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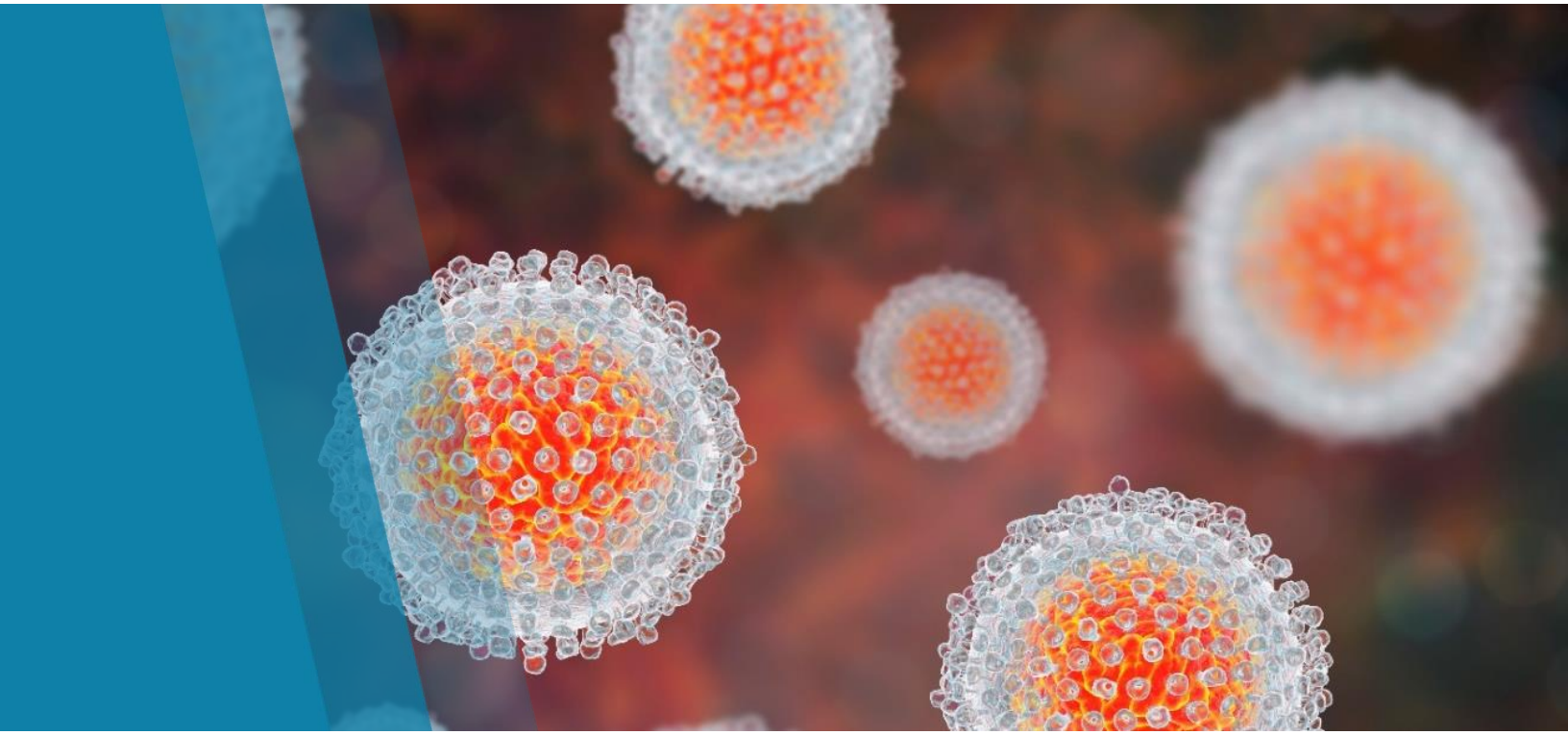
Hepatitis C in Ontario, 2018:

Surveillance summary one year after a case definition update



Surveillance Report

February 2020

Public Health Ontario

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Authors

Christina Renda, MPH
Epidemiologist
Communicable Diseases, Emergency Preparedness and Response
Public Health Ontario

Jennifer Burbidge, RN
Nurse Consultant
Communicable Diseases, Emergency Preparedness and Response
Public Health Ontario

Michael Whelan, MSc
Epidemiologist Lead
Communicable Diseases, Emergency Preparedness and Response
Public Health Ontario

Karin Hohenadel, MSc, MBA
Manager
Communicable Diseases, Emergency Preparedness and Response
Public Health Ontario

Michelle Murti, MD MPH CCFP FRCPC
Public Health Physician
Communicable Diseases, Emergency Preparedness and Response
Public Health Ontario

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Contents

Purpose and Scope

Infection with hepatitis C virus (HCV) is a major global health concern, including in Ontario, where it was described as the most burdensome infectious agent in 2010.[1] In 2016, the World Health Organization (WHO) committed to eliminating hepatitis C as a public health threat by 2030;[2] this includes a 90% reduction in newly identified chronic infections.

Hepatitis C is a reportable disease in Ontario. The provincial surveillance case definition only required a positive test for hepatitis C antibodies to consider someone a confirmed case until 2017. This meant no additional information was provided to help distinguish hepatitis C cases that were newly acquired from those acquired previously or to know whether the hepatitis C case was currently infectious. In January 2018, the provincial surveillance case definition for hepatitis C was updated to incorporate these distinctions and laboratories were required to report on hepatitis C viral load results and the most recent negative hepatitis C testing result, if available. Importantly, the updated provincial surveillance case definition now allows for categorization of hepatitis C cases related to timing of infection (newly acquired versus previously acquired), as well as infection status (ribonucleic acid (RNA) positive, RNA negative, RNA unknown).[3]

The purpose of this report is to provide an epidemiological summary of newly reported hepatitis C cases in Ontario for 2018. It describes trends over time and across groups, with a focus on newly available data after the provincial case definition change in January 2018. In addition, to provide a more detailed description of hepatitis C epidemiology in Ontario, we present medical and behavioural risk factors reported in the integrated Public Health Information System (iPHIS) for hepatitis C cases. The report also includes sections designed to help focus public health actions.

Also new for this report is a summary of the hepatitis C testing cascade for Ontario using available data from iPHIS. The testing cascade assesses what proportion of people newly diagnosed with hepatitis C have follow-up RNA testing, what proportion of those are RNA positive and what proportion of these have a genotype test recorded. Additionally, a summary of hepatitis C cases for 2018 with concurrent and/or prior infections of hepatitis B, Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) or invasive group A streptococcal disease (iGAS) is described. These diseases were chosen for inclusion in this report, as they have either a common mode of acquisition and/or transmission or known co-morbidities with hepatitis C.

The aim of this report is to provide Ontario's Ministry of Health, public health units (PHUs) and other public health stakeholders with data they can use to support policy and programming efforts and to suggest opportunities for action.

Key Messages

Reported case counts and rates of hepatitis C in Ontario have increased in recent years.

Over time, the highest rates of hepatitis C changed from occurring in those 40-59 years old to those 25-39 years old.

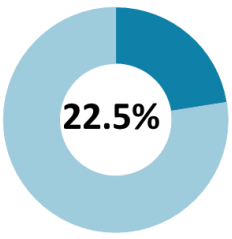
For the first time in Ontario, we can describe newly reported cases of hepatitis C by how recently they acquired their infection and by their infectious status. This will help to improve how the epidemiology of hepatitis C is understood in Ontario.

Drug use continues to be the most commonly reported risk factor for hepatitis C cases across the province.

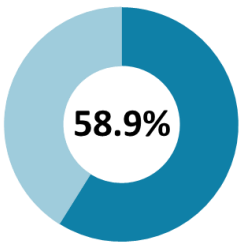
Continuing to strive for complete iPHIS data entry will allow for more complete analysis and understanding of provincial hepatitis C epidemiology, risk factors, as well as potential gaps in the Ontario testing cascade.

By the Numbers: 2018

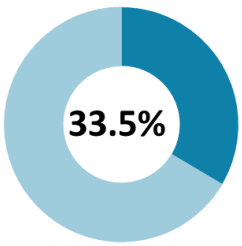
Rate of reported hepatitis C cases per 100,000 population



Newly acquired



RNA+ at first report

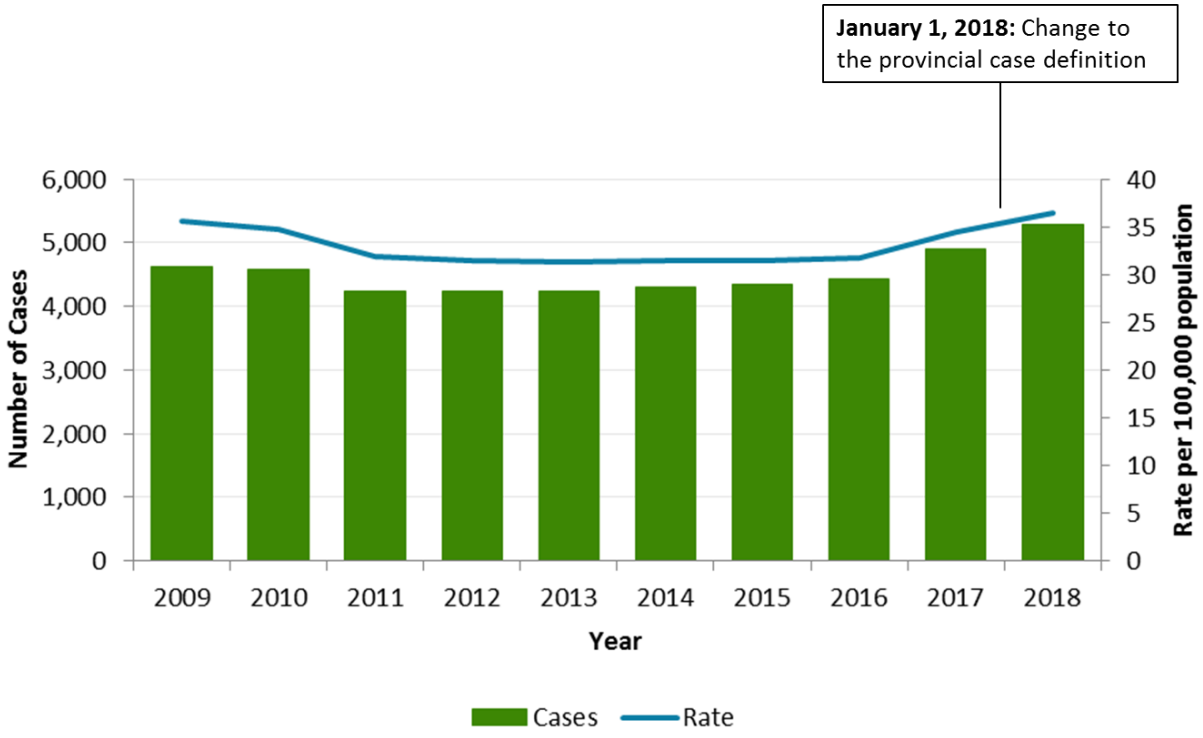


Unknown RNA status

Trends Over the Past Decade

Reported cases and rates of hepatitis C in Ontario have been increasing since 2016 after a period of decline from 2009 to 2012 and relative stability between 2012 and 2016 (Figure 1). The largest increase in cases (10.7%) and rates (8.8%) was observed from 2016 to 2017. From 2017 to 2018, there was a 7.5% increase in reported cases corresponding to a 5.8% increase in the overall provincial rate.

Figure 1. Confirmed cases and rates of hepatitis C by year in Ontario, 2009-2018



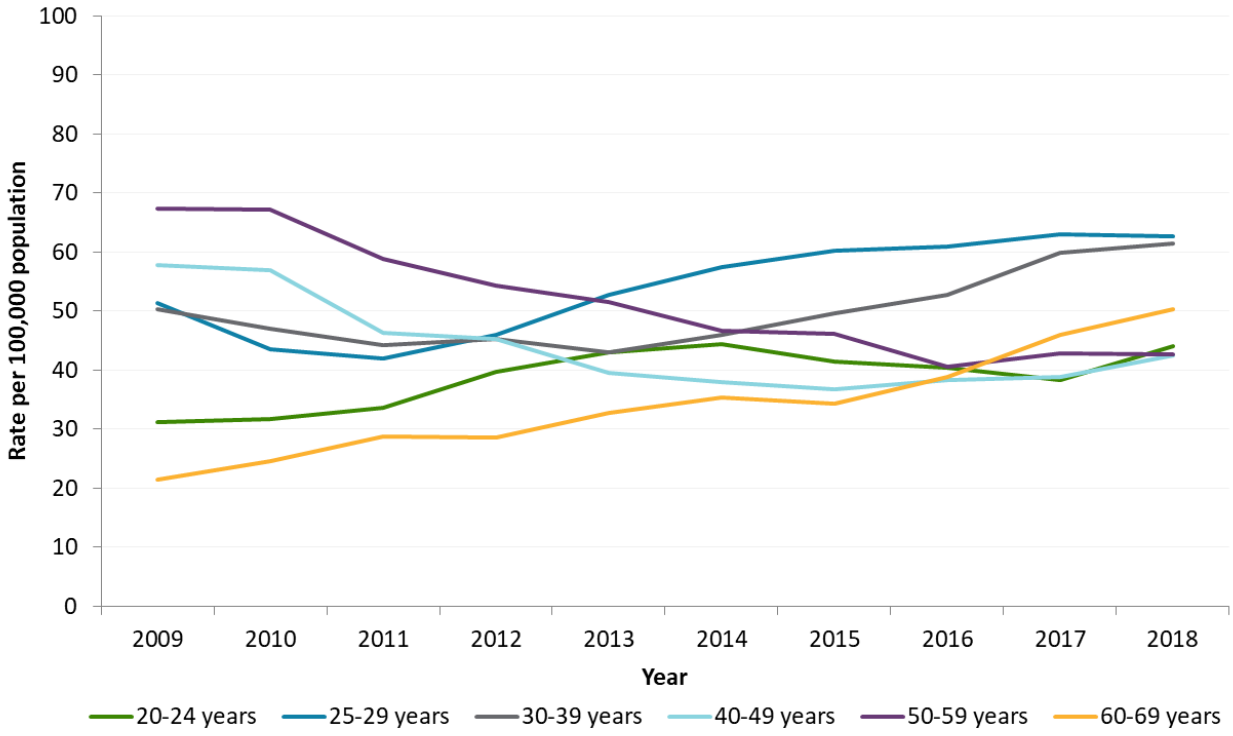
Data Sources:

- Case information: integrated Public Health Information System (iPHIS) database
- Ontario population data: IntelliHEALTH Ontario

Note: For more information on the provincial case definition change, see Appendix C.

In 2018, the highest rates of hepatitis C were observed in those aged 25–29. This is a shift from 2009, where the highest rates of hepatitis C were observed in individuals aged 50–59 (Figure 2). While variation in the rates can be seen over the 10-year period, overall rates in those aged 40–59 have declined and rates have increased in younger age groups, specifically those aged 25–39. Additionally, an increase has been observed in those aged 60–69. Rates of hepatitis C in those 19 years of age and younger and 70 years of age and older have remained low and stable across the time period with under 20 cases per 100,000 population (data not shown). There were a total of 113 cases in children <2 years old from 2009 to 2018.

Figure 2. Overall Rates of Hepatitis C by Age Group and Year in Ontario, 2009-2018



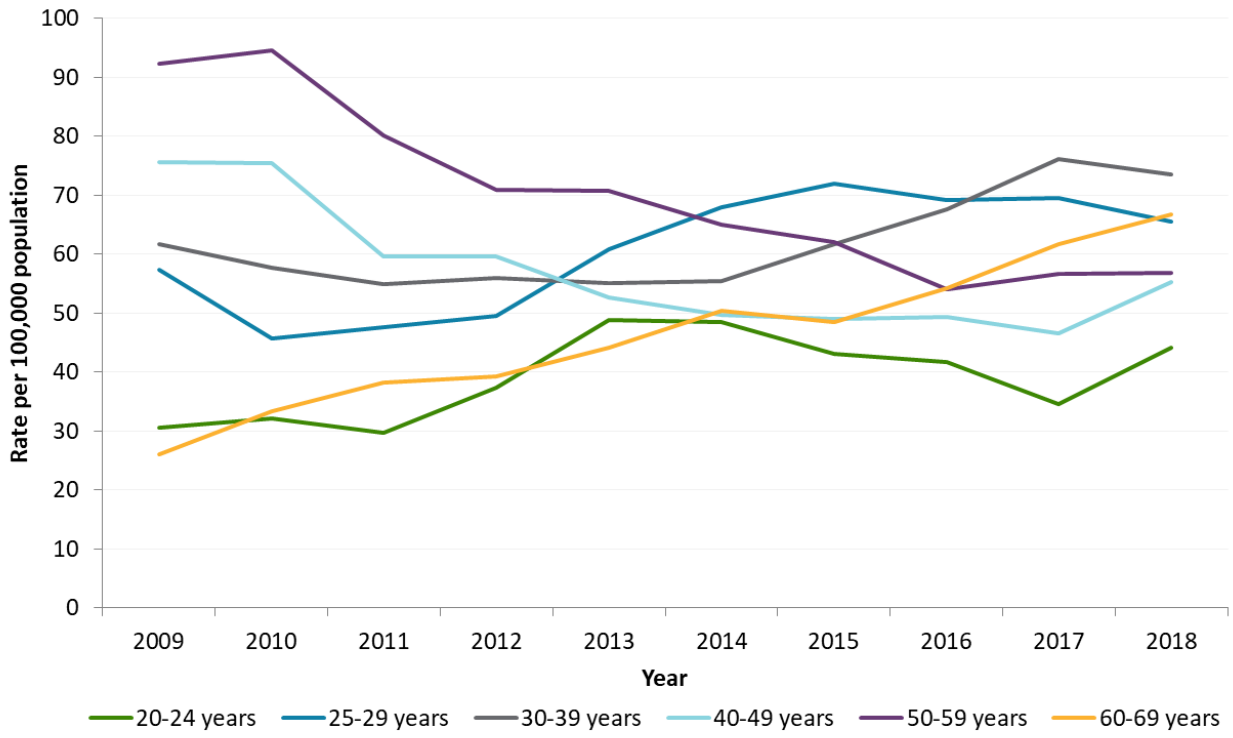
Data Sources:

- Case information: integrated Public Health Information System (iPHIS) database
- Ontario population data: IntelliHEALTH Ontario

The proportion of male cases has remained relatively stable at approximately 60% over the 10-year period. Overall reported rates were higher in males than females in all years from 2009 to 2018. In 2018, rates were higher in males than females in all presented age groups. In 2018, the highest reported rate of hepatitis C in males was observed in those aged 30–39 (Figure 3). This is again in contrast to 2009, where the highest rates were observed in older age groups (40–59); however, in females, the highest rates have consistently been observed in younger age groups, specifically those aged 25–29 (Figure 4).

Additionally, in more recent years, increased rates have also been observed in females aged 20–24 and 30–39.

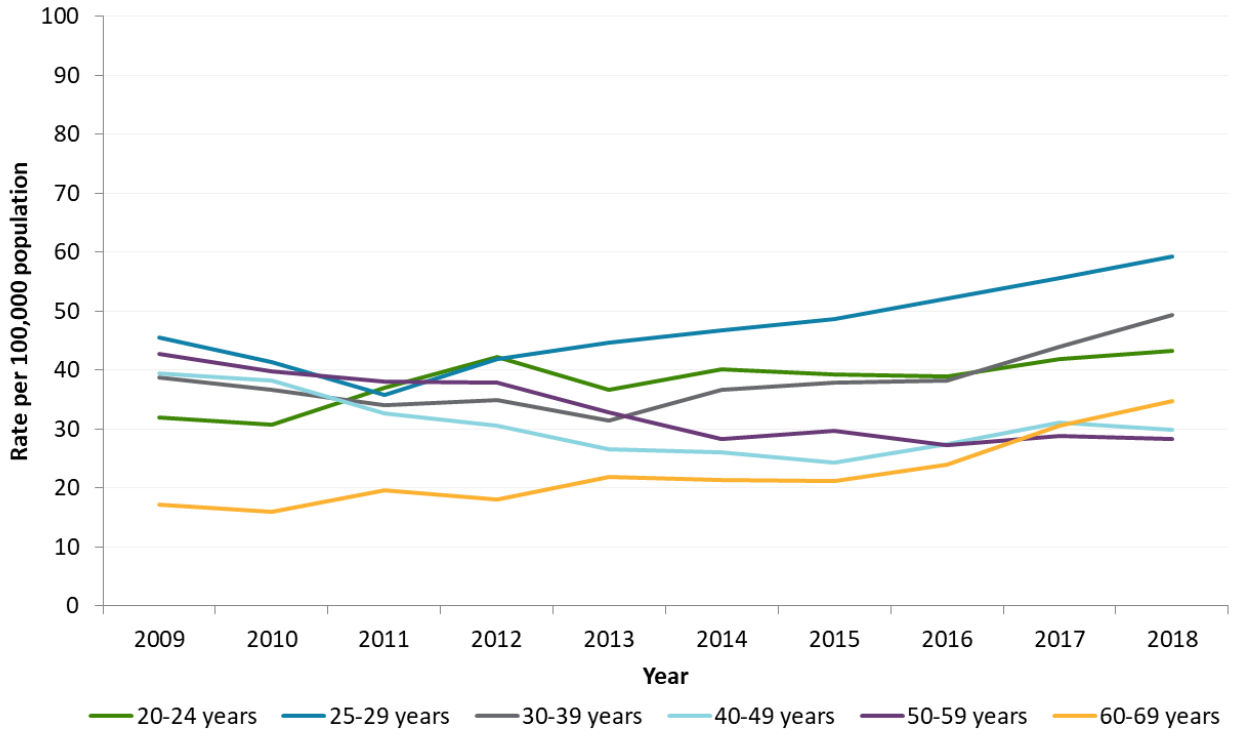
Figure 3. Rates of Hepatitis C in Males by Age Group and Year in Ontario: 2009-2018



Data Sources:

- Case information: integrated Public Health Information System (iPHIS) database
- Ontario population data: IntelliHEALTH Ontario

Figure 4. Rates of Hepatitis C in Females by Age Group and Year in Ontario: 2009-2018



Data Sources:

- Case information: integrated Public Health Information System (iPHIS) database
- Ontario population data: IntelliHEALTH Ontario

OPPORTUNITIES FOR PUBLIC HEALTH UNIT ACTION

From 2009 to 2018, rates of reported hepatitis C increased in multiple age groups (e.g., 25–39 year olds) and decreased in others (e.g., 40–59 year olds).

During this time, rates of reported hepatitis C in women of childbearing age steadily increased. This may increase the opportunity for vertical transmission. There were 113 cases of hepatitis C in children under two years old in the past 10 years.

Consider conducting detailed analyses of hepatitis C data for these age groups in your jurisdiction to help inform local public health action.

Strategies to prevent vertical transmission include: prenatal counselling and testing, as appropriate,[4] as well as follow-up with pregnant women diagnosed with hepatitis C to facilitate linkage to care.

Characteristics of Hepatitis C Cases in 2018

5,277 Number of newly reported hepatitis C cases in 2018

36.5 Rate of newly reported hepatitis C cases per 100,000 population in 2018

The hepatitis C case definition change in 2018 allows cases reported as part of provincial surveillance to be assessed for timing of infection and infectious status. The remainder of the report will focus on hepatitis C cases occurring in 2018. Of the 5,277 cases of hepatitis C reported in 2018, 92.3% (n=4,873) had a defined classification status ('newly acquired' or 'previously acquired/unspecified') and 66.5% (n=3,510) had a known RNA status at first report to the PHU (RNA+ or RNA-) (Table 1). RNA+ cases are currently infectious with the hepatitis C virus. Provincially, there were 36.5 cases of hepatitis C per 100,000 population, with 7.6 newly acquired cases per 100,000 population.

For hepatitis C cases reported in 2018 with a defined classification status, 22.5% (1,098/4,873) were 'newly acquired' and 77.5% (3,775/4,873) were 'previously acquired/unspecified.'

For hepatitis C cases reported in 2018 with a known RNA status at first report to the PHU, 58.9% (2,068/3,510) were RNA+ and 41.1% (1,442/3,510) were RNA-.

Table 1. Confirmed Cases of Hepatitis C in Ontario by Timing of Infection and Infection Status, 2018 (n=5,277)

Timing of infection	RNA+	RNA-	RNA Unspecified	Total
Newly acquired	533	232	333	1,098
Not defined	N/A	N/A	N/A	404
Previously acquired/Unspecified	1,535	1,210	1,030	3,775
TOTAL	**2,068**	**1,442**	**1,363**	**5,277**

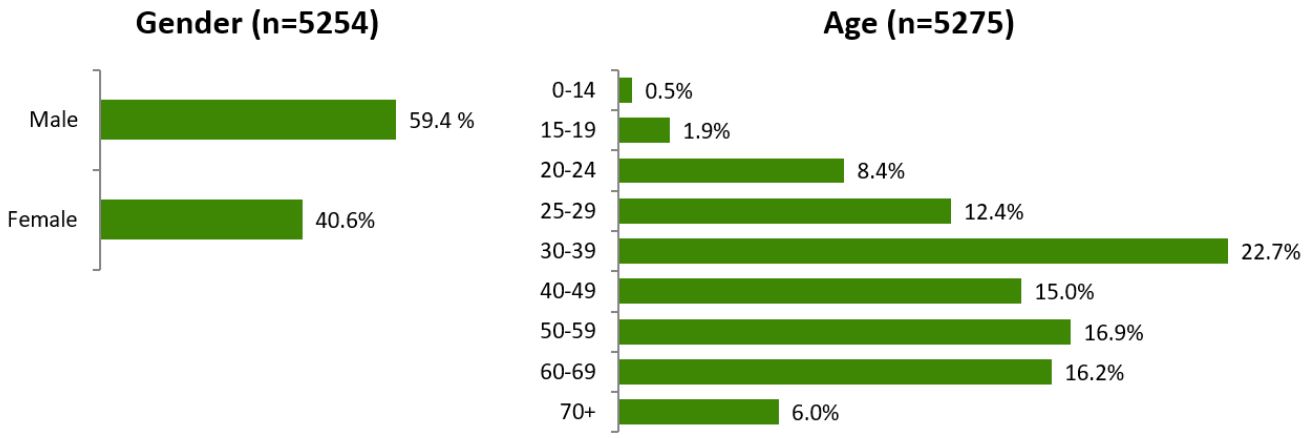
Data Source:

- Case information: integrated Public Health Information System (iPHIS) database

Note: For more information on RNA status classification, see Appendix C.

Overall, of cases with female or male specified and known age, the majority (59.4%, n= 3,123) were male and 30–39 was the most common age group (22.7%, n=1,199) (Figure 5). The median age in 2018 was 42.5 years (range: 0–104 years). Twenty-four cases with an unknown age (n=1), where male or female gender was not specified (n=22) or both (n=1), have been excluded in the analyses for this section.

Figure 5. Percentage of Confirmed Hepatitis C Cases by Gender and Age in Ontario, 2018



Data Sources:

- Case information: integrated Public Health Information System (iPHIS) database
- Ontario population data: IntelliHEALTH Ontario

Note:

- 23 cases did not have female or male specified as the gender and two cases had an unknown age identified; they were excluded from the respective graphs.

The percentage of male cases was similar between those identified as 'previously acquired/unspecified' (59.9%, n=2,251) compared to those identified as 'newly acquired' (58.6%, n=641). Rates of hepatitis C were higher in males than females for both 'previously acquired/unspecified' and 'newly acquired' cases; however, a smaller gap between male and female rates was observed for 'newly acquired' cases compared to 'previously acquired/unspecified' cases (Table 2).

Table 2. Confirmed Cases and Rates of Hepatitis C in Ontario by Timing of Infection and Gender, 2018

Timing of infection/Gender	Count	Rate (per 100,000)
Newly acquired - Female	453	6.2
Newly acquired - Male	641	9.0
Previously acquired/Unspecified - Female	1509	20.6
Previously acquired/Unspecified - Male	2251	31.7

Data Sources:

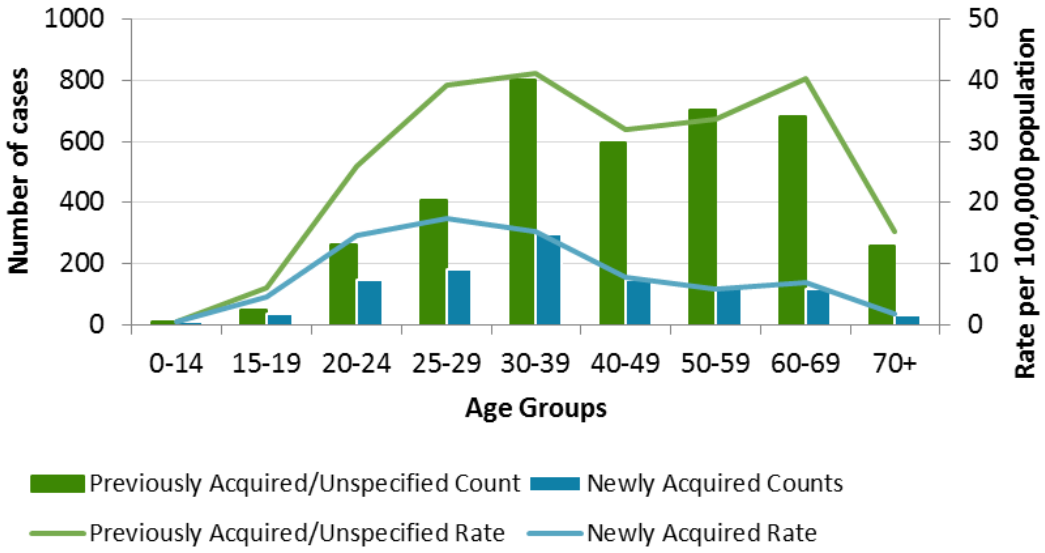
- Case information: integrated Public Health Information System (iPHIS) database
- Ontario population data: IntelliHEALTH Ontario

Note:

- 23 cases that did not specify male or female gender were excluded from the table.

The median age was older for those identified as 'previously acquired/unspecified' compared to those 'newly acquired,' at 45.5 years and 35.1 years, respectively. For cases with timing of infection identified as 'previously acquired/unspecified,' the highest rates were seen in those aged 25–39 and 60–69. This is in contrast to 'newly acquired' cases, where the highest rates were seen in in those aged 20–39 (Figure 6).

Figure 6. Confirmed Cases and Rates of Hepatitis C in Ontario by Timing of Infection and Age Group, 2018 (n=4,871)



Data Sources:

- Case information: integrated Public Health Information System (iPHIS) database
- Ontario population data: IntelliHEALTH Ontario

Note:

- Two cases with an unknown age were excluded from the figure.

OPPORTUNITIES FOR PUBLIC HEALTH UNIT ACTION

For the first time in Ontario, we can distinguish between hepatitis C cases that are newly acquired and those that were previously acquired or acquired at an unspecified time. Additionally, we can measure how many cases of hepatitis C are infectious at first report (RNA+).

Using this new information over time, we will be better able to report on the epidemiology of hepatitis C in Ontario to inform public health policies and practice.

Previous negative anti-HCV antibody test results are needed to determine if a case was newly acquired. The cumulative report provided by PHO has information on previous hepatitis C testing, including antibody and RNA results. Consider asking the diagnosing provider for any previous negative results, as PHO does not conduct all hepatitis C testing in the province. Consider asking clients if they have previously donated blood without being notified of a blood-borne infection.

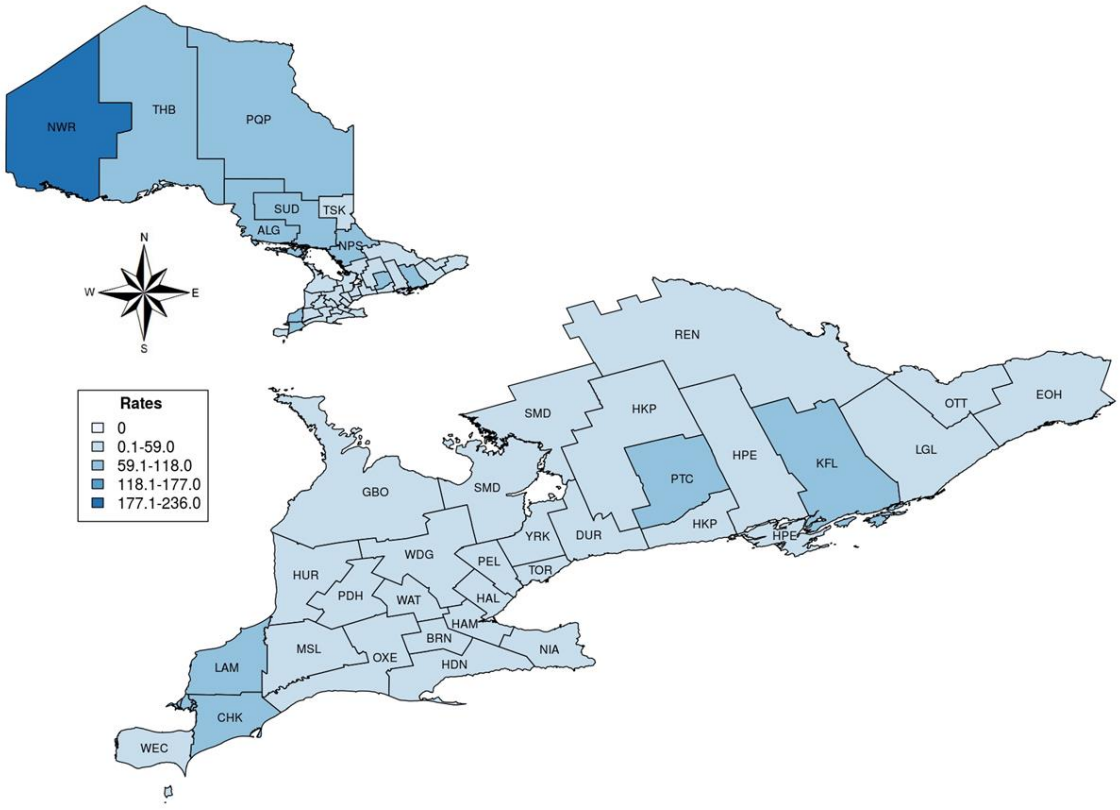
PHUs can explore using these data at the local level for program decision making. As per PHO Quick Reference Guide: Hepatitis C Case and Contact Follow Up, priorities for follow-up and counselling include: individuals identified as being newly acquired (regardless of RNA status), those who are currently infectious (RNA+) and those with unknown RNA status.

For iPHIS data entry considerations, see Improving What We Know About Hepatitis C in Ontario.

Geographic Distribution in 2018

Confirmed cases of hepatitis C were reported in all PHUs across the province for 2018. PHUs with the largest number of hepatitis C cases reported in 2018 were Toronto Public Health (n=853), Peel Public Health (n=376) and Ottawa Public Health (n=309), respectively. The highest rates of hepatitis C for 2018 were reported in Northwestern Health Unit (235.7 per 100,000 population), Thunder Bay District Health Unit (114.8 per 100,000 population) and Lambton Public Health (106.1 per 100,000 population) (Figure 7). PHUs with the largest increase in rates over the past five years include: Porcupine Health Unit, Renfrew County and District Health Unit and Northwestern Health Unit (Table 3). The majority of PHUs with the highest rates of reported hepatitis C, both 'previously acquired/unspecified' and 'newly acquired,' are located in northern Ontario; however, there are other areas of the province which also have high rates (Figure 7, Table 4).

Figure 7. Rates per 100,000 population of Confirmed Cases of Hepatitis C by PHU in Ontario, 2018 (n=5,277)



Data Sources:

- Case information: integrated Public Health Information System (iPHIS) database
- Ontario population data: IntelliHEALTH Ontario

Table 3. Top Three Increases in PHU Rates of Reported Hepatitis C compared to Ontario, 2014-2018

Public Health Unit	Rate per 100,000 population in 2014	Rate per 100,000 population in 2018	Percent increase
Porcupine Health Unit	32.4	70.4	117.3%
Renfrew County and District Health Unit	17.9	38.0	112.3%
Northwestern Health Unit	120.4	235.7	95.8%
ONTARIO	**31.4**	**36.5**	**16.2%**

Data Sources:

- Case information: integrated Public Health Information System (iPHIS) database
- Ontario population data: IntelliHEALTH Ontario

Table 4. Top Three Rates of Reported Hepatitis C by PHU for Cases Identified as Previously Acquired/Unspecified or Newly Acquired in Ontario, 2018

Previously Acquired/Unspecified cases	Newly Acquired cases
1. Northwestern Health Unit (135.6 per 100,000 population)	1. Northwestern Health Unit (87.9 per 100,000 population)
2. Algoma Public Health (63.6 per 100,000 population)	2. Public Health Sudbury & Districts (60.5 per 100,000 population)
3. North Bay Parry Sound District Health Unit (61.3 per 100,000 population)	3. Lambton Public Health (51.5 per 100,000 population)
ONTARIO (26.1 per 100,000 population)	**ONTARIO** (7.6 per 100,000 population)

Data Sources:

- Case information: integrated Public Health Information System (iPHIS) database
- Ontario population data: IntelliHEALTH Ontario

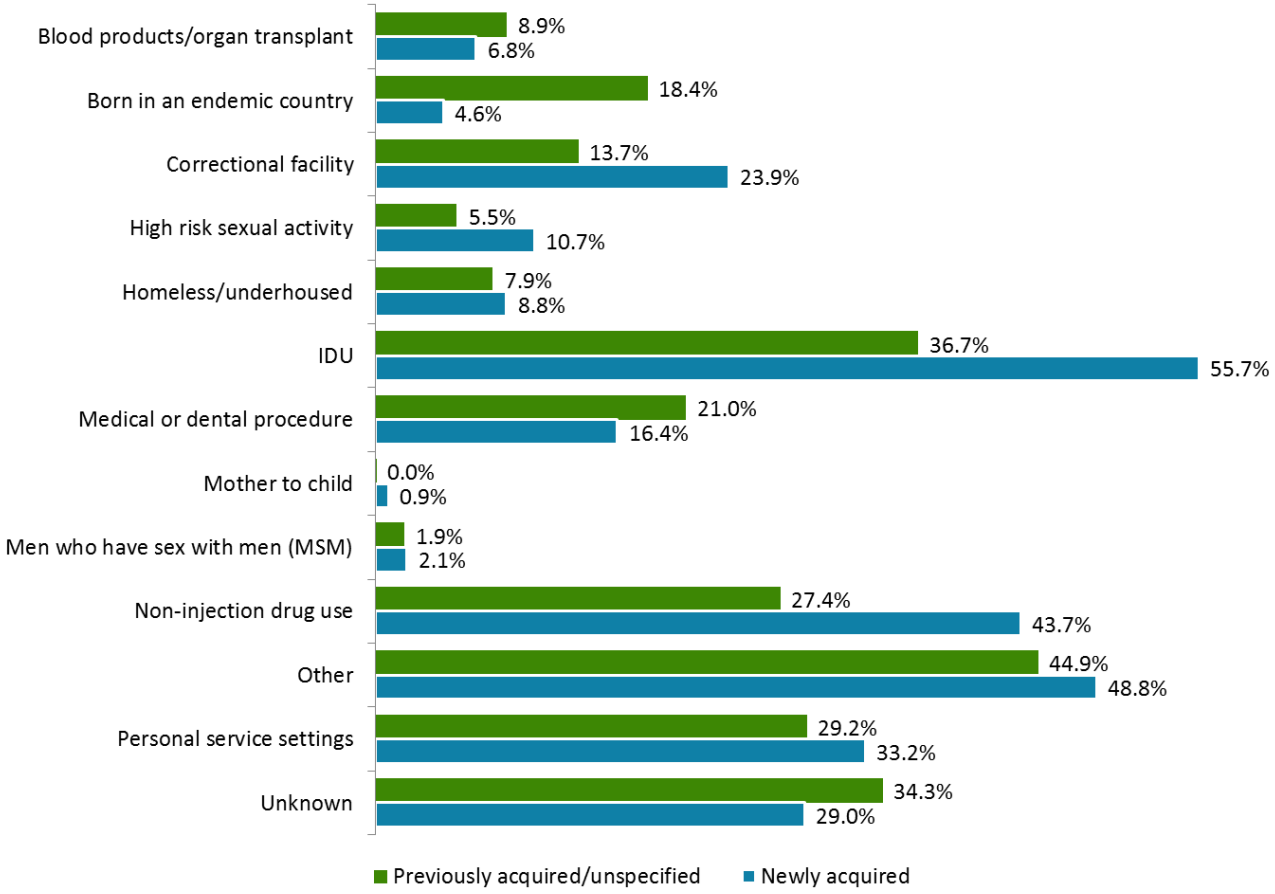
Risk Factors in 2018

Collecting and reporting risk factor data in iPHIS is part of case management and will allow for a better understanding of the epidemiology of hepatitis C in Ontario. Overall, 85.6% (4,516/5,277) of hepatitis C cases in 2018 reported at least one risk factor in iPHIS (including 'unknown'). Among the 14.4% (761/5,277) of cases with no risk factors reported in iPHIS, 32.7% (249/761) were lost to follow up. The percentage was similar for cases identified as either 'previously acquired/unspecified' or 'newly acquired.' The following data are for the subset of 4,516 individuals reporting at least one risk factor.

Outside of the risk factor category 'Other,' injection drug use (IDU) was the most commonly reported risk factor category at 41.3% for all cases. The percentage reporting IDU was higher among cases identified as 'newly acquired' at 55.7% compared to 36.7% for cases identified as 'previously acquired/unspecified' (Figure 8). A list of risk factor categories and corresponding iPHIS risk factors can be found in Appendix B.

Percentage of cases reporting IDU	55.7%	Among **newly acquired** cases	36.7%	Among **previously acquired/unspecified** cases

Figure 8. Percentage Confirmed Hepatitis C Cases by Risk Category and Defined Classification Status, Ontario 2018 (n=4,516)



Data Source:

- Case information: integrated Public Health Information System (iPHIS) database

Note:

- Risk factors are not mutually exclusive and cases may have multiple risk factors reported, no hierarchy was applied to these data and each risk factor was kept for the analyses.

Non-injection drug use was the second most commonly reported (non 'Other') risk category for 'newly acquired' cases at 43.7%. The percentage of cases reporting 'Correctional facility' as a risk factor was also higher among cases identified as 'newly acquired' compared to 'previously acquired/unspecified' (23.9% versus 13.7%). Conversely, the percentage of cases reporting 'Born in an endemic country' was lower among cases identified as 'newly acquired' compared to 'previously acquired/unspecified' cases (4.6% versus 18.4%). The percentage of cases reporting 'Homeless/underhoused' was similar for 'newly acquired' and 'previously acquired/unspecified' cases (8.8% versus 7.9%).

OPPORTUNITIES FOR PUBLIC HEALTH UNIT ACTION

The most commonly reported iPHIS risk factors for hepatitis C cases were injection and non-injection drug use.

There are differences between risk factors reported by hepatitis C cases that are newly acquired (e.g., more likely to report injection and non-injection drug use) and cases that were previously acquired or acquired at an unspecified time (e.g., more likely to report being born in an endemic country).

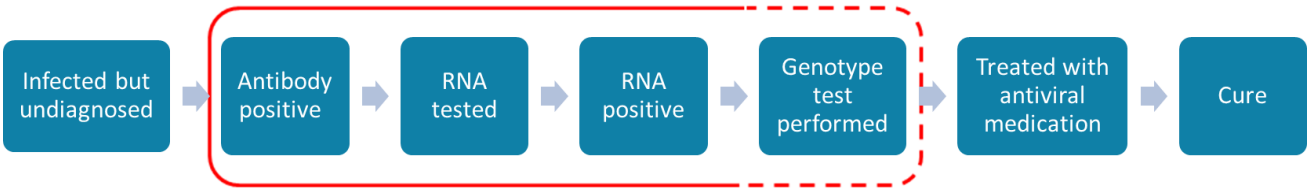
Assessment of injection or non-injection drug use practices is important for all hepatitis C cases. If appropriate, offer harm reduction counselling or provide referrals to local harm reduction services as a strategy to prevent transmission or reinfection.Consider referring clients to one of Ontario's multi-disciplinary Hepatitis C Care Teams, if one is available in your jurisdiction and is appropriate. These teams facilitate linkage to counselling, testing, care and treatment through clinical, psycho-social and community support. Visit the Ontario Hepatitis C Care Teams website to learn more and to locate a team near your community.

Complete comprehensive risk factor collection and data entry in iPHIS, where possible. These data allow a better understanding of hepatitis C in the province. For additional iPHIS considerations, please see Improving What We Know About Hepatitis C in Ontario.

Hepatitis C Testing Cascade in 2018

There are many stages in the progression from hepatitis C infection to cure. This pathway, also known as the hepatitis C cascade of care,[5] involves multiple steps (Figure 9). Using data from iPHIS, this report focuses on the hepatitis C testing cascade outlined in red below.

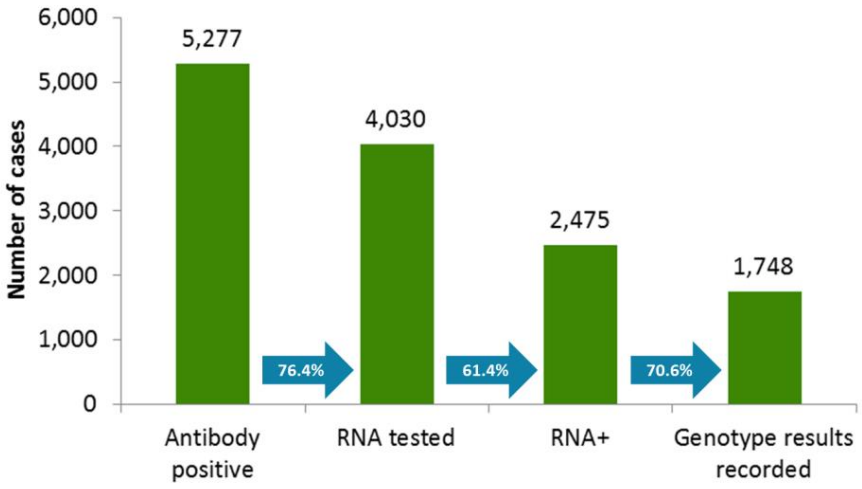
Figure 9. Hepatitis C Cascade of Care and Testing Cascade



Of the 5,277 hepatitis C cases reported in 2018, 76.4% (n=4,030) had an RNA test ever recorded in iPHIS (Figure 10). Of those cases with an RNA test recorded in iPHIS, 87.1% (3,510/4,030) had RNA status recorded in the aetiologic agent field. Based on cases with an RNA recorded in the aetiologic agent field, 58.9% (2,068/3,510) were RNA positive at first report to the PHU. An additional 407 cases had positive RNA results reported at a later date. Of the 2,475 cases with an RNA positive result ever recorded in iPHIS, 70.6% (1,748/2,475) had genotype test results ever recorded in iPHIS (Figure 10).

Hepatitis C cascades of care have historically included a step for genotype testing, as previous treatments for hepatitis C were genotype-specific.[5] With the introduction of pan-genotype treatments, awareness of genotype may not be required for treatment initiation, but can inform public health understanding of hepatitis C in the province.[6]

Figure 10. Testing Cascade for Confirmed Hepatitis C Cases Reported in iPHIS: Ontario, 2018



Data Source:

- Case information: integrated Public Health Information System (iPHIS) database

Note: All hepatitis C cases reported in iPHIS were assumed to have an anti-HCV antibody positive result, even if none was recorded in the laboratory section in iPHIS. For more information on the testing cascade algorithm, see Appendix C.

OPPORTUNITIES FOR PUBLIC HEALTH UNIT ACTION

Based on iPHIS data, 23.6% of hepatitis C cases reported in Ontario for 2018 did not have an RNA status recorded. Identifying gaps in the testing cascade such as this one provide opportunities for public health to prioritize case management activities.

Promote and facilitate access to RNA testing for those with an unknown RNA status. Strategies to do this include, but are not limited to: sending the diagnosing provider the PHO Hepatitis C RNA Requisition with reporting forms or referring clients who may not have Ontario Health Insurance Plan (OHIP) coverage to a local community health centre or Ontario Hepatitis C Care Team, who may be able to provide testing.

PHUs should prioritize follow-up for cases as per the PHO Quick Reference Guide: Hepatitis C Case and Contact Follow Up.

Data should be entered as per existing iPHIS entry guidance. Refer to Improving What We Know About Hepatitis C in Ontario for additional considerations.

Hepatitis C Cases with Concurrent or Prior Infections in 2018

To better understand the potential overlap between hepatitis C and other diseases with common epidemiology, modes of acquisition or that are known to increase morbidity and mortality, iPHIS data were used to determine hepatitis C cases reported in 2018 with concurrent (+/- 30 days of hepatitis C diagnosis) or prior infections (from 1990 to 2018) with hepatitis B (HBV), HIV/AIDS and invasive group A streptococcus (iGAS).

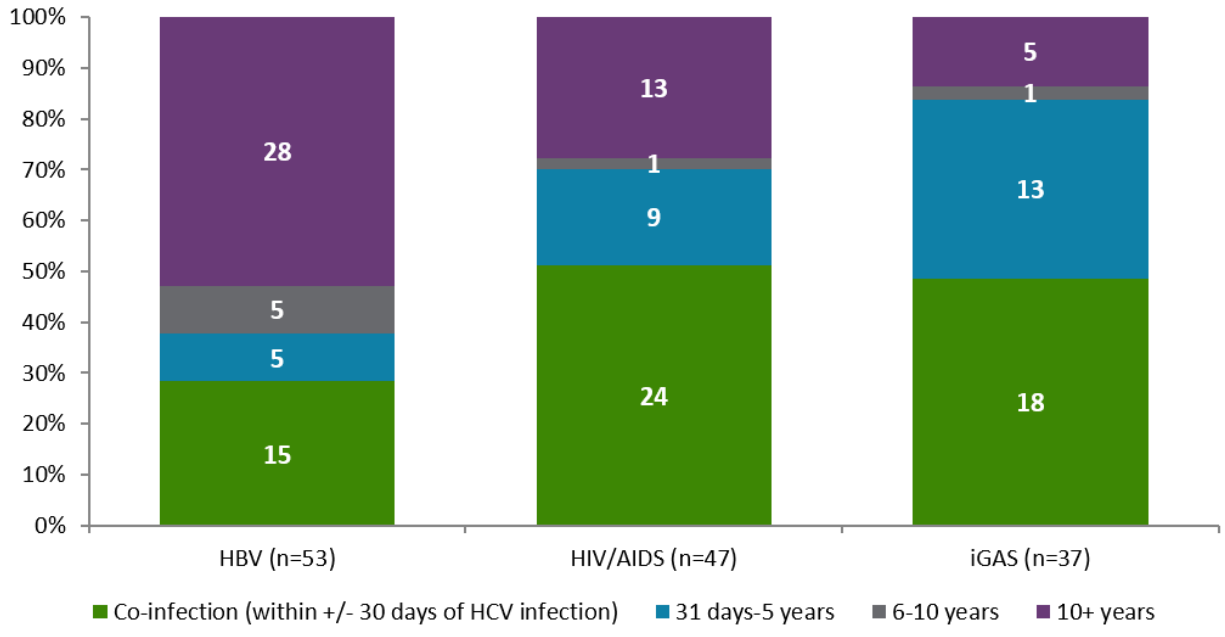
1.0% Percentage of hepatitis C cases in 2018 reporting prior or concurrent **HBV infection**

0.9% Percentage of hepatitis C cases in 2018 reporting prior or concurrent **HIV/AIDS infection**

0.7% Percentage of hepatitis C cases in 2018 reporting prior or concurrent **iGAS infection**

For cases of hepatitis C with HIV/AIDS or iGAS infections, approximately 50% had these infections identified within 30 days of their hepatitis C diagnosis. In comparison, more than half of cases with HBV infection had been diagnosed with HBV 10+ years prior to their hepatitis C diagnosis (Figure 11).

Figure 11. Cumulative Percentage and Number of Confirmed Hepatitis C Cases with Concurrent or Prior HBV, HIV/AIDS or iGAS by Timing of Infection: Ontario, 2018



Data Source:

- Case information: integrated Public Health Information System (iPHIS) database

OPPORTUNITIES FOR PUBLIC HEALTH UNIT ACTION

Of the hepatitis C cases that had a prior or concurrent HIV/AIDS or iGAS infection, 50% were reported within 30 days of their hepatitis C infection.

Continue to counsel hepatitis C cases and healthcare providers regarding the availability of publicly funded hepatitis A and B vaccines to prevent infection. Hepatitis C cases should also be counselled regarding screening for HBV, HIV and other STIs, as appropriate. Additionally, offer harm reduction counselling or provide referrals to local harm reduction services, as a strategy to prevent other bloodborne infections, if appropriate.

Where case management of iGAS, HIV/AIDS and hepatitis are performed by different teams, hepatitis C case finding and management may be enhanced with collaboration between public health program areas regarding opportunities for testing, prevention and treatment.

Improving What We Know About Hepatitis C in Ontario

PHUs, in particular hepatitis C case managers, are key partners in supporting newly diagnosed individuals and obtaining accurate and complete data regarding their hepatitis C. Having a complete assessment and entering that data into iPHIS allows a more clear understanding of the epidemiology of hepatitis C and can inform local level programming decisions, including resource prioritization.

Client follow-up may be challenging, given the common risk factors reported and the fact that PHUs employ various strategies to reach these individuals. When clients are reached, certain iPHIS risk factors may be underreported if the case manager only asks or records the presumed most likely risk factor in iPHIS. Underreported risk factors may include, but are not limited to: non-injection drug use behaviours, men who have sex with men (MSM), use of a personal service setting, correctional facility or homeless/underhoused.

OPPORTUNITIES FOR PUBLIC HEALTH UNIT ACTION

Complete comprehensive risk factor collection and data entry in iPHIS where possible. If follow-up activities are completed by the healthcare provider, it is important to share relevant information between these providers and the PHU to ensure accurate and complete iPHIS data entry.

For any RNA result that is received within six months of an anti-HCV antibody result, PHUs should continue to enter RNA results into the laboratory section in iPHIS and update the aetiologic agent to reflect the RNA status.

When possible, routinely evaluate local data quality to ensure adherence to guidance documents listed below. The iPHIS data cleaning toolkit available in the iPHIS and Cognos Document Repository contains resources to help with improving data quality in iPHIS.

RESOURCES

To assist with reporting of information in iPHIS, PHUs are encouraged to review the available Hepatitis C iPHIS User Guide and accompanying Hepatitis C Laboratory and Diagnostic Testing Quick Reference Guide: iPHIS Data Entry Scenarios.

Support is also available through the Public Health Solutions Service Desk at PublicHealthSolutions@ontario.ca or PHO's Communicable Diseases Unit at cd@oahpp.ca.

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Appendix A: Public Health Unit Codes

Code	Public Health Unit Name
ALG	Algoma Public Health
BRN	Brant County Health Unit
CHK	Chatham-Kent Public Health
DUR	Durham Region Health Department
EOH	Eastern Ontario Health Unit
GBO	Grey Bruce Health Unit
HAL	Halton Region Public Health
HAM	City of Hamilton Public Health Services
HDN	Haldimand-Norfolk Health Unit
HKP	Haliburton-Kawartha-Pine Ridge District Health Unit
HPE	Hastings and Prince Edward Public Health
HUR	Huron County Health Unit
KFL	Kingston-Frontenac and Lennox & Addington Public Health
LAM	Lambton Public Health
LGL	Leeds-Grenville & Lanark District Health Unit
MSL	Middlesex-London Health Unit
NIA	Niagara Region Public Health
NPS	North Bay Parry Sound District Health Unit
NWR	Northwestern Health Unit
OTT	Ottawa Public Health

Code	Public Health Unit Name
OXE	Southwestern Public Health
PDH	Perth District Health Unit
PEL	Peel Public Health
PQP	Porcupine Health Unit
PTC	Peterborough Public Health
REN	Renfrew County and District Health Unit
SMD	Simcoe Muskoka District Health Unit
SUD	Public Health Sudbury & Districts
THB	Thunder Bay District Health Unit
TOR	Toronto Public Health
TSK	Timiskaming Health Unit
WAT	Region of Waterloo Public Health and Emergency Services
WDG	Wellington-Dufferin-Guelph Public Health
WEC	Windsor-Essex County Health Unit
YRK	York Region Public Health

Appendix B: Risk Factor Categories and Corresponding iPHIS Risk Factors

Risk Factor Category	iPHIS Risk Factors
Blood products/organ transplant	Organ/tissue transplant (specify when & where) Organ/tissue transplant abroad (specify country & when) Received blood or blood products (specify when) Received blood or blood products abroad (specify country & when)
Born in an endemic country	Born in an endemic country
Correctional facility	Correctional facility
Non-injection drug use	Shared drug use equipment Illicit drug use – injection/intra nasal (inactivated as of 2011-01-01) Inhalation drug use Intranasal drug use
High risk sexual activity	High risk sexual activity Repeat STI Sex worker
Homeless/underhoused	Homeless/underhoused
Injection drug use	Injection drug use
Medical or dental procedure	Dialysis recipient (specify province or country) Invasive dental procedures abroad (specify when & where, including country) Invasive dental procedures in Canada (specify when & where) Invasive medical/surgical procedures abroad (specify when & where)

Risk Factor Category	iPHIS Risk Factors
	Invasive medical/surgical procedures in Canada (specify when & where)
Mother to child	Client was born to a case or carrier
MSM	Sex with same sex and client gender=male
Other	Contact is hepatitis C positive Contact is HIV positive Fighting, biting, blood brother HIV status Occupational exposure to potentially hepatitis C contaminated body fluids Other (specify) Pregnant Sex with opposite sex Shared personal items, e.g., toothbrush, razor blades
Personal service settings	Acupuncture Electrolysis Other personal services Piercing Tattoo Tattoo and piercing (inactivated as of 2017-12-31) Tattoo/acupuncture/ear piercing/electrolysis (inactivated as of 2011-01-01)
Unknown	Unknown

Appendix C: Technical Notes

Data Sources

- Case data:
    - The data for this report were based on information entered in the Ontario Ministry of Health (MOH), integrated Public Health Information System (iPHIS) database as of July 12, 2019. Data for the concurrent and prior infection section of this report were based on information entered in iPHIS, as of July 3, 2019.
    - iPHIS is a dynamic disease reporting system, which allows ongoing updates to data previously entered. As a result, data extracted from iPHIS represent a snapshot at the time of extraction and may differ from previous or subsequent reports.
- Ontario Population data:
    - Population Estimates 2005-2016, Ontario Ministry of Health and Long-Term Care, IntelliHEALTH Ontario. Data extracted on October 19, 2017.
    - Population Projection, 2017–18, Ontario Ministry of Health and Long-Term Care, IntelliHEALTH Ontario. Data extracted on October 24, 2017.

iPHIS Data Caveats

- The data only represent cases reported to public health and recorded in iPHIS. As a result, all counts will be subject to varying degrees of underreporting due to a variety of factors, such as disease awareness and medical care seeking behaviours, which may depend on severity of illness, clinical practice, changes in laboratory testing and reporting behaviours.
- Only cases meeting the provincial confirmed case classifications, as listed in the Ontario MOH surveillance case definitions are included in the report counts.
    - Changes to provincial surveillance case definitions and disease classifications have occurred over the years and may impact analysis of trends. Cases are classified in iPHIS according to the Ontario MOH surveillance case definitions used at the time the case was identified. Please note that the case definitions available online as part of the Infectious Diseases Protocol represent the most recent definitions. Cases reported in prior years may have been classified according to different case definitions or disease classifications. PHO produced the report Factors affecting Reportable Diseases in Ontario to detail key case definition changes up to 2016. No changes to the hepatitis C case definition took place from 2016 until the current case definition for hepatitis C was implemented January 1, 2018.

    - In January 2018, changes to the provincial case definition for hepatitis C were made. These changes include differentiating between newly and previously acquired cases, as well as infectious status (RNA+, RNA- or RNA unknown). Additionally, changes were made to the *Health Protection and Promotion Act,* Regulation 569 (sec 3. (2).2) to include reporting of all hepatitis C RNA tests, including any initial tests and any tests done at any time subsequent to the initial test. To align with these changes, PHO began reporting all RNA tests to public health units (after the first positive antibody or RNA result was reported) along with a cumulative report showing historical test results, including the last negative test.

- Cases of hepatitis C are reported based on the episode date, which is an estimate of the onset date of disease for a case. In order to determine this date, the following hierarchy is in place in iPHIS: Onset Date > Specimen Collection Date > Lab Test Date > Reported Date. If an onset date exists, it will be used as the episode date. If not available, then the next available date in the hierarchy will be used.

    - Hepatitis C is often undiagnosed for extended periods and detection by public health is generally not indicative of the actual date the infection was acquired.

- Orientation of case counts by geography is based on the diagnosing health unit (DHU). DHU refers to the case's public health unit of residence at the time of illness onset or report to public health and not necessarily the location of exposure. Cases for which the DHU was reported as MOHLTC (to signify a case that is not a resident of Ontario) or Muskoka Parry Sound (a public health unit that no longer exists) have been excluded from the analyses.

- Risk factors were based on information reported in iPHIS and may not be fully captured for every case.

    - Cases may have multiple risk factors reported, no hierarchy was applied to these data and each risk factor was kept for the analyses.

    - Cases were determined to have risk factor data reported if responses of yes or no were provided for any risk factor in the medical risk factors category. The same approach was taken for the behavioural risk factors.

    - Risk factors reported for hepatitis C cases may not reflect the mode of acquisition.

- Cases for which the Disposition Status was reported as ENTERED IN ERROR, DOES NOT MEET DEFINITION, DUPLICATE-DO NOT USE or any variation on these values have been excluded.

- The potential for duplicates exists because duplicate sets were not identified and excluded unless they were resolved at either the local or provincial level prior to data extraction from iPHIS.

- Population estimates were used in rate calculations for 2009-2016. Population projections were used for 2017–18.

- Testing cascade classification algorithm:
    - RNA test ever recorded in iPHIS is based on entry in either the laboratory section or aetiologic agent field in iPHIS.
    - RNA positive result ever recorded in iPHIS is based on entry in either the laboratory section or aetiologic agent field in iPHIS.
    - Genotype ever recorded in iPHIS is based on results entered in the laboratory section or subtype field in iPHIS. Note that at PHO, hepatitis C genotyping will be performed on the first baseline pre-treatment RNA test if the viral load is >500 copies/ml and results should be available on the cumulative report provided to PHUs.
    - Cases may be missing laboratory information in iPHIS if the test was not performed, not received by the health unit or not entered in iPHIS.

Public Health Ontario
480 University Avenue, Suite 300
Toronto, Ontario
M5G 1V2
647.260.7100
communications@oahpp.ca
publichealthontario.ca

Ontario
Agency for Health Protection and Promotion
Agence de protection et de promotion de la santé