispanic	5.6	4.9	9.2	2.6	8.4	6.5	5.2	6.2	5.9	4.6
Black	2.3	2.4	4.6	1.9	0.5	1.1	1.6	2.6	0.5	1.2
Other*	2.0	1.2	3.2	1.9	3.1	1.9	1.3	1.5	1.6	1.1
Unknown	2.3	1.5	1.8	3.9	2.1	8.7	15.4	17.1	26.8	35.2

* Other - Arab/West Asian and other/mixed ethnicity

33. Percentage of infectious syphilis case reports in BC by ethnicity - female, 2007 to 2016

Ethnicity	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
No. Diagnoses	*55*	*41*	*28*	*13*	*13*	*24*	*20*	*24*	*28*	*33*
Caucasian	54.5	43.9	57.1	69.2	38.5	29.2	15.0	20.8	14.3	15.2
Indigenous	34.5	29.3	28.6	15.4	15.4	20.8	15.0	8.3	17.9	6.1
Asian	5.5	12.2	0.0	0.0	23.1	16.7	30.0	37.5	7.1	15.2
South Asian	3.6	9.8	7.1	7.7	7.7	12.5	10.0	4.2	0.0	6.1
Hispanic	0.0	0.0	0.0	0.0	7.7	0.0	5.0	0.0	3.6	0.0
Black	0.0	2.4	3.6	7.7	0.0	4.2	0.0	0.0	0.0	0.0
Other*	0.0	0.0	3.6	0.0	0.0	0.0	0.0	0.0	3.6	0.0
Unknown	1.8	2.4	0.0	0.0	7.7	16.7	25.0	29.2	53.6	57.6

* Other - Arab/West Asian and other/mixed ethnicity

34. Percentage of infectious syphilis case reports in BC by ethnicity - male, 2007 to 2016

Ethnicity	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
No. Diagnoses	*245*	*286*	*188*	*141*	*178*	*344*	*536*	*524*	*732*	*725*
Caucasian	66.9	69.6	66.5	70.2	67.4	63.7	58.4	55.2	51.8	46.6
Indigenous	5.3	5.6	4.8	2.8	2.8	4.7	3.5	2.9	2.9	2.3
Asian	9.4	10.5	8.0	13.5	9.0	10.2	11.6	12.4	9.2	7.2
South Asian	4.1	3.5	0.5	2.8	6.7	3.5	3.4	2.5	2.3	2.5
Hispanic	6.5	5.6	10.6	2.8	8.4	7.0	5.2	6.5	6.0	4.8
Black	2.9	2.4	4.8	1.4	0.6	0.9	1.7	2.7	0.5	1.2
Other*	2.4	1.4	2.7	2.1	3.4	2.0	1.1	1.5	1.5	1.1
Unknown	2.4	1.4	2.1	4.3	1.7	8.1	15.1	16.4	25.8	34.2

* Other - Arab/West Asian and other/mixed ethnicity

Infectious Syphilis among Indigenous Peoples

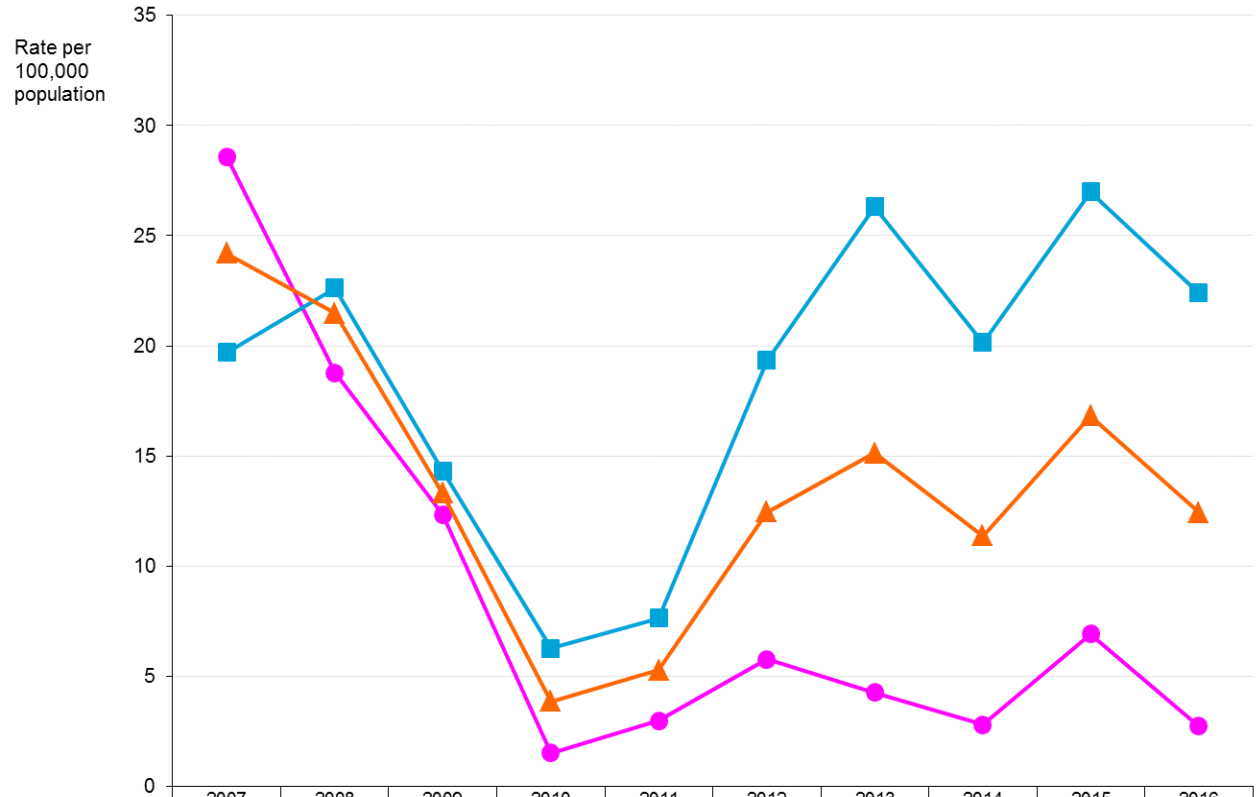
This section describes cases of infectious syphilis among people who identify as Indigenous. Among the nearly 270,000 Indigenous persons living in BC, representing about 6% of the general BC population, approximately 65% are First Nations, 33% are Métis, and fewer than 1% are Inuit or of other Indigenous identity.[18]

Since 2007, the percentage of infectious syphilis cases in BC residents that were reported among Indigenous peoples has been decreasing. In 2016, the percentage of infectious syphilis cases among Indigenous peoples decreased to 2.5% (19 cases) from 3.4% (26 cases) in 2015 (Table 32).

Due to the small number of cases and the limited availability of population estimates of Métis and Inuit people, the remainder of this section focuses on infectious syphilis cases among people who identify as First Nations. See the Technical Appendix for further details about the classification of ethnicity for syphilis cases and the population estimates for status First Nations people used for rate calculations.

Consistent with overall provincial trends, the rate of infectious syphilis among First Nations people in BC has increased since 2011 (Figure 35). The rate decreased in 2016 to 12.4 (18 cases) from 16.8 (24 cases) per 100,000 population in 2015.

35. Infectious syphilis case reports among First Nations people in BC by gender, 2007 to 2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Rate - Female	28.6	18.8	12.3	1.5	3.0	5.8	4.3	2.8	6.9	2.7
Rate - Male	19.7	22.6	14.3	6.3	7.6	19.3	26.3	20.2	27.0	22.4
Rate - Total	24.2	21.5	13.3	3.9	5.3	12.5	15.1	11.4	16.8	12.4

Rates based on First Nations population estimates from the former Aboriginal Affairs and Northern Development Canada now known as Indigenous Services Canada

Infectious Syphilis by Exposure Category

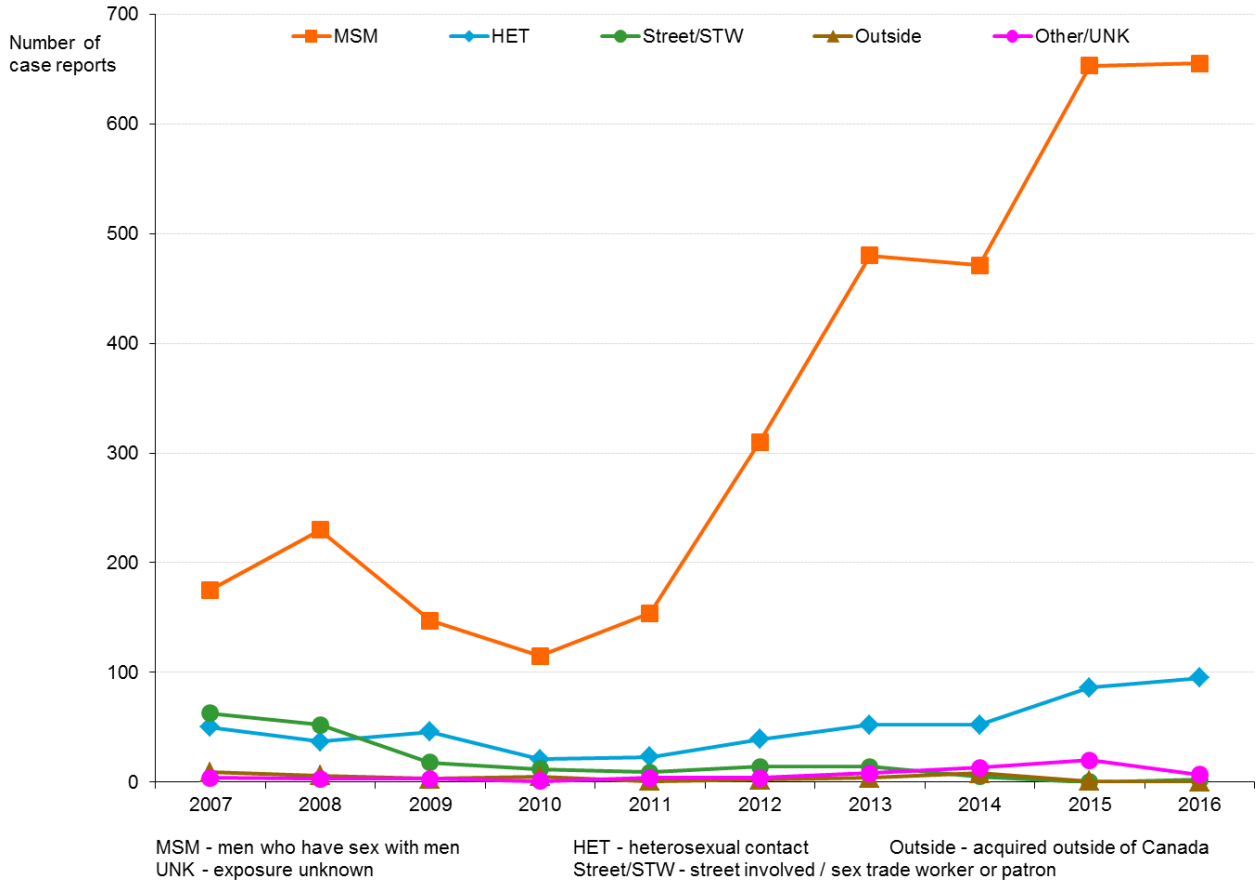
Gay, bisexual, and other men who have sex with men (MSM) continue to comprise the greatest number of infectious syphilis cases in BC (Figure 37). The number of syphilis cases among MSM remained stable in 2016 at 655 cases (86.3% of all cases) when compared to 653 cases (85.9%) in 2015. Infectious syphilis cases among heterosexual persons without other risk factors increased slightly in 2016 (95 cases, 12.5% in 2016; 86 cases, 11.3% in 2015). Trends among MSM in BC are explored in more detail in the next section.

36. Infectious syphilis case reports in BC by exposure category and health authority, 2007 to 2016

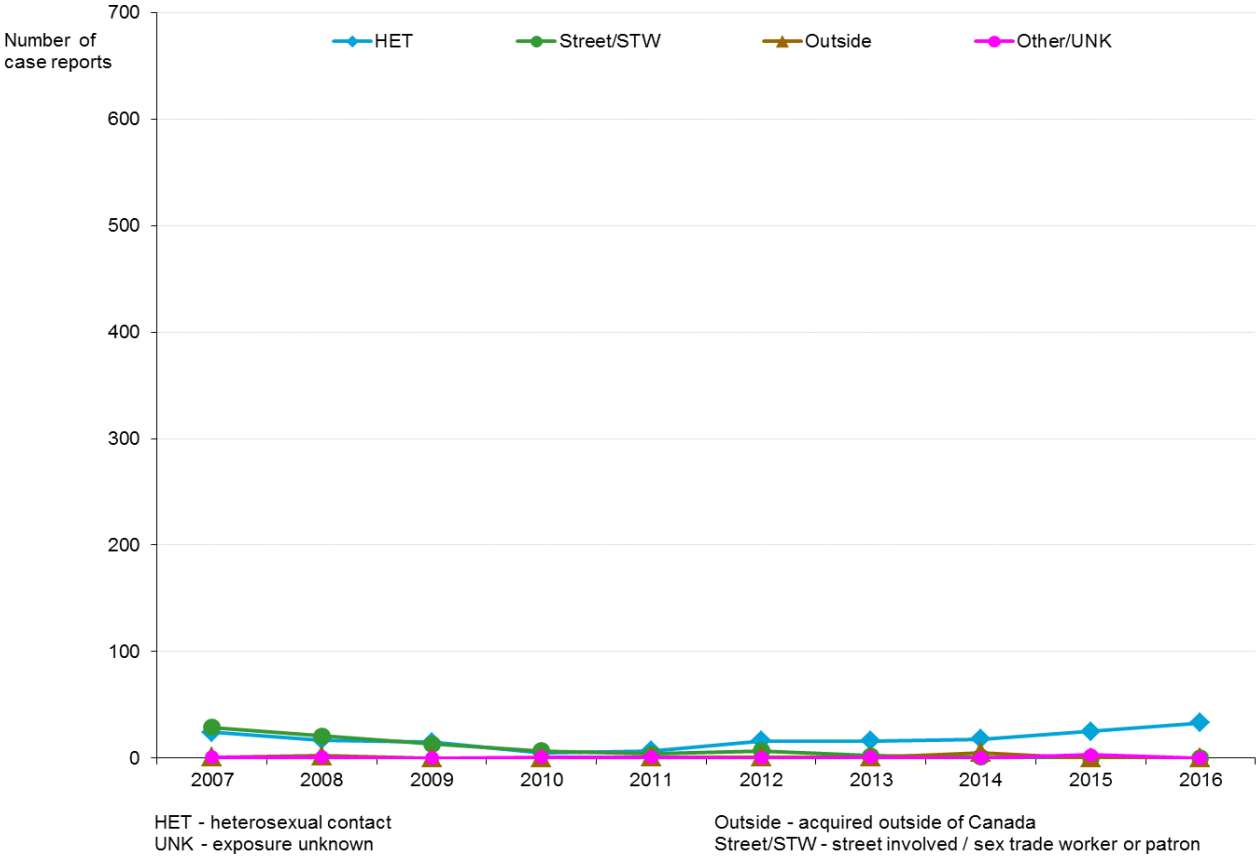
Health Authority	Exposure Category	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Interior	MSM	7	2	4	1	3	6	4	3	23	27
	Street/STW	3	3	1	1	0	0	0	0	0	0
	HET	0	2	7	2	4	2	2	2	6	11
	Outside	0	0	0	0	0	1	0	1	0	0
	Other/UNK	0	0	1	0	0	0	0	1	0	1
Fraser	MSM	14	41	25	17	15	46	73	79	107	133
	Street/STW	22	20	4	2	2	4	4	1	0	1
	HET	21	15	13	5	8	12	19	11	33	35
	Outside	3	5	1	2	0	1	1	2	0	0
	Other/UNK	1	1	0	0	2	1	1	3	6	0
Vancouver Coastal	MSM	136	179	110	94	121	248	388	360	469	416
	Street/STW	33	23	6	9	6	9	10	4	0	0
	HET	14	14	18	11	7	19	25	30	32	39
	Outside	6	1	2	3	1	0	3	4	1	0
	Other/UNK	2	1	1	1	2	3	5	9	10	5
Vancouver Island	MSM	7	7	7	3	13	10	13	22	42	67
	Street/STW	3	2	4	0	0	0	0	0	0	1
	HET	7	2	7	1	3	3	6	8	13	9
	Outside	0	0	0	0	0	0	0	1	0	0
	Other/UNK	0	1	1	0	0	0	1	0	4	1
Northern	MSM	6	1	0	0	2	0	1	4	10	7
	Street/STW	2	4	2	0	1	1	0	0	0	0
	HET	8	4	1	2	1	3	0	1	1	1
	Outside	0	0	0	0	0	0	0	0	0	0
	Other/UNK	0	0	0	0	0	0	1	0	0	0
nonBC	MSM	5	0	1	0	0	0	1	3	2	5
	Street/STW	0	0	1	0	0	0	0	0	0	0
	HET	0	0	0	0	0	0	0	0	1	0
	Outside	0	0	0	0	0	0	0	0	0	0
	Other/UNK	1	0	0	0	0	0	0	0	0	0
BC	MSM	175	230	147	115	154	310	480	471	653	655
	Street/STW	63	52	18	12	9	14	14	5	0	2
	HET	50	37	46	21	23	39	52	52	86	95
	Outside	9	6	3	5	1	2	4	8	1	0
	Other/UNK	4	3	3	1	4	4	8	13	20	7

MSM - men who have sex with men
Street/STW - street involved / sex trade worker or patron
HET - heterosexual contact
Outside - acquired outside of Canada
UNK - exposure unknown

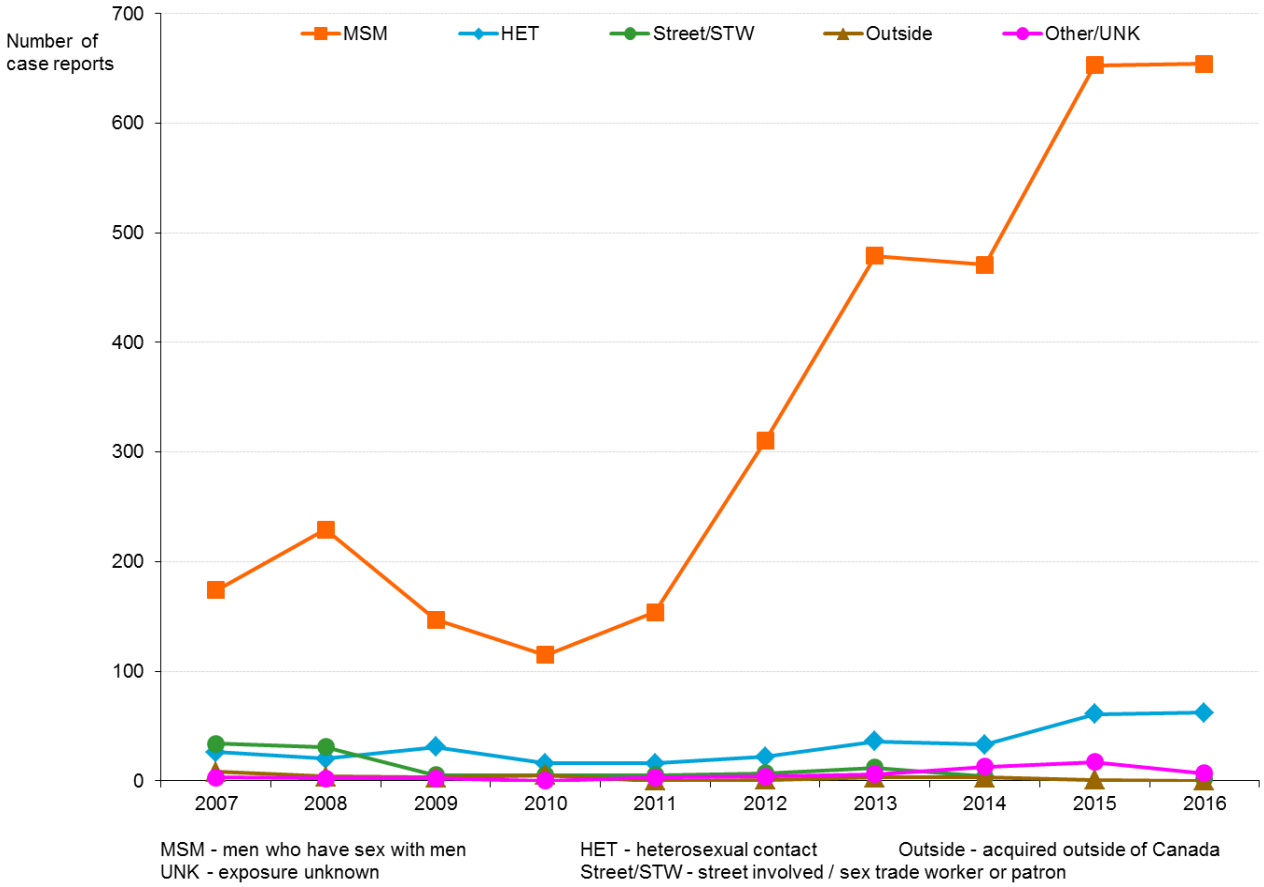
37. Infectious syphilis case reports in BC by exposure category - total, 2007 to 2016



38. Infectious syphilis case reports in BC by exposure category - female, 2007 to 2016



39. Infectious syphilis case reports in BC by exposure category - male, 2007 to 2016



Infectious Syphilis among Men who have Sex with Men

Gay, bisexual, and other men who have sex with men (MSM) continue to be disproportionally affected by the current infectious syphilis epidemic in BC, constituting 86.3% (655/759 cases) of all cases in 2016 (Figure 37). The number of infectious syphilis cases among MSM has been steadily increasing since 2011. This is similar to the profile of syphilis epidemics in other Canadian provinces[19], the US[20], and several European countries[21] where syphilis cases were also predominantly among MSM and trends are increasing.

There were 655 cases among MSM in 2016, 17.9% (117 cases) were diagnosed with primary syphilis, 21.2% (139 cases) with secondary syphilis, and 60.9% (399 cases) were diagnosed with early latent infection. The proportion of infectious syphilis cases among MSM in the early latent stage of infection has steadily increased over time which may reflect increased syphilis testing. In 2016, 167 (25.5%) MSM cases had a prior syphilis diagnosis within the past five years, highlighting the importance of repeat infections in the current epidemic.[22]

Despite recent increases in the number of annual cases, the characteristics of MSM with syphilis have remained similar over time. In 2016, the mean age of MSM diagnosed with syphilis was 40 years (range 17-86 years) and the number of cases among males aged 15-29 years has been increasing steadily since 2014 (Figure 41). In 2016, the majority of cases resided in the Lower Mainland with 63.5% (416 cases) residing in Vancouver and 20.3% (133 cases) in Fraser. As in previous years, the majority of cases in 2016 were among Caucasian (318 cases, 48.5%), Asian (49 cases, 7.5%), and Hispanic (31 cases, 4.7%) men (Table 40).

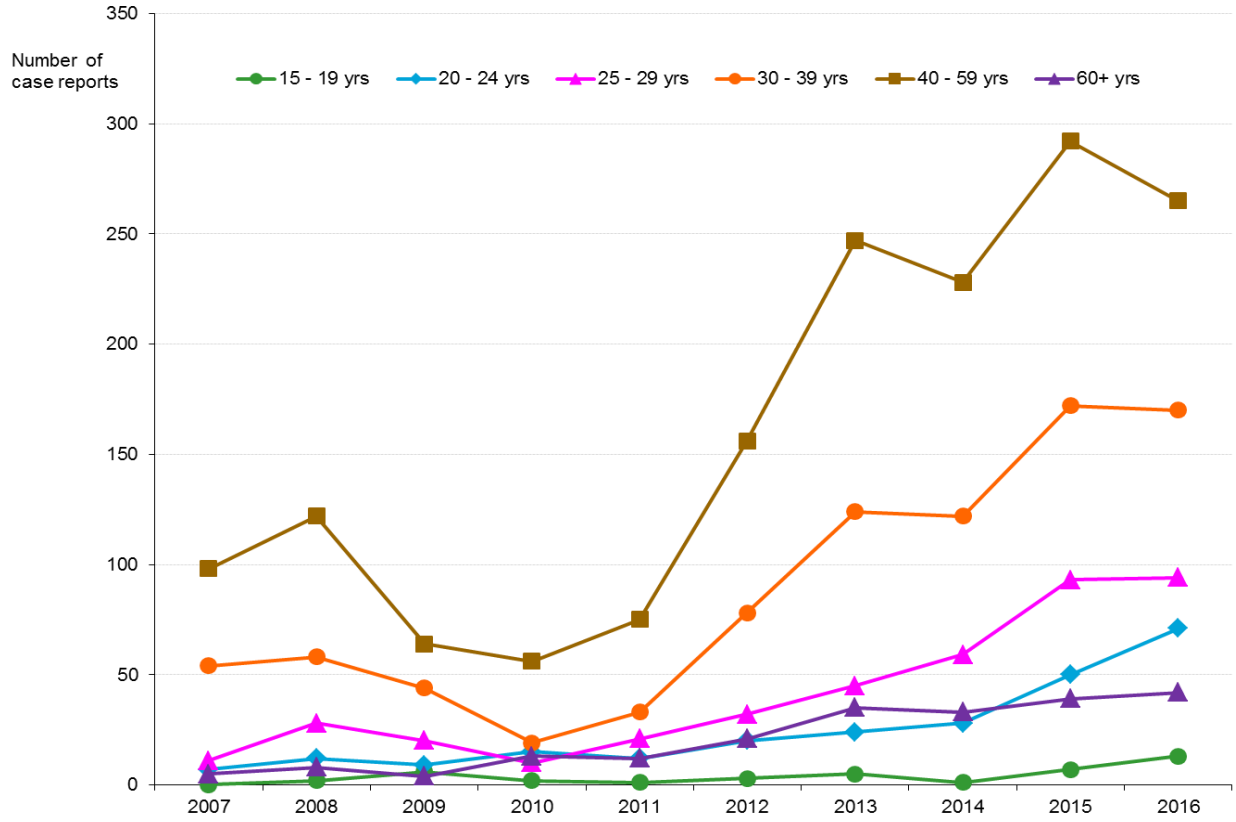
Living with HIV continues to be an important risk factor for acquiring infectious syphilis. In 2016, of the MSM cases with a known HIV status (635 cases), 43.0% (273 cases) were living with HIV at the time of their syphilis diagnosis which is a decrease from 2015 (325/630 cases, 51.6%) (Figure 42). The possible roles of core sexual networks and the biological synergy between HIV and syphilis are important areas of study which may help explain this trend. Coordinated public health follow-up, promotion of condom use, partner notification, and partner testing for all syphilis cases remain the cornerstone to controlling the syphilis epidemic for MSM in BC as do efforts to raise awareness among MSM. Given the continued increase of syphilis cases, the enhancement of ongoing programs and development of new syphilis control interventions for MSM remain a priority in BC.

40. Percentage of infectious syphilis case reports among MSM in BC by ethnicity, 2007 to 2016

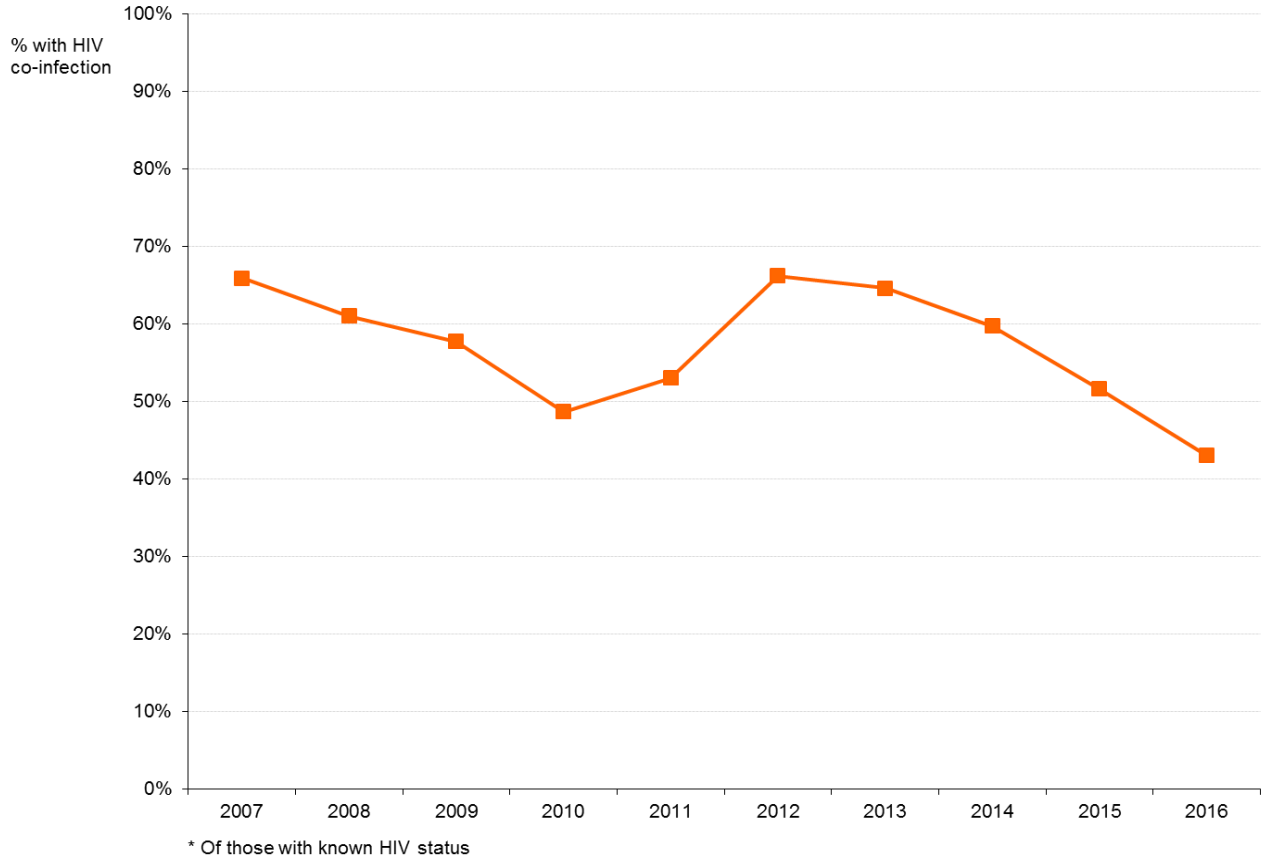
Ethnicity	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
No. Diagnoses	*175*	*230*	*147*	*115*	*154*	*310*	*480*	*471*	*653*	*655*
Caucasian	72.6	75.7	69.4	75.7	70.8	65.2	60.8	56.5	56.4	48.5
Indigenous	2.3	2.6	3.4	3.5	1.9	4.5	3.5	2.8	2.9	2.4
Asian	9.1	10.0	6.1	7.8	7.1	9.4	10.8	13.2	8.6	7.5
South Asian	1.7	3.0	0.0	3.5	5.8	3.2	2.7	2.3	2.1	2.6
Hispanic	8.0	4.8	12.9	3.5	9.7	7.4	5.6	7.0	6.4	4.7
Black	3.4	1.3	3.4	0.9	0.0	1.0	1.7	2.3	0.6	1.4
Other*	2.3	1.7	2.7	1.7	3.2	2.3	1.3	1.3	1.7	0.9
Unknown	0.6	0.9	2.0	3.5	1.3	7.1	13.5	14.6	21.3	31.9

* Other - Arab/West Asian and other/mixed ethnicity

41. Infectious syphilis case reports among MSM in BC by age group, 2007 to 2016



42. Infectious syphilis case reports* among MSM in BC by HIV co-infection, 2007 to 2016



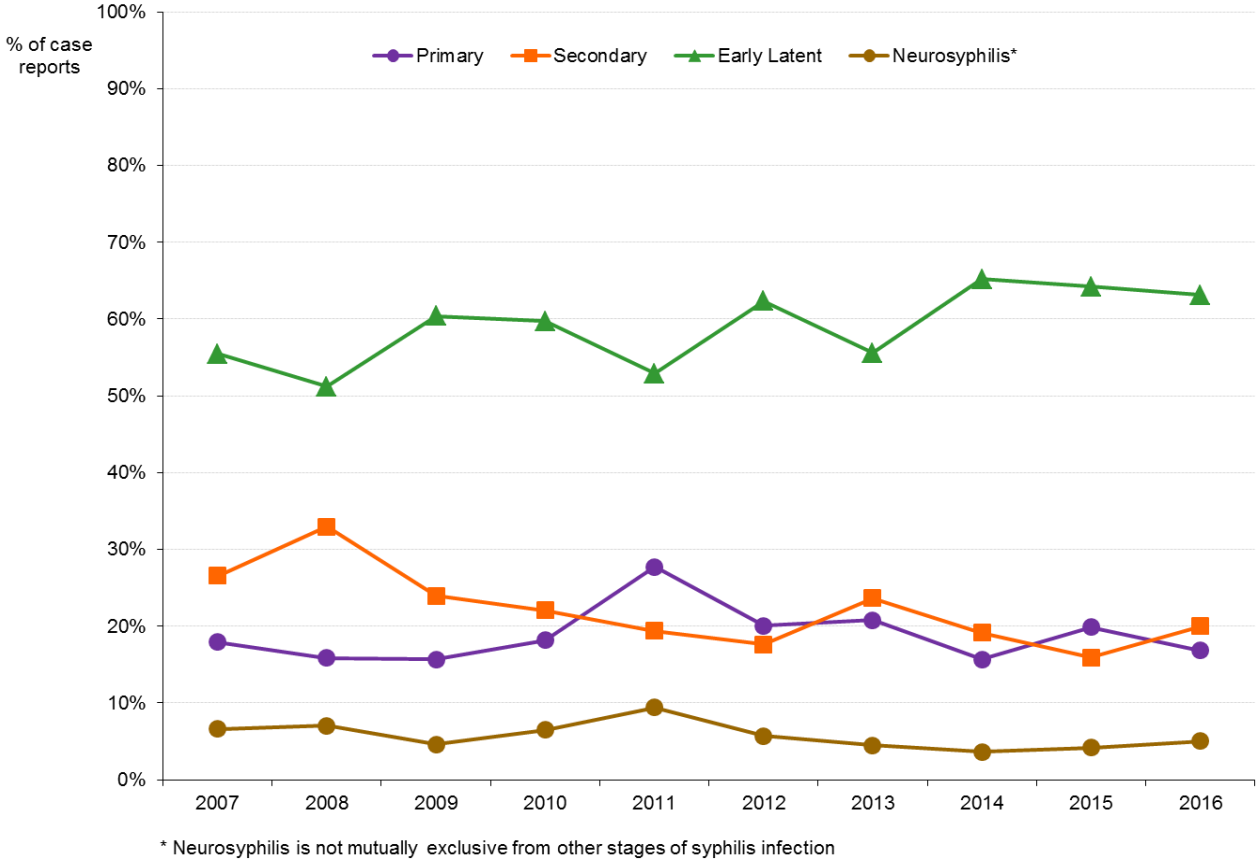
* Of those with known HIV status

Stage of Infection at Time of Syphilis Diagnosis

There have been slow changes in the proportion of infectious syphilis cases by stage of infection (i.e., primary, secondary, and early latent) over time. Most notably, the proportion of cases that are early latent syphilis has been increasing over time. This may reflect a greater uptake of syphilis testing or screening as people with syphilis infections in the early latent stage of infection are typically asymptomatic. In 2016, the proportion of cases that are early latent decreased slightly to 63.1% (479 cases) from 64.2% (488 cases) in 2015 (Figure 43). This increase may be a year-to-year variation.

From 2007 to 2016, 5.2% (217/4,186 cases) of infectious syphilis cases were also diagnosed with neurosyphilis. Neurosyphilis is commonly considered to be indicative of an advanced syphilis infection but can sometimes occur at an early stage of infection.

43. Stage of infection at time of syphilis diagnosis, 2007 to 2016



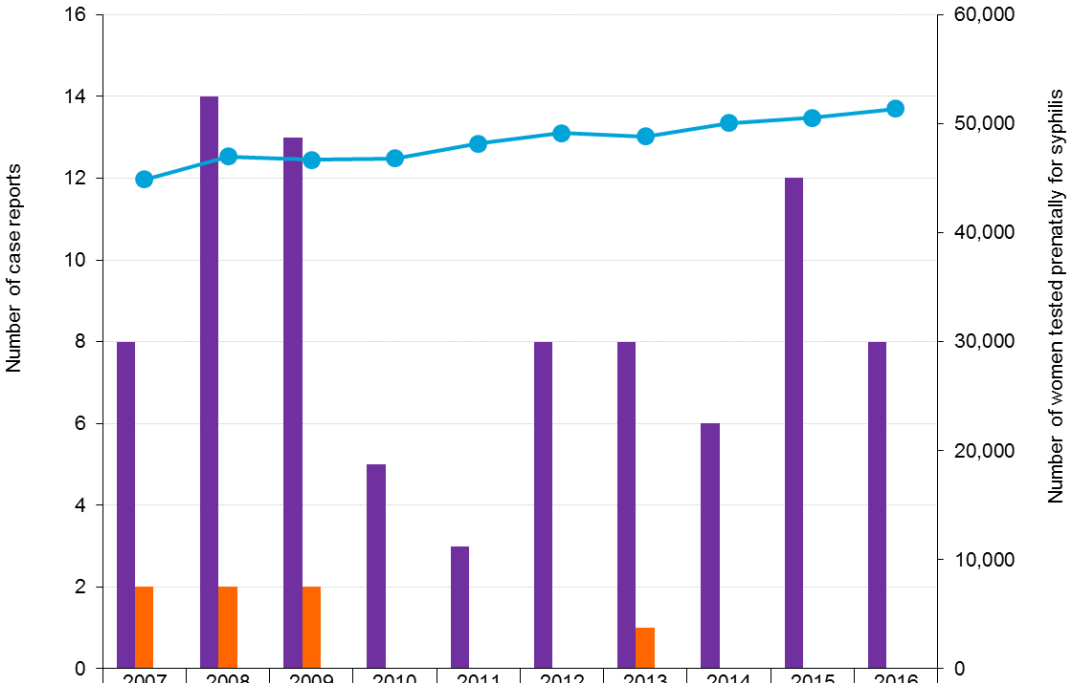
* Neurosyphilis is not mutually exclusive from other stages of syphilis infection

Maternal and Early Congenital Syphilis

Infectious syphilis acquired prior to or during pregnancy can be vertically transmitted to the infant which can have serious consequences, including infant death. Accordingly, prenatal screening for syphilis is recommended for all pregnant women in BC, as treatment will reduce the risk of transmission to or complications in infants.

In 2016, 51,377 syphilis tests were conducted as part of prenatal screening. Overall, the number of syphilis tests performed prenatally each year in BC is increasing slightly. There were no cases of congenital syphilis identified in BC in 2016 (Figure 44). In 2016, eight maternal syphilis cases were reported whereas twelve cases were reported in 2015.

44. Maternal and early congenital syphilis case reports in BC, 2007 to 2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Reports - Maternal	8	14	13	5	3	8	8	6	12	8
Reports - Early Congenital	2	2	2	0	0	0	1	0	0	0
Rate * - Early Congenital	4.6	4.5	4.5	0.0	0.0	0.0	2.3	0.0	0.0	0.0
Tests - Syphilis Prenatal	44,908	47,007	46,674	46,817	48,179	49,129	48,851	50,072	50,528	51,377

* Rate per 100,000 live births

Endnotes

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[16] Minimum inhibitory concentration (MIC) breakpoints to define "resistance" to cefixime and ceftriaxone have not yet been established, however, the Clinical and Laboratory Standards Institute (CLSI) defines MIC ≤ 0.25 µg/mL as susceptible.

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[23] Clinical presentation includes any evidence of congenital syphilis on physical examination (e.g., hepatosplenomegaly), evidence of congenital syphilis on radiographs of long bones, a reactive CSF VDRL, an elevated CSF cell count or protein without other cause. Note that neonates may not display clinical manifestations of congenital syphilis and may meet laboratory criteria only.

Contributors

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- BC Vital Statistics for providing live births data.
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Technical Appendix

Data Limitations

There are several key limitations to surveillance data which are important to understand in order to interpret surveillance data appropriately.

- Surveillance data are only reflective of the proportion of the population who test. Individuals with infections who have not tested are not included in the surveillance data presented in this report. Many people with sexually transmitted infections do not have symptoms and so do not seek health care advice or testing. This under-counting of cases may disproportionately affect some groups. For example, more women than men get syphilis testing in BC because of prenatal syphilis screening. Also, some sexually transmitted infections are more or less likely to show symptoms depending on sex and site of infection (e.g., urethral gonococcal infections in men are more likely to produce symptoms than those in women or those in the pharynx/throat).
- Surveillance trends are influenced by provider testing behaviours which may result in changes to the number of tests performed each year (e.g., increased vigilance for lymphogranuloma venereum in 2010-2011 may have resulted in more diagnoses of this disease, artificially driving up lymphogranuloma rates).
- Trends are influenced by temporal changes in testing technologies. Over the past ten years, nucleic acid amplification tests (NAAT) have replaced culture-based diagnostics for chlamydia and gonorrhea testing. The use of NAAT, which is a more sensitive test, has resulted in increased detection of these infections. NAAT technology has also allowed urine-based screening for chlamydia and gonorrhea thus reducing the use of urethral swabs for asymptomatic male clients. With the use of this less-invasive procedure, more men may be getting screened for chlamydia and gonorrhea.
- The majority of surveillance data presented in this surveillance report are extracted from case report forms completed by health care providers or public health nurses as part of the case follow-up process (which includes partner notification, patient education, and referral to appropriate services). There is an expected reporting delay to receipt of these forms which may range from days to months depending on the infection.
- Cases are classified by exposure category and ethnicity according to information elicited during follow-up from the case or their health care provider and, under-reporting of this information may lead to misclassification. For example, gay, bisexual and other men who have sex with men, and transgender persons may be reluctant to disclose these factors to their health care providers due to social stigma.
- Rates of infectious syphilis diagnoses among First Nations people are calculated with the numerator comprised of individuals with infectious syphilis who self identify as First Nations and the denominator comprised of individuals who are registered First Nations (see Data Sources below for further details).

Case Definitions

Sexually transmitted infections (STIs) included in this report are listed as reportable diseases in the *Communicable Disease Regulation* (Schedule A) of the *Public Health Act*.

Chlamydia

Genital: Detection and confirmation of *C. trachomatis* in anogenital (including rectal) or urinary specimens by appropriate laboratory techniques (e.g., isolation of *C. trachomatis* by culture, demonstration of *C. trachomatis* nucleic acid or antigen).

Extra-genital: Detection and confirmation of *C. trachomatis* in specimens from the conjunctiva, pharynx and other extra-genital sites by appropriate laboratory techniques (e.g., isolation of *C. trachomatis* by culture, demonstration of *C. trachomatis* nucleic acid or antigen).

Perinatally-acquired: Detection and confirmation of *C. trachomatis* in nasopharyngeal or other respiratory tract specimens by appropriate laboratory techniques (e.g., isolation of *C. trachomatis* by culture, demonstration of *C. trachomatis* nucleic acid or antigen) from an infant who developed pneumonia in the first 6 months of life or conjunctival specimens from an infant who developed conjunctivitis in the first month of life.

Gonorrhea

Genital: Detection and confirmation of *N. gonorrhoeae* in anogenital (including rectal) or urinary specimens by appropriate laboratory techniques (e.g., culture, detection of *N. gonorrhoeae* nucleic acid).

Extra-genital: Detection and confirmation of *N. gonorrhoeae* in specimens from the conjunctiva, pharynx, joint, blood, and other extra-genital sites by appropriate laboratory techniques (e.g., culture, detection of *N. gonorrhoeae* nucleic acid).

Perinatally-acquired: Detection and confirmation of *N. gonorrhoeae* infection in the first 4 weeks of life leading to the diagnosis of gonococcal conjunctivitis, scalp abscess, vaginitis, bacteremia, arthritis, meningitis, or endocarditis by an appropriate laboratory technique (e.g., culture, detection of *N. gonorrhoeae* nucleic acid).

Infectious Syphilis

Infectious syphilis is a complex sexually transmitted infection that has a highly variable clinical course. Three stages of syphilis, primary, secondary and early latent, comprise infectious syphilis. Classification by a clinician with expertise in syphilis may take precedence over the following case definitions developed for surveillance purposes.

Primary Syphilis: Current clinical presentation compatible with primary syphilis (e.g., one or more ulcers/chancres), and one of the following:

- Identification of *T. pallidum* in clinical specimens (e.g., from chancre, regional lymph node) by dark field microscopy, direct fluorescent antibody, or nucleic acid amplification test (NAAT), or
- Reactive serology (treponemal, regardless of non-treponemal serology reactivity) in individuals with no previous history of syphilis, or
- Significant (i.e., four-fold or greater) increase in titre over the last known non-treponemal test.

Secondary Syphilis: Clinical presentation compatible with secondary syphilis (e.g., rash, fever, malaise, lymphadenopathy, mucus lesions, condyloma lata, alopecia, meningitis, headaches, uveitis, retinitis, recent hearing impairment), and one of the following:

- Identification of *T. pallidum* in clinical specimens (e.g., from chancre, regional lymph node) by dark-field microscopy, direct fluorescent antibody, or nucleic acid amplification test (NAAT), or

- Reactive serology (non-treponemal and treponemal) in individuals with no previous history of syphilis, or
- Significant (i.e., four-fold or greater) increase in titre over the last known non-treponemal test.

Early Latent Syphilis: An individual without symptoms of primary or secondary syphilis but has a reactive serology (non-treponemal and treponemal) or four-fold increase in titre over the last known non-treponemal test, and one of the following within the previous 12 months:

- Non-reactive serology, or
- Symptoms suggestive of primary or secondary syphilis, or
- Exposure to a sexual partner with primary, secondary or early latent syphilis, or
- Is a member of (or has had sexual partners in the previous 12 months from) groups at known increased risk of syphilis infection in BC, or
- Has a titre of ≥ 1:16.

Early Congenital Syphilis: A stillbirth, neonate or older individual with clinical presentation[23] compatible with congenital syphilis, onset less than two years of age, and one of the following:

- Four-fold higher RPR than maternal titre and positive treponemal confirmatory test, or
- Detection of *T. pallidum* in clinical specimens (e.g., lesions, placenta, umbilical cord, autopsy) through darkfield microscopy, direct fluorescent antibody assay, or PCR, or
- Mother with untreated or inadequately treated syphilis (primary, secondary, early or late latent syphilis) during pregnancy or at birth.

Maternal Syphilis: A woman who meets the case definition of infectious syphilis (primary, secondary, early latent syphilis) or late latent syphilis, and one of the following:

- Syphilis serology conducted as part of prenatal blood screening, or
- Known to have given birth to an infant (live or stillborn) with congenital syphilis, or
- Clinical presentation with infectious syphilis during pregnancy.

Lymphogranuloma Venereum (LGV)

Confirmed: DNA sequencing for *C. trachomatis* confirming serovars of L1, L2, or L3 present.

Probable: One of the following two case definitions:

i) Positive chlamydia NAAT or culture (from any site), and one of the following:
   - Proctitis, or
   - Inguinal/femoral lymphadenopathy, or
   - Suspicious lesion, or
   - Sexual partner who is confirmed or probable LGV case

ii) Clinical symptoms consistent with LGV (proctitis or inguinal/femoral lymphadenopathy or suspicious lesion) without a positive chlamydia test, and sexual partner who is confirmed or probable LGV case.

Data Sources

STI Data (Chlamydia, Gonorrhea, Infectious Syphilis)

When an individual is diagnosed with a reportable STI, the care provider completes a case report form (Health 208 form) then forwards it to BCCDC where the information is entered into the provincial STI database. Public health clinics with access to the provincial STI database directly enter the information for their newly diagnosed individuals.

Pelvic Inflammatory Disease and Ectopic Pregnancy Data

The diagnoses of pelvic inflammatory disease (PID) and ectopic pregnancy (EP) are captured in the Discharge Abstract Database (DAD) and the Medical Service Plan (MSP) payment database maintained by the BC Ministry of Health. The DAD includes data on patient discharges and day surgeries directly from hospitals in BC, including all known facilities for acute care and day surgery, and most facilities for

chronic care and rehabilitation. The MSP database contains data on insured medical services delivered on a fee-for-service basis. This data includes physician billings for inpatient and outpatient care, claims from supplementary health care practitioners, and claims for laboratory services and diagnostic procedures. MSP data do not include services provided via an Alternate Payment Program (e.g., contract or salary). Approximately 30% of BC physicians receive some remuneration through alternative payments. In particular, physicians in rural areas are more likely to be paid with Alternate Payment Programs. Some hospital emergency departments in BC are also funded through Alternate Payment Program contracts. Administrative data on PID and EP included in this surveillance report are extracted for women of reproductive age (15-44 years) who have at least one physician billing or hospital discharge per year based on the following International Classification of Disease (ICD) codes:

Pelvic Inflammatory Disease

ICD 9: MSP (1992-2010), DAD (1992-2000)

- Salpingitis and oophoritis (614, 614.0-614.2)
- Parametritis and pelvic cellulitis/ peritonitis (614.3-614.5, 614.7)
- Other or unspecified inflammatory disease of female pelvic organs and tissues (614.8, 614.9)
- Inflammatory diseases of uterus except cervix (615, 615.0-615.9)

ICD 10: DAD (2001-2010)

- Salpingitis and oophoritis (N70, N70.0-N70.9)
- Parametritis and pelvic cellulitis/ peritonitis (N73.0-N73.5)
- Other or unspecified female pelvic inflammatory diseases (N73.8, N73.9)
- Inflammatory diseases of uterus except cervix (N71, N71.0-N71.9)

Ectopic Pregnancy

ICD 9: MSP (1992-2010), DAD (1992-2000)

- Ectopic pregnancy (633)
- Abdominal pregnancy (633.0)
- Tubal pregnancy (633.1)
- Ovarian pregnancy (633.2)
- Other or unspecified ectopic pregnancy (633.8, 633.9)

ICD 10: DAD (2001-2010)

- Ectopic pregnancy (O00)
- Abdominal pregnancy (O00.0)
- Tubal pregnancy (O00.1)
- Ovarian pregnancy (O00.2)
- Other or unspecified ectopic pregnancy (O00.8, O00.9)

BCCDC Public Health Laboratory (PHL)

Since July 2011, all rectal specimens that test positive for *C. trachomatis* in BC are routinely forwarded to the National Microbiology Laboratory in Winnipeg MB for LGV serovar testing via the BCCDC PHL. In addition, since 2012, clinics operated by the BCCDC have been routinely screening for *C. trachomatis* from extra-genital sites among those reporting behaviours that may put them at risk for pharyngeal or rectal infections.

The BCCDC PHL performs approximately 15-20% of all gonorrhea testing in the province, receiving specimens predominantly from Provincial Sexually Transmitted Infection Clinic sites operated by the BCCDC, from regional public health, youth, reproductive and sexual health clinics, and from hospitals throughout the province. At the BCCDC PHL, gonorrhea may be detected by nucleic acid amplification testing (NAAT) or conventional culture diagnostic methods. Culture testing is preferentially used for rectal and pharyngeal specimens and for all specimens from contacts to gonorrhea as well as patients who are symptomatic, not responding to treatment, or presenting for treatment after an initial NAAT-positive test. Antimicrobial susceptibility testing is routinely performed for all *N. gonorrhoeae* isolated by culture from clinical specimens. The BCCDC PHL additionally receives gonorrhea isolates forwarded for susceptibility testing from community or hospital-based laboratories in BC. Antimicrobial susceptibility testing is by E-test (bioMerieux) and data are analyzed by isolate.

Population Data

Unless noted otherwise, population data and associated rates are based on the P.E.O.P.L.E. 2016 Population Estimates and Projections released by BC Stats, BC Ministry of Technology, Innovation and Citizens' Services.

First Nations Population Estimates

Population rates for First Nations people are calculated using estimates from the former Aboriginal Affairs and Northern Development Canada now known as Indigenous Services Canada.

These estimates are based on the Indian Registry System (IRS), which includes individuals who have registered for First Nations status under the Indian Act. The IRS is subject to several limitations, including:

- Under-counting due to delayed reporting of infants entitled to be registered, as well as other unregistered individuals who are entitled for status designation
- Over-counting due to individuals remaining on the IRS after they are deceased
- Geographic misclassification because individuals are included in the BC population according to membership of a BC band rather than current place of residence
- Systematic biases from imbalance in the migration into and out of the BC region (these are difficult to quantify)

For further details about the data source and its limitations, see the report entitled *Registered Indian Population by Sex and Residence, 2014: Statistics and Measurement Directorate (2014)*. Aboriginal Affairs and Northern Development Canada.

Live Births

Perinatal rates are calculated using live births data from the BC Vital Statistics Agency.

Additional Notes

Classification of Health Region

Cases are assigned to health regions (i.e., Health Authority or Health Service Delivery Area) by residence. If residence is unknown, the case is then assigned to the health region where the individual was tested.

Classification of Ethnicity

Ethnicity is based on information elicited from the case or health care provider during follow-up. Since ethnicity data for chlamydia and gonorrhea cases are often not collected they are not included in this report.

Ethnicity	Example
Arab/West Asian	Armenian, Egyptian, Iranian, Moroccan, Lebanese, Afghani
Asian	Chinese, Japanese, Vietnamese, Cambodian, Indonesian, Filipino, Korean, Laotian
Black	African, Haitian, Jamaican, Somali
Caucasian (White)	Irish, Scottish, English, Portuguese, Italian, Russian
Hispanic	Mexican, Central/South American
Indigenous	First Nations, Inuit, Métis
South Asian	East Indian, Pakistani, Sri Lankan, Punjabi, Bangladeshi
other/mixed ethnicity	ethnicity is known but is not included in one of the above categories or case has dual ethnicity
unspecified	information about ethnicity is not elicited from case or health care provider

Exposure Group Hierarchy

Cases may have more than one type of sexual exposure. The following are definitions of sexual exposures used in this surveillance report. For infectious syphilis cases, individuals are assigned to the exposure category listed first (or highest) in the following hierarchy.

1. **MSM***: Male who reports having male sex partner(s), with or without female sex partners.
2. **Street-Involved, Sex Trade Worker and Patron**:
    i) Street-Involved – Person who reports either: (a) living on the street or in a single room occupancy (SRO) hotel; or (b) attached to the street; or (c) having no fixed address; or (d) transient
    ii) Sex Trade Worker (STW) – Person who reports providing sex to another individual in exchange for money, shelter, food, drugs, etc.
    iii) Patron of STW – Person who reports payment (with money, shelter, food, drugs, etc.) for sex with a STW
3. **Heterosexual Contact***: Male who reports having female sex partner(s) only or female who reports having male with/ without female sex partner(s).
4. **Acquired Outside of Canada**:
    i) Foreign Acquired – Person currently residing in Canada but likely acquired syphilis outside of Canada (i.e., reports sexual partner(s) in other countries)
    ii) Immigration – Person immigrating to Canada and identified with syphilis through testing done as part of the immigration process
5. **Other Risk Factor:** Likely route of exposure is known but cannot be classified into any of the major exposure categories listed here. For example, females reporting female sex partner(s) only.
6. **Unknown:** Route of exposure is unknown or not identified at the time of completion of case follow-up (e.g., route of exposure not provided by case).

* A transgender individual may be assigned to either MSM or Heterosexual Contact exposure category depending on how this individual describes their sexual partners.