IN FOCUS

SYphilis AND HIV CO-INFECTION

Many countries, including Canada, have observed considerable changes in the epidemiology of infectious syphilis (i.e., primary, secondary, early latent, and infectious neurosyphilis) in the past 15 years, both with respect to both incidence and populations at-risk.\textsuperscript{1}\textsuperscript{4} Outbreaks of infectious syphilis, predominantly among men who have sex with men (MSM), have contributed to significant rate increases and sustained transmission of the disease in many jurisdictions across Canada.\textsuperscript{1} In Ontario, prior to 2002, the incidence of infectious syphilis was stable at <1.0 case per 100,000 population and the disease burden was approximately equal among men and women, indicating primarily heterosexual transmission (Figure 1). Between 2002 and 2004, however,
Outbreaks of infectious syphilis among MSM in both Toronto and Ottawa were associated with an almost 800% increase in the provincial incidence of the disease. In 2009, there was another substantial increase in reported cases, and since that time, an average annual incidence of 6.0 cases per 100,000 population has been sustained.

Figure 1. Reported number of cases and incidence of infectious syphilis: Ontario, 2000-2014

Of particular concern is the proportion of syphilis cases that are co-infected with HIV, and the potential synergistic effect of these two infections. Syphilis is known to increase the risk of acquiring HIV, particularly among those with ulcerative lesions in the genital tract. Furthermore, in those who are co-infected, syphilis significantly increases the HIV viral load which, in combination with other biological factors, results in increased infectiousness and transmissibility. Finally, syphilis-associated decreases in CD4 counts among co-infected individuals may influence the progression and severity of clinical illness, particularly with respect to the development of potentially life-threatening manifestations of tertiary syphilis, such as neurosyphilis.

Between 2002 and 2014, a total of 7,534 infectious syphilis cases was reported in Ontario; the majority (95.1%; 7,164/7,534) was male. Of all infectious syphilis cases, 40% (3,011/7,534) were co-infected with...
HIV (i.e., diagnosed with HIV prior to or within one year of their syphilis diagnosis). During this period, males accounted for all but three (3,008/3,011; 99.9%) of the co-infected cases and the proportion of males co-infected ranged from 34.8% to 47.3%. The mean age of the 3,008 males co-infected with infectious syphilis and HIV between 2002 and 2014 was 40.9 years (range: 18.7 to 72.0 years). Those aged 35-44 years accounted for 40.1% (1,206/3,008), of the co-infected cases, followed by those 45-54 years (25.8%; 775/3,008) and 25-34 years (23.5%; 708/3,008). The highest annual incidence rates were also consistently reported among those 35-44 years; in 2014, the incidence of infectious syphilis and HIV co-infection for this age group was 10.9 cases per 100,000 population (Figure 2). Overall, however, the greatest rate increases occurred among those aged 55-64 and 45-54 years who, between 2002 and 2014, observed a change of 1,712% and 1,304%, respectively.

**Figure 2. Reported incidence of infectious syphilis and HIV co-infection among males, by age group: Ontario, 2002-2014**

![Figure 2](image)

**Data source:** MOHLTC, integrated Public Health Information System (iPHIS) database, extracted by PHO [2015/07/10].

**Population data:** Population Estimates 1986-2013, MOHLTC, intelliHEALTH Ontario, extracted [2014/07/02].

Geographically, from 2002 to 2014 the vast majority (81.1%; 2,438/3,008) of these male HIV co-infected infectious syphilis cases were reported in Toronto, which accounted for, on average, 20.6% of the provincial population during this time. Ottawa contributed an additional 5.4% (162/3,008) of co-infected cases to the provincial total, and on average represented 6.8% of the provincial population over this period. The number of public health units (PHUs) reporting co-infected cases increased from six in 2002 to 21 in 2014, with 30 of the 36 PHUs in Ontario reporting syphilis and HIV co-infected cases over this
time period. This indicates that the geographic distribution of infectious syphilis and HIV co-infection in Ontario has become more widespread.

With respect to staging, males co-infected with both HIV and infectious syphilis were significantly more likely to have their syphilis diagnosed at a later stage compared to those without HIV. Between 2002 and 2014, 32.7% (983/3,008) of co-infected males were diagnosed with early latent syphilis, compared to 23.8% (990/4,156) of those without HIV (p<0.05). Similarly, 2.0% (59/3,008) of co-infected cases were diagnosed with infectious neurosyphilis, while the proportion among those not co-infected was 0.7% (29/4,156) (p<0.05). This may reflect the finding that individuals with HIV co-infection may develop manifestations of late stage (i.e., tertiary syphilis) more rapidly than those without HIV co-infection.7,8

Risk factor data for infectious syphilis cases reported in Ontario’s integrated Public Health Information System (iPHIS) are available from 2006 to 2014. Of the 5,732 infectious syphilis cases reported among males during this period, 5,193 (90.6%) recorded at least one risk factor; of these, 4,332 (83.4%) reported sex with same sex (i.e., MSM). This proportion was significantly higher for HIV co-infected males compared to males without HIV (89.6%; 2,030/2,265 vs. 78.6%; 2,302/2,928; p<0.05). Since 2006, among co-infected males with at least one reported risk factor, the proportion reporting sex with same sex has ranged from 76.8% to 92.2%. Since 2008 this proportion has remained at over 90%. Other reported risk factors among co-infected males included no condom use (50.3%; 1,139/2,265), multiple partners in the past six months (38.1%; 936/2,265) and attendance at a bathhouse (9.7%; 217/2,265).

Between 2006 and 2014, 89.6% (2,030/2,265) of co-infected males reporting at least one risk factor reported sex with same sex (i.e., MSM) while 10.4% (235/2,265) did not report this risk factor. Of those who reported as MSM, 1,620 (79.8%) reported at least one additional risk factor (i.e., a risk factor other than sex with same sex). Compared to those who did not report sex with same sex, MSM were significantly more likely to report no condom use (1,009/1,620 vs. 130/235; p<0.05) and multiple partners within the last six months (855/1,620 vs. 31/235; p<0.05). From 2006 to 2014, there was no statistically significant difference in the mean age of co-infected males who reported sex with same sex (mean 41.0 years, 95% confidence interval [CI]: 40.6-41.5 years) compared to those who did not report this risk factor (mean 41.4 years; 95% CI: 40.2-42.7 years).

Several factors have been suggested to account for the observed increase in HIV and infectious syphilis co-infection in the last decade, particularly among MSM. These include increases in unsafe sexual practices and behaviours such as unprotected oral and anal sex, serosorting, and the widespread use of the internet and smartphone applications for finding anonymous sex partners.10,11 However, surveillance data from iPHIS alone are not sufficient to assess the potential contributions of these social and behavioural factors to the epidemiology of syphilis, and syphilis and HIV co-infection, in the Ontario population.

Improving our understanding of the epidemiology of bacterial sexually transmitted infections (i.e., chlamydia, gonorrhea and infectious syphilis) in Canada, including transmission dynamics and risk factors, has been identified by experts as a research priority.12 This brief review suggests that opportunities exist to further explore and strengthen existing surveillance and research to better understand the epidemiology of syphilis and syphilis-HIV co-infection in Ontario and its implications for
public health action. An example of innovative research on syphilis and syphilis-HIV co-infection in Ontario is a recent spatial analysis of Toronto’s syphilis epidemic.\textsuperscript{13} The Ontario HIV Treatment Network Cohort Study is also contributing to our understanding of syphilis and HIV co-infection in Ontario. Further analyses are needed to better understand the complex dynamics of HIV and syphilis co-infection and transmission in MSM, to guide focused public health interventions for this population.
References


7. Fleming DT, Wasserheit JN. From epidemiological synergy to public health policy and practice: the contribution of other sexually transmitted diseases to sexual transmission of HIV infection. Sex Transm Inf. 1999;75:3-17.


SIGNIFICANT REPORTABLE DISEASE ACTIVITY

Table 1 provides a list of reportable diseases for which incidence in 2015 was found to be significantly higher (p<0.05) than expected, compared to the five-year historical average (2010-2014). Both monthly and year-to-month (YTM) comparisons were made for each of the reportable diseases listed in Appendix 1, with the exception of influenza, measles, rubella, and congenital rubella syndrome. Influenza surveillance data are regularly reported through the Ontario Respiratory Virus Bulletin and the Laboratory-based Respiratory Pathogen Surveillance Report. Measles, rubella, and congenital rubella syndrome have been eliminated in Canada, although cases continue to occur related to travel importations. Statistical comparisons are no longer included for these diseases.

Table 1. Summary of statistically significant increases in reportable disease incidence: Ontario, January 1 to July 31, 2015

<table>
<thead>
<tr>
<th>Reportable disease</th>
<th>2015</th>
<th>Historical comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jul</td>
<td>Jul</td>
</tr>
<tr>
<td></td>
<td>rate</td>
<td>YTM rate</td>
</tr>
<tr>
<td>Chlamydial Infections</td>
<td>3146</td>
<td>224.7</td>
</tr>
<tr>
<td>Cyclosporiasis</td>
<td>36</td>
<td>2.6</td>
</tr>
<tr>
<td>Gonorrhoea (All Types)</td>
<td>550</td>
<td>39.3</td>
</tr>
<tr>
<td>Pertussis (Whooping Cough)</td>
<td>73</td>
<td>5.2</td>
</tr>
</tbody>
</table>

Ontario Cases: MOHLTC, iPHIS database, extracted by PHO [2015/08/13].
† Rates listed are cases per 1,000,000 population.
† Percent (%) difference is calculated using unrounded rates; numbers displayed in these columns may vary from calculations using rounded rates.
† Statistically significant difference (p<0.05) in incidence reported in year-to-month (January 1 to July 31, 2015) compared to the five-year historical average (January 1 to July 31, 2010-2014), using a likelihood ratio test.
† Statistically significant difference (p<0.05) in incidence reported in current month (July 2015) compared to the five-year historical average (July 2010-2014), using a likelihood ratio test.

Cyclosporiasis

A statistically significant increase in the YTM incidence rate of Cyclosporiasis in Ontario, in comparison to the corresponding YTM historical five-year (2010-2014) average, has been reported up to and including the month of July. As of July 31, 2015, a total of 177 Cyclosporiasis cases has been reported in Ontario, with the majority reported in May (30 cases), June (91 cases), and July (36 cases). The increase in cases is due to an ongoing national outbreak of non-travel related Cyclosporiasis. As of September 9, a total of 94 outbreak-confirmed cases were reported nationally, of which 84 are from Ontario. Onset dates for outbreak-confirmed cases range from May 3 to August 8. To date, a source has not been identified.
Chlamydia

The monthly incidence of laboratory-confirmed chlamydial infections reported in July 2015 was significantly higher than the five-year (2010-2014) monthly historical average, increasing by 5.9% (from 212.1 to 224.7 cases per 1,000,000 population). This is the first statistically significant monthly increase in chlamydial infections reported since October 2014. PHO will continue to monitor the number of chlamydia infections in subsequent months to determine whether increases noted this month represent the continuation of a trend stretching back over a decade (with the exception of 2013).

Gonorrhea

Compared to the five-year historical averages, there were statistically significant increases in both the monthly and YTM incidence rates of gonorrhea reported in July 2015 and cumulatively from January 1 to July 31, 2015 (29.7% and 26.0%, respectively).

With the exception of January 2015, Ontario has experienced a statistically significant increase in the monthly and YTM incidence of gonorrhea since September 2013, compared to five-year historical averages. The cause of this ongoing provincial increase in reported gonorrhea cases is not yet well understood and is likely multifactorial. For a summary of the analyses conducted to-date, please refer to the Infectious Disease In Focus section of the February 2015 issue of this report. Also, to download the slides and/or audio recording of a recent PHO Rounds presentation on gonorrhea (May 2015), please click here.

Pertussis

Statistically significant increases in the monthly and YTM incidence of pertussis in Ontario, in comparison to corresponding monthly/YTM historical five-year averages, have been noted since May 2015, as identified in the July 2015 of this report. The July 2015 and August 2015 issues of this report provide an explanation for this observed increase in pertussis incidence in Ontario.
INFECTIOUS DISEASE ACTIVITY IN OTHER JURISDICTIONS

This section of the report provides a snapshot of current activity related to infectious diseases across Canada and/or globally. The items included in this section are selected based on ongoing or potential implications for public health in Ontario.

Current high profile infectious disease activity in other jurisdictions has been described in recent issues of this report. Please refer to the August 2014 issue for a review of the ebola outbreak in West Africa, and the October 2014 issue for a review of enterovirus D68.

RECENTLY DISCONTINUED ENHANCED SURVEILLANCE DIRECTIVES

Salmonella Enteritidis

On June 9, 2015 an Outbreak Investigation Coordinating Committee (OICC) was established by Public Health Agency of Canada (PHAC) and provincial and federal partners to investigate a cluster of Salmonella Enteritidis cases with the matching pulsed-field gel electrophoresis (PFGE) pattern SENXAI.0257. As the investigation progressed, an additional serotype (S. Berta) and additional PFGE patterns (SENXAI.0259 and SENXAI.0266) were added to the case definition. Fifty-one outbreak-confirmed cases were reported nationally. Outbreak-confirmed cases were reported from Ontario (35 cases), Quebec (12 cases), Nova Scotia (two cases) and Newfoundland (two cases). Episode dates for Ontario outbreak-confirmed cases range from January 15 to July 2, 2015. Frozen processed chicken products (e.g., chicken burgers, chicken nuggets, etc.) produced at Establishment 375 on January 22, 2015 were identified as a likely source of illness in this outbreak. On June 28, 2015, PHAC issued a public health notice regarding frozen raw breaded chicken. On July 1, 2015, CFIA and Establishment 374 issued a voluntary food recall warning for No Name and Compliments brand frozen raw breaded chicken products produced at Establishment 374 with an expiry date of January 22, 2016. The outbreak was declared over on August 6, 2015 and the Enhanced Surveillance Directive (ESD) was discontinued on August 7, 2015. Additional strategies are currently being considered to support initiatives to reduce the risk of Salmonella infection from frozen processed chicken products.
Appendix – Reportable Diseases

**Appendix 1.** Confirmed cases of reportable diseases, and probable cases of select reportable diseases, by month: Ontario, 2010-2015*

<table>
<thead>
<tr>
<th>Reportable disease</th>
<th>2015</th>
<th>Historical comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jan</td>
<td>Feb</td>
</tr>
<tr>
<td>Acute Flaccid Paralysis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>AIDs</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Meningococcal</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>Poliomyelitis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rubella</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Salmonellosis entérica</td>
<td>114</td>
<td>114</td>
</tr>
<tr>
<td>Salmonella Enteritidis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tobacco</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Typhoid Fever</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Typhoid Fever</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>YTM</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Reportable disease* data are based on the sum of confirmed and probable cases as reported in iPHIS.

**Ontario Cases:** MOHLTC, iPHIS database, extracted by PHO[2015/08/13].


**Column or row-specific notes:**
- Appendix 1 is not an exhaustive list of all reportable diseases in Ontario. Case counts for amebiasis, Lyme disease, mumps, pertussis, and West Nile Virus illness are based on the sum of confirmed and probable cases as reported in iPHIS.
- Rates listed are cases per 1,000,000 population.
- Percent (%) difference is calculated using unrounded rates; numbers displayed in these columns may vary from hand calculations using rounded rates.

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**Ontario Infectious Diseases Surveillance Report**

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# Historical comparison data are not provided for measles, rubella, and congenital rubella syndrome because these diseases have been eliminated in Canada. However, as these diseases remain endemic in other countries, imported and import-related cases continue to occur in Ontario.

n/a Acute Flaccid Paralysis and Paralytic Shellfish Poisoning became reportable in Ontario in December 2013. No historical data are available for comparisons. Also, a provincial case definition for chronic hepatitis B was released in January 2012. Please note that chronic and acute hepatitis B case counts are not mutually exclusive and should not be added to obtain a total for hepatitis B cases in Ontario. Historical comparisons are not available as cases of chronic hepatitis B may have been entered using varying criteria prior to this time.

- Does not include cases for which the Ministry of Health and Long-Term Care was selected as the Diagnosing Health Unit or cases with a Disposition Description set to “DOES NOT MEET” or “ENTERED IN ERROR.”
- Differentials in year over year comparisons are reflective of changes in disease incidence and changes in the size of the population.
- Statistical tests comparing rates were not performed when the YTM rate in previous years was zero.
- Case counts for tuberculosis and AIDS are based on diagnosis date and not episode date. HIV case counts are based on encounter date. Case counts for all other diseases are based on episode date.