HEPATITIS C

True Incidence and Prevalence

There are a number of factors that complicate hepatitis C surveillance and make the true incidence and prevalence of hepatitis C difficult to estimate. For example, newly diagnosed cases that are reported to the health unit may have been infected many years ago, therefore incidence rates may better reflect the intensity of testing practices rather than newly acquired infections (Public Health Ontario, 2014). Studies estimate that one-third of those infected with hepatitis C have never been tested, which could result in an underestimate of hepatitis C rates. In addition, the provincial case definition only requires a positive antibody result to meet case definition and at least 15% of persons infected with hepatitis C will clear the virus spontaneously (Public Health Ontario, 2014). This could result in an inflated prevalence of disease an underestimated incidence rate as persons who clear the virus may be re-infected. Mathematical modelling must be used to try to estimate the true incidence and prevalence of disease.

Modelled Incidence and Prevalence

Through mathematical modelling, Dr. Robert Remis at the Ontario HIV Epidemiology Monitoring Unit estimated that the true incidence hepatitis C in the North Bay Parry Sound District Health Unit (NBPSDHU) area in 2010 was 28.8 cases per 100,000 population, similar to the estimated incidence for Ontario (27.2 cases per 100,000 population) and lower than the reported crude incidence based on integrated Public Health Information System (iPHIS) data (39.8 cases per 100,000 population) (Public Health Ontario, 2014; Figure 1). This mathematical modelling accounts for persons who would spontaneously clear the virus without treatment, among other factors. The modelled estimated prevalence in 2010 was 0.89 cases per 100 persons. Unfortunately, more recent modelled data is not available.

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Data sources:

NBPSDHU regional hepatitis C confirmed cases – NBPSDHU & Ontario counts: Public Health Ontario. Query: North Bay Parry Sound District Health Unit & Ontario: Case counts of reportable disease by disease, year, age group, and gender. Toronto, ON: Ontario Agency for Health Protection and Promotion; 2017 May 10 [cited 2017 May 11]. Available from: http://www.publichealthontario.ca/en/DataAndAnalytics/Query/Pages/default.aspx

NBPSDHU & Ontario Population – 2006-2015 Population estimates: Statistics Canada 2006-2015, IntelliHEALTH Ontario, Ministry of Health and Long-term Care, extracted 2016/09/07.

Rate calculations:

Crude rates were age-standardized using the Direct Method and standard 2011 Canadian population. Confidence intervals (95%) were calculated for age-standardized rates based on the gamma distribution (Fay and Feuer, 1997. Tiwari and al., 2006).

Interpretation of a significant difference:

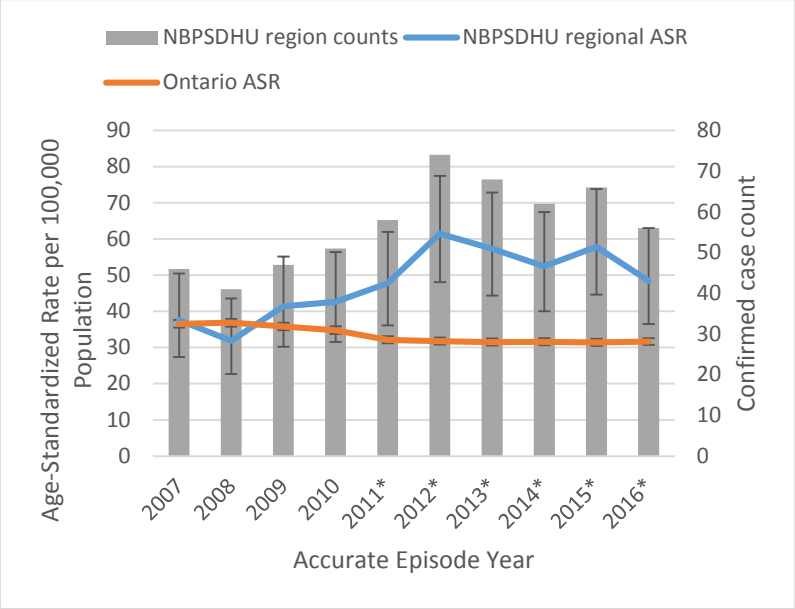
A statistic interpreted as 'significantly different' from another is an estimate found to be statistically meaningful; the difference is unlikely due to chance. Error bars noted in figures within this report illustrate 95% confidence intervals. If there is no overlap in range, the difference can be described as statistically significant.

Confidence intervals (CI) and variances were estimated using the exact method in STATA IC/14.2 (2014) for the North Bay Parry Sound District Health Unit (NBPSDHU) and Ontario

Reported overall rates

In 2016, the North Bay Parry Sound District Health Unit (NBPSDHU) age-standardized rate (ASR) for hepatitis C was 50% higher and significantly different compared to the Ontario rate. The age-standardized rates for the NBPSDHU region increased significantly between 2007 and 2012, and remained stable between 2013 and 2016.

Figure 1. Count and Age-Standardized Rate per 100,000 Population of Confirmed Hepatitis C Cases, by Region, 2007 – 2016



* Age-standardized rate (ASR) for the NBPSDHU region is significantly higher than the Ontario rate during the corresponding calendar year.
Note: Annual case counts include cases that were identified in a correctional facility within the NBPSDHU region that holds inmates from across the province. Between 5% and 22% of annual case counts had addresses attributed to this facility each year, therefore interpret differences in regional rates with caution.

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Definitions:

Hepatitis C case:

Includes confirmed cases as defined by the Ministry of Health & Long-Term Care (Infectious Diseases Protocol: Hepatitis C; Appendix B. Available from http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/hep_c_cd.pdf).

Accurate episode year:

Accurate episode year is defined by the symptom onset date. If the symptom onset date is missing, laboratory test date determines accurate episode year. If the laboratory test date is missing, the date the was reported is used to define the accurate episode year.

Table 1. Count and Age-Standardized Rate per 100,000 Population of Confirmed Hepatitis C Cases, by Region, 2007 – 2016

Accurate Episode Year	NBPSDHU Regional Case Count	NBPSDHU Regional Age-Standardized Rate (95% CI)	Ontario Age-Standardized Rate (95% CI)
2007	46	37.6 (27.3, 50.5)	36.5 (35.5, 37.6)
2008	41	31.9 (22.7, 43.6)	36.8 (35.8, 37.9)
2009	47	41.4 (30.3, 55.2)	35.8 (34.8, 36.9)
2010	51	42.7 (31.6, 56.4)	34.8 (33.8, 35.8)
2011	58	47.8* (36.1, 62)	32.1 (31.2, 33.1)
2012	74	61.5* (48.1, 77.4)	31.8 (30.8, 32.8)
2013	68	57.3* (44.4, 72.9)	31.5 (30.6, 32.5)
2014	62	52.4* (40, 67.4)	31.6 (30.6, 32.6)
2015	66	57.9* (44.6, 73.8)	31.4 (30.5, 32.4)
2016	56	48.4* (36.5, 63)	31.7 (30.7, 32.6)

* Age-standardized rate (ASR) for the NBPSDHU region is significantly higher than the Ontario rate during the corresponding calendar year.

Note: Annual case counts include cases that were identified in a correctional facility within the NBPSDHU region that holds inmates from across the province. Between 5% and 22% of annual case counts had addresses attributed to this facility each year, therefore interpret differences in regional rates with caution.

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Sex-Specific Rates

The age-standardized rate for confirmed hepatitis C cases among males has increased significantly between 2007 and 2016 by about 36% (see Figure 2 & Table 2). The age-standardized rate for females has remained stable between 2007 and 2016, however between 2011 and 2015 the rate was, on average, double and significantly higher than the rate for Ontario females.

Figure 2. Age-Standardized Rate per 100,000 Population of Confirmed Hepatitis C Cases, by Sex, NBPSDHU region, 2007 – 2016

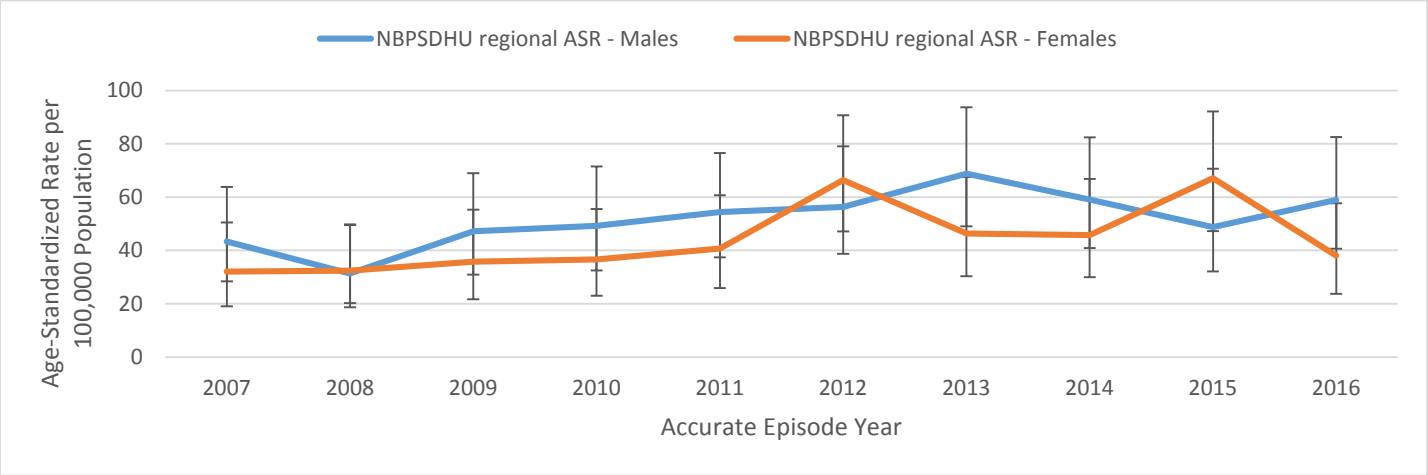

Table 2. Age-Standardized Rate per 100,000 Population of Confirmed Hepatitis C Cases, by Sex, 2007 – 2016

Accurate episode year	NBPSDHU Regional Age-Standardized Rate among Males (95% CI)	NBPSDHU Regional Age-Standardized Rate among Females (95% CI)
2007	43.4 (28.4, 63.8)	32.0 (19.0, 50.5)
2008	31.3 (18.6, 49.6)	32.5 (20.2, 49.7)
2009	47.2 (30.9, 69)	35.8 (21.7, 55.4)
2010	49.2 (32.5, 71.6)	36.7 (23.0, 55.6)
2011	54.4 (37.4, 76.6)	40.7 (25.9, 60.8)
2012	56.3 (38.8, 79.1)	66.4 (47.2, 90.8)
2013	68.8 (49.1, 93.8)	46.3 (30.4, 67.6)
2014	59.1 (40.9, 82.5)	45.8 (29.9, 66.9)
2015	48.7 (32.2, 70.7)	67.1 (47.3, 92.2)
2016	58.9 (40.6, 82.6)	38.1 (23.8, 57.8)

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Age & Sex-Specific Rates

Age-specific rates for confirmed hepatitis C cases identified between 2012 and 2016 are illustrated for the population aged 15 to 64 years in Figure 3 and Table 3.

Females aged 25 to 29 years had the highest hepatitis C rates in the NBPSDHU region of all sex-age group combinations. Compared to Ontario age & sex-specific rates, hepatitis C rates among females aged 25 to 29, 30 to 34, and 35 to 39 are more than three times the Ontario rates. Meanwhile, rates for males were roughly double that of Ontario rates for the above three age groups.

Figure 3. Age-Specific Rate per 100,000 Population of Confirmed Hepatitis C Cases, by Age Group & Sex, NBPSDHU region, 2012-2016 Combined

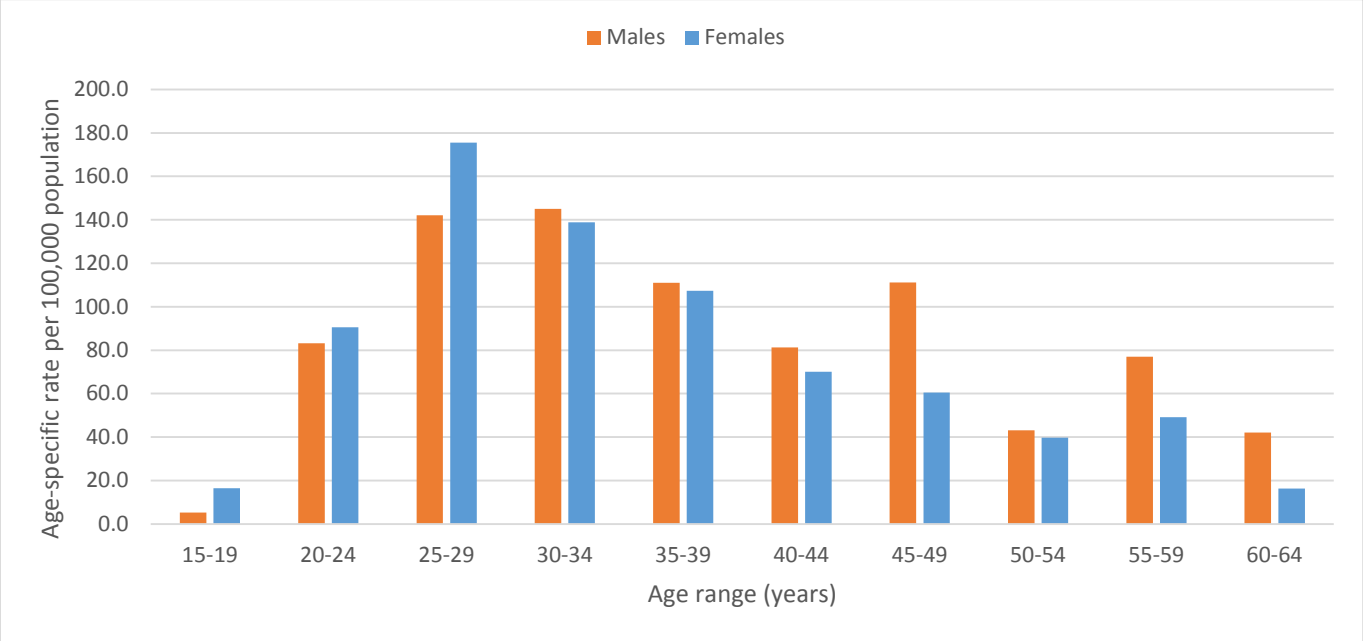

Table 3. Age-Specific Rate per 100,000 Population of Confirmed Hepatitis C Cases, by Age Group, NBPSDHU region, 2012 - 2016

Age Group (Years)	Age-Specific Rate among Males	Age-Specific Rate among Females
15 - 19	5.3	16.5
20 – 24	83.1	90.6
25 – 29	142.0	175.5
30 – 34	145.1	138.9
35 – 39	111.0	107.3
40 – 44	81.3	70.1
45 – 49	111.2	60.5
50 – 54	43.1	39.7
55 – 59	76.9	49.1
60 – 64	42.0	16.2

Data sources:

NBPSDHU regional hepatitis C confirmed case risk factors –Ontario Ministry of Health and Long-Term Care, Integrated Public Health Information System (iPHIS), extracted 2017/05/11.

Risk Factors

Follow-up was incomplete for 131 of the 326 cases (40.2%) identified between 2012 and 2016 in our region. Of those cases, 37 cases had risk factors reported for them. Table 4 lists the top 15 risk factors where case follow-up was complete (195 cases), and the percentage of all 326 cases.

About one in four cases confirmed with hepatitis C reported injection drug use, and more than a third had tattoos or piercings. A quarter of cases were in or had been in a correctional facility, had inhaled drugs, or shared other drug equipment.

Table 4. Count and Percentage of Confirmed Cases of Hepatitis C, by Top 15 Risk Factors Reported, NBPSDHU region, 2012-2016

Risk Factors	NBPSDHU Region Count 2012-2016 (Percentage)
Injection drug use	133 (40.8%)
Tattoo and piercing	117 (35.9%)
Correctional facility	83 (25.5%)
Inhalation drug use	83 (25.5%)
Shared other drug equipment	79 (24.2%)
Sex with opposite sex	57 (17.5%)
Contact is hepatitis C positive	57 (17.5%)
Shared needles	56 (17.2%)
Underhoused/homeless	50 (15.3%)
No condoms used	47 (14.4%)
More than one sex contact in the last two years	46 (14.1%)
Invasive surgical/dental/ocular procedures in Canada	42 (12.9%)
Judgement impaired by alcohol/drugs	39 (12.0%)
Shared personal items, e.g., toothbrush, razor blades	32 (9.8%)
Travel outside province	31 (9.5%)

Note: Cases may report more than one risk factor.

References

Public Health Ontario, Provincial Infectious Diseases Advisory Committee. (2014). *Recommendations for the public health response to hepatitis C in Ontario*. Toronto, ON: Queen's Printer for Ontario.