



# National hepatitis B and C estimates for 2021: Measuring Canada's progress towards eliminating viral hepatitis as a public health concern

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## Abstract

**Background:** Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are major causes of morbidity and mortality worldwide. Measuring the epidemiological burden of HCV and HBV in Canada is essential to measure progress towards global elimination targets and to ultimately eliminate viral hepatitis as a public health concern.

**Objective:** This study aimed to provide the first national estimates of HBV prevalence and unawareness, and to update estimates of HCV incidence, prevalence, and unawareness in the general population and key populations in Canada for 2021. Progress towards elimination targets for 2025, namely incidence, awareness, mortality, and HBV vaccination, was also assessed.

**Methods:** A combination workbook method and mathematical modelling was used to estimate the prevalence and unawareness of chronic hepatitis B (CHB), prevalence and incidence of anti-HCV antibodies, and the prevalence and unawareness of chronic hepatitis C (CHC).

**Results:** The estimated prevalence of CHB was 0.68% (plausible range: 0.40%–0.97%) or 262,000 (152,000–371,000) people in the general population, of whom 42.5% (33.9%–51.0%) were unaware of their infection. Immigrants from countries where HBV is common had the highest prevalence at 4.2% (1.9%–5.6%). An estimated 8,212 new HCV infections occurred in 2021, and the estimated prevalence of CHC was 0.56% (0.15%–0.97%) or 214,000 (58,500–369,000) people, of whom 41.5% (34.3%–48.8%) were unaware of their infection. People who inject drugs had the highest prevalence and largest proportion who were unaware at 36.9% (12.6%–55.1%) and 49.9% (29.0%–70.2%), respectively.

**Conclusion:** While the overall viral hepatitis burden is low in the general Canadian population, these estimates indicate that certain populations and communities remain disproportionately affected. Although Canada has met some of the 2025 targets, more work is needed. To this end, efforts to obtain and standardize provincial and national data will be required to measure progress towards all elimination targets.

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## Introduction

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are sexually transmitted and blood-borne infections (STBBI) leading to chronic liver disease with a risk of progression to cirrhosis, liver failure and liver cancer (1), despite the availability of effective treatment and HBV vaccines. Following HBV infection, approximately 90% of newborns, 20%–30% of children younger than five years, and 5%–10% of adults younger than 50 years develop chronic hepatitis B (CHB) (2,3) which may cause progressive liver injury. Suppressive treatment is available (3) and reduces the risk of liver-related outcomes but must be taken long-term and rarely leads to clearance of the infection. People exposed to and infected with HCV develop antibodies that remain detectable regardless of spontaneous clearance or successful treatment. Detection of viral RNA is necessary to diagnose chronic hepatitis C (CHC) infection, defined as persistence of viremia beyond six months (4). More than 95% of people who take direct-acting antivirals (DAAs) treatment achieve a sustained virological response 12 weeks after the end of treatment and are therefore considered cured (5). Treatment is well tolerated and recommended for all people living with CHC (6).

Key guiding documents identify certain populations and communities that are disproportionately impacted by HBV and HCV (7–10), including immigrants from countries where HBV or HCV is common, gay, bisexual and other men who have sex with men (GBMSM), incarcerated people, people who inject drugs (PWID), First Nations, Inuit and Métis, and adults in the 1945–1975 birth cohort. Canada is committed to achieving the global targets in support of eliminating viral hepatitis as a public health concern (8,11). Global targets include a reduction of incidence and mortality, an increase in the proportion of people living with CHC or CHB who are diagnosed and treated, and an increase of HBV vaccine coverage.

This paper provides updated national estimates of HCV incidence, prevalence, awareness and treatment, as well as the first national estimates of HBV prevalence and awareness, for 2021 (9). These estimates are reported for the general population, as well as for key populations. Finally, Canada's progress towards some of the 2025 global viral hepatitis elimination targets are discussed.

## Methods

A combination of a modified workbook method and mathematical modelling was used to estimate the prevalence of CHB and the proportion of people living with CHB who were unaware of their infection, and to estimate the prevalence of anti-HCV antibodies and CHC and the proportion of people living with CHC who were unaware of their infection. Incidence for HCV was estimated using mathematical modelling. Mortality, HBV vaccination and HCV treatment were estimated using

administrative data. Rates were calculated using national population estimates (12).

## Hepatitis B

### Systematic review

A systematic search for literature published between January 1, 2016 and March 31, 2023, on prevalence and unawareness of HBV infection in Canada was conducted in the MEDLINE, Embase and Scopus databases and yielded an initial 355 records, with an additional 40 records identified through other sources. Using a previously described method (13), 14 records were selected to consider in the workbook method, in addition to unpublished data from organizations and researchers.

### Mathematical modelling

National CHB modelling was described elsewhere (14) and used data from the Canadian Notifiable Disease Surveillance System (CNDSS), extracted in July 2023 for all provinces and territories, as input into the model.

### Modified workbook

A modified workbook method (13) was used to estimate the prevalence of CHB infection (using the hepatitis B surface antigen (HBsAg) as a proxy for CHB, where applicable), and its proportion unaware, for the general population and for key populations informed by an environmental scan. Each measure extracted from the systematic search records were classified as “underestimate,” “appropriate estimate” or “overestimate” based on a review of the methodology of each study. The underestimates and overestimates were used as plausible ranges. When measures from multiple records were available, evidence was ranked to prioritize representative data (e.g., national surveys) over data of lower representativity (e.g., local studies) to determine each plausible range. Where possible, results from comparable studies were averaged. Point estimates were calculated as the midpoint between bounds, except when representative data (“appropriate estimates”) were used as the point estimate. In instances where only one representative estimate was available, the plausible range is the 95% confidence interval, computed as needed using the Wilson method (15). In instances where there was one data source of low representativity or no data, “insufficient data” was indicated. Proportions  $\leq 1$  were rounded to two decimal places, larger proportions were rounded to one decimal place, and absolute numbers were rounded to three significant digits.

### Administrative data: Vaccination and mortality

Vital statistics data (16) were used to estimate the proportion of all live births in Canada that occurred in provinces and territories offering universal birth dose vaccination. Vaccination coverage was taken from the *Childhood National Immunization Coverage Survey* report (17).



Vital statistics data were used to directly estimate the number of deaths in 2021 for which HBV (ICD-10 codes B16.0, B16.1, B16.2, B16.9, B17.0, B18.0, and B18.1) was identified as the underlying cause or one of the other 19 contributing causes of death (18).

## Hepatitis C

### Systematic review

A search on prevalence, incidence and unawareness of infection in Canada was updated with records published between July 1, 2021 and March 31, 2023, yielding 187 records, with an additional 28 records found outside of the search. A total of 31 records were selected for consideration using the workbook method, in addition to the 22 records identified and used through the 2019 estimates process (13) and unpublished data from organizations and researchers.

### Mathematical modelling

Back-calculation mathematical modelling (7,19) with least square method (20) for 2020–2021 pandemic adjustment was used to estimate HCV incidence and as input for the anti-HCV antibodies prevalence estimates. Data from a July 2023 CNDSS extraction for British Columbia, Alberta, Saskatchewan, Ontario, Québec and the Yukon were used as input and model outputs were projected to Canadian population.

### Modified workbook

Using methods described in the HBV section, this study estimated the prevalence of anti-HCV antibodies (as a marker of current or past infection) as well as the prevalence of CHC infection (using detection of HCV RNA as a proxy where applicable) and its proportion unaware, for the general population and for key populations, based on priority populations identified in the blueprint to inform hepatitis C elimination efforts in Canada (7).

### Administrative data: Treatment and mortality

Licensed data were obtained from IQVIA Solutions Canada (IQVIA) to estimate the number of people treated for HCV in Canada between 2012 and 2021. The 2012–2016 estimates were produced by the British Columbia Centre for Disease Control using Compuscript data from IQVIA, and the 2017–2021 estimates were projected patient counts computed by IQVIA using the GPM Custom Solutions information service.

Vital statistics data were used to directly estimate the number of deaths in 2021 for which HCV (ICD-10 codes B17.1 and B18.2) was identified as an underlying cause or one of the other 19 contributing causes of death (18).

## Results

### Chronic hepatitis B prevalence

The prevalence of CHB in the general population was estimated at 0.68% (plausible range: 0.40%–0.97%) or 262,000 (152,000–371,000) people at the end of 2021. Among key populations, the highest estimated prevalence was 4.2% (1.9%–5.6%) among immigrants from countries where HBV is common ( $\geq 2\%$  HBsAg prevalence), followed by GBMSM at 1.4% (0.8%–2.1%) and people incarcerated in federal prisons (Table 1). Additional data are needed to estimate the prevalence in other key populations.

### Unawareness of chronic hepatitis B infection

The proportion of people living with CHB who were unaware of their infection was estimated at 42.5% (33.9%–51.0%), or 111,000 (88,700–134,000) people (Table 2). Additional data are needed to estimate unawareness in key populations.

### Hepatitis B vaccination

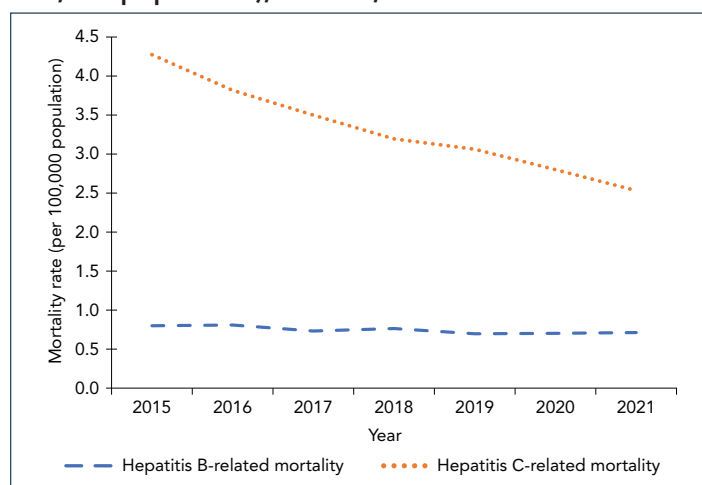
In the seven jurisdictions with a three-dose program for infants, the HBV vaccine coverage among two-year-old children was 82.6% (79.7%–85.1%) in 2021. The national HBV vaccine coverage among 14-year-old adolescents was 89.0% (86.3%–91.2%) in 2021 (17).

Three (New Brunswick, Northwest Territories and Nunavut) out of 13 provinces and territories have universal HBV vaccination programs initiated at birth, and 7,690 live births occurred in these jurisdictions between July 1, 2021 and June 30, 2022, representing 2% of live births in Canada during that period (16).

### Hepatitis B-related mortality

In 2021, HBV was identified as a contributing cause for 274 deaths for a crude mortality rate of 0.72 per 100,000 population. Between 2015 and 2021, the annual mortality rate for HBV-related deaths was relatively stable (Figure 1).

**Figure 1: Crude annual hepatitis B-related and hepatitis C-related mortality rates (per 100,000 population), Canada, 2015–2021**



**Table 1: Estimated chronic hepatitis B prevalence for the general population and key populations, Canada, 2021**

| Population                                                | Population size estimate | Prevalence (%) |             |             | Estimated number of people living with CHB |             |             | Reference(s)                                                                                    |
|-----------------------------------------------------------|--------------------------|----------------|-------------|-------------|--------------------------------------------|-------------|-------------|-------------------------------------------------------------------------------------------------|
|                                                           |                          | Point estimate | Lower bound | Upper bound | Point estimate                             | Lower bound | Upper bound |                                                                                                 |
| General population                                        | 38,239,864               | 0.68%          | 0.40%       | 0.97%       | 262,000                                    | 152,000     | 371,000     | (12,14,21–24)                                                                                   |
| Immigrants from countries where HBV is common (HBsAg ≥2%) | 5,599,485                | 4.2%           | 1.9%        | 5.6%        | 237,000                                    | 106,000     | 312,000     | (21,25,26)                                                                                      |
| GBMSM                                                     | 669,613                  | 1.4%           | 0.8%        | 2.1%        | 9,310                                      | 5,360       | 14,100      | (27,28)<br>Unpublished data from the Engage cohort study, 2017–2019                             |
| People incarcerated in federal prisons <sup>a</sup>       | 12,405                   | 0.28%          | 0.19%       | 0.41%       | 35                                         | 24          | 51          | Unpublished data from Correctional Service Canada, 2021 ( <i>personal communication</i> , 2024) |
| People incarcerated in provincial prisons <sup>b</sup>    | Insufficient information |                |             |             |                                            |             |             |                                                                                                 |
| PWID                                                      | Insufficient information |                |             |             |                                            |             |             |                                                                                                 |
| First Nations                                             | Insufficient information |                |             |             |                                            |             |             |                                                                                                 |
| Inuit                                                     | Insufficient information |                |             |             |                                            |             |             |                                                                                                 |
| Métis                                                     | Insufficient information |                |             |             |                                            |             |             |                                                                                                 |

Abbreviations: CHB, chronic hepatitis B; HBsAg, hepatitis B surface antigen; HBV, hepatitis B virus; GBMSM, gay, bisexual and other men who have sex with men; PWID, people who inject drugs

<sup>a</sup> Who were sentenced for two years or more<sup>b</sup> Who were sentenced for less than two years**Table 2: Estimated number and proportion of people living with chronic hepatitis B who were unaware of their infection for the general population and key populations, Canada, 2021**

| Population                                                | Estimated number of people living with CHB | Proportion who were unaware (%) |             |             | Estimated number of people who were unaware |             |             | Reference(s) |
|-----------------------------------------------------------|--------------------------------------------|---------------------------------|-------------|-------------|---------------------------------------------|-------------|-------------|--------------|
|                                                           |                                            | Point estimate                  | Lower bound | Upper bound | Point estimate                              | Lower bound | Upper bound |              |
| General population                                        | 262,000                                    | 42.5%                           | 33.9%       | 51.0%       | 111,000                                     | 88,700      | 134,000     | (14,21)      |
| Immigrants from countries where HBV is common (HBsAg ≥2%) | Insufficient information                   |                                 |             |             |                                             |             |             |              |
| GBMSM                                                     | Insufficient information                   |                                 |             |             |                                             |             |             |              |
| People incarcerated in federal prisons <sup>a</sup>       | Insufficient information                   |                                 |             |             |                                             |             |             |              |
| People incarcerated in provincial prisons <sup>b</sup>    | Insufficient information                   |                                 |             |             |                                             |             |             |              |
| PWID                                                      | Insufficient information                   |                                 |             |             |                                             |             |             |              |
| First Nations                                             | Insufficient information                   |                                 |             |             |                                             |             |             |              |
| Inuit                                                     | Insufficient information                   |                                 |             |             |                                             |             |             |              |
| Métis                                                     | Insufficient information                   |                                 |             |             |                                             |             |             |              |

Abbreviations: CHB, chronic hepatitis B; HBsAg, hepatitis B surface antigen; HBV, hepatitis B virus; GBMSM, gay, bisexual and other men who have sex with men; PWID, people who inject drugs

<sup>a</sup> Who were sentenced for two years or more<sup>b</sup> Who were sentenced for less than two years

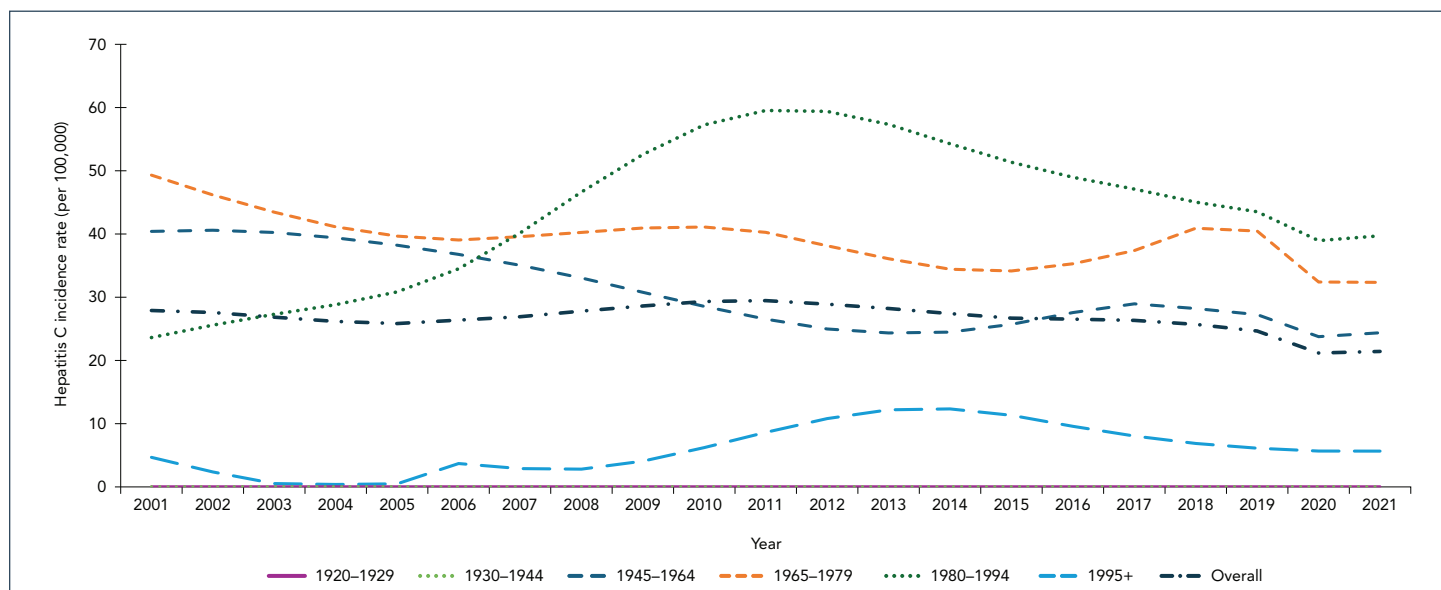
## Hepatitis C incidence

An estimated 8,212 seroconversions (representing new HCV infections) occurred in 2021 in Canada, corresponding to an annual incidence rate of 21.47 per 100,000 population. The overall incidence rate has been slowly declining since

2013 (Figure 2). When grouped by birth cohort, as a proxy for established generations, those born between 1980 and 1994 had the highest incidence in 2021 (Figure 2) with 3,179 estimated seroconversions, for a rate of 39.76 per 100,000 population (data not shown).



**Figure 2: Estimated annual hepatitis C incidence rates (per 100,000 population), by birth cohort and overall, Canada, 2001–2021**



### Hepatitis C prevalence

The estimated prevalence of anti-HCV antibodies in Canada was 0.99% (0.68%–1.30%) or 378,000 (258,000–497,000) people who were ever infected with HCV at the end of 2021. Among key populations, the highest estimated prevalence was among PWID (within 12 months) at 64.2% (36.7%–91.8%), followed by those who have ever injected drugs (35.4%; 9.3%–61.5%). In absolute numbers, adults in the 1945–1975 birth cohort represented the population with the largest number of people ever infected at 270,000 (157,000–383,000) (Table 3).

The prevalence of CHC in Canada was estimated at 0.56% (0.15%–0.97%) or 214,000 (58,500–369,000) people living with CHC at the end of 2021. Among key populations, PWID (within 12 months) and those who have ever injected drugs had the highest estimated prevalence of CHC at 36.9% (12.6%–55.1%) and 18.1% (5.7%–30.5%), respectively. In absolute numbers, adults in the 1945–1975 birth cohort had the largest number of people living with CHC at 157,000 (30,000–284,000) (Table 4).

**Table 3: Estimated anti-hepatitis C virus antibodies prevalence for the general population and key populations, Canada, 2021**

| Population                          | Population size estimate | Prevalence (%) |             |             | Estimated number of people with current or past HCV infection |             |             | Reference(s)                                                                                                                                                                                                                    |
|-------------------------------------|--------------------------|----------------|-------------|-------------|---------------------------------------------------------------|-------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     |                          | Point estimate | Lower bound | Upper bound | Point estimate                                                | Lower bound | Upper bound |                                                                                                                                                                                                                                 |
| General population                  | 38,239,864               | 0.99%          | 0.68%       | 1.3%        | 378,000                                                       | 258,000     | 497,000     | (12,21,29–31)<br>Unpublished data from PHAC, 2021 (this study)                                                                                                                                                                  |
| PWID, within 12 months              | 100,300                  | 64.2%          | 36.7%       | 91.8%       | 64,400                                                        | 36,800      | 92,100      | (32–35)<br>Unpublished data from the Virtual Cascade of Care Cohort study, 2018–2019 (personal communication, Stine Høj, 2023)<br>Unpublished data from the HEPCO study, 2022–2023 (personal communication, Sarah Larney, 2024) |
| People who have ever injected drugs | 388,400                  | 35.4%          | 9.3%        | 61.5%       | 137,000                                                       | 36,100      | 239,000     | (21,33,35–37)<br>Unpublished data from the Virtual Cascade of Care Cohort study, 2018–2019 (personal communication, Stine Høj, 2023)                                                                                            |



**Table 3: Estimated anti-hepatitis C virus antibodies prevalence for the general population and key populations, Canada, 2021 (continued)**

| Population                                                                         | Population size estimate | Prevalence (%) |             |             | Estimated number of people with current or past HCV infection |             |             | Reference(s)                                                                                                            |
|------------------------------------------------------------------------------------|--------------------------|----------------|-------------|-------------|---------------------------------------------------------------|-------------|-------------|-------------------------------------------------------------------------------------------------------------------------|
|                                                                                    |                          | Point estimate | Lower bound | Upper bound | Point estimate                                                | Lower bound | Upper bound |                                                                                                                         |
| People incarcerated in provincial prisons <sup>a</sup>                             | 18,950                   | 14.2%          | 9.5%        | 19.0%       | 2,700                                                         | 1,790       | 3,600       | (38–41)<br>Unpublished data from Alberta Health Services, 2023 ( <i>personal communication</i> , Kaylee Goralcyk, 2024) |
| People incarcerated in federal prisons <sup>b</sup>                                | 12,405                   | 11.1%          | 10.2%       | 12.0%       | 1,370                                                         | 1,260       | 1,490       | Unpublished data from Correctional Service Canada, 2021 ( <i>personal communication</i> , 2024)                         |
| First Nations                                                                      | 1,048,400                | 8.0%           | 3.5%        | 12.5%       | 84,000                                                        | 36,600      | 131,000     | (42–44)<br>Unpublished data from the CHMS, Statistics Canada, 2014–2015                                                 |
| Immigrants from countries where hepatitis C is common ( $\geq 2\%$ seroprevalence) | 1,276,405                | 4.0%           | 2.9%        | 6.7%        | 51,500                                                        | 36,700      | 85,300      | (25)                                                                                                                    |
| GBMSM                                                                              | 669,613                  | 3.0%           | 0.82%       | 5.2%        | 20,100                                                        | 5,490       | 34,800      | (27,45,46)<br>Unpublished data from the Engage cohort study, 2017–2019                                                  |
| Adults in the 1945–1975 birth cohort                                               | 14,267,340               | 1.9%           | 1.1%        | 2.7%        | 270,000                                                       | 157,000     | 383,000     | (12,21,29–31,36,47)<br>Unpublished data from PHAC, 2021 (this study)                                                    |
| Inuit                                                                              | Insufficient information |                |             |             |                                                               |             |             |                                                                                                                         |
| Métis                                                                              | Insufficient information |                |             |             |                                                               |             |             |                                                                                                                         |

Abbreviations: CHMS, Canadian Health Measures Survey; HCV, hepatitis C virus; HEPCO, Hepatitis Cohort; GBMSM, gay, bisexual and other men who have sex with men; PHAC, Public Health Agency of Canada; PWID, people who inject drugs

<sup>a</sup> Who were sentenced for two years or more

<sup>b</sup> Who were sentenced for less than two years

**Table 4: Estimated chronic hepatitis C prevalence for the general population and key populations, Canada, 2021**

| Population                                             | Population size estimate | Prevalence (%) |             |             | Estimated number of people living with CHC |             |             | Reference(s)                                                                                                                                                                                                                                            |
|--------------------------------------------------------|--------------------------|----------------|-------------|-------------|--------------------------------------------|-------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                        |                          | Point estimate | Lower bound | Upper bound | Point estimate                             | Lower bound | Upper bound |                                                                                                                                                                                                                                                         |
| General population                                     | 38,239,864               | 0.56%          | 0.15%       | 0.97%       | 214,000                                    | 58,500      | 369,000     | (12,21,30,31,48–52)                                                                                                                                                                                                                                     |
| PWID, within 12 months                                 | 100,300                  | 36.9%          | 12.6%       | 55.1%       | 37,000                                     | 12,600      | 55,300      | (32–35,53,54)<br>Unpublished data from the HEPCO study, 2022–2023 ( <i>personal communication</i> , Sarah Larney, 2024)<br>Unpublished data from the Virtual Cascade of Care Cohort study, 2018–2019 ( <i>personal communication</i> , Stine Høj, 2023) |
| People who have ever injected drugs                    | 388,400                  | 18.1%          | 5.7%        | 30.5%       | 70,100                                     | 21,900      | 118,000     | (21,35)<br>Unpublished data from the Virtual Cascade of Care Cohort study, 2018–2019 ( <i>personal communication</i> , Stine Høj, 2023)                                                                                                                 |
| People incarcerated in provincial prisons <sup>a</sup> | 18,950                   | 5.1%           | 4.4%        | 5.7%        | 957                                        | 834         | 1,080       | (38,40,41)<br>Unpublished data from Alberta Health Services, 2023 ( <i>personal communication</i> , Kaylee Goralcyk, 2024)                                                                                                                              |
| First Nations                                          | 1,048,400                | 3.3%           | 1.5%        | 5.0%        | 34,300                                     | 15,800      | 52,800      | (42–44,55,56)                                                                                                                                                                                                                                           |

**Table 4: Estimated chronic hepatitis C prevalence for the general population and key populations, Canada, 2021 (continued)**

| Population                                                                         | Population size estimate | Prevalence (%) |             |             | Estimated number of people living with CHC |             |             | Reference(s)                                                                                    |
|------------------------------------------------------------------------------------|--------------------------|----------------|-------------|-------------|--------------------------------------------|-------------|-------------|-------------------------------------------------------------------------------------------------|
|                                                                                    |                          | Point estimate | Lower bound | Upper bound | Point estimate                             | Lower bound | Upper bound |                                                                                                 |
| People incarcerated in federal prisons <sup>b</sup>                                | 12,405                   | 3.2%           | 2.7%        | 3.7%        | 396                                        | 335         | 464         | Unpublished data from Correctional Service Canada, 2021 ( <i>personal communication, 2024</i> ) |
| Immigrants from countries where hepatitis C is common ( $\geq 2\%$ seroprevalence) | 1,276,405                | 2.2%           | 1.6%        | 3.5%        | 28,100                                     | 19,800      | 44,600      | (25)                                                                                            |
| Adults in the 1945–1975 birth cohort                                               | 14,267,340               | 1.1%           | 0.21%       | 2.0%        | 157,000                                    | 30,000      | 284,000     | (12,21,48,49,57)                                                                                |
| GBMSM                                                                              | 669,613                  | 0.94%          | 0.18%       | 1.7%        | 6,290                                      | 1,210       | 11,400      | (27,45,46)<br>Unpublished data from the Engage cohort study 2017–2019                           |
| Inuit                                                                              | Insufficient information |                |             |             |                                            |             |             |                                                                                                 |
| Métis                                                                              | Insufficient information |                |             |             |                                            |             |             |                                                                                                 |

Abbreviations: CHC, chronic hepatitis C; HEPCO, Hepatitis Cohort; GBMSM, gay, bisexual and other men who have sex with men; PWID, people who inject drugs

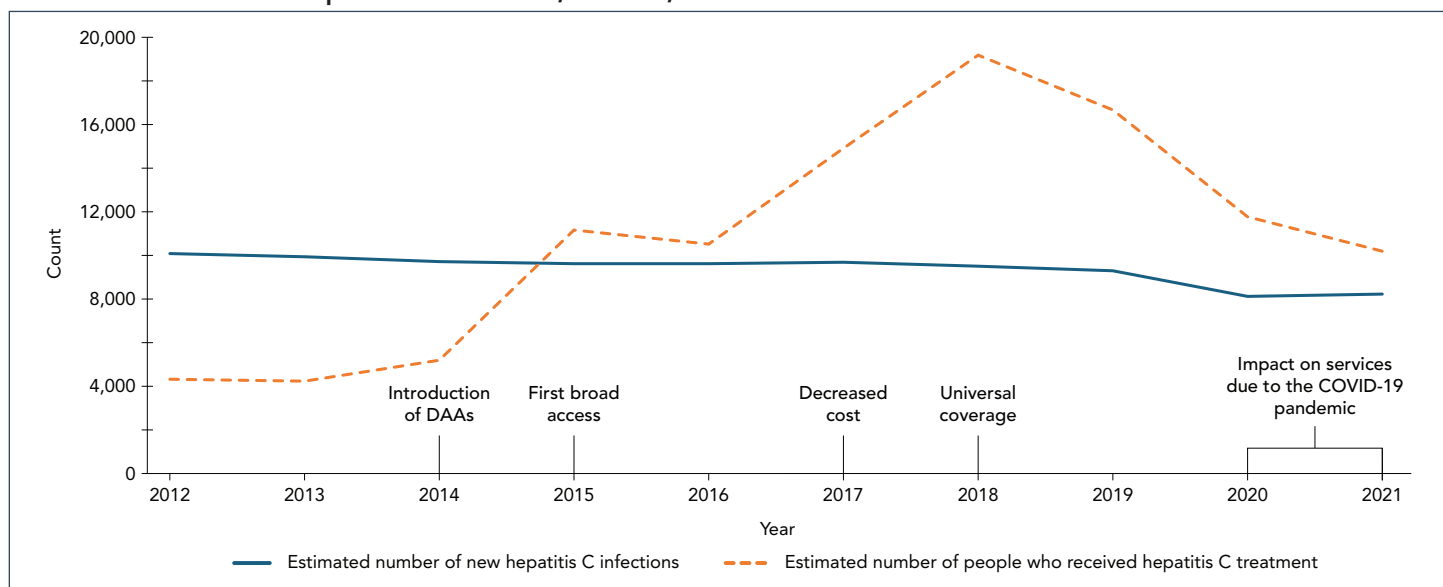
<sup>a</sup> Who were sentenced for two years or more<sup>b</sup> Who were sentenced for less than two years

## Unawareness of chronic hepatitis C infection

The proportion of people living with CHC who were unaware of their infection was estimated at 41.5% (34.3%–48.8%) or 104,000 people. Among key populations, the largest proportion was among PWID at 49.9% (29.0%–70.2%), followed by people incarcerated in federal prisons at 32.7% (28.2%–37.5%). In absolute numbers, adults in the 1945–1975 birth cohort had the largest number of people unaware of their infection at 45,200 (24,700–65,800) (Table 5). Additional data are needed to estimate unawareness in other key populations.

## Hepatitis C treatment

It is estimated that, between 2012 and 2021, 108,000 people living with CHC received treatment. Since the introduction of highly effective DAAs in Canada in 2014, approximately 99,400 people were treated. Between 2015 and 2021, but drastically starting in 2017, the estimated number of people treated annually surpassed the estimated number of new infections annually (Table 6, Figure 3).

**Figure 3: Estimated annual number of people living with chronic hepatitis C who were treated and estimated annual number of new hepatitis C infections, Canada, 2012–2021**

Abbreviation: DAAs, direct-acting antivirals



**Table 5: Estimated number and proportion of people living with chronic hepatitis C who were unaware of their infection, for the general population and key populations, Canada, 2021**

| Population                                                                         | Estimated number of people living with CHC | Proportion who were unaware (%) |             |             | Estimated number of people living with CHC who are unaware |             |             | Reference(s)                                                                                     |
|------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------|-------------|-------------|------------------------------------------------------------|-------------|-------------|--------------------------------------------------------------------------------------------------|
|                                                                                    |                                            | Point estimate                  | Lower bound | Upper bound | Point estimate                                             | Lower bound | Upper bound |                                                                                                  |
| General population                                                                 | 214,000                                    | 41.5%                           | 34.3%       | 48.8%       | 104,000                                                    | 73,300      | 104,000     | (21,48,49)                                                                                       |
| PWID, within 12 months                                                             | 37,000                                     | 49.9%                           | 29.0%       | 70.2%       | 18,500                                                     | 10,700      | 26,000      | (32)                                                                                             |
| People who have ever injected drugs                                                | Insufficient information                   |                                 |             |             |                                                            |             |             |                                                                                                  |
| People incarcerated in provincial prisons <sup>a</sup>                             | Insufficient information                   |                                 |             |             |                                                            |             |             |                                                                                                  |
| First Nations                                                                      | Insufficient information                   |                                 |             |             |                                                            |             |             |                                                                                                  |
| People incarcerated in federal prisons <sup>b</sup>                                | 396                                        | 32.7%                           | 28.2%       | 37.5%       | 129                                                        | 112         | 148         | Unpublished data from Correctional Services Canada, 2021 ( <i>personal communication, 2024</i> ) |
| Adults in the 1945–1975 birth cohort                                               | 157,000                                    | 28.9%                           | 15.7%       | 41.9%       | 45,200                                                     | 24,700      | 65,800      | (21,48,49,58)                                                                                    |
| Immigrants from countries where hepatitis C is common ( $\geq 2\%$ seroprevalence) | Insufficient information                   |                                 |             |             |                                                            |             |             |                                                                                                  |
| Inuit                                                                              | Insufficient information                   |                                 |             |             |                                                            |             |             |                                                                                                  |
| Métis                                                                              | Insufficient information                   |                                 |             |             |                                                            |             |             |                                                                                                  |
| GBMSM                                                                              | Insufficient information                   |                                 |             |             |                                                            |             |             |                                                                                                  |

Abbreviations: CHC, chronic hepatitis C; GBMSM, gay, bisexual and other men who have sex with men; PWID, people who inject drugs

<sup>a</sup> Who were sentenced for two years or more

<sup>b</sup> Who were sentenced for less than two years

**Table 6: Estimated number of new hepatitis C virus infections and estimated number of people who received hepatitis C virus treatment by year, Canada, 2012–2021**

| Year | Estimated number of new HCV infections | Estimated number of people who received HCV treatment |
|------|----------------------------------------|-------------------------------------------------------|
| 2012 | 10,075                                 | 4,370                                                 |
| 2013 | 9,912                                  | 4,221                                                 |
| 2014 | 9,690                                  | 5,147                                                 |
| 2015 | 9,557                                  | 11,138                                                |
| 2016 | 9,580                                  | 10,496                                                |
| 2017 | 9,673                                  | 14,887                                                |
| 2018 | 9,506                                  | 19,155                                                |
| 2019 | 9,298                                  | 16,619                                                |
| 2020 | 8,086                                  | 11,774                                                |
| 2021 | 8,212                                  | 10,155                                                |

Abbreviation: HCV, hepatitis C virus

## Hepatitis C-related mortality

In 2021, HCV was identified as a contributing cause for 972 deaths for a crude mortality rate of 2.54 per 100,000 population. Between 2010 and 2021, the annual mortality rate decreased, starting in 2016 (Figure 1).

## Progress towards viral hepatitis elimination

**Table 7** summarises the intermediary global targets for 2025 in relation to the 2021 estimates. For HBV, these estimates suggest that, as of 2021, Canada was on track to meet or had met three of the seven targets for 2025. For HCV, these estimates suggest that, as of 2021, Canada was on track to meet or had met three of the eight targets for 2025.



**Table 7: Progress towards viral hepatitis elimination targets for 2025 outlined in the Global Health Sector Strategy 2022–2030, Canada, 2021**

| Indicator                                                                                                                                                                                         | 2025 target (11)      | 2021 estimates                                           | Reference(s)                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------------|---------------------------------------------|
| Hepatitis B                                                                                                                                                                                       |                       |                                                          |                                             |
| Hepatitis B surface antigen prevalence among children 0–4 years old                                                                                                                               | 0.5%                  | Additional data needed                                   |                                             |
| Number of new hepatitis B infections per year                                                                                                                                                     | 11/100,000 population | Additional data needed                                   |                                             |
| Number of people dying from hepatitis B per year                                                                                                                                                  | 7/100,000 population  | 0.72/100,000 population                                  | This study using Vital statistics data (18) |
| Percentage of newborns who have benefitted from a timely birth dose of hepatitis vaccine and from other interventions to prevent the vertical (mother-to-child) transmission of hepatitis B virus | 70%                   | Less than 2%                                             | This study using Vital statistics data (18) |
| Hepatitis B vaccine coverage among children (third dose) <sup>a</sup>                                                                                                                             | 90%                   | 89.0% among 14-year-olds, 1 or more dose                 | (17)                                        |
| Percentage of people living with hepatitis B diagnosed                                                                                                                                            | 60%                   | 57.5%                                                    | This study                                  |
| Percentage of people living with hepatitis B diagnosed and treated                                                                                                                                | 50%                   | Additional data needed                                   |                                             |
| Hepatitis C                                                                                                                                                                                       |                       |                                                          |                                             |
| Number of new hepatitis C infections per year                                                                                                                                                     | 13/100,000 population | 21.47/100,000 population                                 | This study                                  |
| Number of new hepatitis C infections among PWID per year                                                                                                                                          | 3/100                 | Additional data needed                                   |                                             |
| Number of people dying from hepatitis C per year                                                                                                                                                  | 3/100,000 population  | 2.54/100,000 population                                  | This study using Vital statistics data (18) |
| Number of needles and syringes distributed per PWID                                                                                                                                               | 200                   | Additional data needed                                   |                                             |
| Blood safety: proportion of blood units screened for blood-borne diseases                                                                                                                         | 100%                  | 100% of blood donations are tested for hepatitis B and C | (59)                                        |
| Safe injections: proportion of safe healthcare injections                                                                                                                                         | 100%                  | Additional data needed                                   |                                             |
| Percentage of people living with hepatitis C diagnosed                                                                                                                                            | 60%                   | 58.5%                                                    | This study                                  |
| Percentage of people living with hepatitis C diagnosed and cured                                                                                                                                  | 50%                   | Additional data needed                                   |                                             |

Abbreviation: PWID, people who inject drugs

<sup>a</sup> The domestic vaccine coverage goal in Canada is to achieve 90% vaccination coverage by 17 years of age for one or more doses of the hepatitis B vaccine, by 2025 (60). As of 2024, no other domestic targets were set

## Discussion

Although the overall viral hepatitis burden is low in the general Canadian population, the 2021 national estimates indicate that certain populations and communities remain disproportionately affected, and that a significant number of people in Canada would benefit from targeted testing and treatment. These estimates mostly use data sources preceding the COVID-19 pandemic. Measuring post-pandemic estimates will be important to account for decreased demand for, and access to prevention, testing, treatment and care services for HBV and HCV. Given changes in methods and available evidence, these estimates replace previously published estimates and should not be compared over time.

It is estimated that 0.68% of people in Canada were living with CHB at the end of 2021. Other estimates for Canada include a 0.4% prevalence (2007–2011) (61) and a 0.6% HBsAg prevalence (2022) (62,63), which are comparable to the results in this study. Immigrants from countries where HBV is common

have the highest burden, by far. Regarding progress towards HBV elimination, we cannot report on the incidence target using available data. Estimates suggest that Canada is close to meeting the 60% diagnosis target for 2025 with 57.5% people living with CHB who were aware of their infection. Awareness data for key populations is scarce, limiting the evidence base for planning targeted interventions. An estimated 0.72 deaths per 100,000 population were identified as HBV-related in 2021, suggesting that the 2025 target of seven per 100,000 population is met, which is supported by a modelling study estimating one per 100,000 population HBV-related deaths in Canada in 2019 (64). The HBV vaccine coverage of 89% in adolescents approximates the 2025 target of 90% among children. We estimate that less than 2% of infants born in Canada in 2021 had access to universal birth dose vaccination, far from the 70% global target set for 2025. Of note, health care is a provincial and territorial responsibility, and the *Canadian Immunization Guide* indicates that the HBV vaccine should be provided according to provincial and territorial immunization schedules (65). Hepatitis B treatment data were not nationally validated at the time of press.



An estimated 21.47 new HCV infections per 100,000 population occurred in 2021, highlighting that more prevention work, including harm reduction services in all settings (8,10), is needed to reduce the incidence of HCV and meet the 2025 target of 13 per 100,000 population. We estimate that 0.99% of the Canadian population was ever infected with HCV. Other estimates include a 0.07% anti-HCV prevalence among Canadian first-time blood donors in nine provinces, representing a low-risk and undiagnosed population (66). We estimate the CHC prevalence at 0.56% in the general population; other CHC estimates include a prevalence of viremic infection of 130,000 people (2022) (67), and of 0.03% among low-risk undiagnosed blood donors (2021) (66). Among people living with CHC, we estimate that 58.5% were diagnosed, suggesting that Canada is close to meeting the 2025 diagnosis target of 60%. However, additional data will be needed to quantify awareness of CHC in all key populations. We identified 2.54 HCV-related deaths per 100,000 population, suggesting that Canada has met the 2025 target of 3 per 100,000. However, this finding contrasts with other evidence suggesting a seven per 100,000 population mortality rate in Canada for 2021 (64). Of note, in absolute numbers, more deaths were attributed to HCV than HBV in 2021, despite the availability of curative treatment which is associated with reduced mortality (68). Treatment data suggest that more people are being treated for HCV each year than there are new infections. Administrative data for key populations is not available at the national level, although it is documented that self-reported treatment uptake varies by key populations (32,69). Since treatment estimates do not consider mortality among treated individuals, we are unable to report on the proportion treated among people living with diagnosed HCV.

## Limitations

The main strengths of this study are the use of updated Canadian Health Measures Survey (CHMS) data, in combination with results from modelling using national surveillance data as model inputs for the first national HBV estimates and updated HCV estimates. We also compiled a thorough list of relevant scientific studies to inform the workbook estimates.

The analyses for this study have several limitations. First, mathematical modelling used for incidence (HCV) and as a lower bound for prevalence was based on reported cases, likely underestimating the true burden. The COVID-19 pandemic had an impact on STBBI testing in Canada (70–73), potentially making the modelled estimates for 2020–2021 an underestimation despite mathematical corrections. The workbook method produces large ranges of uncertainty given the heterogeneity of studies (e.g., participants, sampling, methods, geographic location) and data. In some instances, results from local studies were extrapolated nationally. These may impact the precision and accuracy of the estimates. Data is limited for key populations, restricting our capacity to provide estimates for all. Moreover, given the intersection of risks and identities across key populations, estimates cannot be added together or used to create proportions. The general population estimates for

CHC rely on data for a reference period up to 2019, therefore this study's findings may be more representative of the burden for 2019 than for the end of 2021. Measures of HBsAg and HCV RNA, where applicable, were used as proxies for CHB and CHC infections, respectively. Both could potentially result in a slightly overestimated chronicity, given that HBsAg is a marker of active HBV infection that occurs in its acute or chronic phase (74), and that HCV RNA is detectable for most people in the acute phase of the infection (75). The measure of the HBV vaccine target is likely overestimated since it is measured in adolescents with at least one dose. For mortality, a direct measurement method of documented causes of deaths was used, which excludes all deaths among undiagnosed individuals. As well, potential underreporting of causes on death certification is likely, which could lead to underestimation of the measure towards the target for deaths not identified as viral hepatitis-related. On the other hand, deaths with other direct causes, such as accidents or drug toxicity, may be misclassified as viral hepatitis-related, which would result in overestimation of mortality. Given the nature of this study, we could not control for confounding and missing data.

## Conclusion

Prevention of advanced liver disease caused by viral hepatitis is possible, and epidemiological estimates are essential to identify gaps in the care continuum by key population, contribute to planning evidence-based interventions, and track progress towards elimination as a public health concern. While these estimates suggest that Canada has met or is on track to meet six of the 15 global targets for 2025, more work is needed to address data gaps and to meet the targets that are not on track, such as HCV incidence. Additional national-level data are needed to produce estimates of prevalence and proportion unaware among all key population and to report Canada's progress towards all elimination targets, including validated treatment data for HBV and cascade of care data.

## Authors' statement

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LC — Conceptualization, methodology, formal analysis, validation

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## Competing interests

The statements, findings, conclusions, views, and opinions expressed in this report are based in part on data obtained under licence from IQVIA Solutions Canada Inc. concerning the following information service(s): CompuScript and GPM Custom Solutions from January 2012 to December 2021. All Rights Reserved. The statements, findings, conclusions, views, and opinions expressed herein are not necessarily those of IQVIA Solutions Canada Inc. or any of its affiliated or subsidiary entities.

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