BC Centre for Disease Control

Infectious Syphilis among gay, bisexual and other men who have sex with men in British Columbia

2003 to 2012

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Executive Summary

Background
Infectious syphilis rates in British Columbia—as elsewhere in North America—have increased over the past fifteen years. Apart from an intermittent period of decline in 2009-2010, this increase has been steady, and in 2012 rates reached 8 per 100,000, the highest rate in more than thirty years. Since 2004, the majority of cases have been gay, bisexual, and other men who have sex with men (MSM), more than half of whom are known to be HIV-positive. In this context, we sought to examine trends, and epidemiological and clinical characteristics of MSM diagnosed with infectious syphilis in BC during the past ten years.

Methods
Syphilis cases in BC are followed centrally through the BC Centre for Disease Control in Vancouver. Surveillance records were reviewed for all infectious syphilis (primary, secondary, or early latent stage) case reports among MSM residing in BC and diagnosed between August 1, 2003 and June 31, 2012. The recent epidemic was divided into three phases (the initial rise in MSM cases from 2003 to 2008, the period of decrease from 2008 to 2011, and the subsequent period of increase), and characteristics were compared across these three phases. Cases were also compared by known HIV sero-status at time of syphilis diagnosis.

Results
Of the 1415 infectious syphilis cases among MSM between August 2003 and June 2012:

- Cases spanned a wide range of ages with a median age of 41 years.
- Two-thirds of cases were white, 7% Asian, and 6% Latino.
- Eighty-one percent resided in the Vancouver Coastal health region.
- Half were diagnosed by a private physician, half in an asymptomatic (early latent) stage of infection, and 55% were known to be HIV-positive.
- Four percent were diagnosed with neurosyphilis at the time of infectious syphilis diagnosis.
- Fifteen percent of individuals had more than one infectious syphilis diagnosis during the period of analysis.
- Few differences were observed across the three epidemic phases; the percentage of cases diagnosed in the early latent stage increased over time, from 46% in Phase 1 to 54% in Phase 3.
- HIV-positive cases were more likely than HIV-negative cases to be diagnosed by a private physician, and HIV-positive individuals experienced higher rates of re-diagnosis (21% versus 7% of HIV-negative men)
- Among named sexual partners with a recorded test result, 21% were positive for syphilis.

Discussion
The current syphilis epidemic in BC is concentrated among gay, bisexual, and other MSM living predominantly in the Lower Mainland, many of whom are HIV-positive. The rate of neurosyphilis was high, even at early (infectious) stages of infection; serious outcomes can be prevented through earlier testing and treatment. There were few differences in characteristics of cases across epidemic phases, suggesting recent fluctuations in trends are part of a single ongoing epidemic rather than distinct outbreaks.

Public health actions supported by the epidemiology of infectious syphilis in BC described here include the following: increasing the frequency of syphilis screening among sexually active MSM, including HIV-positive men; continuing to support and enhance partner notification methods for men diagnosed with syphilis; working with private physicians, particularly those diagnosing a large number of cases; raising awareness of the epidemic within the community of gay and bisexual men in Greater Vancouver; and continuing research and evaluation to identify and work with core groups of MSM experiencing high rates of HIV and STI, including syphilis.

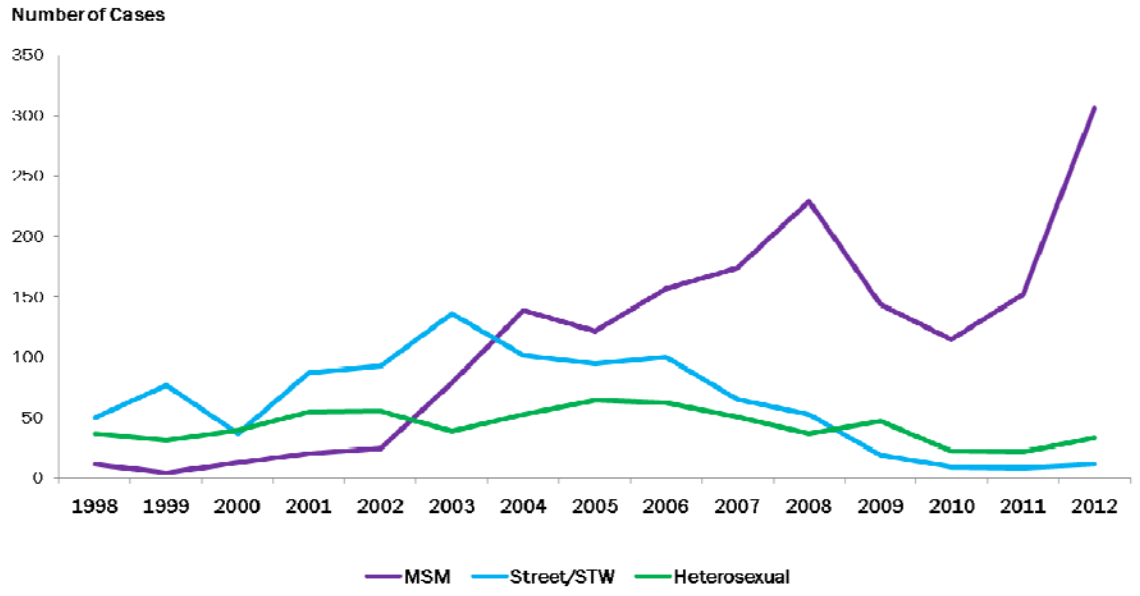
Background

From 1988 to 1998 infectious syphilis rates in BC remained below 2 per 100,000 population. Cases began to increase in 1997, initially in street involved persons (e.g., sex trade workers and their patrons, as well as persons with unstable housing), and after 2003 among gay, bisexual, and other men who have sex with men (MSM). By 2006, BC had a rate nearly double that of Canada (7.8 cases per 100,000 population as compared with 4.0 per 100,000).[1] The rate of infectious syphilis dropped in 2009-2010 and then increased again in 2011-2012, reaching the highest rate in over 30 years (8.0 per 100,000 in 2012). Since 2004, MSM have constituted the majority of infectious syphilis cases, with the recent increase occurring almost exclusively among this group (Figure 1).

The increase in infectious syphilis among MSM is concerning and warrants careful investigation. While the number of syphilis tests ordered in BC has increased over time, this trend has been steady (including during the trough in 2009-10), and has applied to a general population (including both men and women). The proportion of testing among gay and bisexual men is unknown. Furthermore, there have been no known changes in laboratory (e.g., new assays) or reporting practices that would explain this trend. Increases in case reports have been observed for all stages of infection, including symptomatic (primary and secondary). Thus, increased screening is ultimately unlikely to be the sole explanation for the rise in cases. The recent decrease (2009-10) and subsequent increase (ongoing) are also noteworthy. Central to an effective response is the question of whether this pattern is oscillation within the existing provincial syphilis epidemic, or rather a new outbreak (e.g., among a newly susceptible group of MSM).

HIV status is an important consideration in understanding the epidemiology of sexually transmitted infections (STI) among MSM in BC. HIV co-infection has been historically high among MSM diagnosed with syphilis in BC [1,2], and over 60% of all persons newly diagnosed with HIV in BC are gay, bisexual, or other MSM.[3] A previously published analysis of syphilis cases in BC revealed that MSM and HIV positive individuals were both significantly more likely to be diagnosed with repeat syphilis infections.[2] A similar epidemiologic profile was observed in the recent Lymphogranuloma venereum (LGV) epidemic. LGV emerged in BC in 2005; all of the 31 cases in 2005-2011 were MSM, and 73% were co-infected with HIV.[1]

Figure 1: Infectious syphilis case reports in BC by exposure category, 1998-2012



MSM: gay, bisexual, two-spirit, and other men who have sex with men. Street/STW: Includes sex trade workers, patrons of sex trade workers, individuals with housing insecurity (i.e. transient housing, homeless, no fixed address, living on the street).

Objectives

The goal of this report is to summarize provincial infectious syphilis surveillance data in order to inform public health action and identify additional areas for enhanced analysis and evaluation. The primary objectives of the present report are to:

- Describe overall trends and characteristics of infectious syphilis cases among MSM in BC; and,
- Compare characteristics of recent MSM cases to earlier periods within the epidemic.

In addition, we sought to:

- Compare HIV-positive and HIV-negative MSM diagnosed with syphilis in order to identify any distinct needs with regard to prevention, diagnosis, screening, or other public health measures for these groups of men;
- Estimate rates of syphilis re-diagnosis; and,
- Review syphilis test/diagnosis outcomes among sexual partners of syphilis cases.

Methods

Case finding and data collection:

The majority of screening and 100% of confirmatory syphilis serologic tests in BC are performed at the BC Public Health Microbiology and Reference Laboratory (PHMRL). All reactive results are reported to the Clinical Prevention Services (CPS) Division at BCCDC, where staff ensure appropriate clinical management and offer support for partner notification and testing. As part of this follow-up, enhanced surveillance forms are completed for all infectious syphilis cases, and the information collected is stored in the provincial STI Information System (STIIS) and adjunct databases, which were the primary sources of data for this analysis. Information routinely collected and stored in STIIS includes: disease staging, date of test, basic demographics (age at time of diagnosis, gender, region of residence), exposure category, clinic where diagnosed, and partner notification outcomes (i.e., whether notified and tested). For cases tested at a BCCDC clinic—which uses STIIS for clinical charting—we additionally ascertained whether the case was tested as a result of partner notification (i.e., partner with infectious syphilis). We relied upon a central work-list used by CPS staff for case management to examine ethnicity and HIV status at the time of syphilis diagnosis and to verify exposure category information from STIIS. Where HIV status was not routinely captured (e.g., earlier in the period of analysis) STIIS chart reviews were conducted to supplement the information from the central work-list.

Inclusion criteria:

All cases of infectious syphilis among MSM (based on self-identification as gay or bisexual, or males naming male sexual contacts) who were diagnosed and residing in BC between August 1, 2003 and June 31, 2012 (nine years) were included for this analysis.

Case definitions:

1. Infectious syphilis: Infectious stages were defined as those classified as primary, secondary, and early latent (including probable and confirmed) based on provincial surveillance case definitions (see Appendix).
2. HIV status: An individual with known HIV status had either a documented HIV laboratory result or self-reported HIV status noted in STIIS or central work-list. Cases were considered to have an unknown HIV status at time of diagnosis if they had no documented HIV test result or a documented negative HIV test more than three months prior to syphilis diagnosis.
3. Re-diagnosis: Consistent with previous analyses[3] individuals were considered to have a re-diagnosis if they had ≥ 2 infectious syphilis diagnoses within the study period, at least six weeks apart and with evidence of adequate treatment after the earlier diagnosis (defined by stage of infection as per Canadian STI Guidelines 2010)[4].

Analysis:

Data extracted from STIIS and the central work-list were analyzed descriptively. Comparisons between groups were conducted in SAS using Pearson's Chi-square and Fishers Exact test (categorical data) or t-test (continuous data), with $p<0.05$ considered statistically significant, though emphasis was placed on the magnitude of difference when interpreting results. With the exception of re-diagnosis analysis, data were analyzed on a per-episode basis (i.e., persons with multiple diagnoses of infectious syphilis contributed separate data for each episode).

We conducted five analyses corresponding to the objectives above:

A. **Description of the characteristics of MSM infectious syphilis cases over the entire study period.**
B. **Comparison of characteristics of MSM infectious syphilis cases by epidemic phase.** The study period was divided into three phases based on inspection of monthly case counts and general trends of epidemic growth and decline (summarized by quarter in Figure 2). Phase 1 began August 1, 2003 and encompassed the initial rise of cases to a peak in March 31, 2008. Phase 2 was the intervening period when cases declined (April 1, 2008 to February 29, 2011). Phase 3 includes the current period of increase (March 1, 2011 to June 30, 2012).
C. **Comparison of the characteristics of HIV negative MSM cases to HIV positive MSM cases.** For this analysis, cases having unknown HIV status were excluded.
D. **Estimation of rate of re-diagnosis among unique MSM individuals.** Analyses looking at re-diagnosis were based on unique individuals over the study period (not episodes). For this analysis, 33 cases diagnosed after May 15, 2012 (i.e., within six weeks of the end of the study period) were excluded as they did not have opportunity for re-diagnosis. Cases were matched based on STIIS chart number and name. For individuals with repeat diagnosis within the study period, chart reviews were conducted to determine documentation of a syphilis diagnosis prior to August 2003.
E. **Description of partner notification outcomes of MSM with infectious syphilis.** The number of contacts per case was calculated using the stated number of contacts, or sum of known contact outcomes, if greater. The look-back period for public health contact notification is determined by stage of syphilis infection (3 months for primary, 6 months for secondary, 12 months for early latent). The positivity of contacts was calculated using the number of contacts who tested positive for syphilis divided by the number of contacts who were tested for syphilis.

Findings

A. Characteristics of infectious syphilis among MSM in BC, 2003-2012

Key socio-demographic and clinical characteristics of the 1415 infectious syphilis cases among MSM in BC over this time period are shown in Table 1, with stratification by epidemic phase. Overall, cases spanned a wide age range with a mean and median age of 41 years (inter-quartile range: 32-47). Two-thirds of cases were white, 7% Asian, and 6% Latino. Eighty-one percent lived in the Vancouver Coastal health region. Half were diagnosed by a private physician and one third by BCCDC clinics. Approximately half were diagnosed at an asymptomatic (early latent) stage. Four percent were co-diagnosed with neurosyphilis, and 55% were known to be HIV-positive. Of those diagnosed at BCCDC clinics, 25% were known to be a contact to a syphilis case.

B. Characteristics of MSM across epidemic phases

Of the socio-demographic characteristics examined, only region differed significantly across the three phases, with slightly more cases residing outside the Vancouver Coastal health region in Phases 2 and 3 . Among clinical characteristics, only stage of diagnosis and HIV status were statistically significant. An increasing proportion of cases were diagnosed in the early latent stage over the course of the epidemic (Figure 3). Ascertainment of HIV status improved in more recent phases, as shown in Table 1. Restricting to only those with known HIV status, a non-linear trend over time was observed (Figure 4): 62% of those cases in Phase 1, 56% in Phase 2, and 61% in Phase 3 were HIV-positive. While statistically significant, the proportions in Phases 2 and 3 were consistent with the historical range.

Figure 2: Distribution of infectious syphilis cases among MSM by phase

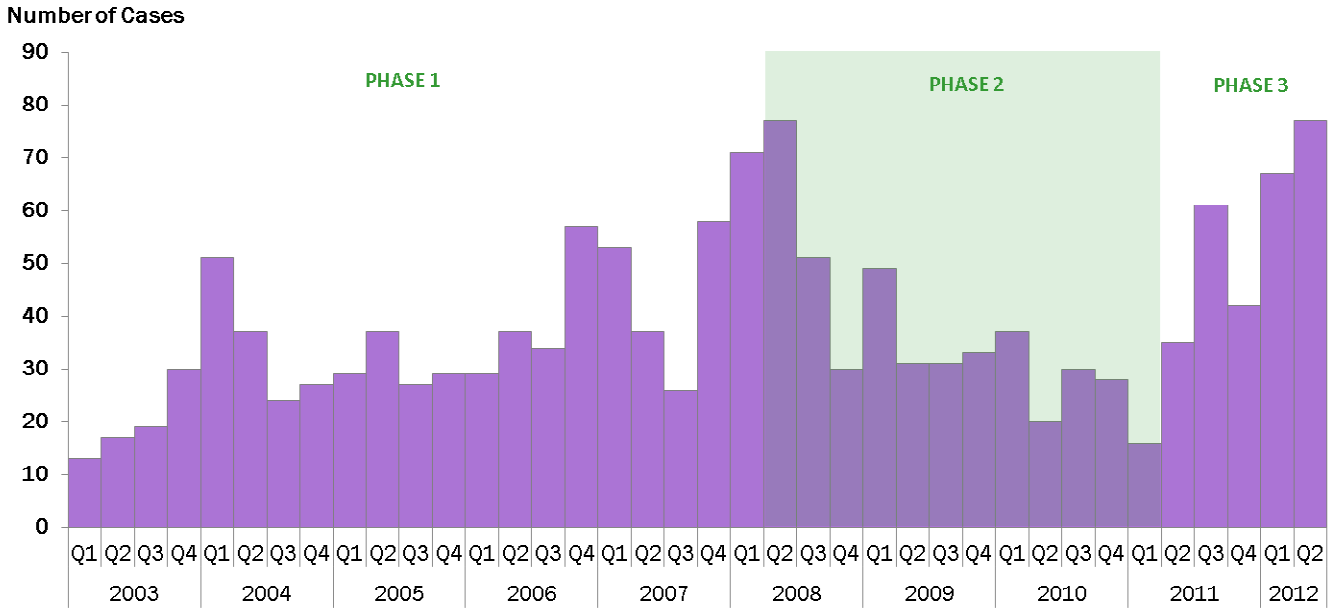


Table 1: Characteristics of infectious syphilis cases among MSM in BC, 2003-2012

Characteristic		*Analysis A*	*Analysis B*			
		Overall *(n=1415)*	**Phase 1** *(n=700)*	**Phase 2** *(n=429)*	**Phase 3** *(n=286)*	*p value*
Age	Mean (range)	40.5 (17,81)	40.2 (17, 81)	40.0 (17, 82)	41.9 (18, 78)	0.06
Ethnicity	White	951 (67%)	471 (67%)	285 (66%)	195 (68%)	0.07
	Asian	103 (7%)	52 (7%)	32 (7%)	19 (7%)	
	Latino/Hispanic	87 (6%)	34 (5%)	29 (7%)	24 (8%)	
	South Asian	37 (3%)	15 (2%)	10 (2%)	12 (4%)	
	Aboriginal	36 (3%)	14 (2%)	15 (3%)	7 (2%)	
	Other*	45 (3%)	21 (3%)	18 (4%)	6 (2%)	
	Unknown	156 (11%)	93 (13%)	40 (9%)	23 (8%)	
Region of residence	Vancouver Coastal	1147 (81%)	587 (84%)	336 (78%)	224 (78%)	0.03
	Other HA	268 (19%)	113 (16%)	93 (22%)	62 (22%)	
Testing provider	Private Physician	724 (51%)	365 (52%)	222 (52%)	137 (48%)	0.16
	BCCDC clinic	459 (32%)	229 (33%)	138 (32%)	92 (32%)	
	Public Health/CHC	184 (13%)	78 (11%)	58 (14%)	48 (17%)	
	Hospital	39 (3%)	20 (3%)	11 (3%)	8 (3%)	
	Other	9 (1%)	8 (1%)	0 (0%)	1 (0.3%)	
Stage	Primary	298 (21%)	144 (21%)	78 (18%)	76 (27%)	<0.01
	Secondary	466 (33%)	270 (39%)	141 (33%)	55 (19%)	
	Early Latent	651 (46%)	286 (41%)	210 (49%)	155 (54%)	
Neurosyphilis (at diagnosis)		63 (4%)	35 (5%)	17 (4%)	11 (4%)	0.61
HIV status	HIV-positive	783 (55%)	389 (56%)	234 (55%)	160 (56%)	<0.01
	HIV-negative	473 (33%)	189 (27%)	181 (42%)	103 (36%)	
	Unknown	159 (11%)	122 (17%)	14 (3%)	23 (8%)	
Known contact to syphilis case†	Yes	111 (8%)	61 (9%)	35 (8%)	15 (5%)	0.31
	No	332 (24%)	156 (22%)	100 (23%)	76 (27%)	
	Unknown	972 (69%)	483 (69%)	294 (69%)	195 (68%)	

Phase 1: Aug 1 ,2003 to Mar 31, 2008. Phase 2: Apr 1, 2008 to Feb 29, 2011. Phase 3: Mar 1, 2011 to Jun 30, 2012. HA: health authority; CHC: community health centre; * Includes Arab, Black, and other. † Based on reason for testing, known for cases tested through BCCDC clinics only.

Figure 3: Proportion of infectious syphilis cases diagnosed in early latent stage of infection, MSM, BC, 2003-2012

Figure 4: Proportion of infectious syphilis cases known to be HIV positive at diagnosis (excluding those with unknown HIV status), MSM, BC, 2003-2012

C. Comparison of HIV-positive and HIV-negative men

Comparisons of socio-demographic characteristics between HIV-positive (55% of cases) and HIV-negative cases (33%) (excluding those with unknown HIV status, 11%) revealed several statistically significant differences, though these were generally small in magnitude (Table 2). HIV-positive cases were slightly older and more likely to be white and to reside in the Vancouver Coastal health region. A comparison of number of sex partners (not shown due to limited data completion) showed no statistically significant difference between HIV-positive and negative cases. Condom use was measured for only 320 of the 459 cases diagnosed at BCCDC clinics; 27% of these cases reported consistently using condoms for anal sex, and consistent condom use increased over time (22% in Phase 1 to 34% in Phase 3) for both HIV-positive and HIV-negative men.

Larger differences were observed in clinical characteristics between HIV-positive and HIV-negative cases. HIV-positive cases were much more likely to be diagnosed with syphilis by a private physician (61% versus 36%) and more likely to be diagnosed in the early latent stage of infection (49% versus 44%). Rates of neurosyphilis co-diagnosis were comparable between HIV-positive and HIV-negative cases. Restricting to those cases diagnosed at BCCDC clinics (n=142 HIV-positive cases; n=217 HIV-negative cases), HIV-positive cases were more likely to be a known contact to syphilis at time of testing (49/142, 35% versus 44/217, 20%; $p<0.01$).

Table 2: Comparison of infectious syphilis cases among MSM in BC by HIV status, 2003-2012

Characteristic		Analysis C		
		HIV positive (n=783)	HIV negative (n=473)	P value
Age	Mean (range)	42.3 (21, 69)	38.1 (17, 78)	<0.01
Ethnicity	White	572 (73%)	322 (68%)	
	Asian	61 (8%)	32 (7%)	
	Latino/Hispanic	47 (6%)	30 (6%)	
	South Asian	18 (2%)	15 (3%)	
	Aboriginal	25 (3%)	8 (2%)	
	Other*	24 (3%)	27 (6%)	
	Unknown	36 (5%)	39 (8%)	
Region of residence	Vancouver Coastal	656 (84%)	355 (75%)	<0.01
	Other HA	127 (16%)	118 (25%)	
Testing provider	Private Physician	480 (61%)	168 (36%)	<0.01
	BCCDC clinic	186 (24%)	216 (46%)	
	Public Health/CHC	77 (10%)	85 (18%)	
	Hospital	36 (5%)	1 (0.2%)	
	Other	4 (1%)	3 (1%)	
Stage	Primary	130 (17%)	128 (27%)	<0.01
	Secondary	268 (34%)	138 (29%)	
	Early Latent	385 (49%)	207 (44%)	
Neurosyphilis (at diagnosis)		42 (5%)	18 (4%)	0.21
Known contact to syphilis case†	Yes	49 (6%)	44 (9%)	
	No	93 (12%)	173 (37%)	
	Unknown	666 (85%)	256 (54%)	
Re-diagnosis‡		121 (21%)	29 (7%)	<0.01
Number of diagnoses	Mean (range)	2.3 (2, 6)	2.0 (2, 3)	0.09

HA: health authority; CHC: community health centre; * Includes Arab, Black, and other. † Based on reason for testing, known for cases tested through BCCDC clinics only. ‡ Percentage of re-diagnosis is based on individuals, not episodes (HIV positive: n=583; HIV negative: n=446).

D. Rate of infectious syphilis re-diagnosis among individual MSM

Overall, 15% (173/1171) of individuals had more than one diagnosis of infectious syphilis during the period of study. Among the individuals with multiple diagnoses, 79% (137/173) had 2 diagnoses, 15% (26/173) had 3 diagnoses, and 6% (10/173) had 4-6 diagnoses. Of those with more than one syphilis diagnosis during 2003-2012, 13% (22/173) also had a syphilis diagnosis on record prior to the start of the study period (August 1, 2003). The average time between first and second diagnoses was 27.5 months, and the average time between second and third diagnoses was 25.4 months. Individuals who were known to be HIV-positive at any time 2003-2012 were more likely to have an infectious syphilis re-diagnosis during this period than HIV-negative men (21% versus 7%; see Table 2).

E. Outcomes among sexual partners of syphilis cases

Of the 1415 cases of infectious syphilis among MSM, 81% (1152) provided contact information about sexual partners, resulting in 6751 total named contacts, or on average 5.9 contacts per case. Twenty-one percent of cases (301/1415) named contacts who resided outside of BC. Among the 6751 named contacts, 64% (4315/6751) had insufficient information for public health to notify them of exposure (i.e., first name only, wrong telephone number, or online profile name only). Of the 35% (2436/6751) who were notified, 62% (1499/2436) had a documented syphilis test in STIIS, of which 21% (318/1499) were positive. The remaining 38% were treated and not tested or were tested at a non-BCCDC clinic. There were no significant differences in average number of contacts, proportion tested, or contact positivity between the three epidemic phases or between HIV-positive and HIV-negative cases.

Discussion

The current (post-2003) syphilis epidemic in British Columbia is concentrated among gay, bisexual, and other MSM living predominantly in the Lower Mainland, many of whom are HIV-positive. Infectious syphilis cases among MSM in BC have demonstrated a general increasing trend since 2003, and after a two-year intervening period of decline have increased substantially in 2011-2012, reaching historically high levels. Serious outcomes—i.e., neurosyphilis—were common, even at early (infectious) stages of infection, and can be prevented by earlier diagnosis and treatment.

MSM diagnosed with syphilis during this period were ethnically diverse; the most common ethnic identifications were white (67%), Asian (7%), and Latino (6%). This epidemiological profile is comparable to that for MSM recently diagnosed with HIV in the province[3], and as with HIV, Latino men are over-represented in the syphilis epidemic, given that Latin American persons comprise only 0.7% of the BC population.[5] MSM syphilis cases were on average 41 years old, and 50% of cases were between 32 and 47 years; however, cases ranged from 17 to 81 years of age.

The infectious syphilis epidemiology and trends in BC described here are mirrored in many jurisdictions throughout North America and other high-income settings globally (including parts of Europe, South America, Australia, and New Zealand). Across Canada and the US, syphilis is highly concentrated among MSM and predominantly in urban/metropolitan settings. Co-infection with HIV is also common, typically ranging 30-60% in these other settings with MSM epidemics. No jurisdictions that we are aware of have sustained a decrease of syphilis cases among MSM in the past decade. [6-18]

Almost half of the cases in BC were diagnosed at an asymptomatic (early latent) stage of infection, and this proportion increased steadily over the past 10 years. This figure is notably higher than the proportion reported in MSM epidemics in San Francisco and England, where an estimated 20-30% of cases were diagnosed in early latent stage. [17,18] Because early latent is an asymptomatic stage, these cases largely reflect those tested as a result of routine screening or being named as a contact to a case. Routine

screening (every 3-4 months) has been shown to be a successful case-finding strategy; 33% of cases detected through routine screening in Netherlands MSM clinic were asymptomatic [19], and routine screening among HIV-positive clients resulted in an increase in the percent of syphilis cases detected (3% to 10%). [20]

Apart from a slight shift in region of residence, the increasing trend in early latent diagnoses (Figure 3), and "U"-shaped trend in HIV co-infection (Figure 4), we found no significant differences across the three epidemic phases. Several other health jurisdictions have also reported fluctuating infectious syphilis epidemics[7,12,21],and a similar study in San Francisco also found few differences between individuals diagnosed in separate phases of the epidemic.[17] This supports a hypothesis of one ongoing epidemic with periodic fluctuations rather than one of two separate outbreaks.

We compared HIV-positive cases with HIV-negative cases in order to determine whether there are distinct needs for these groups with regard to prevention, diagnosis, screening, follow-up/treatment, or other public health measures. While the socio-demographic characteristics showed statistically significant differences, these were small in magnitude. By contrast, some clinical features were substantially different between HIV-positive and negative men. Notably, 61% of HIV-positive cases—and 36% of HIV-negative cases—were diagnosed by a private physician, highlighting the importance of working with physicians in the community with regard to all aspects of epidemic response, particularly physicians providing HIV primary care. In particular, ensuring routine (quarterly) syphilis screening for these men engaged in care with a private physician is a current area of focus in BC.

Of concern, neurosyphilis co-diagnosis was high (4%) for both groups of men. Contrary to common misperception, neurosyphilis and other complications can occur early in the course of infection, often at the secondary stage [22]; this important fact is now being emphasized in communication to various stakeholders, including providers and the community affected. Some research has suggested that HIV-positive individuals with syphilis may have lower rates of serologic response than HIV-negative persons. [23-25] Given the potentially significant implications of these findings for treatment and follow-up of HIV-positive syphilis cases in BC, a more detailed study using retrospective case and laboratory data from BC is now underway.

The re-diagnosis rate in this analysis (15%) is markedly higher than that calculated in a previous analysis of BC data during an earlier period of the epidemic, 1995-2005 (6%), though the populations were different—the previous analysis at a time when the epidemic was predominantly occurring among heterosexual street-involved persons—and there may have also been differences in data quality and methods.[2] Other jurisdictions have reported increases in re-diagnosis rates. In California 8.6% of MSM had a re-diagnosis between 2000-2005 (75% of repeat cases were HIV positive) [26] and reports from San Francisco state that re-diagnosis rates increased from 6.6 % (2001-2001) to 24.9% (2007-2011)[27], with re-diagnosis more likely among HIV positive individuals. The high rate of re-diagnosis in our analysis highlights an opportunity for ongoing prevention strategies for people diagnosed with syphilis (as with other STI), and cases should be counseled to undergo frequent screening.

Contact follow-up is an important element of an effective syphilis response strategy, as evidenced by the 21% positivity among notified contacts known to be tested for syphilis in BC. By comparison, a study in the Netherlands reported contact positivity of 4-11%. [28] Providing names and phone numbers/email addresses to public health in BC is voluntary, and many cases choose to notify partners themselves (up to 65% of partners in the data reviewed here). In this context, new strategies for supporting partner notification are needed. It is increasingly common for MSM—and indeed, all sexually active people—to find partners using phone apps or internet sites. This presents obstacles to traditional partner notification both by public health and STI cases. Supplemental prevention strategies may include message banners on popular websites to highlight signs and symptoms of syphilis and encourage frequent testing. The large number of sexual contacts from outside of BC (21%) may further pose a barrier to partner notification activities. This figure also reminds us of the interconnectedness of the syphilis epidemic in BC with those in other parts of the world, as described earlier.

Explanations for the increasing trend in syphilis in BC—and elsewhere—remain largely hypothetical at this time and will require further study. Collectively, the data presented here suggest that the recent rise in syphilis rates in BC is concentrated in core sexual networks; this is substantiated by the high rate of HIV co-infection and the high rate of re-diagnosis. Thus, efforts to better characterize and identify this core group are needed. Analytical approaches may include description of STI and blood-borne virus co-infection (e.g., using the provincial gonorrhea, chlamydia, and hepatitis C databases), as well as spatial study .[29] While further evaluation of the decrease in cases during 2008-11 could prove informative in understanding the periods of increase, as noted above, this is a common feature to recent MSM epidemics across North America (Seattle, New York City, San Francisco, Toronto, Chicago), and some have suggested a natural and universal oscillation in syphilis trends, though this has been contested as an artifact of the time-span(s) of data used.[30,31] Lastly, in an era of HIV treatment expansion, some have questioned whether STI trends, including syphilis, are influenced by changes in condom use patterns as MSM incorporate new information regarding HIV viral load and risk of transmission.[32] While limited in quality and completion, syphilis surveillance data from BC do not demonstrate this (consistent condom use in fact increased during this period). Data from the provincial *Sex Now* survey likewise show no significant trend in condom-less anal sex among gay and bisexual men between 2008 and 2012.[33] Notably, syphilis is also transmitted through oral sex, for which condom use is low or negligible; in one analysis of MSM syphilis cases in Chicago, ≥20% of cases were attributed to oral sex.[34] Oral sex remains a common risk reduction strategy in the context of HIV; in recent Canadian survey data, while only ~50% of men reported anal sex at their last encounter, 90% reported oral sex. [33]

Syphilis control is important for public health as the consequences of untreated syphilis are severe. Additional and enhanced public health measures which are supported by the data in this report are many. The relatively high rate of early latent cases indicates that there is an ongoing need for more frequent screening. Public health focus should therefore be on targeted messaging and increased frequency of screening of MSM, an approach that has been demonstrated to be effective in mathematical modeling.[35] For HIV-positive individuals, incorporation of opt-out, routine syphilis testing reminders has been shown to increase testing rates.[36] While HIV co-infection is clearly an important aspect of the BC syphilis epidemic, 33% of cases were HIV-negative, and our analysis shows comparable socio-demographic profiles for HIV-positive and HIV-negative cases, suggesting that prevention messaging must be inclusive of men of both sero-status. Expansion of low barrier testing sites including testing in sex-on-site venues are possible strategies in facilitating testing. Further exploration of point-of-care tests for syphilis may be helpful, particularly for outreach settings such as these. Identifying and treating cases early may reduce onward transmission. It is common for MSM diagnosed with syphilis to have a large number of anonymous or casual partners,[17] and there is a need for innovative strategies to raise syphilis awareness and support frequent testing among all sexually active MSM, in addition to traditional approaches partner notification. Qualitative research, including interviews with men recently diagnosed with syphilis, may help to identify additional barriers to prevention and testing; in one study from England, interviews with MSM suggested that prevention efforts were limited by widely health beliefs that syphilis is 'rare' and 'dirty', leading many men to discount their risk for infection.[37] Numerous social marketing campaigns to increase awareness of and testing for syphilis among gay and bisexual men have been employed over the past decade in the UK and North America [38,39] ; however, these campaigns have had varying degrees of success, and none has been accompanied by sustained decreases in rates of syphilis. Lastly, with half of cases diagnosed by private physicians' offices, working with these partners is critical, for all areas of syphilis response.

Limitations

While syphilis cases in BC are followed through an active surveillance system, with thorough, centralized follow-up through the BCCDC, the data used in this report are as expected limited by some aspects common to all public health surveillance data:

- Cases analyzed include only those who were tested (and thus reported to BCCDC). We may expect there are more cases (largely asymptomatic) who will not be detected until tested or manifesting symptoms of infection.

- We may have included more repeat cases among HIV-positive MSM as they are more likely to undergo frequent syphilis screening with routine blood work.
- HIV-positivity may be underestimated. In earlier years it was not routine practice to include HIV status in electronic records, and clients often tested under different names or pseudonyms.
- Condom usage and information on how and where cases met their sexual partners is available for only a few cases which limits generalizability to all cases.
- Because much of the interview and discussion with cases are necessarily focused on treatment and partner follow-up, we are limited in the variables which can be collected. There may be other important characteristics of syphilis cases beyond the minimal socio-demographic and clinical descriptions presented here.

Next Steps

Ultimately, we may conclude that an effective response to the ongoing syphilis epidemic must be comprehensive and include multiple strategies in each of prevention, education & awareness-raising, screening, diagnosis, and treatment. The following actions in response to these findings are being explored in BC. Communications about the current syphilis epidemic, its epidemiology, and relevant messages about symptoms, testing, prevention, and treatment are ongoing, including with key clinical, public health, and community stakeholders across the province. Several approaches are being employed to increase testing and diagnosis among MSM, including provision of outreach (in-venue) testing, trial of rapid (point-of-care) testing, ensuring standing (routine) RPR screening orders for MSM engaged in care (especially HIV-positive men receiving routine blood work), and supporting frequent testing recommendations to MSM in BC. Next steps for enhanced evaluation and research include qualitative interviews with individuals recently diagnosed with syphilis, evaluation of RPR patterns following treatment (by HIV co-infection status and syphilis re-infection history) to further inform treatment and follow-up guidelines, and spatial/temporal cluster detection (pilot study).

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Appendix: BC Infectious Syphilis Cases Definitions

Primary syphilis (confirmed)

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 (e.g., four-fold or greater) increase in titre over the last known non-treponemal test

Secondary syphilis (confirmed)

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

Note: The possibility of a prozone reaction should be considered in individuals who are suspected of having secondary syphilis but whose non-treponemal test is non-reactive. Neurological symptoms may be present

Early latent syphilis (confirmed)

- An individual without symptoms of primary or secondary syphilis, and 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

Early latent syphilis (probable) Note: Only in use since March 2008

- An individual without symptoms of primary or secondary syphilis, and 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:
  - 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 at time of diagnosis