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

STI

Annual Report 2013

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Summary of Trends

Genital Chlamydia

In 2013, the rate of genital chlamydia decreased slightly to 264.6 (12,352 cases) per 100,000 population, however, the overall provincial trend has been a steady increase since 1998.

- The highest rates were in Northeast, Northern Interior, Vancouver, and Northwest Health Service Delivery Areas.
- Females continue to have higher rates of reported genital chlamydia infection compared to males.
- The highest rates were among young adults (20-24 years for both genders) followed by both adolescents (15-19 years) and young adults (25-29 years).
- In 2013, there were 57 extra-genital infections identified and 1 perinatally-acquired infection.
- A decrease in lymphogranuloma venereum (LGV) was identified in 2013 although the number of LGV cases remains higher than historic levels. All cases were among men who have sex with men, many of whom are co-infected with HIV.

Genital Gonorrhea

In 2013, the provincial rate of genital gonorrhea increased to 36.5 (1,704 cases) per 100,000 population, continuing an overall steady increase since 1998.

- The highest rates were in Vancouver, Northwest, and Northern Interior Health Service Delivery Areas.
- Males have higher rates of infection compared to females and in 2013, rates in males increased while rates in females have been more stable.
- The highest rates of infection were among both females and males aged 20-29 years.
- In 2013, there were 220 extra-genital infections identified and 1 perinatally-acquired infection.
- Analysis of recent gonorrhea antimicrobial resistance trends in BC demonstrates a reduction in the proportion of isolates with reduced susceptibility to cefixime and ceftriaxone since 2011.

Pelvic Inflammatory Disease and Ectopic Pregnancy

In 2011, 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 2013, the provincial rate of infectious syphilis increased to 12.0 (558 cases) per 100,000 population, continuing a reversal of declining provincial rates first observed in 2011.

- The highest rates of infection were in Vancouver, Fraser North, and North Shore/Coast Garibaldi North Health Service Delivery Areas.
- In 2013, over 95% of cases were male, with highest rates observed in individuals aged 30-59 years. A slight decrease in female cases (and maternal syphilis cases) was identified in 2013.
- The majority of cases in 2013 were among people identified as Caucasian (55%).
- Men who have sex with men (MSM) continue to comprise the greatest number of new infectious syphilis cases in BC (85% in 2013). Among MSM cases where HIV status is known, 65% were co-infected with HIV.

Chlamydia

Genital Chlamydia by Region, Gender, and Age

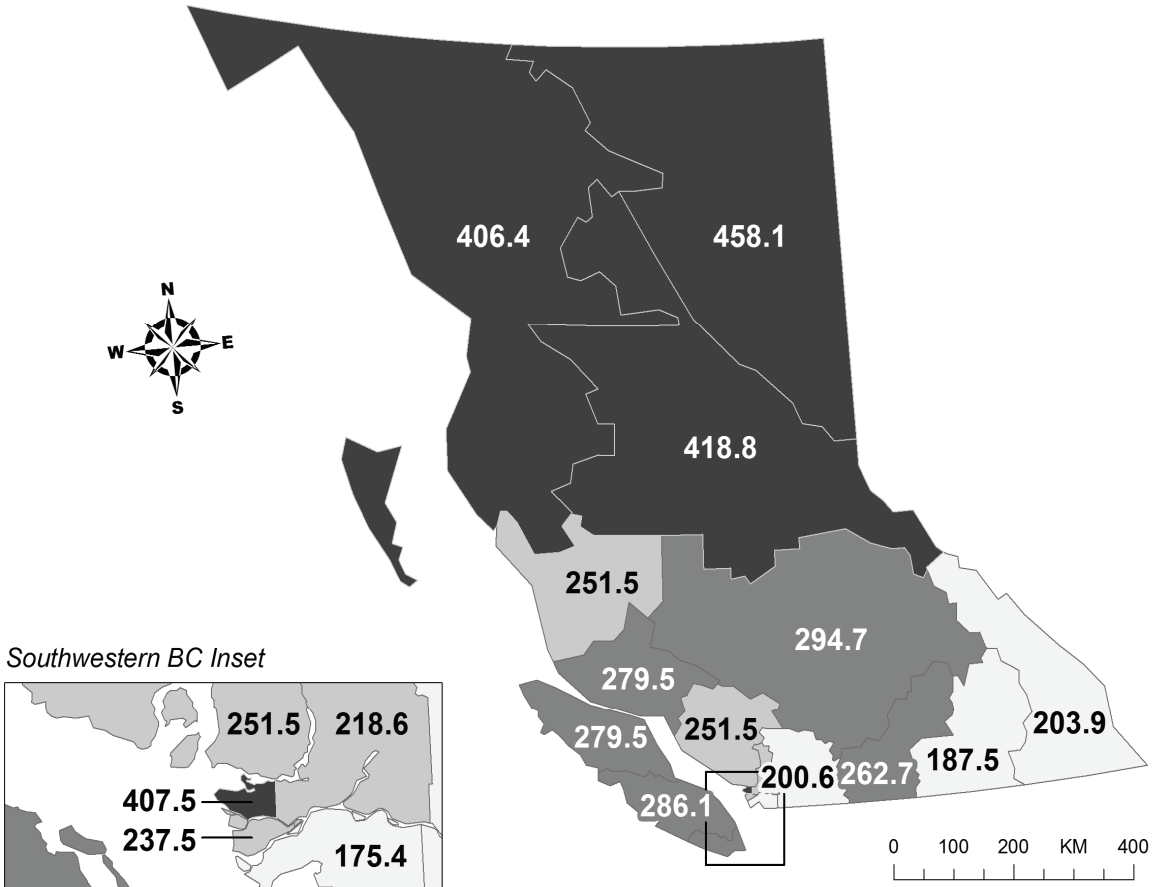
Genital chlamydia is the most commonly reported sexually transmitted infection in BC. As the majority of chlamydia infections are asymptomatic, the reported number of chlamydia infections is only a portion of the total population burden. If untreated, genital chlamydia may lead to complications such 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, genital chlamydia rates have steadily increased from 1998 to 2013 following a decline in the early 1990s (Figure 2). In 2013, the rate of genital chlamydia for BC decreased slightly to 264.6 (12,352 cases) from 267.5 (12,365 cases) per 100,000 population in 2012. The highest rates of genital chlamydia were in Northern Health Authority even though rates decreased substantially in 2013 from 2012 in this region (Figure 3). Rates among Health Service Delivery Areas varied with the highest rates in Northeast, Northern Interior, Vancouver and Northwest, and the lowest rates in Fraser South, Kootenay Boundary, and Fraser East (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 are 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 twice the diagnosis rate compared to males, however, the rate for females in 2013 decreased to 332.5 (7,830 cases) from 341.3 (7,956 cases) per 100,000 population in 2012 (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 2013, the highest rates of chlamydia were among young adults aged 20-24 years followed both by adolescents aged 15-19 years and young adults aged 25-29 years (Figure 6), driven primarily by the high rates of infection among young females. For females, the rate for the age group 20-24 years decreased while the rates for all other age groups were stable from 2012 to 2013 (Figure 7). Males aged 20-29 years had the highest chlamydia rates in 2013 compared with other age groups (Figure 8).

1. Genital chlamydia case reports in BC by health service delivery area, 2013



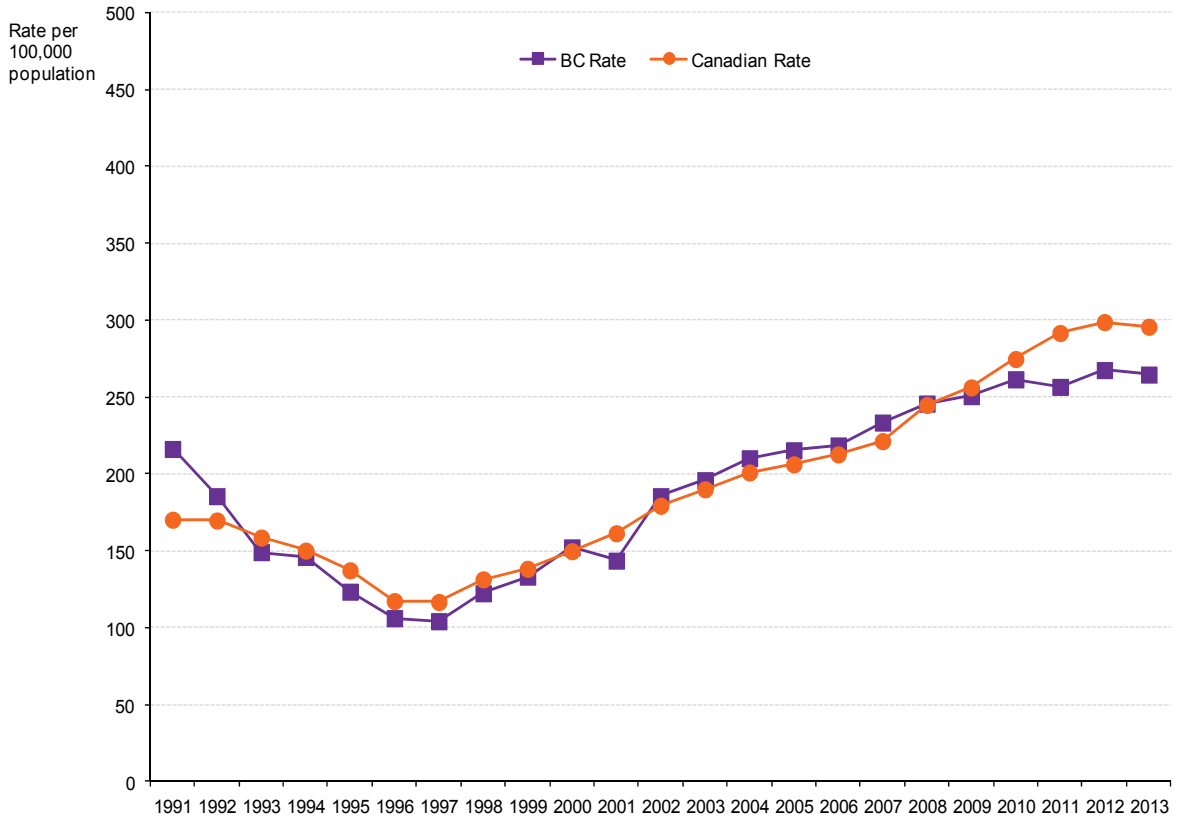
ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	155	203.9
12	Kootenay Boundary	144	187.5
13	Okanagan	911	262.7
14	Thompson Cariboo Shuswap	642	294.7
21	Fraser East	576	200.6
22	Fraser North	1391	218.6
23	Fraser South	1344	175.4
31	Richmond	478	237.5
32	Vancouver	2679	407.5
33	North Shore/Coast Garibaldi	704	251.5
41	South Vancouver Island	979	263.9
42	Central Vancouver Island	750	286.1
43	North Vancouver Island	333	279.5
51	Northwest	295	406.4
52	Northern Interior	594	418.8
53	Northeast	318	458.1

Rate per 100,000 population by HSDA

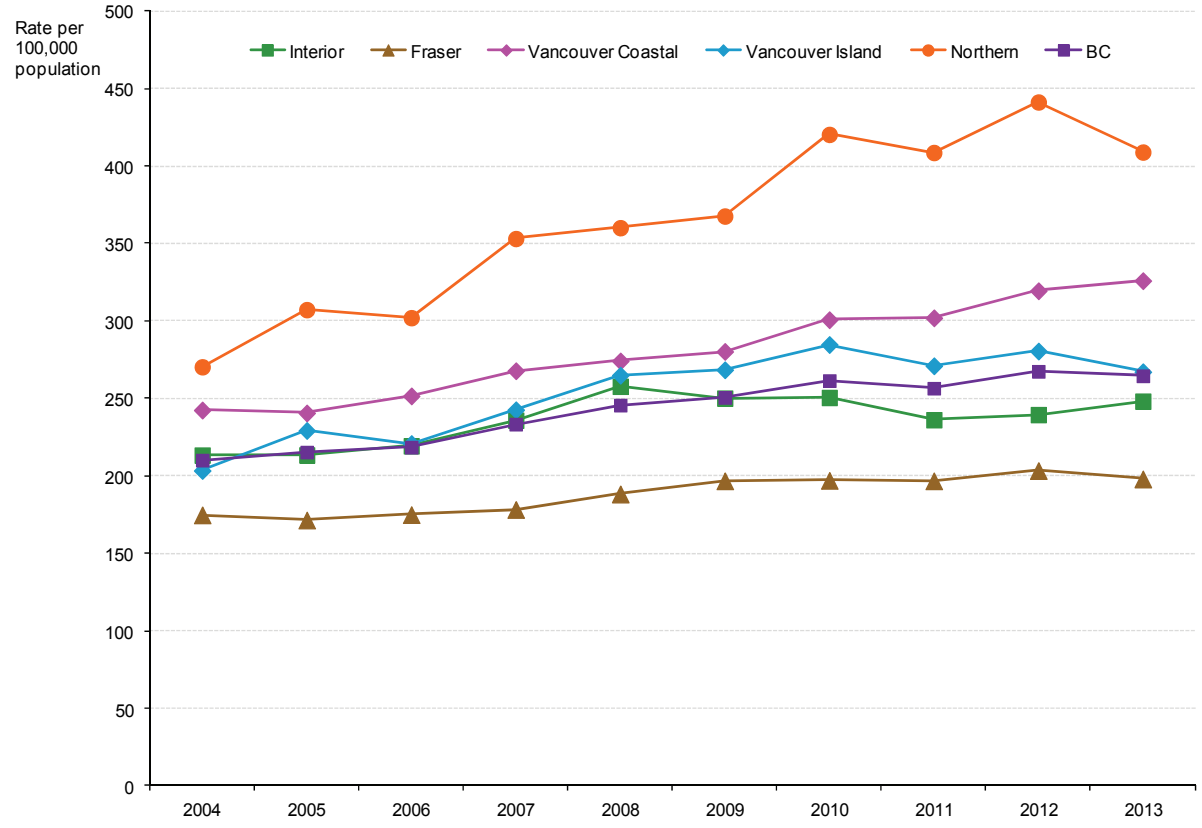
- 175.4 - 203.9
- 218.6 - 251.5
- 262.7 - 294.7
- 406.4 - 458.1

Rates calculated with population estimates released by BC Stats

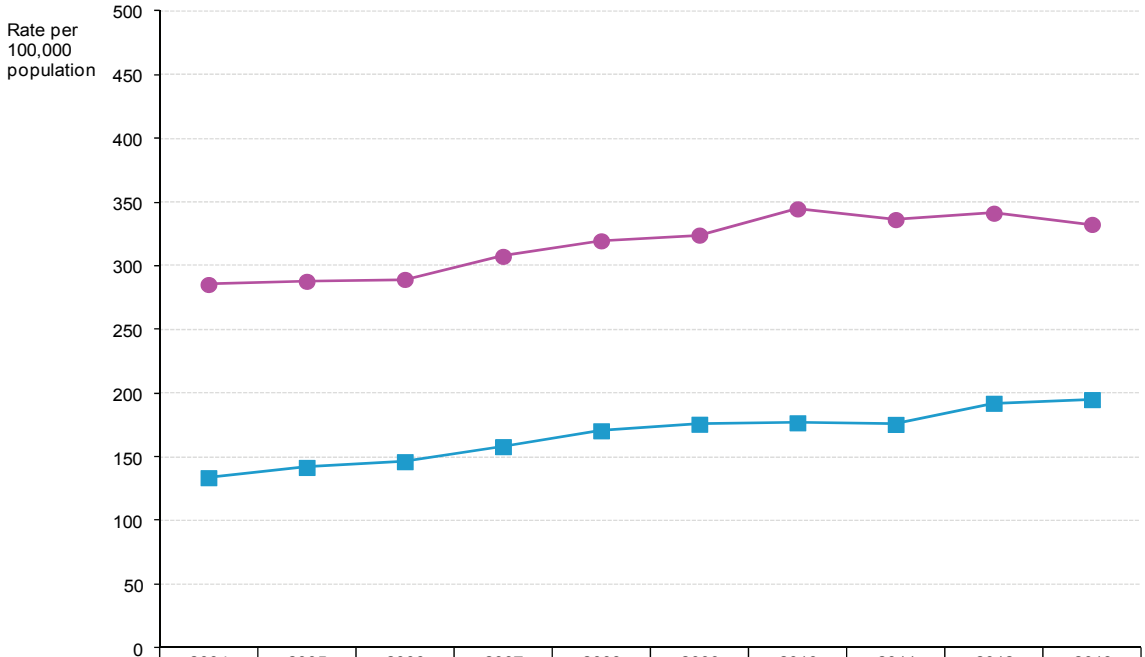
2. Genital chlamydia case reports in BC and Canada, 1991 to 2013



3. Genital chlamydia case reports in BC by health authority, 2004 to 2013



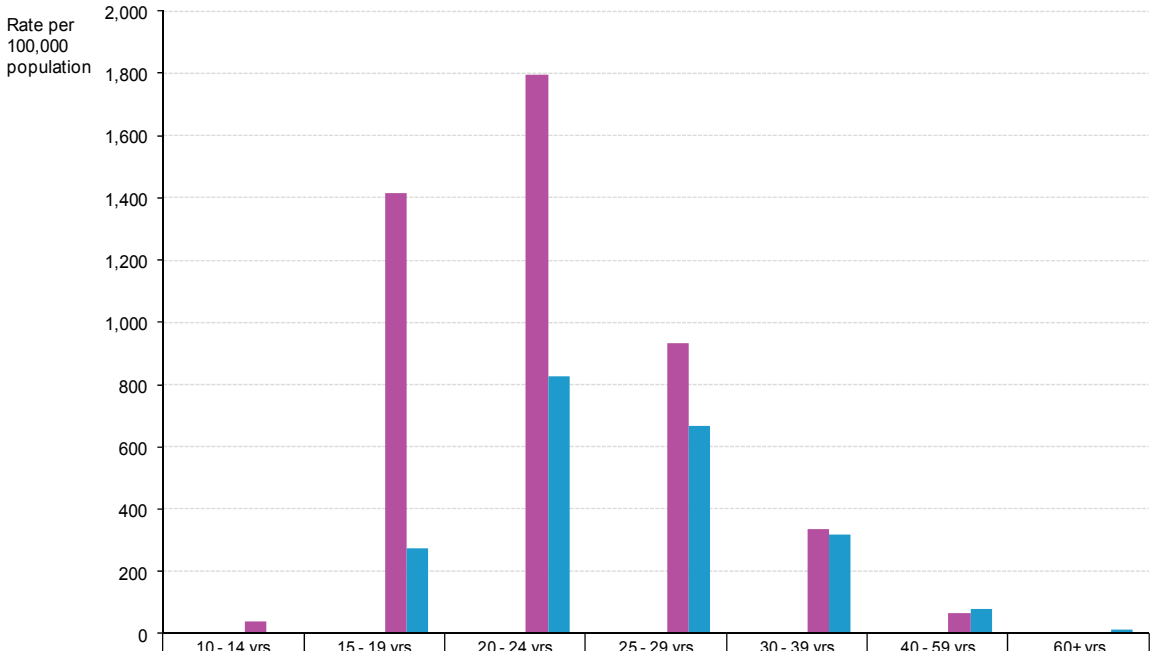
4. Genital chlamydia case reports in BC by gender, 2004 to 2013



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Reports - Female	5,983	6,094	6,195	6,683	7,065	7,287	7,871	7,760	7,956	7,830
Reports - Male	2,749	2,945	3,072	3,373	3,703	3,881	3,969	3,979	4,399	4,511
Reports - Other *	1	1	6	4	6	8	5	6	10	11
Rate - Female	285.3	287.8	289.3	307.4	319.6	324.1	344.7	336.3	341.3	332.5
Rate - Male	133.5	141.6	146.1	157.9	170.4	175.5	176.7	175.4	192.0	194.9

* Other - transgender and gender unknown

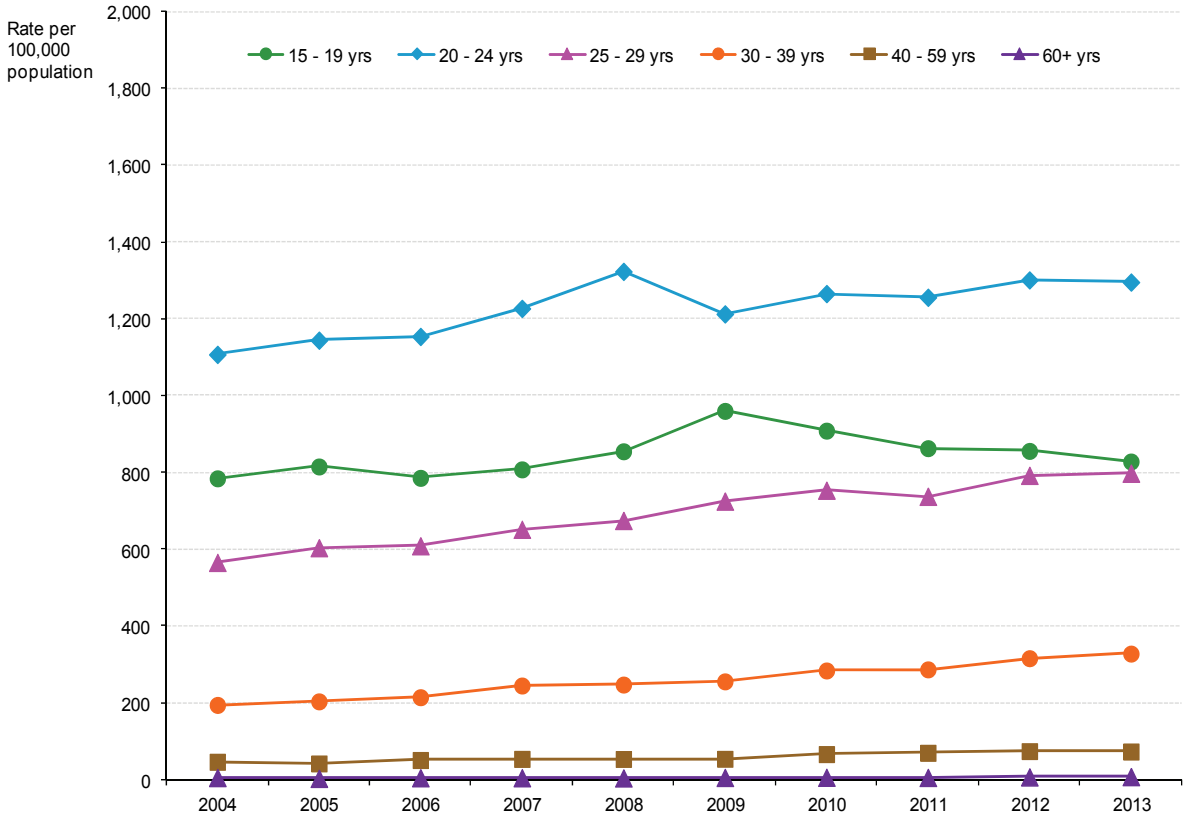
5. Genital chlamydia case reports in BC by age group and gender, 2013



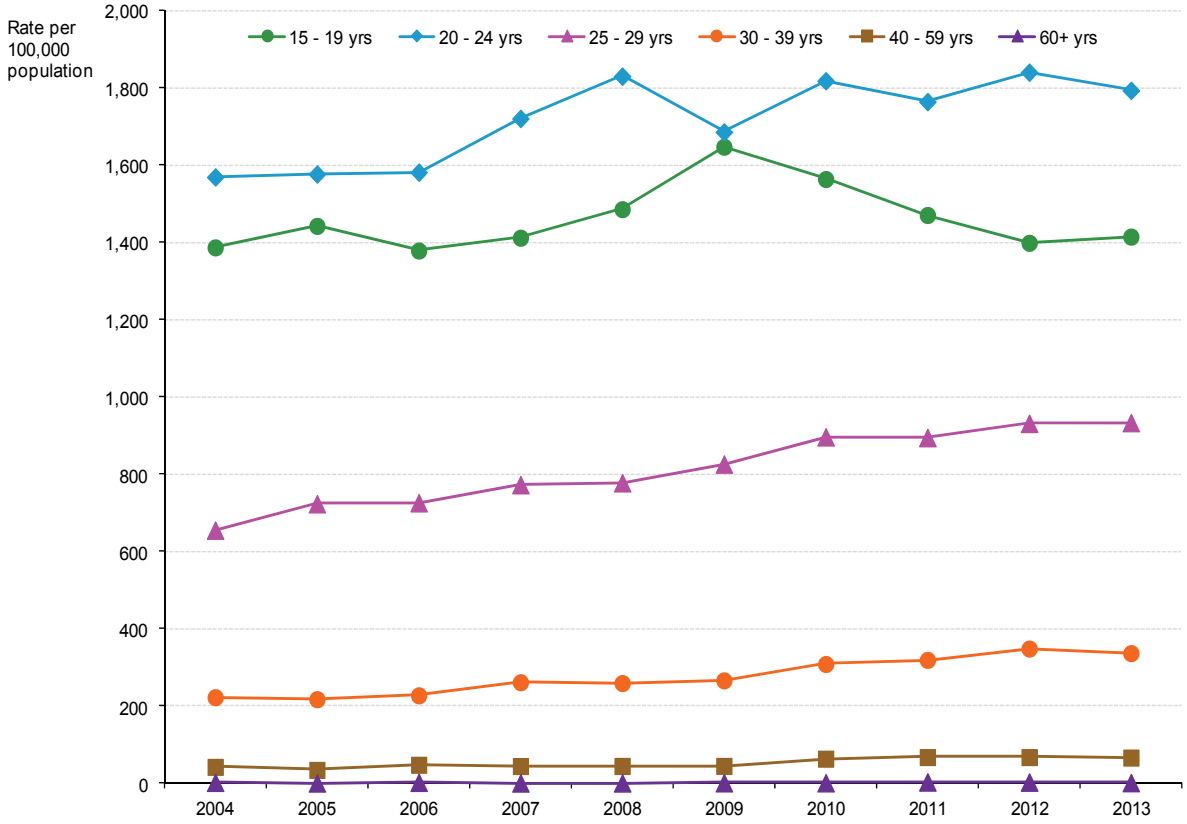
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	44	1,841	2,880	1,530	1,049	465	12
Reports - Male	1	380	1,410	1,148	961	536	69
Reports - Other *	0	1	5	1	3	0	0
Rate - Female	39.2	1,415.2	1,793.7	933.7	337.2	67.0	2.1
Rate - Male	0.8	275.1	824.9	667.9	317.6	79.3	13.8

* Other - transgender and gender unknown

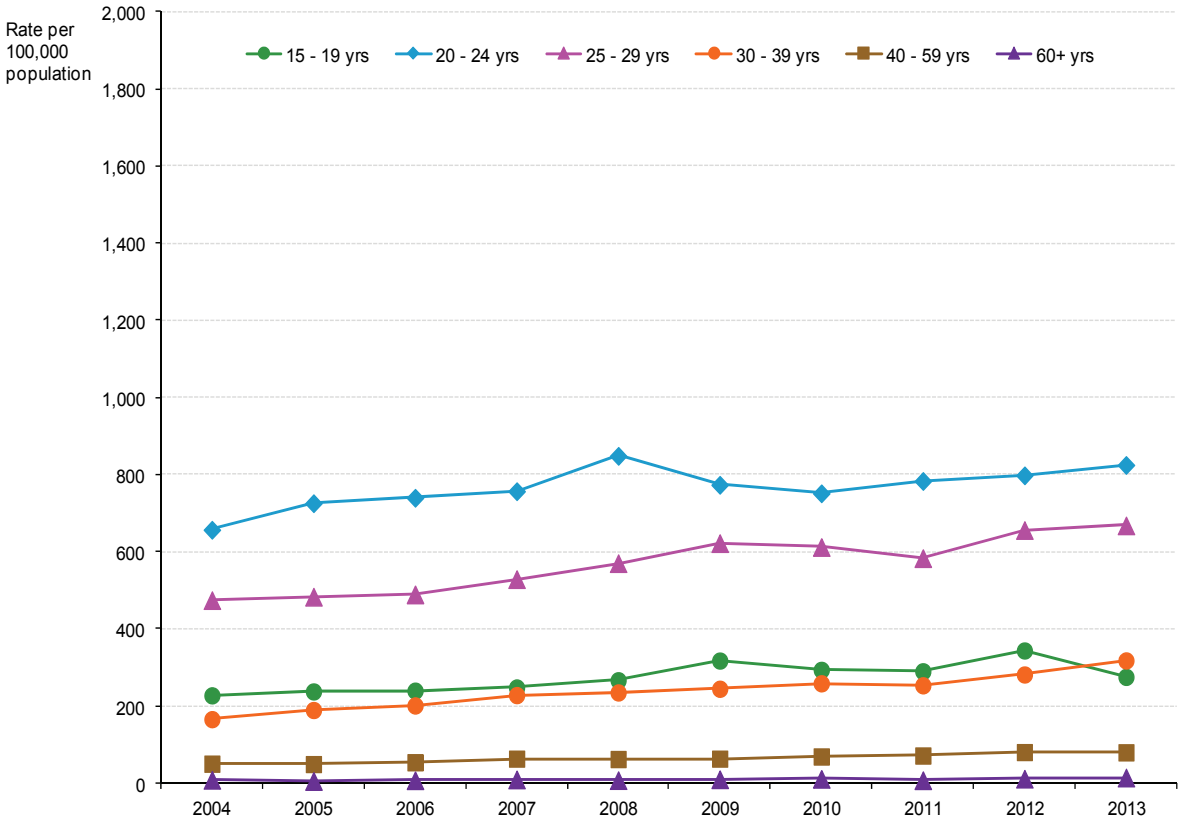
6. Genital chlamydia case reports in BC by age group - total, 2004 to 2013



7. Genital chlamydia case reports in BC by age group - female, 2004 to 2013



8. Genital chlamydia case reports in BC by age group - male, 2004 to 2013



Extra-genital Chlamydia

Up until 2011, a small number of extra-genital chlamydia infections have been diagnosed each year in BC. In 2013, 57 extra-genital cases were identified (11 females, 46 males) which is a decrease from 67 cases in 2012 (9 females and 57 males). As screening for chlamydia 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 two years. From 2004 to 2013, 260 infections were identified in specimens collected from the following sites: throat (133 cases, 51.2%), eye (97 cases, 37.3%), lung (1 case, 0.4%), and other sites (29 cases, 11.2%) (Table 9).

Please note extra-genital chlamydia data presented in this report differ from previous reports as a chart review was undertaken for each extra-genital chlamydia case report. Some of these extra-genital case reports were misclassified and have now been corrected.

9. Extra-genital chlamydia case reports in BC by site/culture, 2004 to 2013

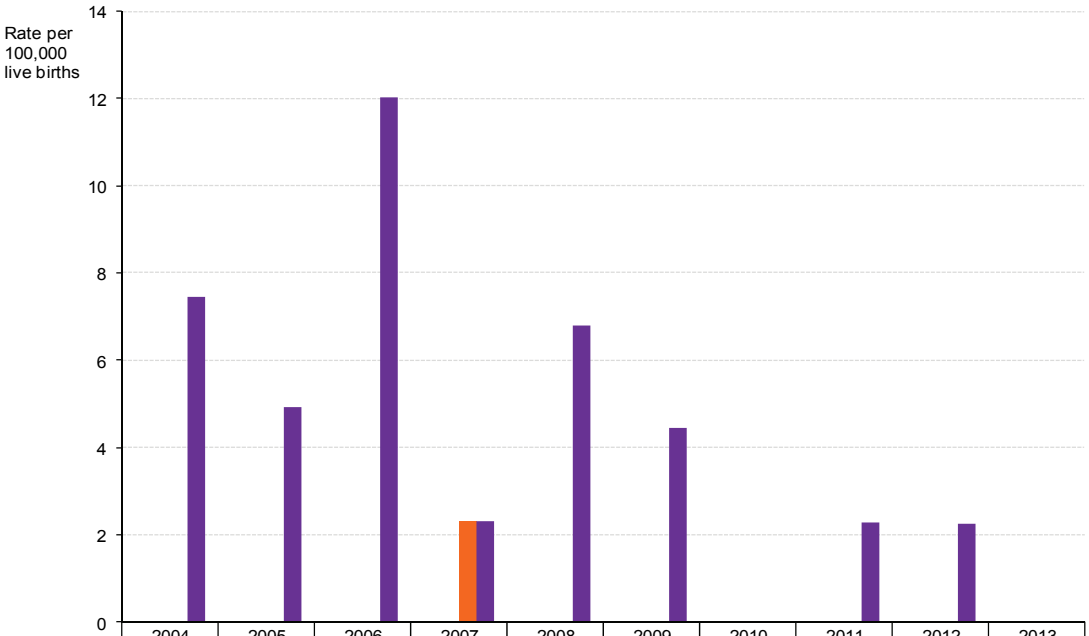
Gender	Site	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Female	Throat	0	0	1	2	0	0	0	0	6	5
	Eye	5	9	6	3	3	6	3	3	2	2
	Lung	0	0	0	0	0	0	0	0	0	0
	Other *	0	0	0	1	1	4	5	1	1	4
	Total	5	9	7	6	4	10	8	4	9	11
Male	Throat	0	4	4	1	6	2	6	1	52	42
	Eye	12	5	8	5	5	5	5	5	3	2
	Lung	0	0	0	1	0	0	0	0	0	0
	Other *	0	0	0	0	2	0	2	4	2	2
	Total	12	9	12	7	13	7	13	10	57	46
BC	Throat	0	4	5	3	6	2	6	1	59	47
	Eye	17	14	14	8	8	11	8	8	5	4
	Lung	0	0	0	1	0	0	0	0	0	0
	Other *	0	0	0	1	3	4	7	5	3	6
	Total	17	18	19	13	17	17	21	14	67	57

* 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 2013. From 2004 to 2013, the majority of perinatal cases are from conjunctival specimens (19/20 cases, 95.0%) while one case (5.0%) was identified in a respiratory specimen (Figure 10).

10. Perinatally-acquired chlamydia case reports in BC by site, 2004 to 2013*



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Reports - Respiratory	0	0	0	1	0	0	0	0	0	0
Reports - Conjunctival	3	2	5	1	3	2	0	1	1	1
Rate - Respiratory	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	
Rate - Conjunctival	7.4	4.9	12.0	2.3	6.8	4.5	0.0	2.3	2.3	

* 2013 respiratory and conjunctival rates are not available

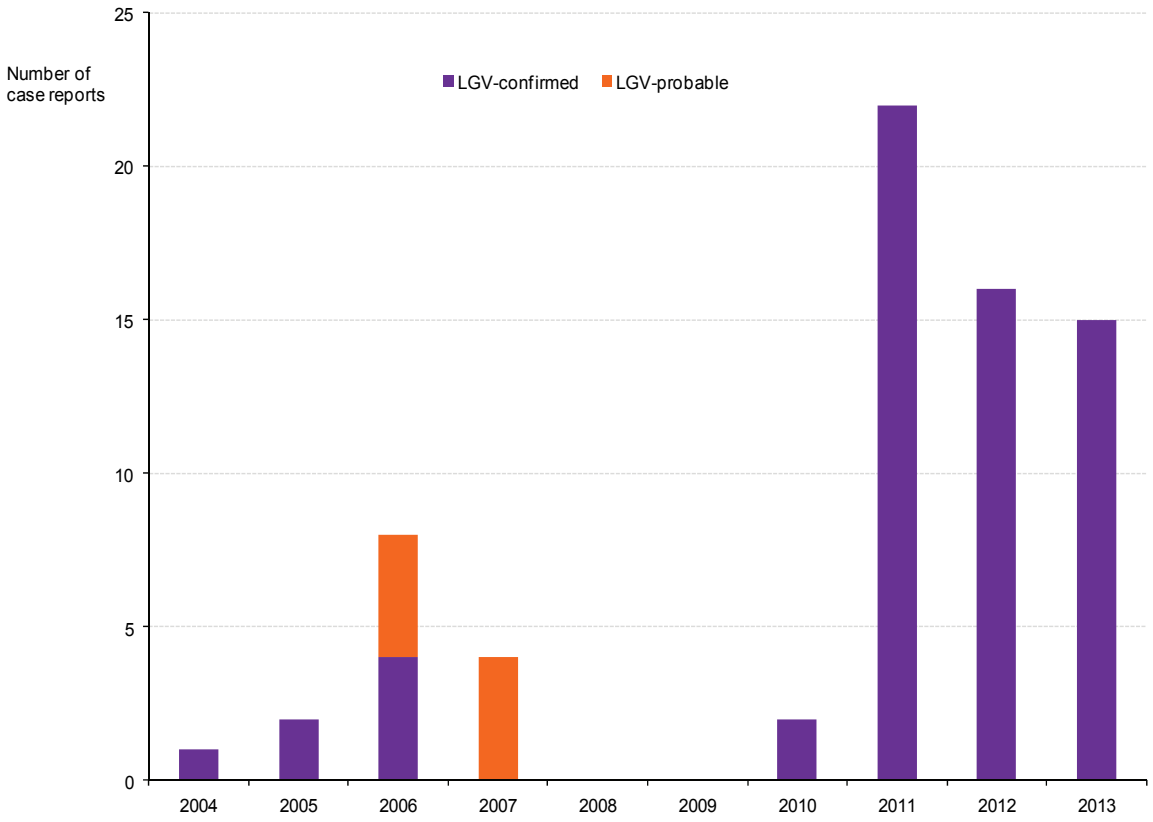
Lymphogranuloma Venereum

Lymphogranuloma venereum (LGV) is a sexually transmitted infection caused by *C. trachomatis* serotypes 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 Europe[5] and the US[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 2013, 15 LGV cases were identified, one less case than in 2012 (16 cases) but still elevated in comparison to historic trends (Figure 11).

From 2004 to 2013, 70 cases of LGV (62 confirmed, 8 probable) were reported in BC. Most cases (67 cases, 95.7%) were among MSM and most (62 cases, 88.6%) were either diagnosed in Vancouver or southern Vancouver Island. Of those with known HIV status, 69.8% (44/63 cases) were co-infected with HIV. Many cases (46/59 cases, 78.0%) presented with symptoms of proctitis. In 2013, the male rate of LGV in BC was 0.6 (15 cases) per 100,000 population and the average age was 45 years (range 26-67 years). The majority of cases in 2013 were among men who identified as Caucasian (10 cases, 66.7%).[7]

11. Lymphogranuloma venereum case reports in BC, 2004 to 2013



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.

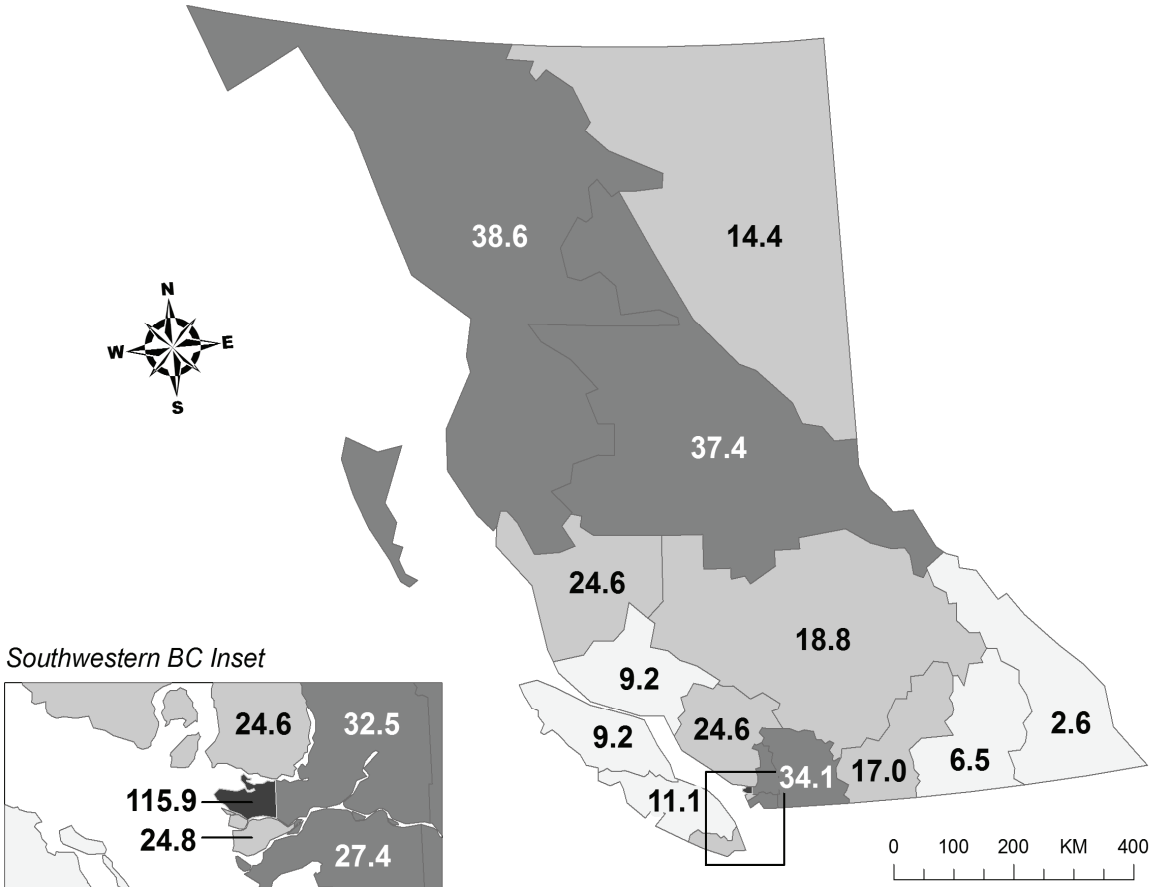
Overall since 1998, the provincial genital gonorrhea rate in BC has increased consistent with national rates (Figure 13). The genital gonorrhea rate in BC increased to 36.5 (1,704 cases) in 2013 from 28.0 (1,296 cases) per 100,000 population in 2012. The highest rates were in Vancouver Coastal, Fraser, and Northern Health Authorities (Figure 14). Rates among Health Service Delivery Areas vary with the highest rates in Vancouver, Northwest and Northern Interior, and the lowest rates in East Kootenay, Kootenay Boundary, and North Vancouver Island (Figure 12). Reasons for the increase in gonorrhea rates over time include the routine inclusion of gonorrhea with chlamydia urine nucleic acid testing and increased acceptability of urine-based testing among men. It is also possible that changes in behaviour, such as decreased condom use, may be contributing to a true increase in incidence during this time period.

Males continue to have a rate two times greater than females (Figure 15). Since 2004, male gonorrhea rates have been relatively stable. In 2013, the rate among males increased to 50.9 (1,177 cases) from 36.8 (844 cases) per 100,000 population in 2012. Female gonorrhea rates have gradually increased since 2004. The rate among females increased slightly in 2013 to 22.2 (522 cases) from 19.3 (449 cases) per 100,000 population in 2012.

Similar to trends from 2004 to 2012, in 2013, the highest rates of gonorrhea were among those aged 20-29 years (Figure 17). In 2013, the highest rates among males were in those aged 25-29 years (256 cases, 148.9 per 100,000 population) and among females in those aged 20-24 years (138 cases, 85.9 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 do not permit identification of MSM cases, this has been observed in other jurisdictions.[8,9]

12. Genital gonorrhea case reports in BC by health service delivery area, 2013



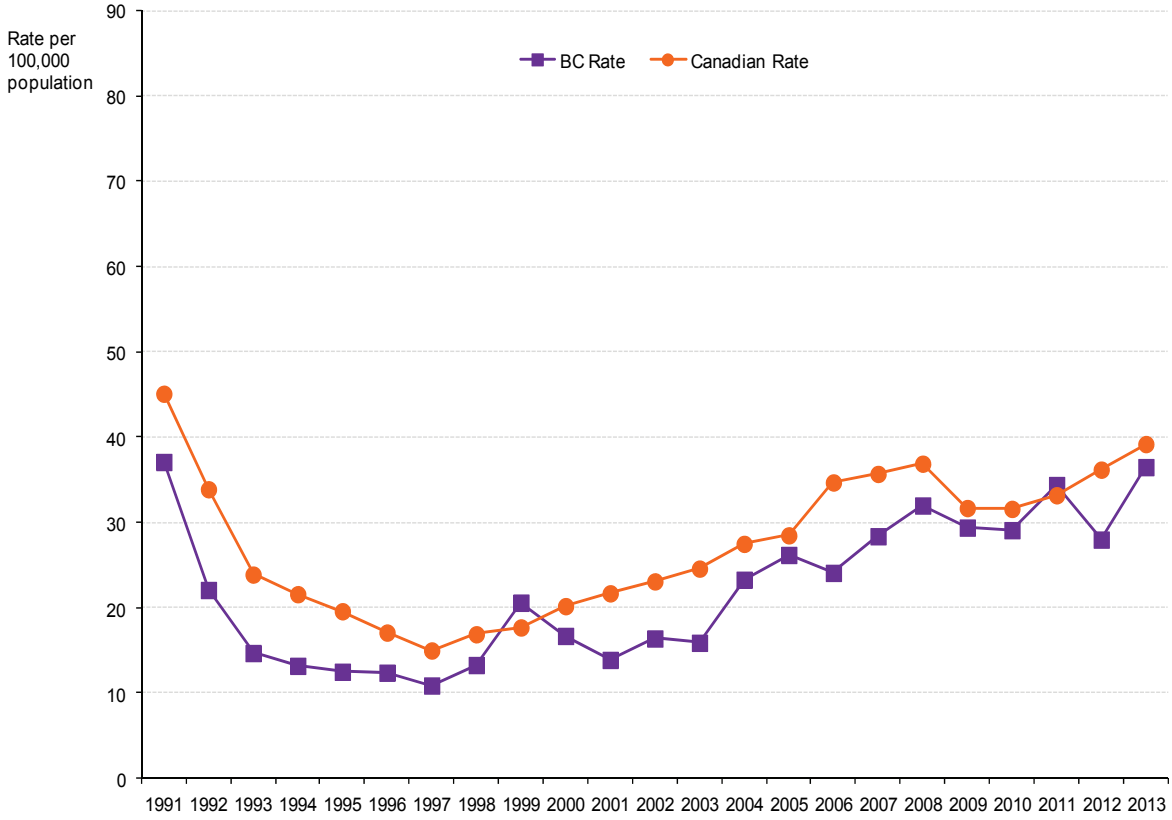
Rate per 100,000 population by HSDA

- 2.6 - 11.1
- 14.4 - 24.8
- 27.4 - 38.6
- 115.9

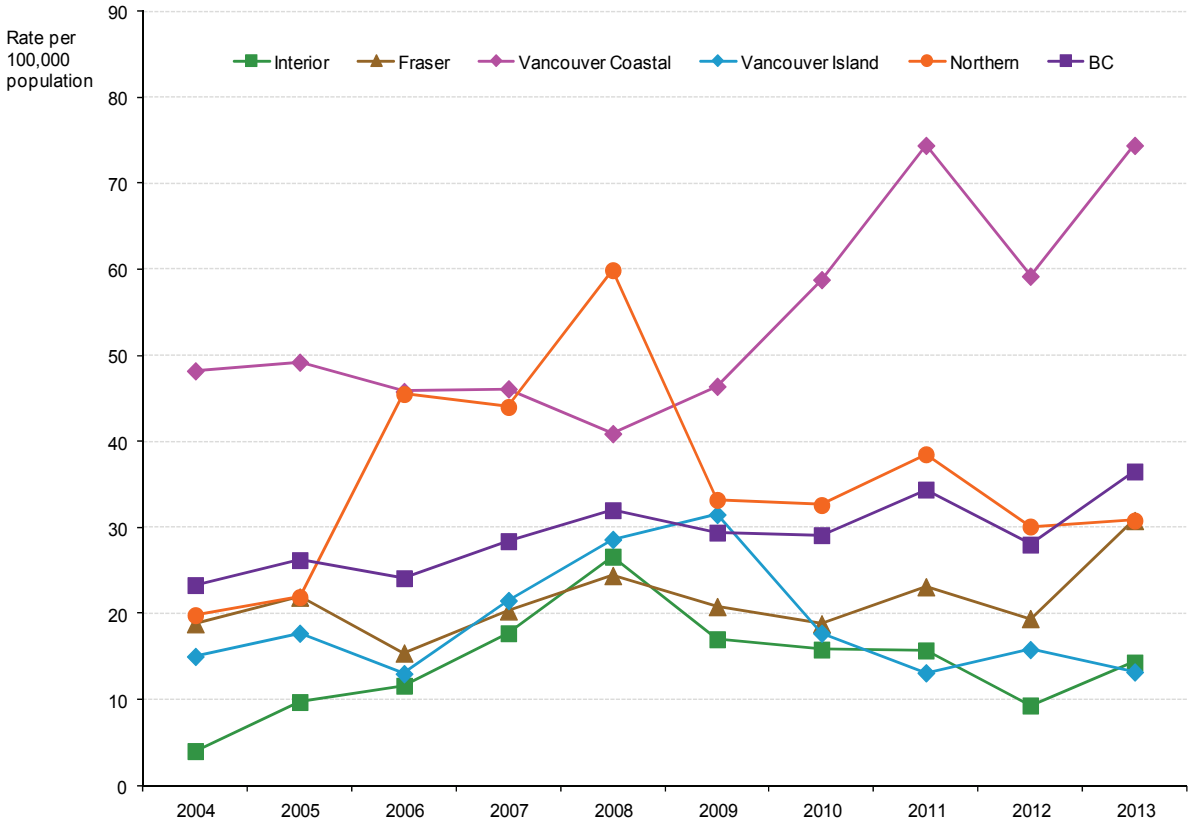
ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	2	2.6
12	Kootenay Boundary	5	6.5
13	Okanagan	59	17.0
14	Thompson Cariboo Shuswap	41	18.8
21	Fraser East	98	34.1
22	Fraser North	207	32.5
23	Fraser South	210	27.4
31	Richmond	50	24.8
32	Vancouver	762	115.9
33	North Shore/Coast Garibaldi	69	24.6
41	South Vancouver Island	62	16.7
42	Central Vancouver Island	29	11.1
43	North Vancouver Island	11	9.2
51	Northwest	28	38.6
52	Northern Interior	53	37.4
53	Northeast	10	14.4

Rates calculated with population estimates released by BC Stats

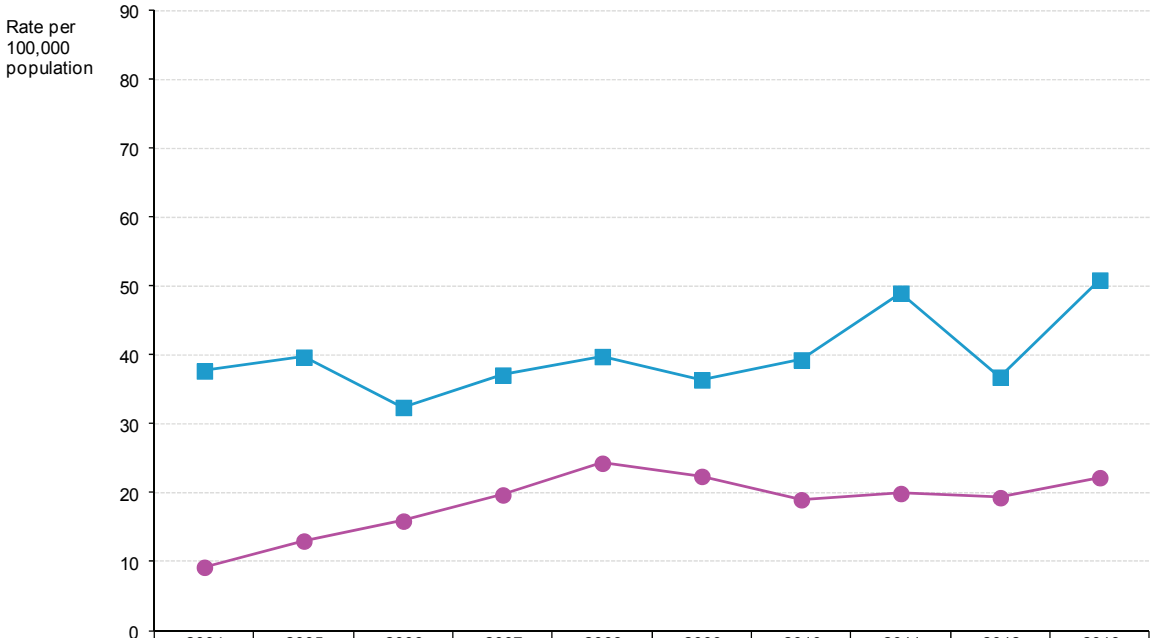
13. Genital gonorrhea case reports in BC and Canada, 1991 to 2013



14. Genital gonorrhea case reports in BC by health authority, 2004 to 2013



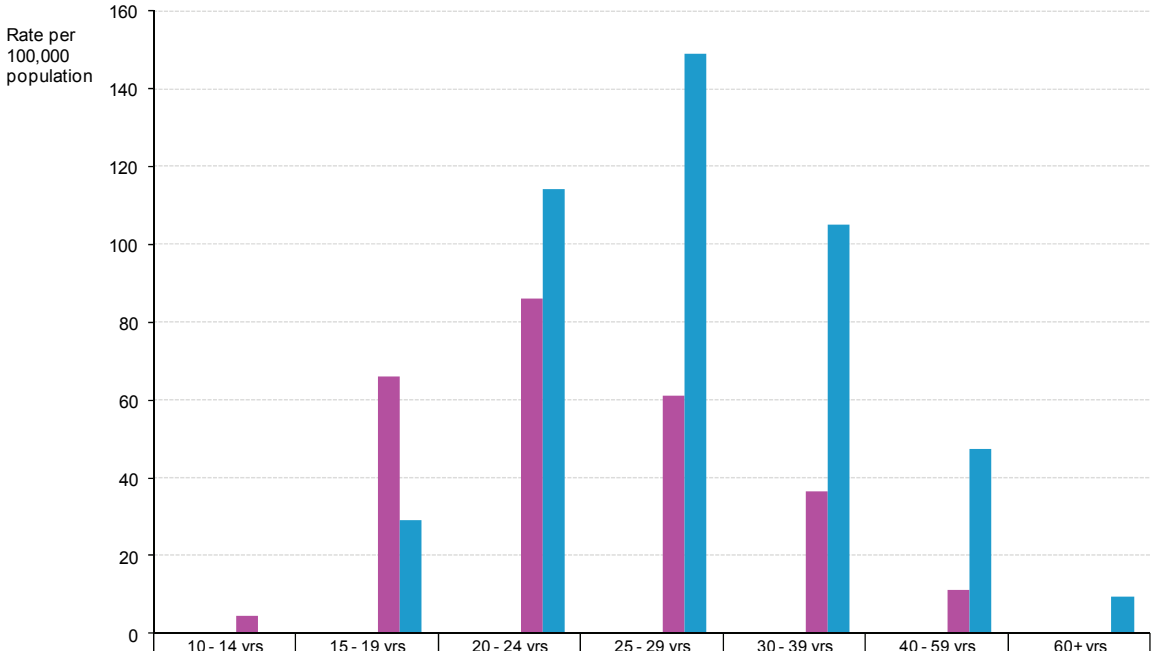
15. Genital gonorrhea case reports in BC by gender, 2004 to 2013



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Reports - Female	192	275	340	429	537	503	434	459	449	522
Reports - Male	776	825	681	793	866	805	883	1,112	844	1,177
Reports - Other *	1	0	1	2	2	1	3	3	3	5
Rate - Female	9.2	13.0	15.9	19.7	24.3	22.4	19.0	19.9	19.3	22.2
Rate - Male	37.7	39.7	32.4	37.1	39.8	36.4	39.3	49.0	36.8	50.9

* Other - transgender and gender unknown

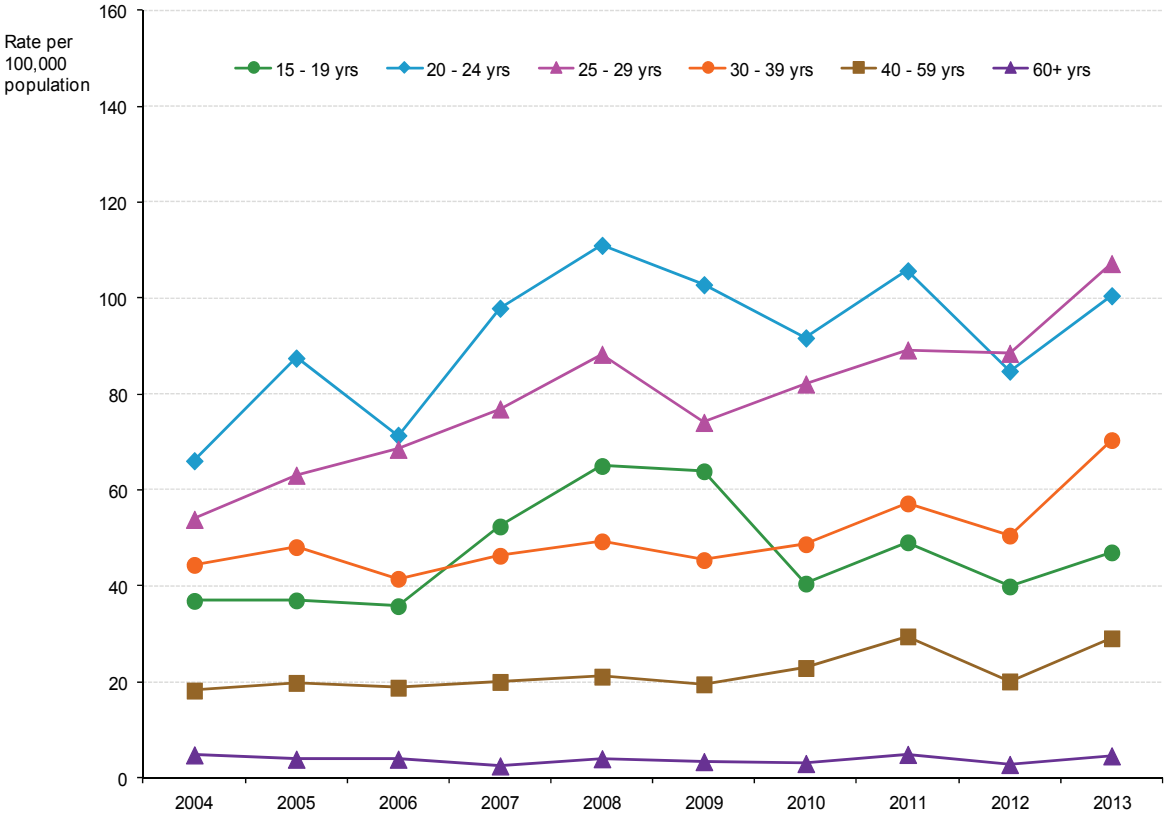
16. Genital gonorrhea case reports in BC by age group and gender, 2013



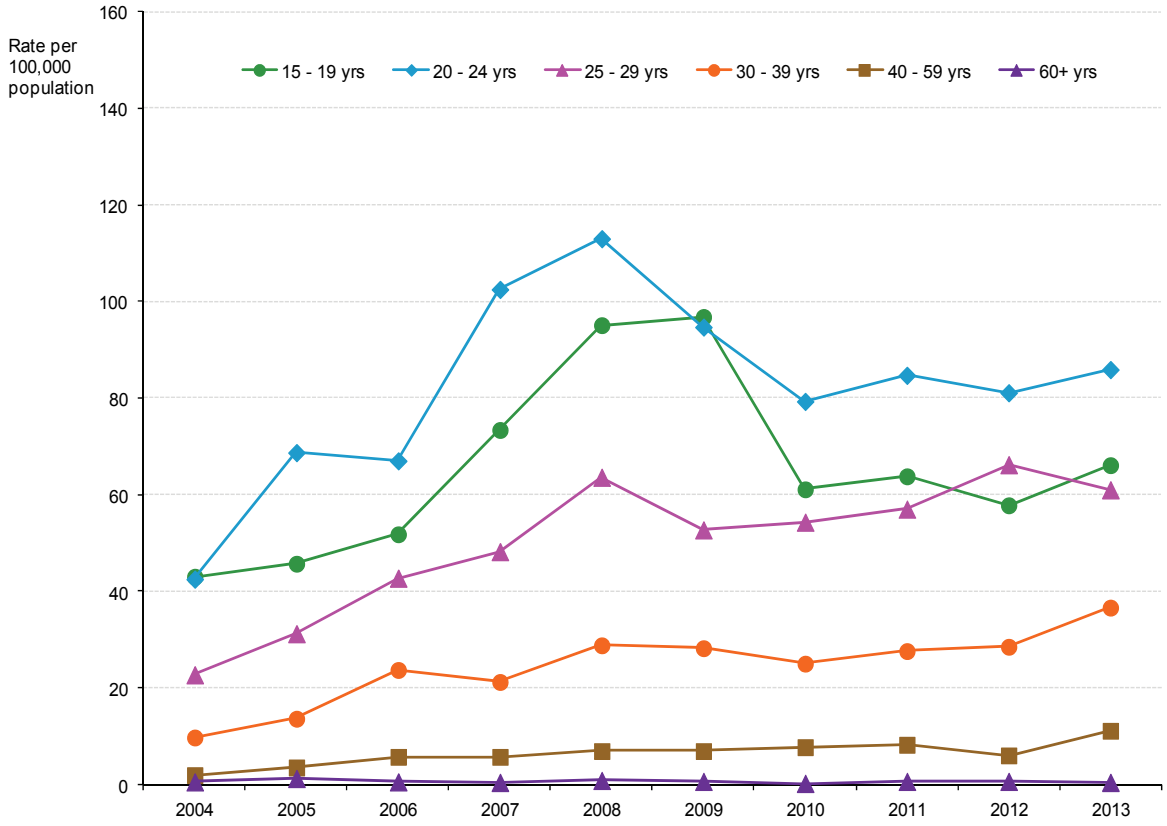
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	5	86	138	100	114	77	2
Reports - Male	0	40	195	256	318	321	47
Reports - Other *	0	0	0	4	0	1	0
Rate - Female	4.5	66.1	85.9	61.0	36.6	11.1	0.4
Rate - Male	0.0	29.0	114.1	148.9	105.1	47.5	9.4

* Other - transgender and gender unknown

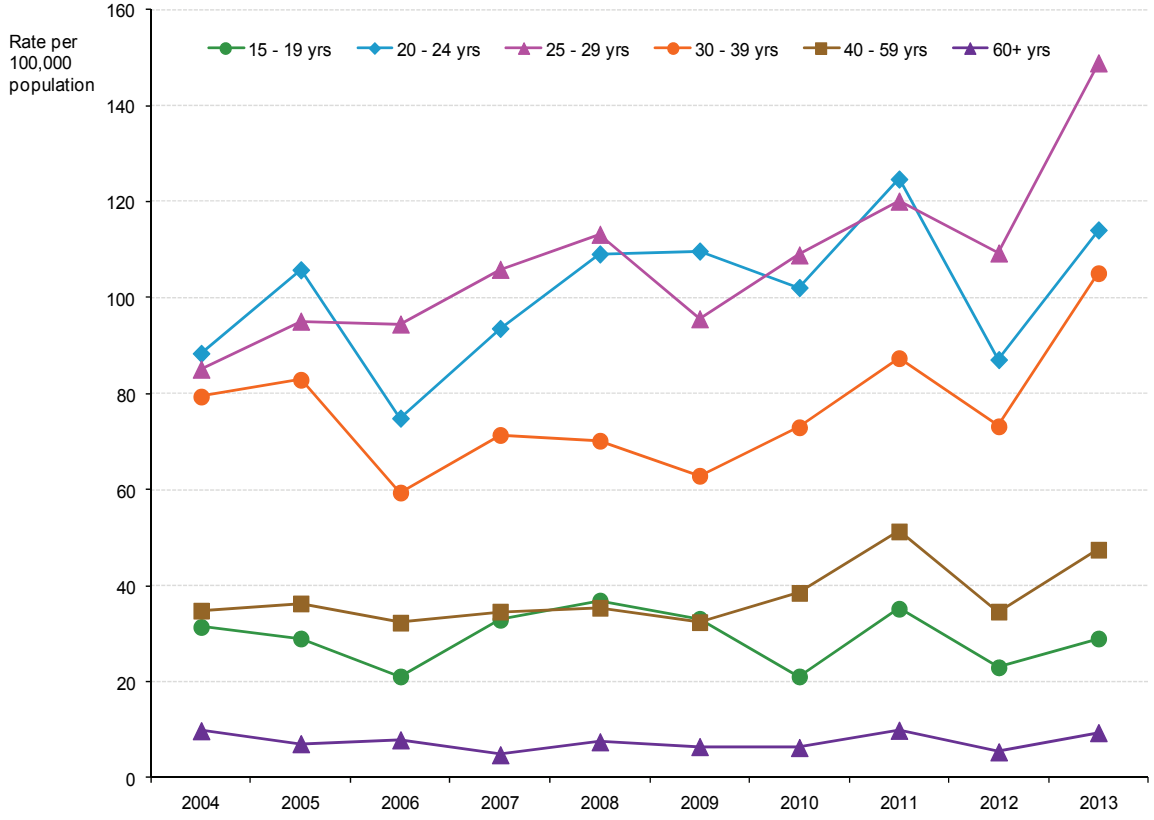
17. Genital gonorrhea case reports in BC by age group - total, 2004 to 2013



18. Genital gonorrhea case reports in BC by age group - female, 2004 to 2013



19. Genital gonorrhea case reports in BC by age group - male, 2004 to 2013



Extra-genital Gonorrhea

Within BC, a small number of extra-genital gonorrhea infections are diagnosed each year. In 2013, 220 cases were identified (28 females, 189 males) which was an increase from 169 cases (9 females, 159 males) in 2012. 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 952 cases diagnosed from 2004 to 2013, cases were identified in the throat (906 cases, 95.2%), eye (20 cases, 2.1%), and other sites (17 cases, 1.8%). A small number of the diagnosed cases represented disseminated gonococcal infection (9 cases, 0.9%) (Table 20).

Please note extra-genital gonorrhea data presented in this report differ from previous reports as a chart review was undertaken for each extra-genital gonorrhea case report. Some of these extra-genital gonorrhea case reports were misclassified and have now been corrected.

20. Extra-genital gonorrhea case reports in BC by site/culture, 2004 to 2013

Gender	Site	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Female	Throat	1	14	16	15	3	7	8	12	8	26
	Eye	1	0	0	1	1	0	1	0	0	1
	Other *	0	0	0	4	0	0	1	0	0	0
	DGI **	1	2	0	0	1	0	0	0	1	1
	Total	3	16	16	20	5	7	10	12	9	28
Male	Throat	54	74	41	46	41	43	55	95	156	185
	Eye	0	1	0	1	1	5	4	0	1	2
	Other *	0	1	1	0	0	1	3	3	1	2
	DGI **	0	0	0	0	1	1	0	0	1	0
	Total	54	76	42	47	43	50	62	98	159	189
BC	Throat	55	88	57	61	44	52	63	107	165	214
	Eye	1	1	0	2	2	5	5	0	1	3
	Other *	0	1	1	4	0	1	4	3	1	2
	DGI **	1	2	0	0	2	1	0	0	2	1
	Total	57	92	58	67	48	59	72	110	169	220

* 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 2013, there was one report of perinatally-acquired gonorrhea. From 2004 to 2013, two 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. Historically effective antibiotics – penicillin, doxycycline, and ciprofloxacin – can no longer be used successfully against gonorrhea, leaving few remaining options. Canadian treatment guidelines currently recommend third-generation cephalosporins for the treatment of gonorrhea: injectable ceftriaxone (250mg) or oral cefixime (800mg), co-treated with 1g of azithromycin.[10] Recent international surveillance data and case reports, however, suggest that susceptibility of gonorrhea to these current first-line treatments is also now threatened.[11,12] In this context, local surveillance is critical.

The BC Public Health Microbiology & Reference Laboratory (BCPHMRL) located at BCCDC routinely tests *N. 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.

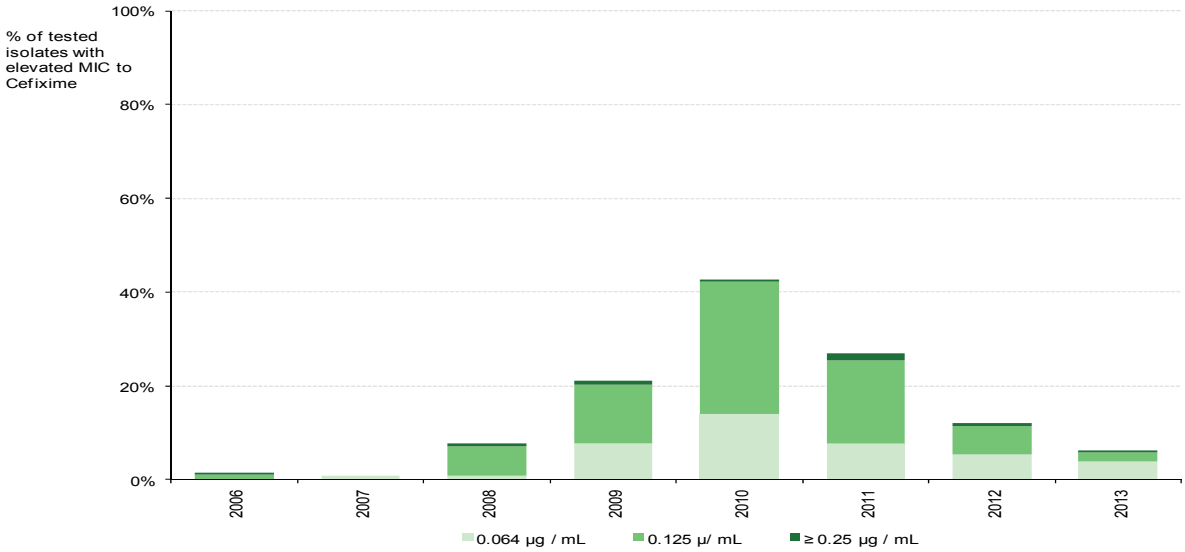
A total of 2,604 isolates were tested between 2006 and 2013, representing 22.8% (2,604/11,438) of all gonorrhea cases (genital and extra-genital) reported in the province. Fifty percent (1,307/2,604) of isolates tested for drug susceptibility were sampled from the urethra, 24.5% (639/2,604) from the rectum, 12.4% (322/2,604) from the cervix, and 11.9% (309/2,604) from the throat.

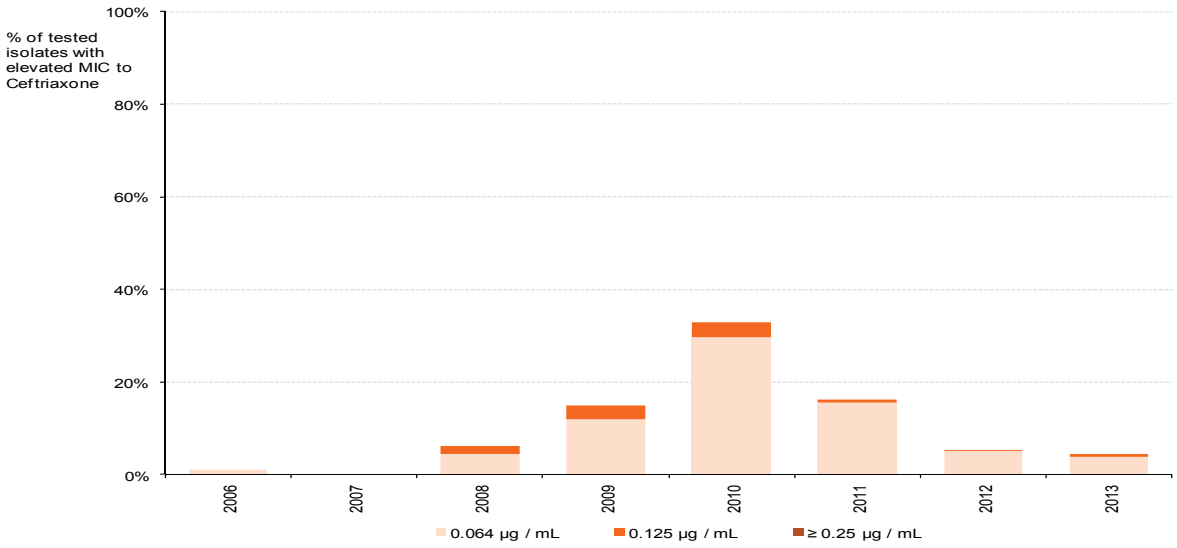
Since 2006, 0.8% (20/2,604) of isolates showed an MIC ≥0.25 µg/mL to cefixime. Fortunately, no isolate was fully resistant to cefixime or ceftriaxone[13] and no treatment failures were reported in BC during this period (Figure 21). The increasing trend in percentage of isolates with elevated MIC (i.e., reduced susceptibility) to cefixime or ceftriaxone observed in 2006-2010 reversed in 2011-2013. Similarly, the increasing trend in percentage of isolates with elevated MIC to azithromycin[14] in 2006-2011 reversed in 2012-2013.

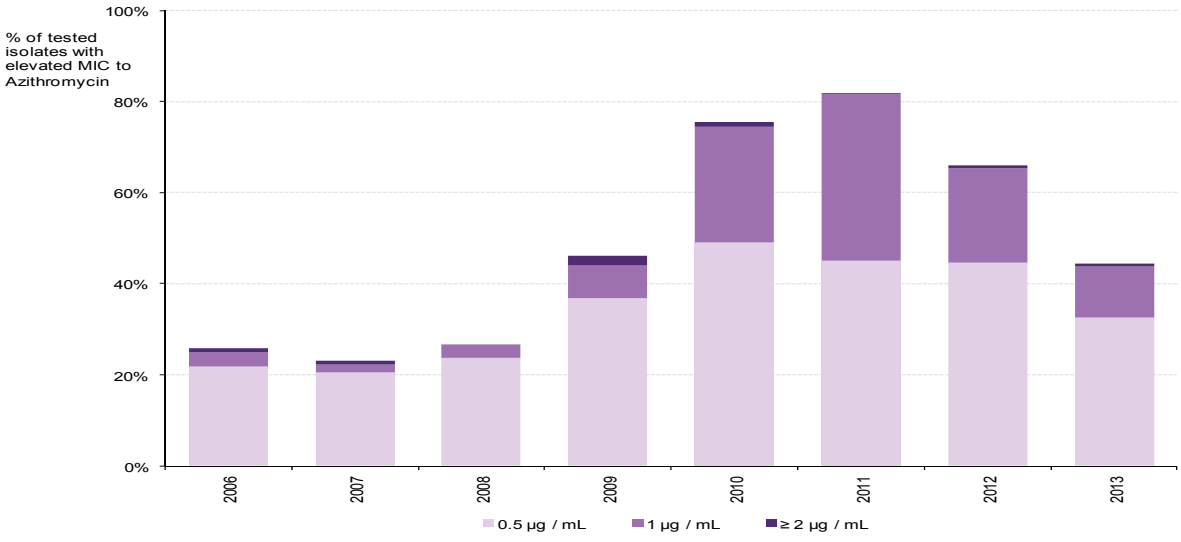
The decline observed in 2011-2013 for reduced susceptibility to cefixime or ceftriaxone among tested isolates is encouraging and, may in part be due to changes in the Canadian and provincial gonorrhea treatment guidelines and/or to more effective regimens (i.e., increased cefixime dosage or improved 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, 2006 to 2013

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 sometimes be caused by chlamydia or gonorrhea infection. Examination of the rates of these conditions can provide an indication of the burden 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. While typically these data are delayed by one year due to the lags in reporting, collation, and transfer of data, in this report only data to 2011 are presented as data for 2012 are not yet available.

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. These trends, especially with the increase in chlamydia and gonorrhea infections among women, are encouraging that public health programs to improve detection and early treatment of these infections have been successful.[15]

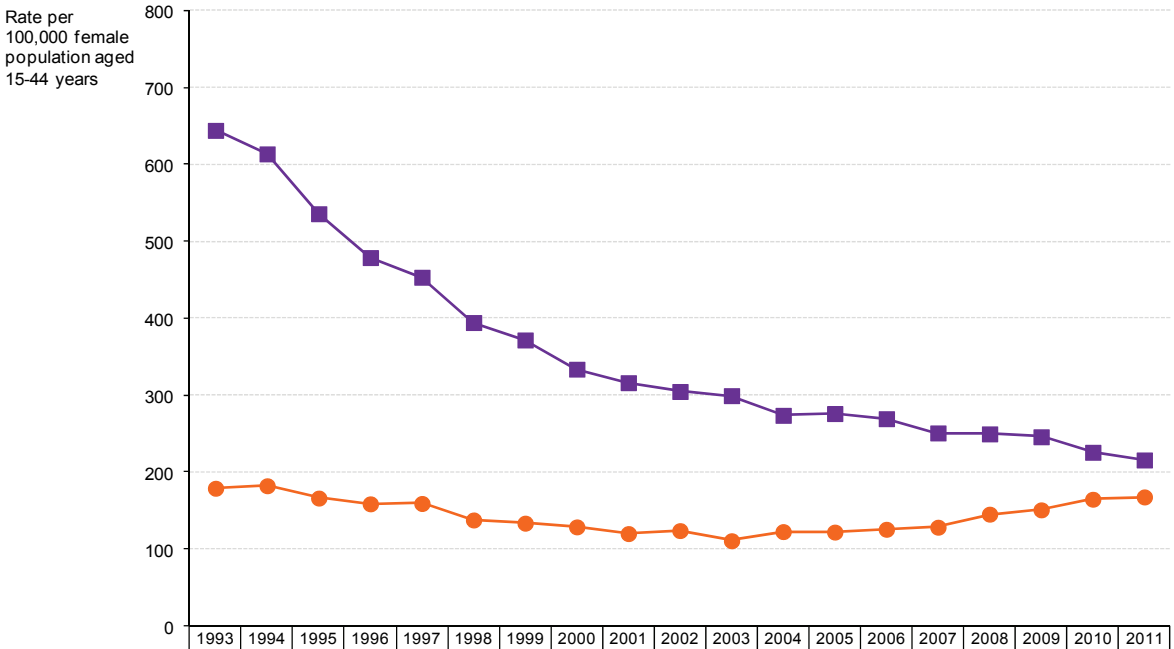
Pelvic Inflammatory Disease

In 2011, the rate of physician billings related to PID decreased to 215.6 (1,990 physician billings) from 225.5 (2,061 physician billings) per 100,000 women aged 15-44 years in 2010 (Figure 22). Rate of hospital discharges related to PID show a decrease to 26.9 (248 hospital discharges) in 2011 from 31.8 (291 hospital discharges) per 100,000 women aged 15-44 years in 2010 (Figure 23).

Ectopic Pregnancy

The rate of physician billings related to EP increased to 167.5 (1,546 physician billings) in 2011 from 164.5 (1,504 physician billings) per 100,000 women aged 15-44 years in 2010 (Figure 22). In contrast, the rate of hospital discharges related to EP have decreased to 50.3 (464 hospital discharges) in 2011 from 53.5 (489 hospital discharges) per 100,000 women aged 15-44 years in 2010 (Figure 23).

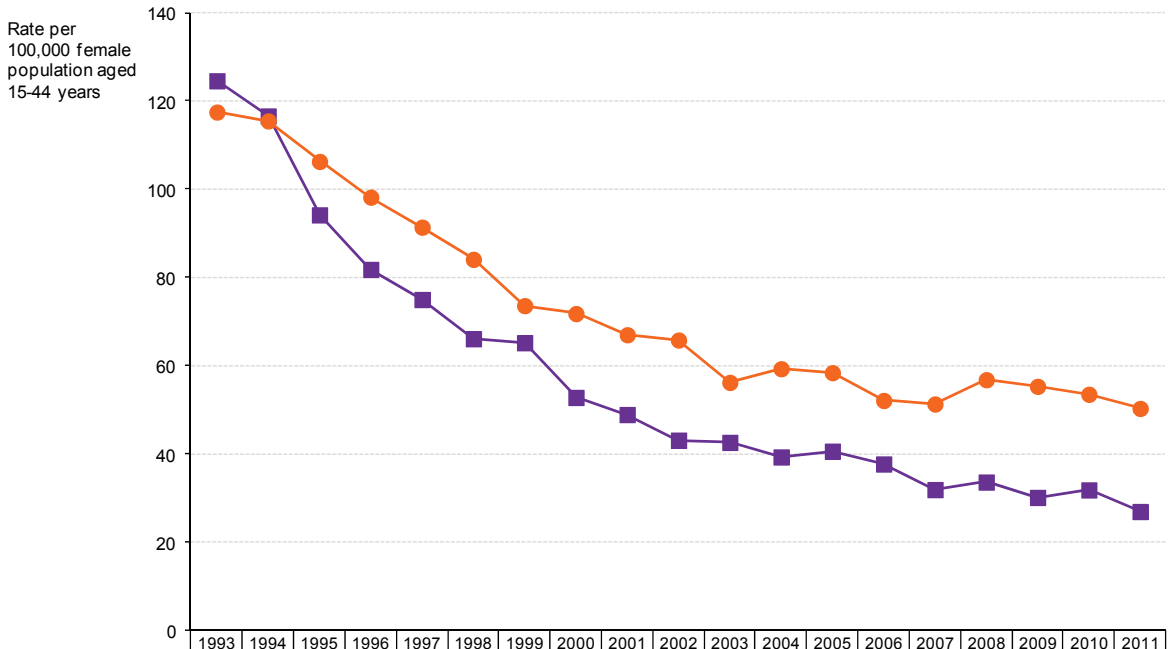
22. Case reports of women aged 15-44 years with a physician billing related to pelvic inflammatory disease or ectopic pregnancy in BC, 1993 to 2011



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Reports - PID	5,326	5,196	4,636	4,261	4,089	3,559	3,351	3,002	2,846	2,724	2,652	2,417	2,435	2,377	2,230	2,242	2,225	2,061	1,990
Reports - EP	1,478	1,541	1,436	1,410	1,435	1,241	1,203	1,156	1,078	1,106	979	1,081	1,075	1,107	1,140	1,303	1,365	1,504	1,546
Rate - PID	644.3	613.7	535.9	478.9	453.2	394.4	371.6	333.7	316.2	304.7	299.2	273.7	276.0	269.3	250.7	249.6	245.7	225.5	215.6
Rate - EP	178.8	182.0	166.0	158.5	159.0	137.5	133.4	128.5	119.8	123.7	110.5	122.4	121.8	125.4	128.1	145.1	150.7	164.5	167.5

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 2011



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Reports - PID	1,030	987	815	728	677	596	588	475	440	385	378	347	358	333	284	302	273	291	248
Reports - EP	971	978	920	874	825	759	664	646	603	588	498	524	515	460	456	510	501	489	464
Rate - PID	124.6	116.6	94.2	81.8	75.0	66.1	65.2	52.8	48.9	43.1	42.6	39.3	40.6	37.7	31.9	33.6	30.1	31.8	26.9
Rate - EP	117.5	115.5	106.3	98.2	91.4	84.1	73.6	71.8	67.0	65.8	56.2	59.3	58.4	52.1	51.3	56.8	55.3	53.5	50.3

PID - pelvic inflammatory disease
EP - ectopic pregnancy

Infectious Syphilis

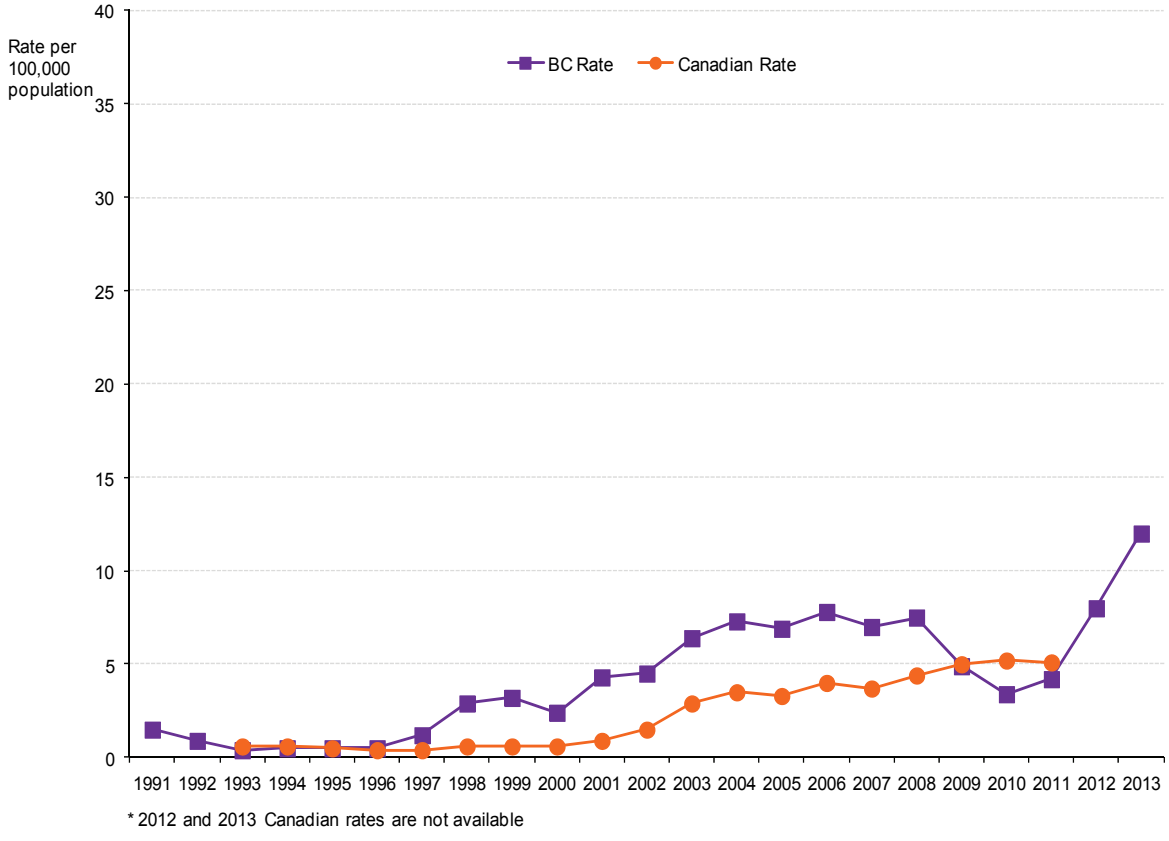
Infectious Syphilis by Region, Gender, and Age

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.

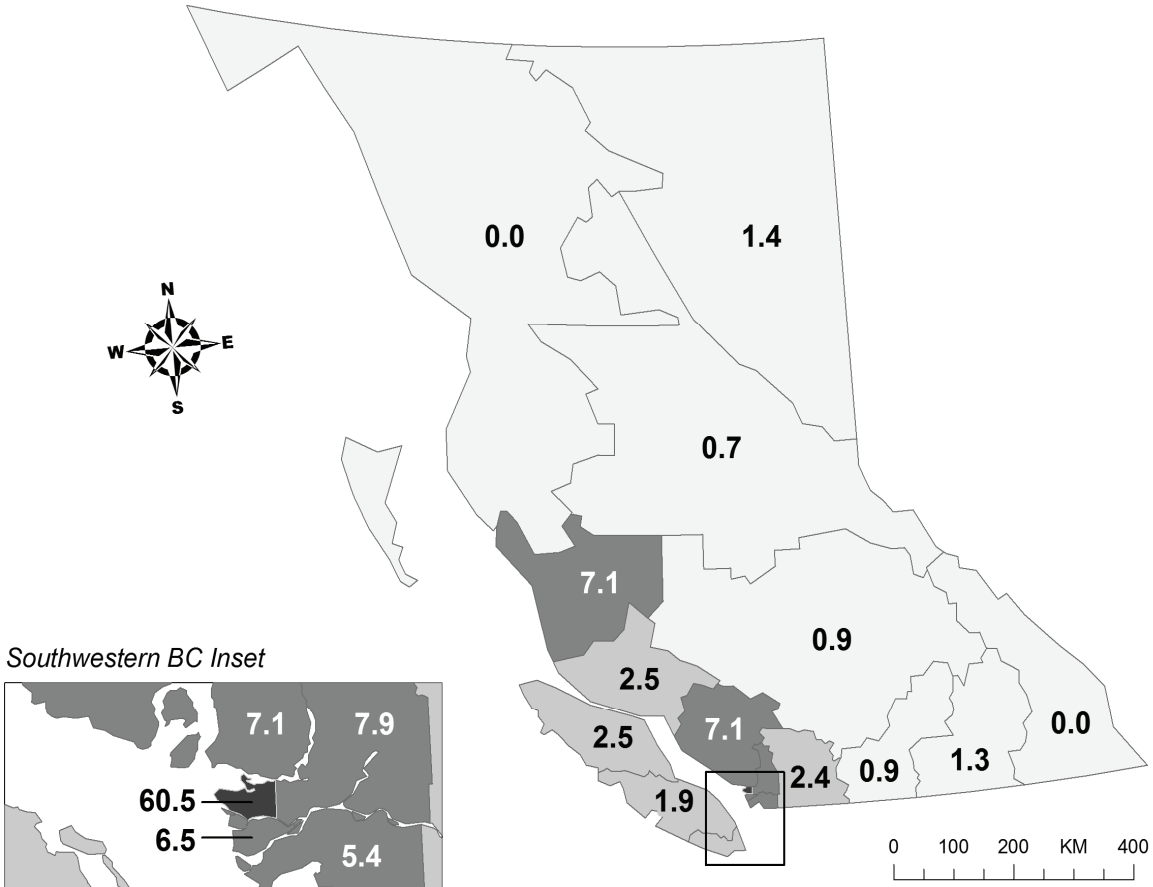
Following a decline in rates in BC in the early 1990's, infectious syphilis (i.e., primary, secondary, and early latent stages) began to re-emerge in BC starting in 1997, corresponding to a series of outbreaks in different populations. While provincial trends had been decreasing in 2009-2010, infectious syphilis rates began to increase in 2011 and this became more evident in 2012-2013. In BC, the rate of infectious syphilis increased in 2013 to 12.0 (558 cases) from 8.0 (368 cases) per 100,000 population in 2012 (Figure 24). The highest rates of infectious syphilis were in Vancouver Coastal and Fraser Health Authorities (Figure 26). Across Health Service Delivery Areas, the highest rates were in Vancouver, Fraser North, and North Shore/Coast Garibaldi (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 15.0 (343 cases) per 100,000 population in 2012 and then to 23.2 (536 cases) per 100,000 in 2013. The increase in cases among males in 2013 was observed in all age groups with the highest rates in those aged 30-59 years (Figure 31). In 2013, the rate of infectious syphilis among females was 0.8 (20 cases), a slight decrease from 1.0 (24 cases) per 100,000 population in 2012 (Figure 27).

24. Infectious syphilis case reports in BC and Canada, 1991 to 2013*



25. Infectious syphilis case reports in BC by health service delivery area, 2013



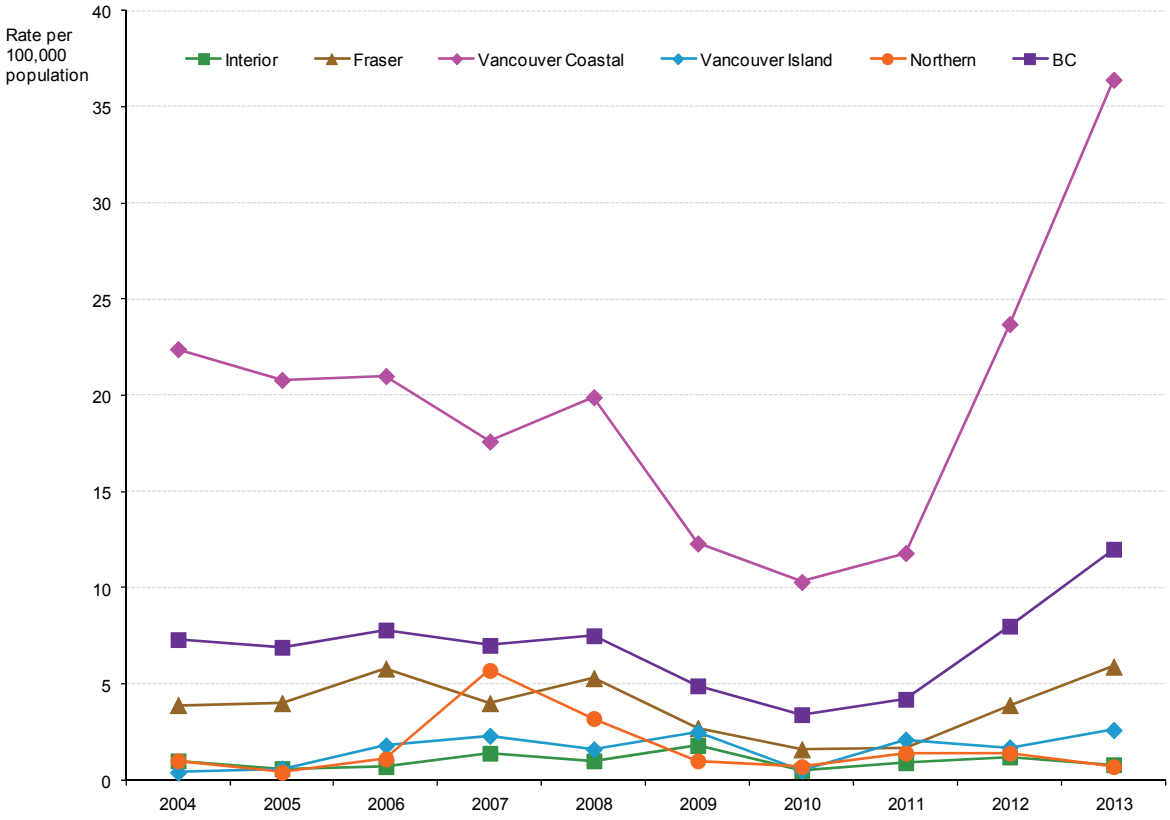
ID	Health Service Delivery Area	Cases	Rate
11	East Kootenay	0	0.0
12	Kootenay Boundary	1	1.3
13	Okanagan	3	0.9
14	Thompson Cariboo Shuswap	2	0.9
21	Fraser East	7	2.4
22	Fraser North	50	7.9
23	Fraser South	41	5.4
31	Richmond	13	6.5
32	Vancouver	398	60.5
33	North Shore/Coast Garibaldi	20	7.1
41	South Vancouver Island	12	3.2
42	Central Vancouver Island	5	1.9
43	North Vancouver Island	3	2.5
51	Northwest	0	0.0
52	Northern Interior	1	0.7
53	Northeast	1	1.4

Rate per 100,000 population by HSDA

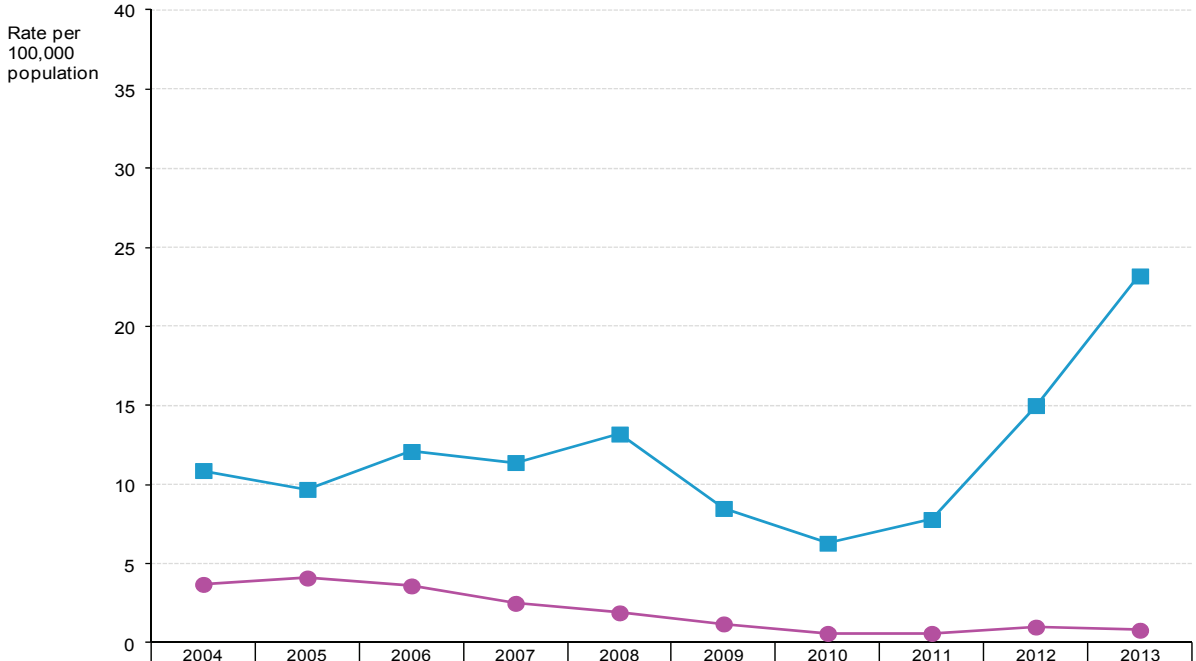
- 0.0 - 1.4
- 1.9 - 3.2
- 5.4 - 7.9
- 60.5

Rates calculated with population estimates released by BC Stats

26. Infectious syphilis case reports in BC by health authority, 2004 to 2013



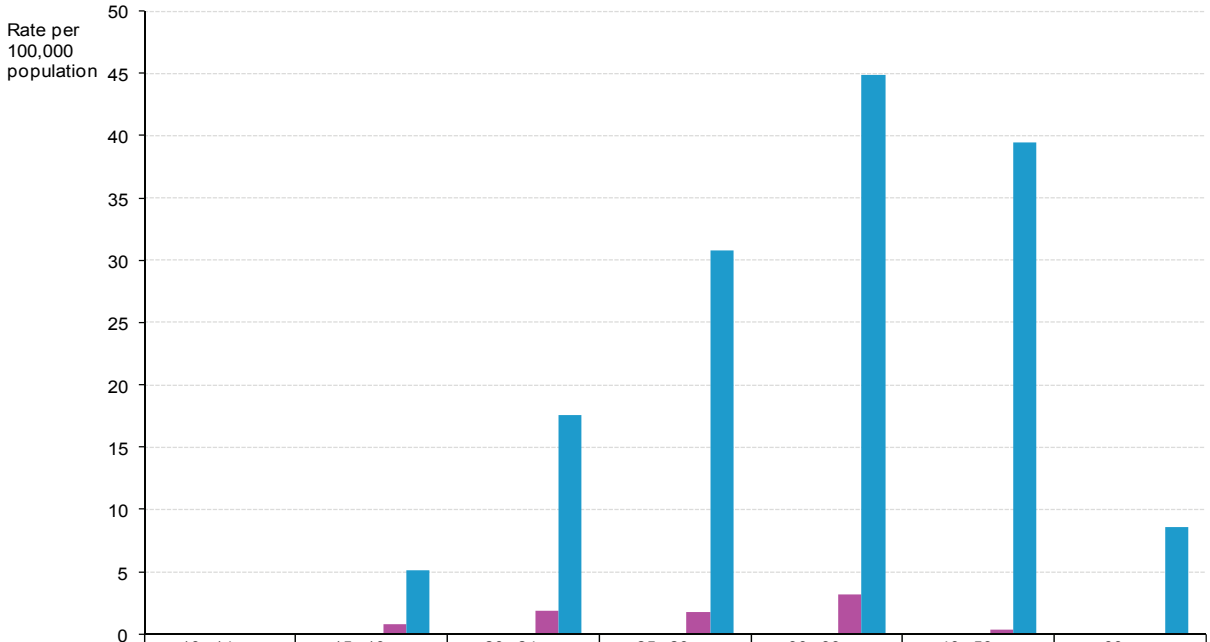
27. Infectious syphilis case reports in BC by gender, 2004 to 2013



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Reports - Female	78	86	77	55	41	28	13	13	24	20
Reports - Male	225	202	254	244	286	188	141	177	343	536
Reports - Other *	1	0	0	1	1	1	0	0	1	2
Rate - Female	3.7	4.1	3.6	2.5	1.9	1.2	0.6	0.6	1.0	0.8
Rate - Male	10.9	9.7	12.1	11.4	13.2	8.5	6.3	7.8	15.0	23.2

* Other - transgender and gender unknown

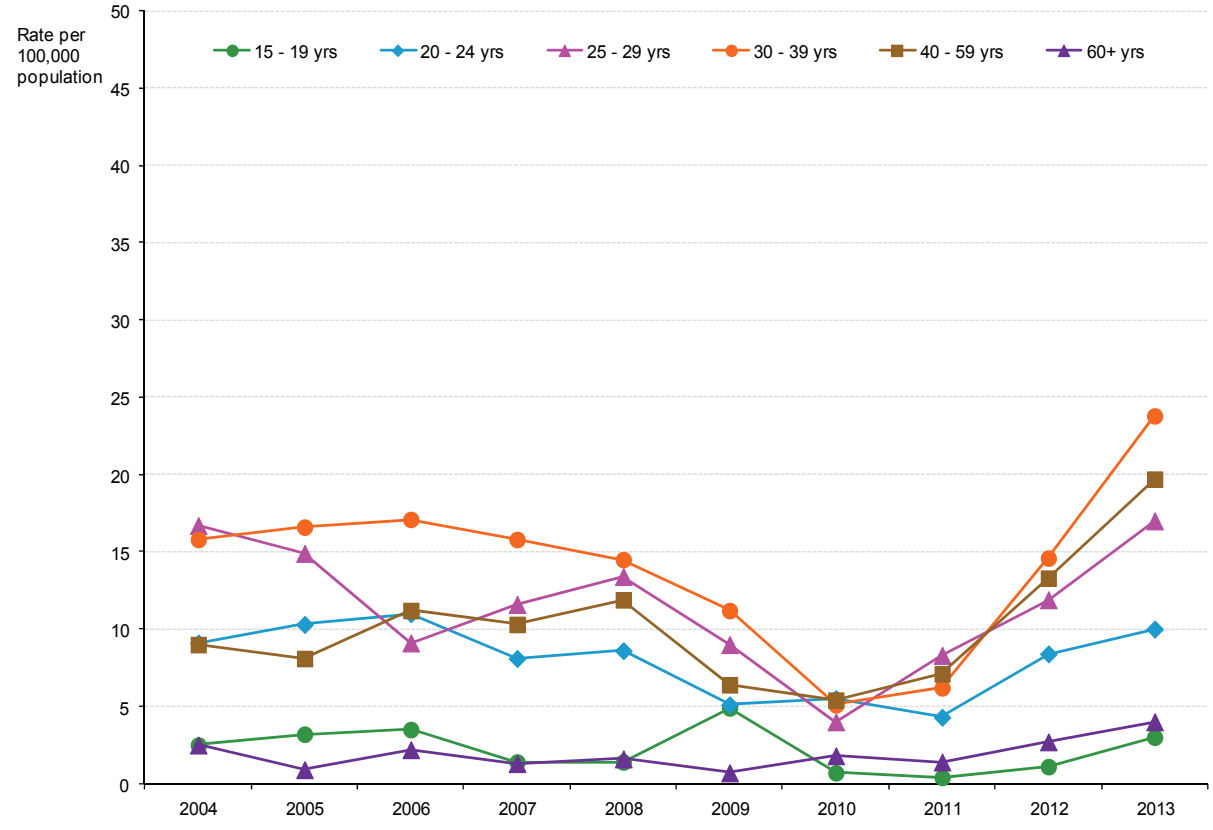
28. Infectious syphilis case reports in BC by age group and gender, 2013



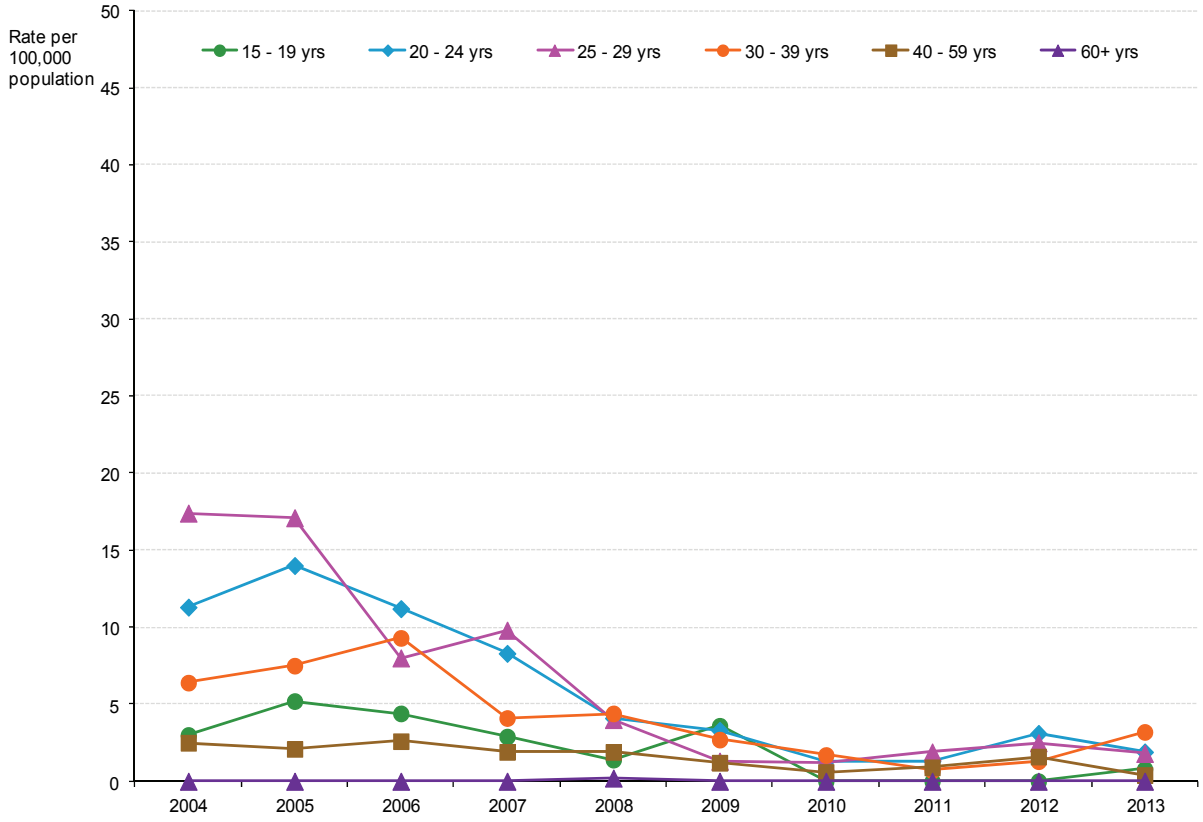
	10 - 14 yrs	15 - 19 yrs	20 - 24 yrs	25 - 29 yrs	30 - 39 yrs	40 - 59 yrs	60+ yrs
Reports - Female	0	1	3	3	10	3	0
Reports - Male	0	7	30	53	136	267	43
Reports - Other *	0	0	0	1	0	0	0
Rate - Female	0	0.8	1.9	1.8	3.2	0.4	0
Rate - Male	0	5.1	17.6	30.8	44.9	39.5	8.6

* Other - transgender and gender unknown

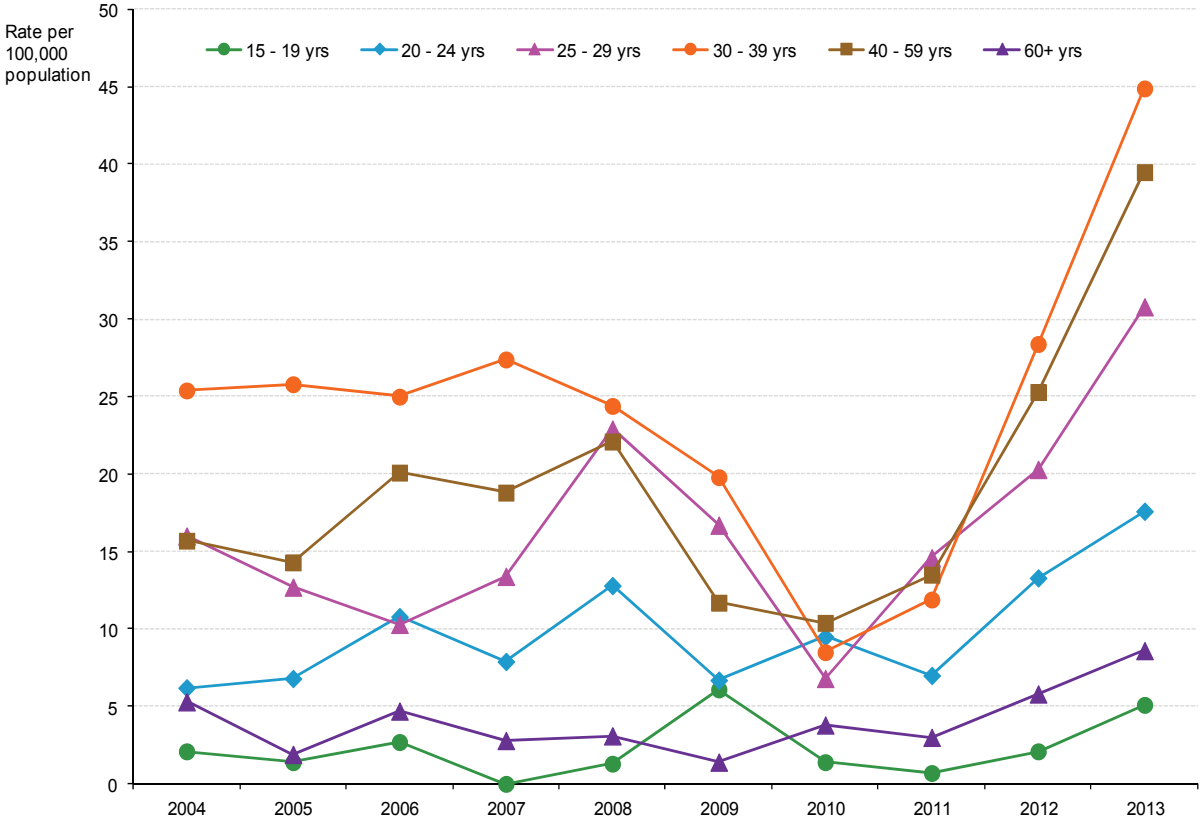
29. Infectious syphilis case reports in BC by age group - total, 2004 to 2013



30. Infectious syphilis case reports in BC by age group - female, 2004 to 2013



31. Infectious syphilis case reports in BC by age group - male, 2004 to 2013



Infectious Syphilis by Ethnicity

In males, the majority of cases in 2013 are among people who identified as Caucasian (307 cases; 57.3%) (Table 34). In comparison, the majority of cases in females in 2013 are among women who identified as Asian (6 cases, 30.0%), however, the trends are highly variable due to the small number of female cases each year (i.e., 20 cases in 2013) (Table 33).

32. Percentage of infectious syphilis case reports in BC by ethnicity - total, 2004 to 2013

Ethnicity	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
No. Diagnoses	*304*	*288*	*331*	*300*	*328*	*217*	*154*	*190*	*368*	*558*
Caucasian	66.1	59.0	60.4	64.7	66.2	65.0	70.1	64.7	61.4	55.7
Aboriginal	10.5	15.6	12.4	10.7	8.8	7.8	3.9	3.7	5.7	3.9
Asian	9.9	12.2	11.5	8.7	10.7	6.5	12.3	10.0	10.6	12.2
South Asian	3.6	3.8	6.0	4.0	4.3	1.4	3.2	6.8	4.1	3.6
Hispanic	4.3	5.6	4.2	5.7	4.9	9.2	2.6	8.4	6.3	5.2
Black	2.6	2.1	2.7	2.3	2.4	4.6	1.3	0.5	1.1	1.6
Other*	1.0	0.3	2.4	2.0	1.2	3.7	2.6	3.2	1.9	1.3
Unknown	2.0	1.4	0.3	2.0	1.5	1.8	3.9	2.6	9.0	16.5

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

33. Percentage of infectious syphilis case reports in BC by ethnicity - female, 2004 to 2013

Ethnicity	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
No. Diagnoses	*78*	*86*	*77*	*55*	*41*	*28*	*13*	*13*	*24*	*20*
Caucasian	52.6	39.5	40.3	54.5	43.9	57.1	69.2	38.5	29.2	15.0
Aboriginal	29.5	37.2	42.9	34.5	29.3	28.6	15.4	15.4	20.8	15.0
Asian	10.3	11.6	7.8	5.5	12.2	0.0	0.0	23.1	16.7	30.0
South Asian	2.6	1.2	6.5	3.6	9.8	7.1	7.7	7.7	12.5	10.0
Hispanic	2.6	5.8	0.0	0.0	0.0	0.0	0.0	7.7	0.0	5.0
Black	0.0	1.2	1.3	0.0	2.4	3.6	7.7	0.0	4.2	0.0
Other*	1.3	0.0	1.3	0.0	0.0	3.6	0.0	0.0	0.0	0.0
Unknown	1.3	3.5	0.0	1.8	2.4	0.0	0.0	7.7	16.7	25.0

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

34. Percentage of infectious syphilis case reports in BC by ethnicity - male, 2004 to 2013

Ethnicity	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
No. Diagnoses	*225*	*202*	*254*	*244*	*286*	*188*	*141*	*177*	*343*	*536*
Caucasian	71.1	67.3	66.5	67.2	69.6	66.5	70.2	66.7	63.6	57.3
Aboriginal	3.6	6.4	3.1	5.3	5.6	4.8	2.8	2.8	4.7	3.5
Asian	9.8	12.4	12.6	9.4	10.5	7.4	13.5	9.0	10.2	11.6
South Asian	4.0	5.0	5.9	4.1	3.5	0.5	2.8	6.8	3.5	3.4
Hispanic	4.9	5.4	5.5	6.6	5.6	10.6	2.8	8.5	6.7	5.2
Black	3.6	2.5	3.1	2.9	2.4	4.8	0.7	0.6	0.9	1.7
Other*	0.9	0.5	2.8	2.5	1.4	3.2	2.8	3.4	2.0	1.1
Unknown	2.2	0.5	0.4	2.0	1.4	2.1	4.3	2.3	8.5	16.2

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

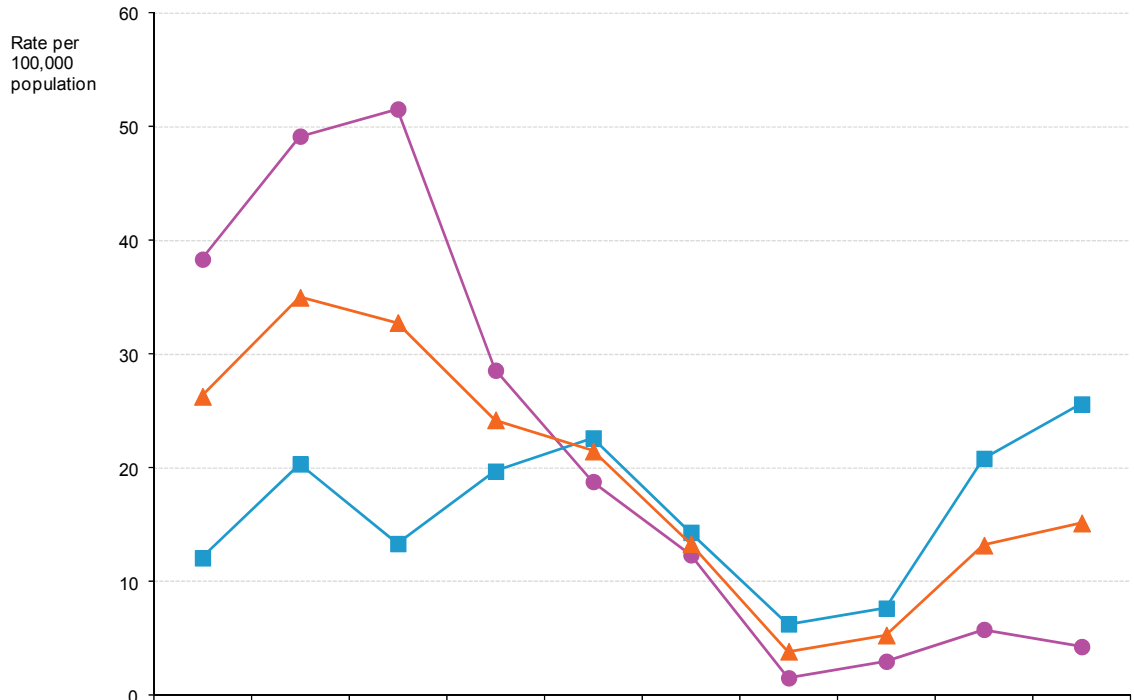
Infectious Syphilis among Aboriginal Peoples

This section describes cases of infectious syphilis among people who identify as Aboriginal. Among the nearly 200,000 Aboriginal persons living in BC, approximately 66% are First Nations, 30% are Métis, and fewer than 5% are Inuit or of other Aboriginal identity.[16]

Since 2004, the percentage of infectious syphilis cases in BC residents that were reported among Aboriginal Peoples has been decreasing. The percentage of infectious syphilis cases among Aboriginal Peoples decreased from 5.7% (21 cases) in 2012 to 3.9% (22 cases) in 2013 (Figure 32). In comparison, Aboriginal Peoples represent about 5% of the general BC population.[17] While numbers are small, Aboriginal women in BC are disproportionately represented among all female infectious syphilis cases (3 cases or 15.0% of all female cases in 2013).

The rate of infectious syphilis among First Nations people in BC decreased from 2005 to 2010, but has increased moderately since 2010 (Figure 35). The rate increased from 13.2 (18 cases) in 2012 to 15.1 (21 cases) per 100,000 population in 2013, with the increase occurring predominantly among males. Due to limitations in the availability of population estimates it is not possible to calculate comparable rates for Métis and Inuit peoples. (See Technical Appendix for further details about the classification of ethnicity for syphilis cases and calculation of incidence for First Nations population.)

35. Infectious syphilis case reports among First Nations people in BC by gender, 2004 to 2013



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Rate - Female	38.3	49.2	51.6	28.6	18.8	12.3	1.5	3.0	5.8	4.3
Rate - Male	12.1	20.3	13.3	19.7	22.6	14.3	6.3	7.6	20.8	25.6
Rate - Total	26.3	35.0	32.8	24.2	21.5	13.3	3.9	5.3	13.2	15.1

Rates based on First Nations population estimates from Aboriginal Affairs and Northern Development Canada (AANDC)

Infectious Syphilis by Exposure Category

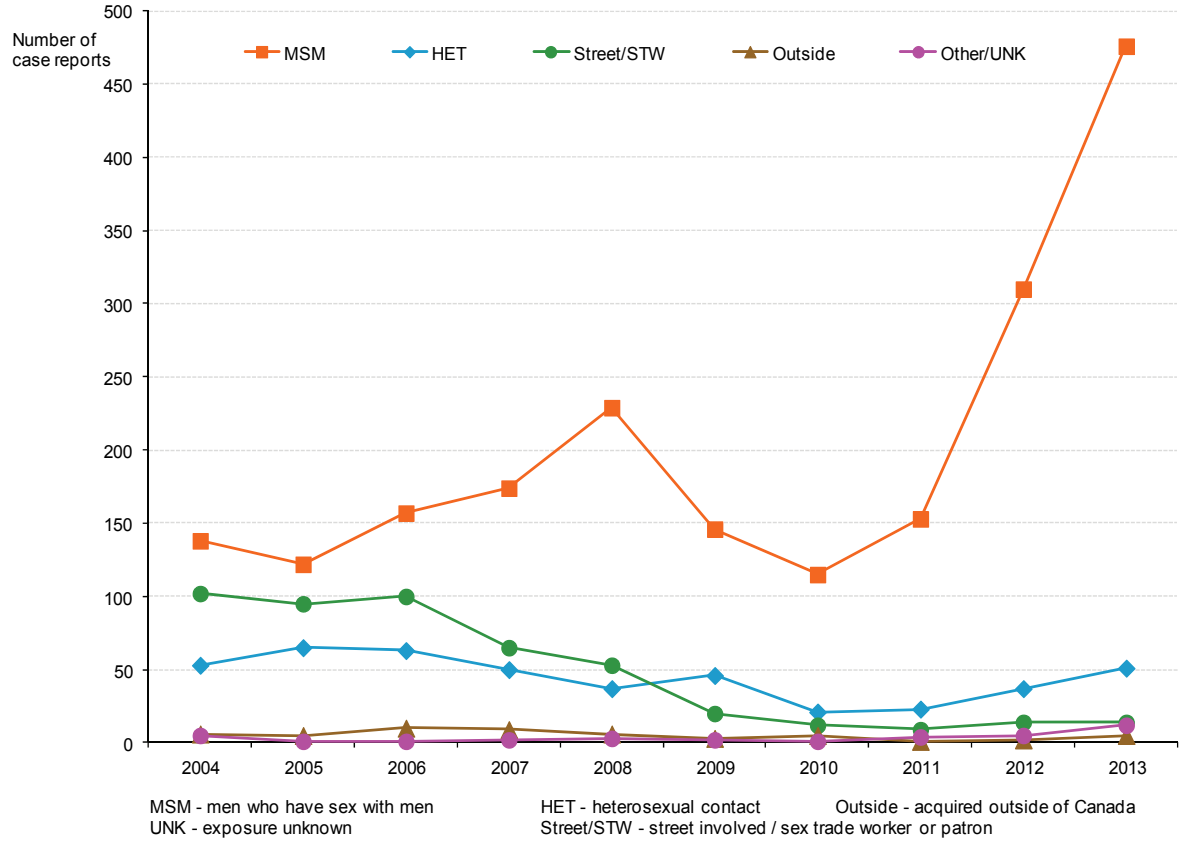
Gay, bisexual, and other men who have sex with men (MSM) continue to comprise the greatest number of infectious syphilis cases in BC (Figure 37). The number of syphilis cases among MSM increased from 310 cases (84.2% of all cases) in 2012 to 476 cases (85.3%) in 2013. Infectious syphilis cases among heterosexual persons without other risk factors increased from 37 cases (10.1 %) in 2012 to 51 cases (9.1%) in 2013. The number of infectious syphilis cases among street involved persons, sex trade workers, and their patrons has continued to decrease in recent years (14 cases, 3.8% in 2012 and 14 cases, 2.5% in 2013). 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, 2004 to 2013

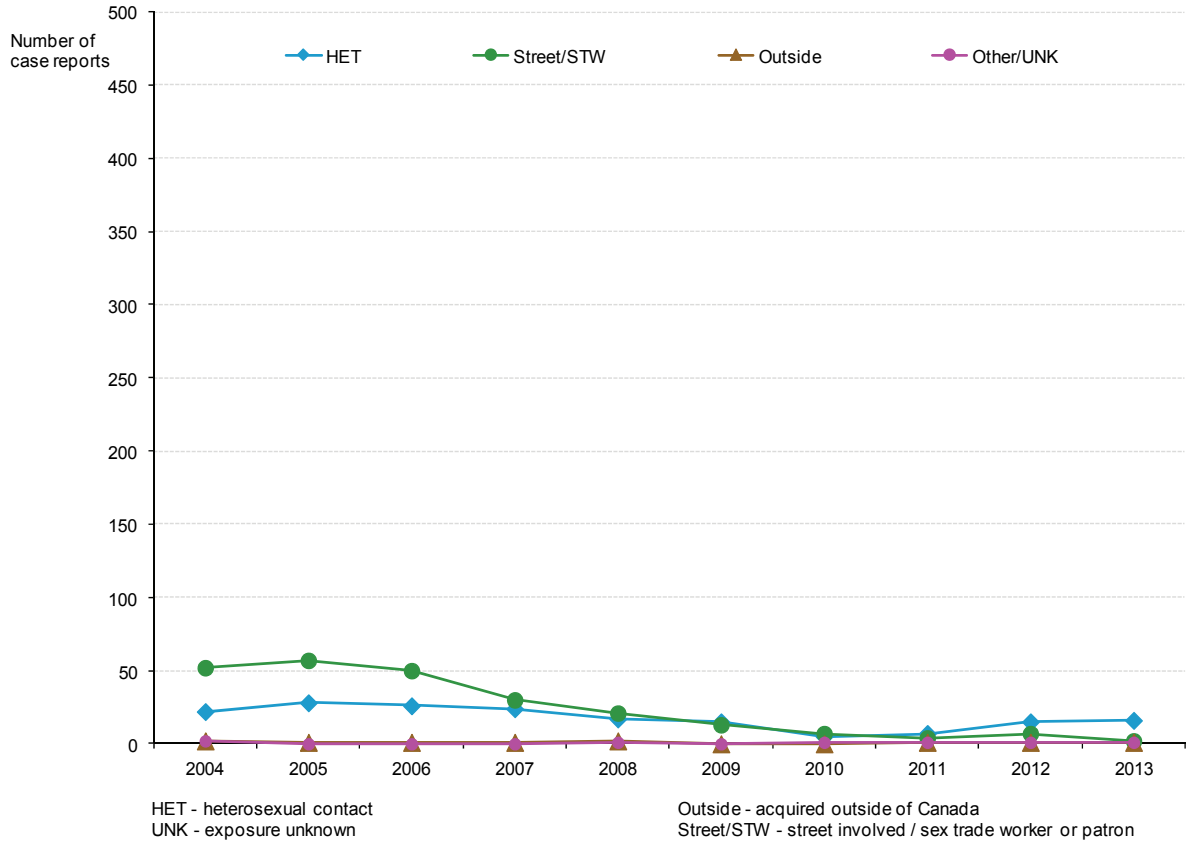
Health Authority	Exposure Category	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Interior	MSM	2	1	2	7	2	5	1	3	6	4
	Street/STW	1	0	1	3	3	1	1	0	0	0
	HET	4	3	2	0	2	7	2	4	2	2
	Outside	0	0	0	0	0	0	0	0	1	0
	Other/UNK	0	0	0	0	0	0	0	0	0	0
Fraser	MSM	12	10	22	13	41	25	17	15	46	70
	Street/STW	25	23	35	23	19	4	2	2	3	4
	HET	16	22	25	21	17	13	5	7	11	18
	Outside	4	3	3	3	4	1	2	0	1	2
	Other/UNK	0	0	1	1	1	0	0	3	3	4
Vancouver Coastal	MSM	123	108	129	136	179	108	94	120	248	386
	Street/STW	74	71	62	34	23	8	7	6	8	5
	HET	30	37	27	15	14	18	13	6	17	29
	Outside	3	2	6	5	1	2	3	2	0	2
	Other/UNK	3	1	0	0	1	1	1	2	5	9
Vancouver Island	MSM	1	1	4	7	6	6	3	13	10	13
	Street/STW	1	1	0	3	3	4	0	0	0	0
	HET	0	2	8	7	2	8	1	3	2	6
	Outside	0	0	1	0	0	0	0	0	0	0
	Other/UNK	1	0	0	0	1	1	0	0	1	1
Northern	MSM	0	0	0	6	1	0	0	1	0	1
	Street/STW	1	0	2	2	4	1	0	1	1	0
	HET	2	1	1	8	4	2	2	2	3	0
	Outside	0	0	0	0	0	0	0	0	0	0
	Other/UNK	0	0	0	0	0	0	0	0	0	1

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

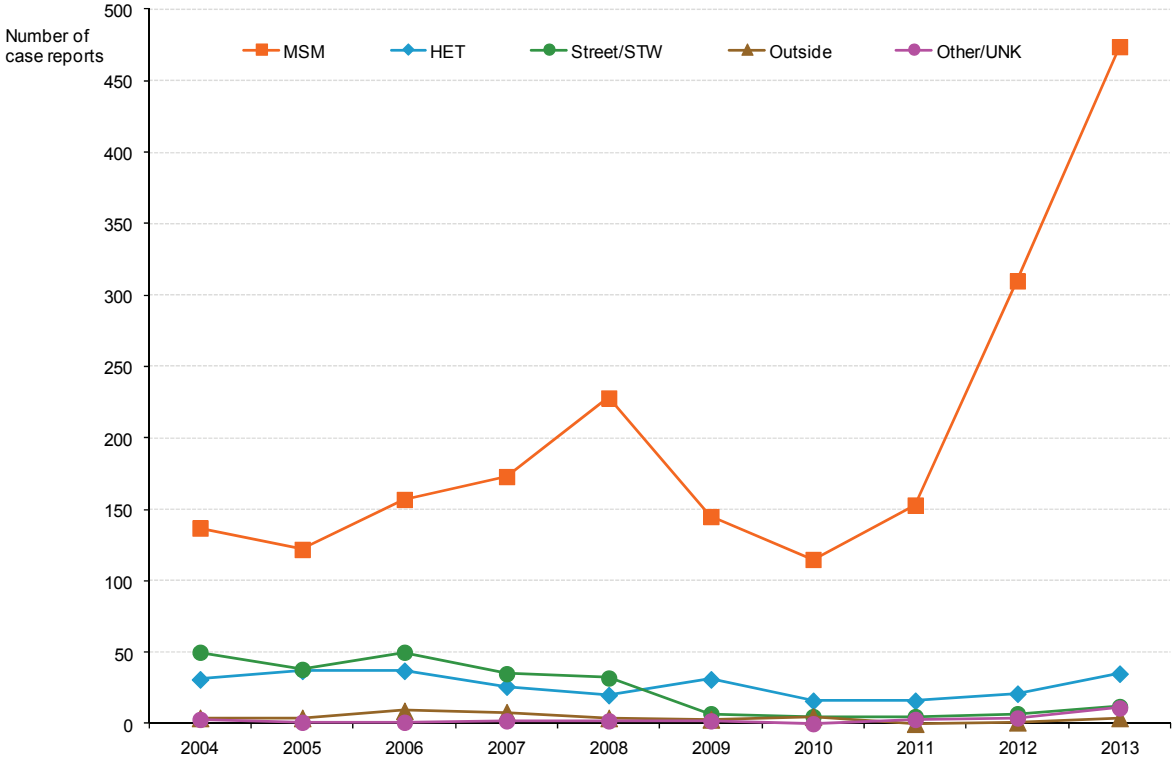
37. Infectious syphilis case reports in BC by exposure category - total, 2004 to 2013



38. Infectious syphilis case reports in BC by exposure category - female, 2004 to 2013



39. Infectious syphilis case reports in BC by exposure category - male, 2004 to 2013



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 85.3% (476 cases) of all cases in 2013 (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, the US, and several European countries where syphilis cases were also predominantly among MSM and trends are increasing.[18, 19, 20]

There were 476 cases among MSM in 2013: 20.8% (99 cases) were diagnosed with primary syphilis, 25.0% (119 cases) with secondary syphilis, and 54.2% (258 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 2013, 121 (25.4%) MSM cases had a prior syphilis diagnosis within the past five years, highlighting the importance of repeat infections in the current epidemic.[21]

Despite recent increases in the number of annual cases, the characteristics of MSM with syphilis have remained similar over time. While the number of cases has increased for all age groups in 2013 (Figure 41), the mean age of MSM diagnosed with syphilis has remained relatively stable at 42 years (range 17-79 years). In 2013, the majority of cases resided in the Lower Mainland with 81.3% (386 cases) residing in Vancouver, 14.7% (70 cases) in Fraser, and 2.7% (13 cases) on Vancouver Island. As in previous years, the majority of cases in 2013 were among Caucasian (285 cases, 59.9%), Asian (50 cases, 10.5%), and Hispanic (27 cases, 5.7%) men (Table 40).

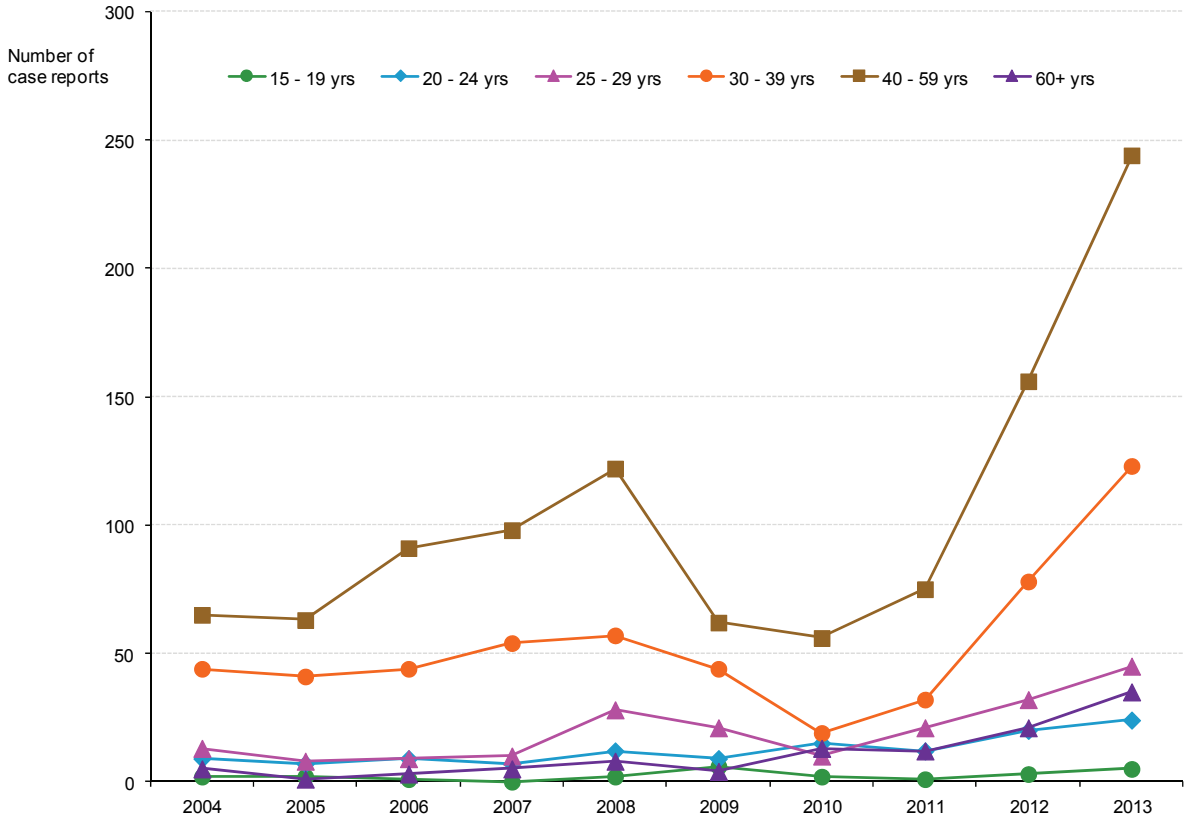
Being HIV positive continues to be an important risk factor for acquiring infectious syphilis. In 2013, of the MSM cases with a known HIV status (473 cases), 64.5% (305 cases) were HIV positive at the time of their syphilis diagnosis which is a decrease from 2012 (192/290 cases, 66.2%) (Figure 42). The 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. Centralized public health follow-up, 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, 2004 to 2013

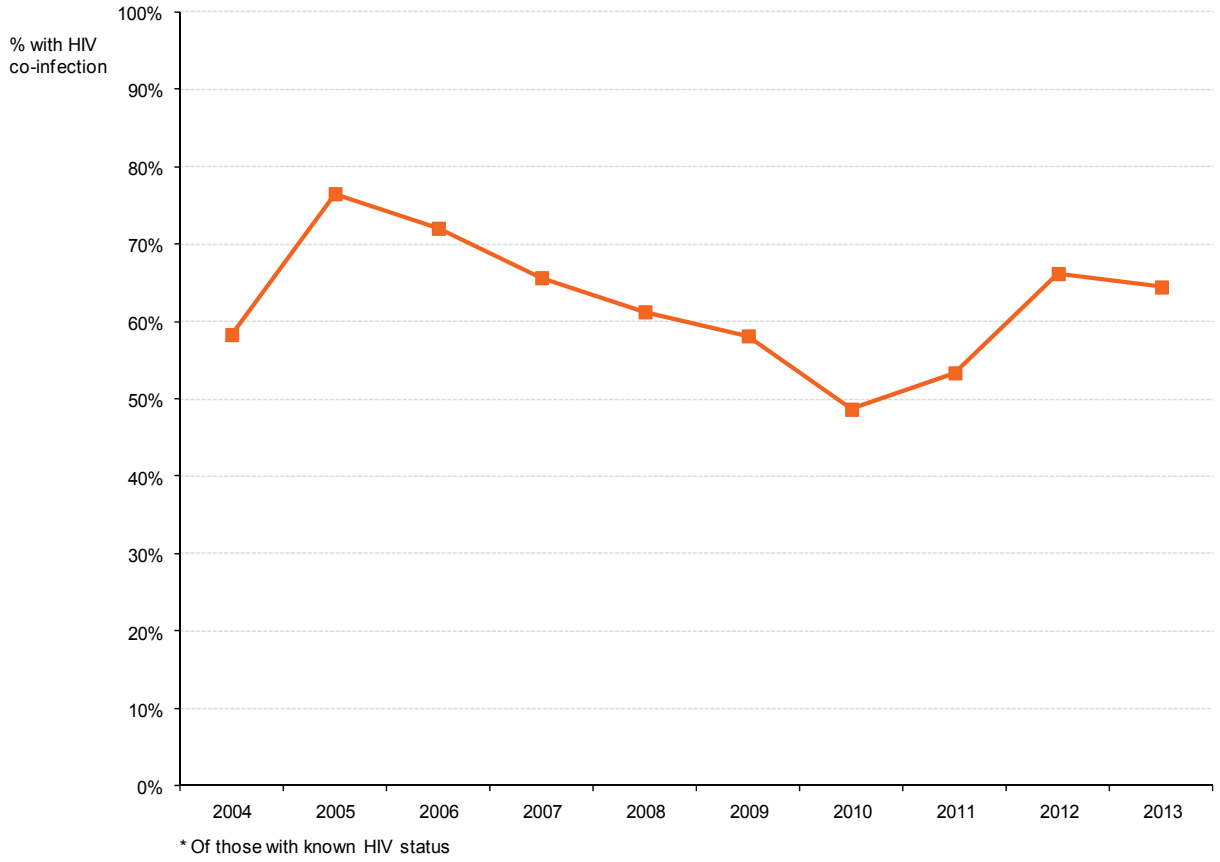
Ethnicity	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
No. Diagnoses	*138*	*122*	*157*	*174*	*229*	*146*	*115*	*153*	*310*	*476*
Caucasian	78.3	77.9	79.6	73.0	75.5	68.5	75.7	69.9	64.8	59.9
Aboriginal	2.9	3.3	0.6	2.3	2.6	3.4	3.5	2.0	4.5	3.6
Asian	6.5	10.7	7.6	8.6	10.0	5.5	7.8	7.2	9.4	10.5
South Asian	2.2	3.3	3.2	1.7	3.1	0.0	3.5	5.9	3.2	2.7
Hispanic	5.1	1.6	6.4	8.0	4.8	13.0	3.5	9.8	7.1	5.7
Black	2.2	1.6	1.3	3.4	1.3	3.4	0.0	0.0	1.0	1.7
Other*	0.7	0.8	1.3	2.3	1.7	4.1	2.6	3.3	2.3	1.5
Unknown	2.2	0.8	0.0	0.6	0.9	2.1	3.5	2.0	7.7	14.5

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

41. Infectious syphilis case reports among MSM in BC by age group, 2004 to 2013



42. Infectious syphilis case reports* among MSM in BC by HIV co-infection, 2004 to 2013

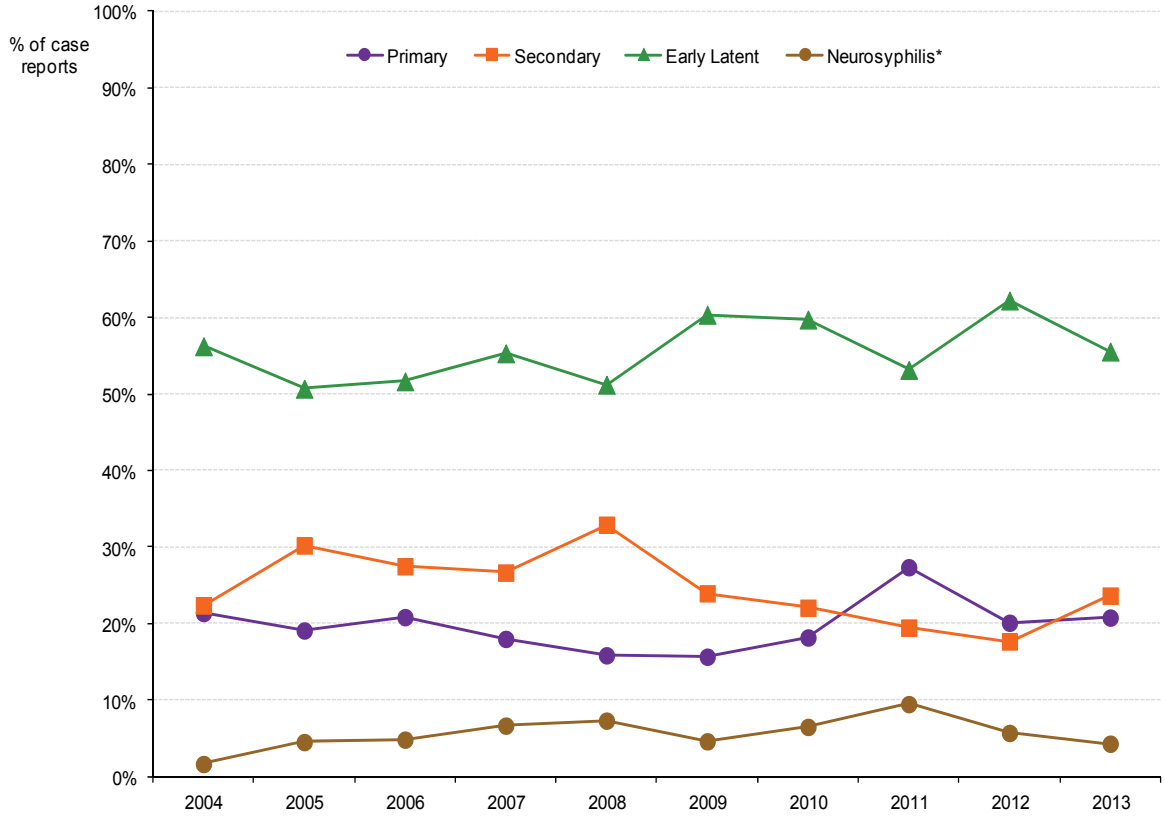


Stage of Infection at Time of Syphilis Diagnosis

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 2013, the proportion of cases that are early latent decreased to 55.6% (310 cases) from 62.2% (229 cases) in 2012 (Figure 43). This decrease may be a year-to-year variation.

From 2004 to 2013, 5.3% (161/3,038 cases) of infectious syphilis cases were also diagnosed with neurosyphilis. Neurosyphilis is commonly considered to be indicative of advanced syphilis infection but can sometimes occur at an early stage of infection.

43. Stage of infection at time of syphilis diagnosis, 2004 to 2013



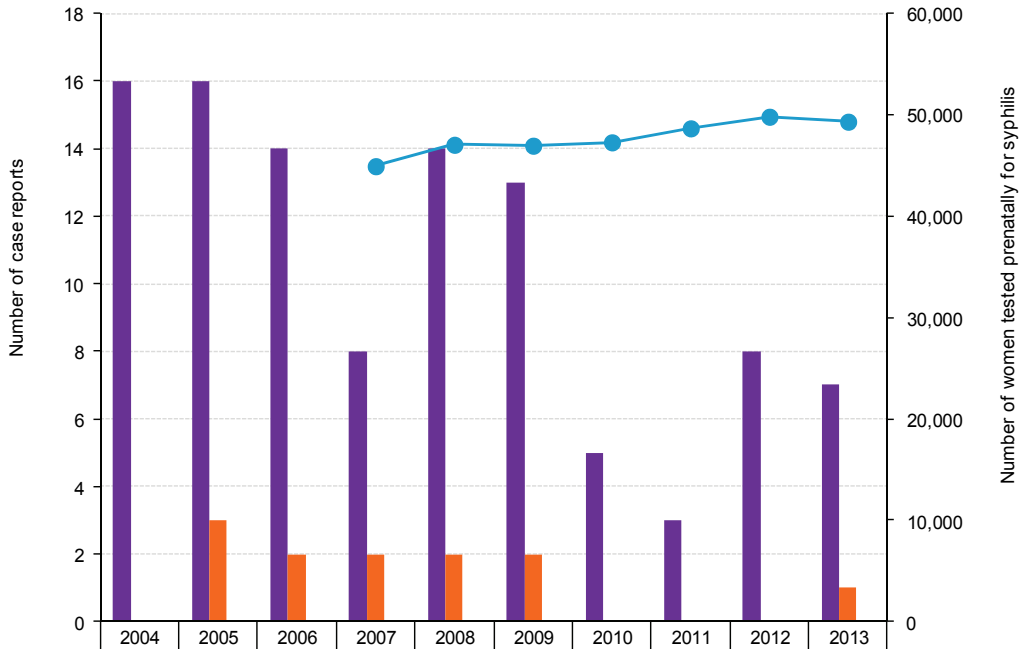
* Neurosyphilis is not mutually exclusive from other stages of syphilis infection (i.e., primary, secondary and early latent)

Maternal and Early Congenital Syphilis

Infectious syphilis acquired prior to or during pregnancy can be passed from a mother to her 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 2013, 49,319 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 was one case of early congenital syphilis identified in BC in 2013 (Figure 44). In 2013, seven maternal syphilis cases were reported whereas eight maternal syphilis cases were reported in 2012.

44. Maternal and early congenital syphilis case reports in BC, 2004 to 2013*



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Reports - Maternal	16	16	14	8	14	13	5	3	8	7
Reports - Early Congenital	0	3	2	2	2	2	0	0	0	1
Rate ** - Early Congenital	0.0	7.4	4.8	4.6	4.5	4.5	0.0	0.0	0.0	
Total number of syphilis prenatal tests				44,929	47,038	46,952	47,285	48,662	49,810	49,319

* 2013 early congenital rate is not available
** Rate per 100,000 live births

Endnotes

[1] Reference to the increase in chlamydia infections in high income countries around the world see: European Centre for Disease Prevention and Control. (February 2014). Chlamydia control in Europe: literature review. Retrieved from http://www.ecdc.europa.eu/en/publications/Publications/chlamydia-control-europe.pdf

[2] Reference to the increase in chlamydia infections in high income countries around the world see: Centers for Disease Control and Prevention. (January 2014). Sexually transmitted disease surveillance 2012. Retrieved from http://www.cdc.gov/std/stats12/Surv2012.pdf

[3] Reference to the "arrested immunity" hypothesis: Brunham RC, Rekart ML. (January 2008). The arrested immunity hypothesis and the epidemiology of chlamydia control. *Sexually Transmitted Diseases, 35*(1), 53-54.

[4] Reference to the "arrested immunity" hypothesis: Rekart ML, Gilbert M, Meza R, Kim PH, Chang M, Money DM, Brunham RC. (2012). Chlamydia public health programs and the epidemiology of pelvic inflammatory disease and ectopic pregnancy. *Journal of Infectious Diseases,* advance access published October 24, 2012. Retrieved from http://jid.oxfordjournals.org/content/early/2012/10/24/infdis.jis644.full.pdf?keytype=ref&ijkey=y7YveY9ycdjbCr2

[5] Reference to increase in lymphogranuloma venereum (LGV) in Europe: Nieuwenhuis RF, Ossewaarde JM, Gotz HM, Dees J, Thio HB, Thomeer MGJ, den Hollander JC, Neumann MHA, van der Meijden WI. (2004). Resurgence of Lymphogranuloma venereum in Western Europe: an outbreak of Chlamydia trachomatis serovar L2 proctitis in the Netherlands among men who have sex with men. *Clinical Infectious Diseases*, *39*(7), 996-1003. Retrieved from http://cid.oxfordjournals.org/content/39/7/996.full.pdf+html

[6] For information about the increase in lymphogranuloma venereum (LGV) in US: Schachter J, Moncada J. (June 2005). Lymphogranuloma venereum: how to turn an endemic disease into an outbreak of a new disease? Start looking. *Sexually Transmitted Diseases, 32*(6), 331-332. Retrieved from http://journals.lww.com/stdjournal/Citation/2005/06000/Lymphogranuloma_Venereum__How_to_Turn_an_Endemic.1.aspx

[7] For more information about lymphogranuloma venereum (LGV) in BC: BC Centre for Disease Control. (2012, March). Lymphogranuloma venereum in British Columbia, 2004 to 2011. Retrieved from http://www.bccdc.ca/NR/rdonlyres/27E4F543-7D0E-417B-AF41-AEB262776FC3/0/STI_Reports_LGVinBC_20120404.pdf

[8] Reference to the increase in gonorrhea infections among MSM in other jurisdictions: Public Health England. (17 June 2014). Sexually transmitted infections and chlamydia screening in England, 2013. Health Protection Report, 8(24). Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/345181/Volume_8_number_24_hpr2414_AA_stis.pdf

[9] Reference to the increase in gonorrhea infections among MSM in other jurisdictions: Wolitski RJ, Fenton KA. (2011). Sexual health, HIV, and sexually transmitted infections among gay, bisexual, and other men who have sex with men in the United States. AIDS and Behavior, 15 Suppl 1:S9-17.

[10] For more information about the Canadian treatment guidelines for gonorrhea: Public Health Agency of Canada website http://www.phac-aspc.gc.ca/std-mts/sti-its/cgsti-ldcits/section-5-6-eng.php

[11] Reference to international surveillance data that suggests susceptibility of gonorrhea to cephalosporin treatments is threatened: Unemo M, Golparian D, syversen G, Vestrheim DF, Moi H. (25 November 2010). Two cases of verified clinical failures using internationally recommended first-line cefixime for gonorrhoea treatment, Norway, 2010. Euro Surveillance, 15(47). Retrieved from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19721

[12] Reference to international surveillance data that suggests susceptibility of gonorrhea to cephalosporin treatments is threatened: Yokoi S, Deguchi T, Ozawa T, Yasuda M, Ito S, Kubota Y, et al. (August 2007). Threat to cefixime treatment for gonorrhea. Emerging Infectious Diseases, 13(8), 1275-1277. Retrieved from: http://wwwnc.cdc.gov/eid/content/13/8/pdfs/v13-n8.pdf

[13] 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.

[14] The US Centers for Disease Control and Prevention (CDC) has proposed MIC ≥2 µg/mL as the non-susceptible threshold for azithromycin.

[15] Reference to the declines in pelvic inflammatory disease and ectopic pregnancy as chlamydia rates are steadily increasing: see Endnote #3.

[16] BC Stats. Census Statistical Profiles of Aboriginal Peoples, 2006. Retrieved from http://www.bcstats.gov.bc.ca/statisticsbysubject/AboriginalPeoples/CensusProfiles.aspx

[17] See Endnote #16

[18] Reference to the increase in infectious syphilis cases among MSM: US Center for Disease Control, 2011. Retrieved from http://www.cdc.gov/std/stats11/syphilis.htm

[19] Reference to the increase in infectious syphilis cases among MSM: Savage EJ, Hughes G, Ison C, Lowndes CM, the European Surveillance of Sexually Transmitted Infections (ESSTI) network. (November 2009). Syphilis and gonorrhea in men who have sex with men: a European overview. *Euro Surveillance,* 14(47). Retrieved from http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19417

[20] Reference to the increase in infectious syphilis cases among MSM: Public Health Agency of Canada. (2009). Executive Summary - Report on sexually transmitted infections in Canada: 2009. Retrieved from http://www.phac-aspc.gc.ca/sti-its-surv-epi/sum-som-eng.php

[21] For more information about the increase in infectious syphilis among MSM: BC Centre for Disease Control. (2013, June). Infectious syphilis among gay, bisexual and other men who have sex with men in British Columbia, 2003-2012. Retrieved from http://www.bccdc.ca/NR/rdonlyres/B917A2F2-54C5-4691-8015-4F80538CAC1E/0/CPS_Report_Infectious_Syphilis_MSMBC_20032012_20130624.pdf

[22] 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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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 venereum 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 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 (i.e., 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, mucous lesions, condyloma lata, alopecia, meningitis, headaches, uveitis, retinitis, or 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[22] 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 (i.e., 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 health 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.

Extra-genital chlamydia and gonorrhea data presented in this report differ from previous reports as a chart review was undertaken for each extra-genital case report. Some of these extra-genital case reports were misclassified and have now been corrected.

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. These data include 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)

BC Public Health Microbiology & Reference Laboratory located at BCCDC

The BC Public Health Microbiology & Reference Laboratory (BCPHMRL) 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 BCPHMRL, 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 BCPHMRL 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. 2013 Population Estimates and Projections released by BC Stats, BC Ministry of Labour and Citizens' Services.

First Nations Population Estimates

Population rates for First Nations people are calculated using estimates from Aboriginal Affairs and Northern Development Canada (AANDC, formerly INAC: http://www.aadnc-aandc.gc.ca/).

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, 2012*. Aboriginal Affairs and Northern Development Canada.

Live Births

Perinatal rates are calculated using live births data from the BC Vital Statistics Agency (http://www.vs.gov.bc.ca/stats/annual/2011/index.html).

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 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
Aboriginal*	First Nations, Inuit, Métis
Arab/West Asian	Aremnian, 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
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

* For infectious syphilis, enhanced case report forms have not included response categories for Inuit or Métis. On this basis, some Métis individuals may have been incorrectly described as First Nations in these surveillance data. Revisions to reporting forms are underway to correct this issue.

Exposure Group Hierarchy

Cases may have more than one type of sexual exposure. The following are definitions of sexual exposures used in this 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.