



# TRENDS IN REPORTABLE INFECTIOUS DISEASES IN EYYOU ISTCHEE 2000-2020

SURVEILLANCE REPORT

DECEMBER 2025



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CONSEIL CRI DE LA SANTÉ ET DES SERVICES SOCIAUX DE LA BAIE JAMES  
CREE BOARD OF HEALTH AND SOCIAL SERVICES OF JAMES BAY

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# LIST OF ABBREVIATIONS

## ORGANIZATIONAL BODIES AND PROGRAMS

|                 |                                                                          |
|-----------------|--------------------------------------------------------------------------|
| <b>CBHSSJB</b>  | Cree Board of Health and Social Services of James Bay                    |
| <b>CFIA</b>     | Canadian Food Inspection Agency                                          |
| <b>CMC</b>      | Community Miyupimaatisiun Centre (community health clinic)               |
| <b>ICS</b>      | International Circumpolar Surveillance                                   |
| <b>INESSS</b>   | Institut national d'excellence en santé et en services sociaux           |
| <b>INSPQ</b>    | Institut national de santé publique du Québec                            |
| <b>MAPAQ</b>    | Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec |
| <b>MSSS QC</b>  | Ministère de la Santé et des Services sociaux du Québec                  |
| <b>NACI</b>     | National Advisory Committee on Immunization                              |
| <b>PH Dept.</b> | Public Health Department of the CBHSSJB                                  |
| <b>PHAC</b>     | Public Health Agency of Canada                                           |
| <b>PIQ</b>      | Protocole d'immunisation du Québec                                       |
| <b>PNSP</b>     | Programme national de santé publique                                     |

## OTHERS

|              |                                                |
|--------------|------------------------------------------------|
| <b>BCG</b>   | Bacillus Calmette-Guérin vaccine               |
| <b>DAA</b>   | Direct-acting antiviral                        |
| <b>HBV</b>   | Hepatitis B virus                              |
| <b>HCV</b>   | Hepatitis C virus                              |
| <b>Hia</b>   | <i>Haemophilus influenzae</i> type a           |
| <b>Hib</b>   | <i>Haemophilus influenzae</i> type b           |
| <b>HIV</b>   | Human immunodeficiency virus                   |
| <b>IBD</b>   | Invasive bacterial disease                     |
| <b>iGAS</b>  | Invasive group A streptococcus                 |
| <b>iHi</b>   | Invasive <i>Haemophilus influenzae</i>         |
| <b>IMD</b>   | Invasive meningococcal disease                 |
| <b>IPD</b>   | Invasive pneumococcal disease                  |
| <b>LTBI</b>  | Latent tuberculosis infection                  |
| <b>MADO</b>  | Maladies à déclaration obligatoire             |
| <b>MSM</b>   | Men who have sex with men                      |
| <b>PCR</b>   | Polymerase chain reaction                      |
| <b>PEP</b>   | Post-exposure prophylaxis                      |
| <b>STI</b>   | Sexually transmitted infection                 |
| <b>STBBI</b> | Sexually transmitted and blood-borne infection |
| <b>TB</b>    | Tuberculosis                                   |

# EXECUTIVE SUMMARY

This report provides an overview of the trends and findings on reportable infectious diseases in Eeyou Istchee, based on more than 2 decades of public health surveillance data. In compiling this report, we used data from the Maladies à déclaration obligatoire (MADO) surveillance system, supplemented by additional sources such as public health investigations, Quebec's hospitalization database (MED-ECHO), and Quebec's immunization registry (SI-PMI).

Decades of multi-sectorial and population-based public health interventions, especially since the establishment of the Cree Board of Health and Social Services of James Bay (CBHSSJB) in 1978, have contributed to a reduction in the burden of infectious diseases among the Cree people of Eeyou Istchee. One successful public health intervention was the intensive strategy to control and prevent tuberculosis (TB) implemented in the early 1980s by the CBHSSJB's then newly-formed Community Health Department, in close collaboration with regional and local Cree authorities, and with remarkable participation by Cree people. From 2000 to 2020, continued vigilance ensured timely identification and management of new TB cases and their priority contacts, further contributing to the region's low TB incidence rate.

Vaccination was unequivocally one of the most successful public health interventions in Eeyou Istchee from 2000 to 2020, achieving higher coverage rates among infants and children than in the general population of Quebec. Since before 2000, widespread vaccination coverage has contributed to the elimination of several vaccine-preventable diseases, such as invasive *Haemophilus influenzae* type b (Hib), invasive meningococcal disease (IMD) caused by serogroup C, and hepatitis B. It has also helped in controlling other vaccine-preventable diseases, including invasive pneumococcal disease (IPD). Coupled with Quebec's and Canada's elimination strategies, high vaccination rates in Eeyou Istchee additionally prevented any cases of measles, poliomyelitis, diphtheria and tetanus during this 21-year period.

Of note, COVID-19 data is not included in this report. However, the impact of the COVID-19 pandemic in 2020 and in subsequent years on other infectious diseases dynamics is evident. For sexually transmitted infections (STIs) for example, incidence rates of chlamydia and gonorrhea dropped in Eeyou Istchee in 2020. This may have been a result of decreased screening due to reduced access to clinical preventive services, or other factors like reduced social interactions.

Other key findings from the period of 2000 to 2020 included:

- Genital chlamydia was the most frequently reported declarable infectious disease during this period, particularly affecting young adults. Still, complications such as ectopic pregnancy did not surpass that of the rest of Quebec. The data also showed that young men were markedly under-tested for STIs, highlighting a need for targeted public health interventions to reach this demographic.
- While incidence rates of chlamydia, and to a lesser extent gonorrhea, were elevated in Eeyou Istchee compared to the rest of Quebec, other sexually transmitted and blood-borne infections (STBBIs) such as syphilis and human immunodeficiency virus (HIV) remained less common.

- No acute cases of hepatitis B or C were reported during the entire 21-year period. The successful elimination of hepatitis B can be attributed to decades of widespread vaccination among infants and children. Although there was no vaccine available for hepatitis C, more recent availability of direct-acting antivirals (DAAs) has made it possible to safely and effectively cure hepatitis C and prevent its transmission. Since 2016, the regional Public Health Department of the CBHSSJB (henceforth referred to as the PH Dept.) has supported community health clinics, known as Community Miyupimaatisiun Centres (CMCs), in identifying individuals with chronic hepatitis C and referring them for treatment assessment. Based on available data, at least 79% of people with hepatitis C living in Eeyou Istchee have been treated and are considered cured.
- Challenges included ongoing high rates of invasive bacterial diseases (IBDs), including invasive group A streptococcal (iGAS) disease and invasive *Haemophilus influenzae* (iHi) disease, particularly affecting older adults and infants. Eeyou Istchee carried a disproportionately higher burden of iGAS and iHi compared to the general population of Canada.
  - The average annual incidence rate of iGAS among older adults aged 60 years or more in Eeyou Istchee was 18 times higher than that in the rest of Canada from 2011 to 2020.
  - The average annual incidence rate of iHi among infants under 1 year old in Eeyou Istchee was 48 times higher than that in the rest of Canada from 2007 to 2020. In fact, iHi of serotype a was the leading cause of bacterial meningitis among infants in Eeyou Istchee.
  - More advanced, evidence-based public health interventions, including safe and effective vaccines, are needed to curb the burden of invasive *Haemophilus influenzae* type a (Hia) and iGAS, especially among infants in Eeyou Istchee.
- The incidence rates of reported bacterial and parasitic enteric infectious diseases in Eeyou Istchee were relatively low during this 21-year period and remained comparable with that in the general population of Canada. No significant outbreaks of declarable enteric infectious diseases were reported during this period.
- Although no human cases of rabies have been reported, limited data from passive surveillance indicates that rabies transmission occurs among wild animals and roaming community dogs. In 2017, there were 2 community dogs diagnosed with rabies. Notably since 2015, the PH Dept. has collaborated closely with local communities and the Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec (MAPAQ) to mitigate the risk of rabies through various evidence-informed strategies. These strategies include: establishing a reporting system for risky animal exposures, supporting the MAPAQ's capacity-building program for dog rabies vaccination, and guiding clinics in case management of individuals with risky exposures to dogs and other high-risk animals, as per the guidelines of the Ministère de la Santé et des Services sociaux du Québec (MSSS QC).

- Although incidence rates of TB remained low during this 21-year period, data suggests that a significant proportion of older adults were exposed to TB before 1990 and many may have undiagnosed and untreated latent TB infection (LTBI). Moving forward, it is important to prioritize the identification, assessment, and treatment of individuals at high risk for LTBI reactivation. Continued vigilance is necessary for the timely identification and management of new TB cases and their priority contacts.

In conclusion, this report underscores decades of collaborative efforts among communities, clinics, and the regional PH Dept. to mitigate the impact of reportable infectious diseases in Eeyou Istchee. Strengthening community participation, enhancing outreach efforts, and maintaining robust surveillance systems remain key strategies to sustain progress and effectively address future challenges.

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# 1 SEXUALLY TRANSMITTED AND BLOOD-BORNE INFECTIONS (STBBIs)



# 1.1. CHLAMYDIA

## 1.1.1. EPIDEMIOLOGY

Between 2000 and 2020, genital chlamydia infection was the most commonly reported notifiable infectious disease, or maladie à déclaration obligatoire (MADO), in Eeyou Istchee, with evidence of sustained community-based transmission during the 21-year period.

- During the 5-year period of 2016 to 2020, an average of 325 cases of chlamydia per year were reported to the PH Dept.
- Between 2011 and 2020, the age-adjusted incidence rates of chlamydia in Eeyou Istchee were 3.4 to 6.1 times higher than the age-adjusted incidence rates in the rest of Quebec (Table 1).
- After Nunavik, Eeyou Istchee had the highest crude incidence rate of reported chlamydia infections in Quebec in 2020 (Figure 1).

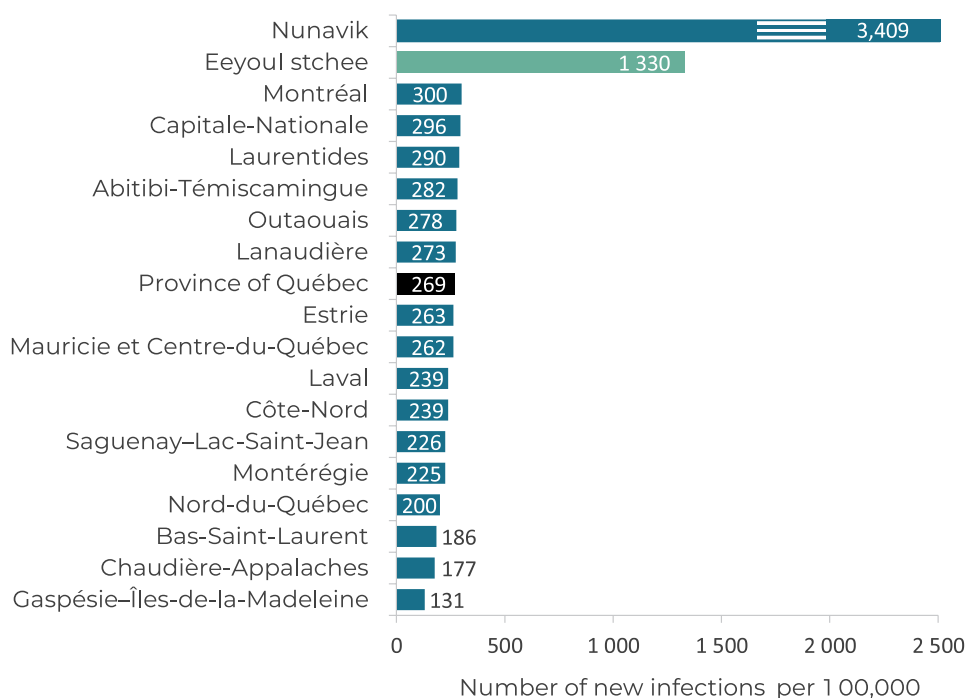
**Table 1** Age-standardized incidence ratios<sup>a</sup> of chlamydia infections by year, Eeyou Istchee and rest of Quebec, 2011-2020

| Year | Standardized incidence ratio | 95% CI    |
|------|------------------------------|-----------|
| 2011 | 5.36                         | 5.28-5.43 |
| 2012 | 6.09                         | 6.01-6.18 |
| 2013 | 5.01                         | 4.94-5.08 |
| 2014 | 5.63                         | 5.56-5.71 |
| 2015 | 5.06                         | 5.00-5.13 |
| 2016 | 4.32                         | 4.27-4.38 |
| 2017 | 4.81                         | 4.76-4.87 |
| 2018 | 4.87                         | 4.81-4.93 |
| 2019 | 3.38                         | 3.34-3.42 |
| 2020 | 3.47                         | 3.43-3.52 |

<sup>a</sup> The ratios presented are the reciprocal of the standardized incidence ratio.

Note: Standardized incidence ratio is indirect age-adjusted using Eeyou Istchee age-specific rates and compares Eeyou Istchee to the rest of Quebec. Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

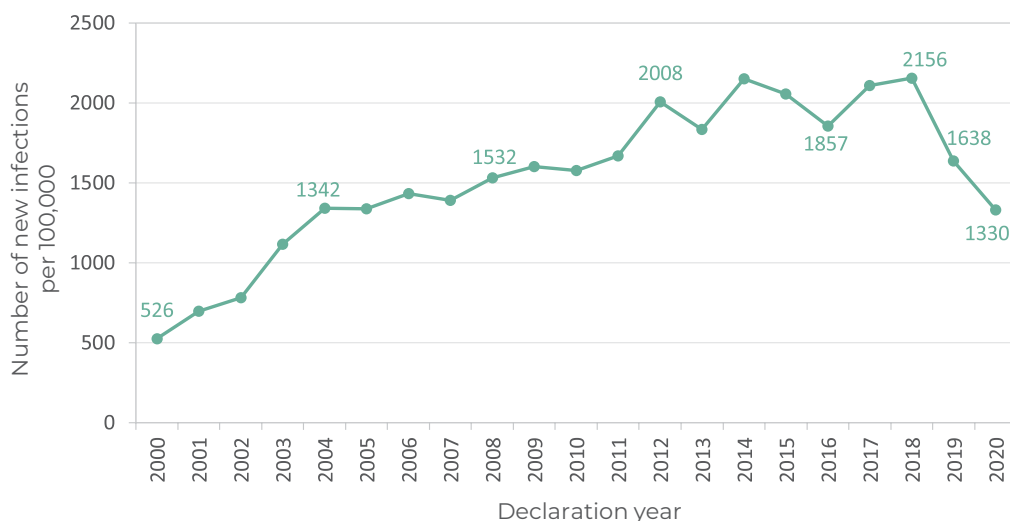
**Figure 1** Crude incidence rates of reported chlamydia infections per 100,000 people by health regions of Quebec, 2020



Note: Incidence rates are presented per 100,000 person-years. The striped area represents an expansion beyond the horizontal axis.  
Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

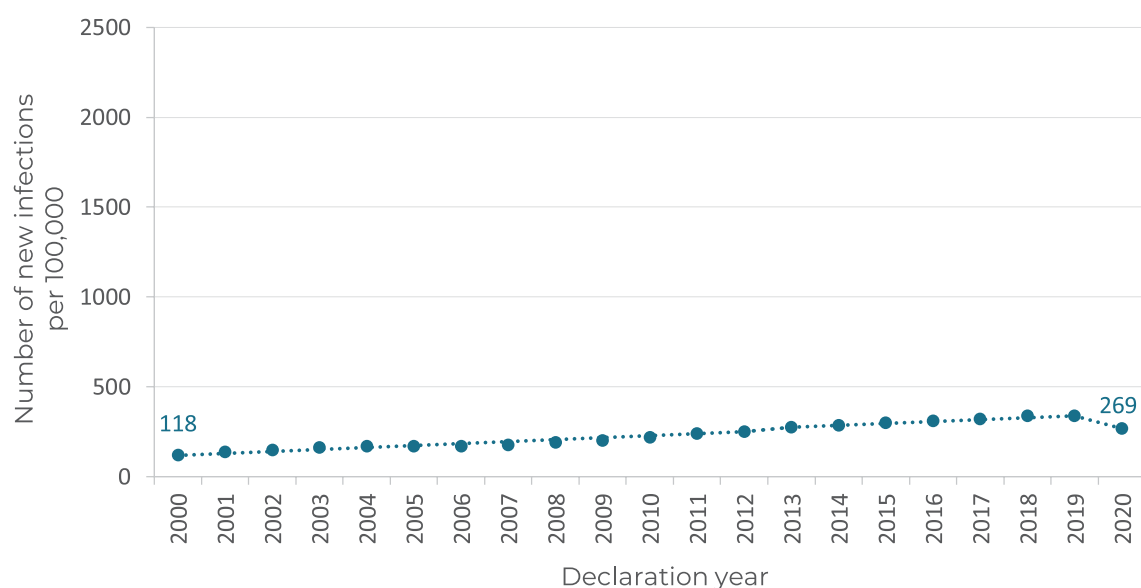
In Eeyou Istchee, the crude incidence rates of chlamydia increased steadily from 2000 to 2018 and then dropped from 2018 to 2020 (Figure 2). The temporal trend of reported chlamydia infections observed in the general population of Quebec was similar, with the decline occurring from 2019 to 2020 (Figure 3).

**Figure 2** Crude incidence rates of reported chlamydia infections per 100,000 people by year, Eeyou Istchee, 2000-2020



Note: Incidence rates are presented per 100,000 person-years.  
Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

**Figure 3** Crude incidence rates of reported chlamydia infections per 100,000 people by year, Quebec, 2000-2020



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

Increased screening in CMCs over the years likely contributed to the upward trend of chlamydia observed in Eeyou Istchee. However, the 2019 decline in chlamydia incidence did not appear to be related to a reduction in testing. Data shows that the percentage of youths aged 15 to 25 years\* who were screened for chlamydia and gonorrhea did not decrease from 2018 to 2019 (Table 2). The percentage of youths tested for chlamydia and gonorrhea dropped in 2020, likely due to limited access to preventive health services during the COVID-19 pandemic (Table 2).

**Table 2** Percentage (%) of population aged 15-25 years screened for chlamydia and gonorrhea, by year and sex, Eeyou Istchee, 2018-2020

| Sex                | 2018 | 2019 | 2020 |
|--------------------|------|------|------|
| Female             | 48   | 48   | 41   |
| Male               | 13   | 13   | 11   |
| All sexes combined | 29   | 29   | 25   |

Note: Individuals with multiple tests done are counted once.

Sources: Omnitech laboratory, UCHLAGON and CHLAGON tests, August 2022 extraction; ISQ, estimations et projections de population comparables (1996-2041).

Although the PH Dept. received a few reports of individuals with anal chlamydia infection (on average, fewer than 10 cases per year), no cases of lymphogranuloma venereum (LGV) were reported in the region between 2000 and 2020.

Since 2000, no cases of ocular or pulmonary chlamydia infection have been reported among newborns and infants in Eeyou Istchee.

\* The age group at highest risk for chlamydia infection in the region.

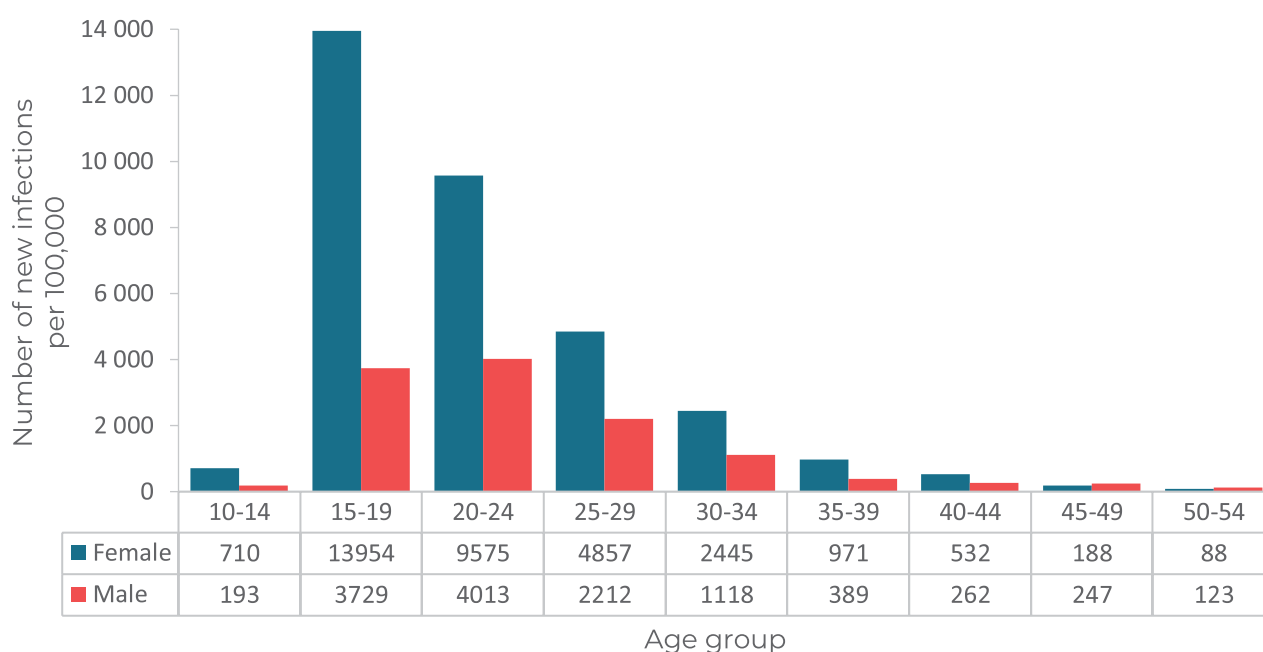
## 1.1.2. RISK FACTORS

### Age

Youths were at highest risk of chlamydia infection in both Eeyou Istchee and in the general population of Quebec. Between 2016 and 2020:

- The age group at highest risk of chlamydia for both men and women in Eeyou Istchee was 15 to 24 years (Figure 4).
- In the general population of Quebec, the age group at highest risk of chlamydia for women was 15 to 24 years. For men, the age group at highest risk was slightly older, at 20 to 29 years (Figure 5).
- The average annual incidence rate of chlamydia among youths aged 15 to 24 years in Eeyou Istchee was 4.8 times higher (95% CI [4.6,5.1]) than the incidence in the same age group in the rest of Quebec.\*
- The reasons for this higher average annual incidence rate of chlamydia infection among youths in Eeyou Istchee, compared to the rest of Quebec, were not fully understood. Limited access to preventive care, including condoms and screening tests (especially among men; Table 2) could have contributed to this disparity.

**Figure 4** Average annual incidence rates of reported chlamydia infections per 100,000 people, by sex and age group,<sup>a</sup> Eeyou Istchee, 2016-2020



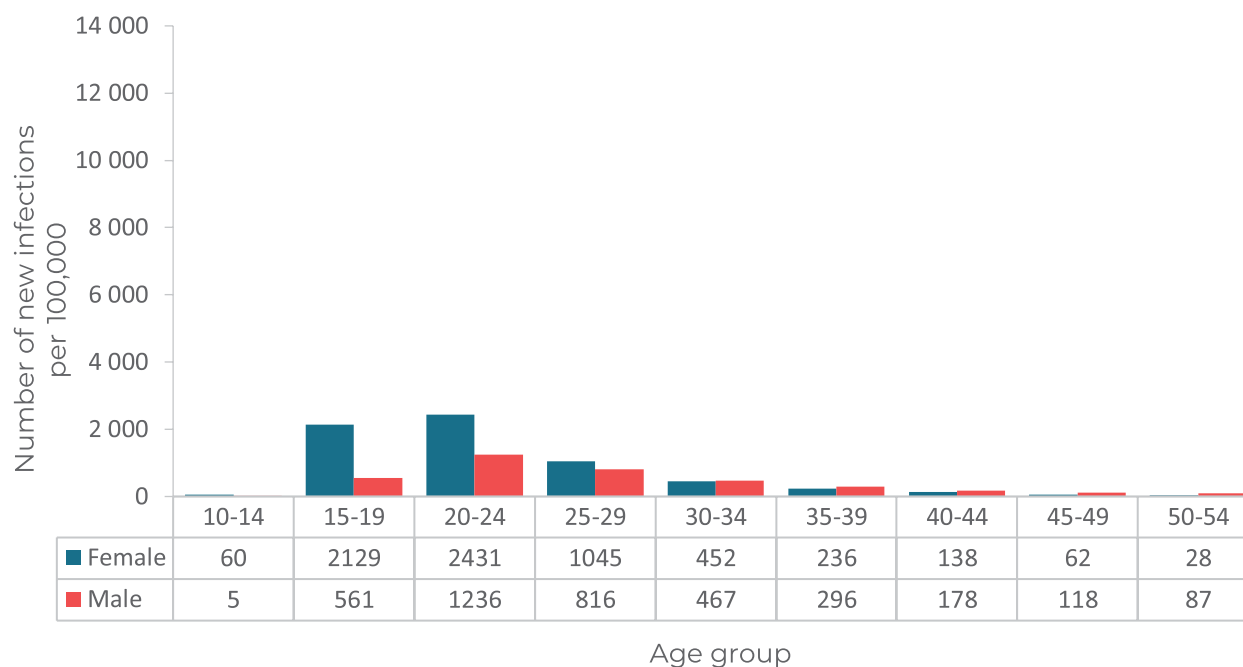
<sup>a</sup> One case was excluded due to missing information on age.

Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

\* Relative rate ratios were calculated using estimated rates from the rest of Quebec (with data from Eeyou Istchee excluded), rather than using rates from the general population of Quebec (which would have included data from Eeyou Istchee). For more information about how rates were calculated, see [Appendix A: Methodological Notes](#).

**Figure 5** Average annual incidence rates of reported chlamydia infections per 100,000 people, by sex and age group, Quebec, 2016-2020



Note: Incidence rates are presented per 100,000 person-years.

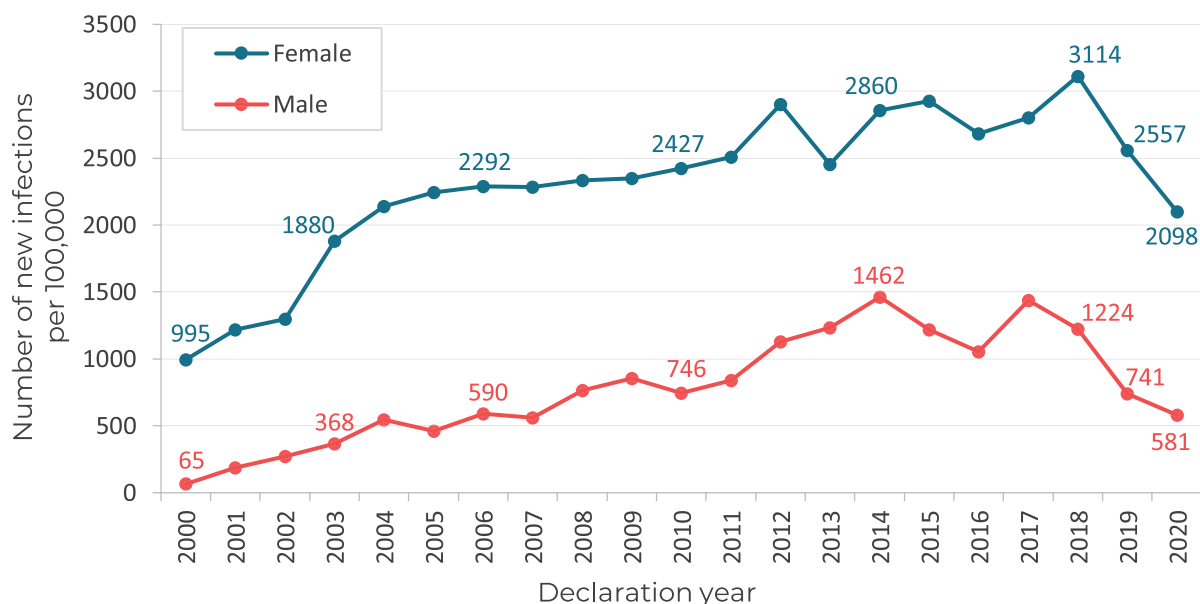
Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

## Sex

As indicated in Figures 6 and 7, between 2000 and 2020, the crude incidence rates of reported chlamydia infections were higher among women, compared to men, in both Eeyou Istchee and in the general population of Quebec.

- In Eeyou Istchee, the number of women who tested positive for chlamydia between 2016 and 2020 was on average 3 times higher than the number of men who tested positive (Figure 6). More STBBI testing in women, including systematic testing of pregnant women, likely contributed to this difference.
- As indicated in Table 2, in Eeyou Istchee, only 13% of men aged 15 to 25 years were tested for chlamydia and gonorrhea infections in 2018 and 2019, and only 11% in 2020. Meanwhile, 48% of women in the same age group were tested in 2018 and 2019, and 41% in 2020.
- One possible explanation for the ongoing community-based transmission of chlamydia is that men who did not undergo STBBI testing likely contributed to the continuous circulation of chlamydia in the region.

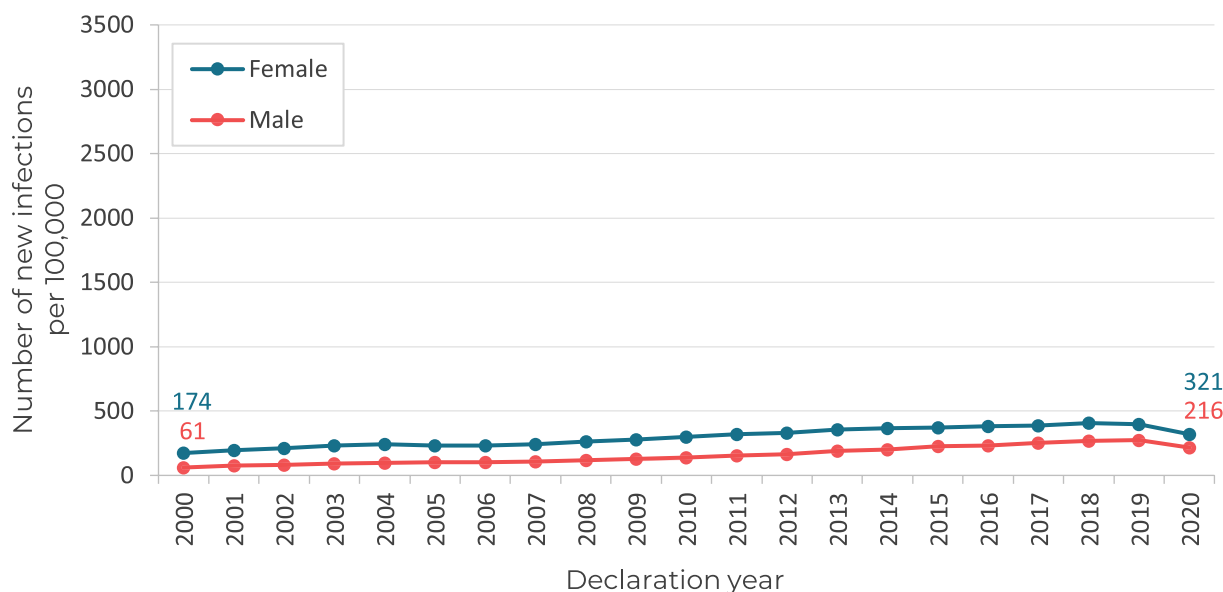
**Figure 6. Incidence rates of reported chlamydia infections per 100,000 people, by year and sex, Eeyou Istchee, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

**Figure 7. Incidence rates of reported chlamydia infections per 100,000 people, by year and sex, Quebec, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

## 1.1.3. PREVENTION

### Screening

In Eeyou Istchee, the PH Dept. promoted routine screening for genital chlamydia and gonorrhea among individuals at risk of these conditions,<sup>\*</sup> as per regional epidemiological data and the recommendations of the *Guide québécois de dépistage des ITSS* by the MSSS QC.<sup>1</sup> At-risk individuals included:

1. Youths aged 15 to 25 years;
2. Persons with new, anonymous, or multiple sexual partners;
3. Persons diagnosed with other STBBIs; and
4. Persons with a history of incarceration.

Risk-based STBBI screening by local clinicians remained opportunistic, with variable coverage in communities over the years.

From 2000 to 2020, the only systematic and population-based screening for chlamydia and gonorrhea (and other STBBIs) was prenatal testing of pregnant women.

Since the late 1990s, all tests for chlamydia infection in Eeyou Istchee have been done using polymerase chain reaction (PCR).<sup>†</sup> In 2014, the PH Dept. began promoting urine as the preferred sample for screening genital chlamydia and gonorrhea in both men and women using PCR. Urine samples, using newer PCR technology, offered comparable sensitivity to genital samples while being more acceptable to patients and local clinicians, due to requiring fewer resources and less clinical intervention.<sup>‡,2</sup>

### Case and contact management

Detailed information regarding the follow up of individuals with chlamydia infection and their sexual contacts has been available since 2013. The PH Dept. promoted and supported CMCs in the prompt treatment of individuals with lab-confirmed and/or with symptoms of chlamydia and gonorrhea infections, and the timely management of their recent sexual contacts,<sup>\*</sup> in accordance with the latest guidelines from the Institut national d'excellence en santé et en services sociaux (INESSS).<sup>§,3</sup>

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\* As per a memorandum on the Surveillance and management of gonorrhea and other sexually transmitted infections in Eeyou Istchee, by Dr. Kianoush Dehghani, Public Health Physician (PH Dept., CBHSSJB), Dr. France Morin, Consultant Physician (PH Dept., CBHSSJB), and Patrice Larivée, Nurse Counselor in Sexual Health (PH Dept., CBHSSJB), last revised on November 6, 2018.

† As per email communication with Annick Trudelle, Scientific Advisor (Le Comité sur les analyses de laboratoire en ITSS (CALI), INSPQ), on February 29, 2024.

‡ As per consultation with Dr. Cédric Yansouni, Microbiologist-Infectious Disease Specialist (Research Institute, McGill University Health Centre), in 2014.

§ For more information about chlamydia treatment, see [Appendix B: Clinical Treatment Details](#).

## 1.2. GONORRHEA

### 1.2.1. EPIDEMIOLOGY

Between 2000 and 2020, genital gonorrhea infection was the second most commonly reported infectious disease (MADO), after genital chlamydia, in Eeyou Istchee.

- From 2016 to 2020, an average of 27 cases of gonorrhea (ranging from 8 to 47 cases) per year were reported to the PH Dept.
- Between 2011 and 2020, the age-adjusted incidence rates of gonorrhea in Eeyou Istchee ranged from 0.4 to 10 times the age-adjusted incidence rates in the rest of Quebec, peaking at 10 times higher in 2012 and dropping to 0.4 times, or 60% lower than the rest of Quebec, in 2020 (Table 3).
- In 2020, the crude incidence rate of reported gonorrhea in Eeyou Istchee was lower than in several other regions in Quebec and was below the provincial average (Figure 8).

**Table 3.** Age-standardized incidence ratios<sup>a</sup> of gonorrhea infections by year, Eeyou Istchee and rest of Quebec, 2011-2020

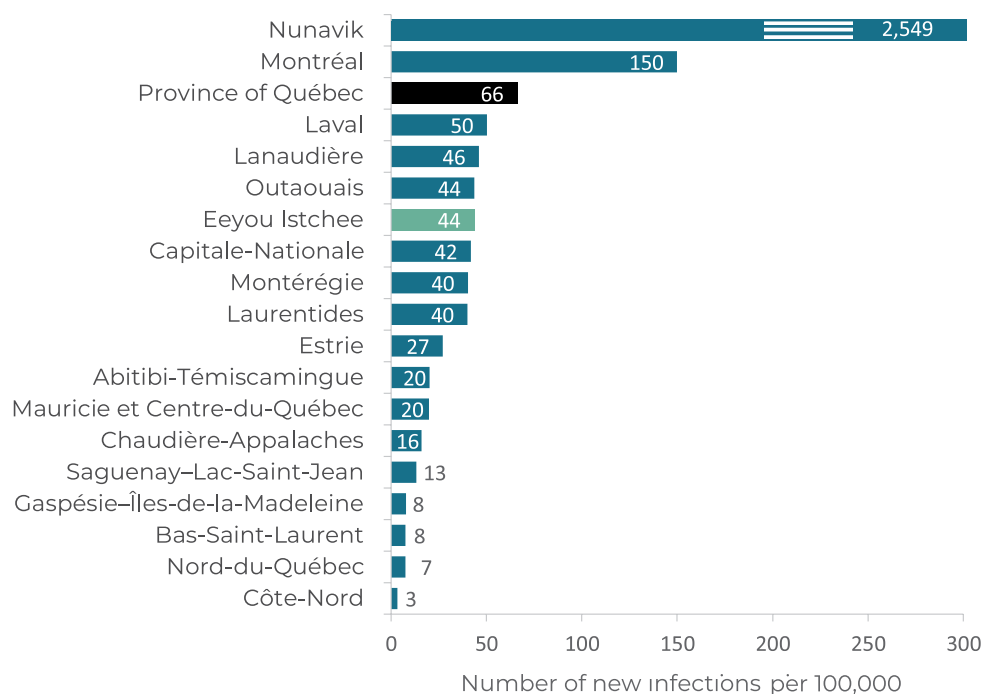
| Year | Standardized incidence ratio | 95% CI     |
|------|------------------------------|------------|
| 2011 | 9.13                         | 8.73-9.57  |
| 2012 | 10.02                        | 9.61-10.46 |
| 2013 | 5.98                         | 5.75-6.22  |
| 2014 | 4.29                         | 4.14-4.44  |
| 2015 | 3.76                         | 3.65-3.89  |
| 2016 | 3.24                         | 3.15-3.34  |
| 2017 | 1.47                         | 1.43-1.50  |
| 2018 | 1.73                         | 1.70-1.77  |
| 2019 | 1.04                         | 1.02-1.06  |
| 2020 | 0.42                         | 0.41-0.43  |

<sup>a</sup> The ratios presented are the reciprocal of the standardized incidence ratio.

Note: Standardized incidence ratio is indirect age-adjusted using Eeyou Istchee age-specific rates and compares Eeyou Istchee to the rest of Quebec.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

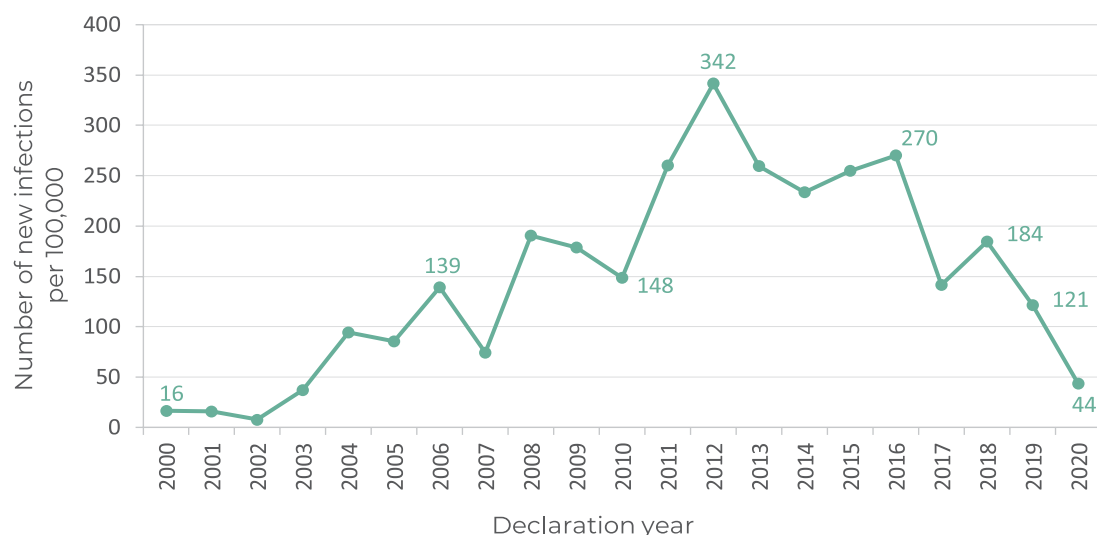
**Figure 8. Crude incidence rates of reported gonorrhea infections per 100,000 people by health regions of Quebec, 2020**



Note: Incidence rates are presented per 100,000 person-years. The striped area represents an expansion beyond the horizontal axis.  
Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

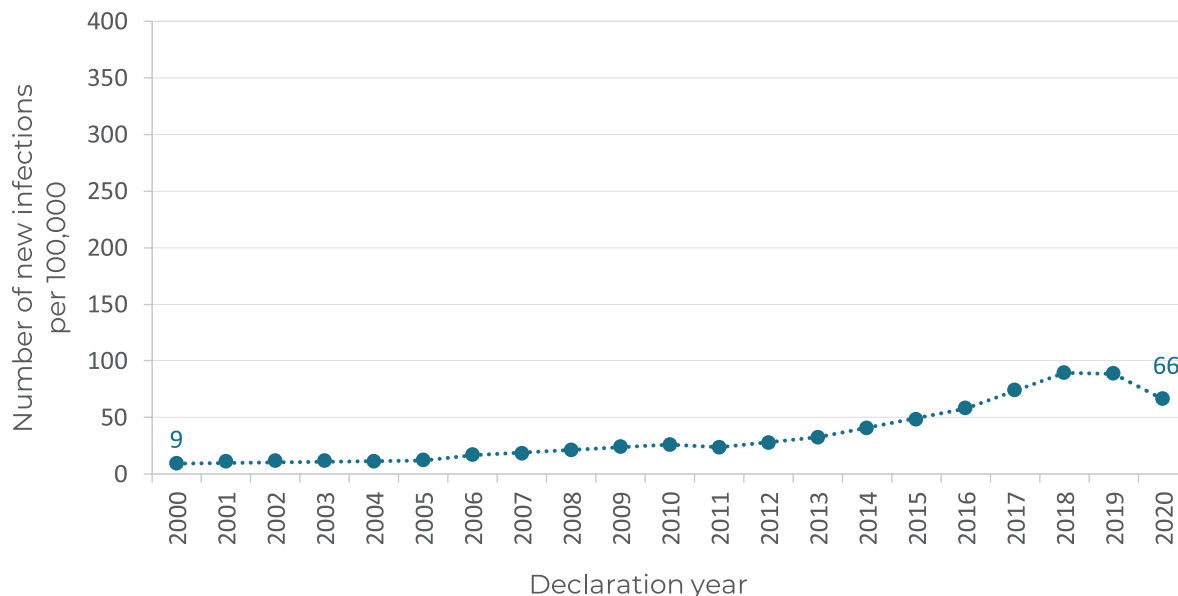
In Eeyou Istchee, the crude incidence rates of reported gonorrhea fluctuated annually but showed an overall declining trend from around 2012 to 2020 (Figure 9). This trend differed from that of the general population of Quebec, which saw increasing incidence rates of gonorrhea until around 2018, followed by a decline from 2019 to 2020 (Figure 10).

**Figure 9. Crude incidence rates of reported gonorrhea infections per 100,000 people by year, Eeyou Istchee, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.  
Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

**Figure 10. Crude incidence rates of reported gonorrhea infections per 100,000 people by year, Quebec, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

In nearly all cases, individuals were tested for both genital chlamydia and gonorrhea infections simultaneously, using the same biological sample (most commonly urine), analyzed through PCR. Still, the annual number of gonorrhea cases was significantly fewer than the annual number of chlamydia cases in Eeyou Istchee.

The great majority of reported cases involved genital gonorrhea, while cases of anal or oral gonorrhea remained uncommon (fewer than 5 cases per year) in Eeyou Istchee.

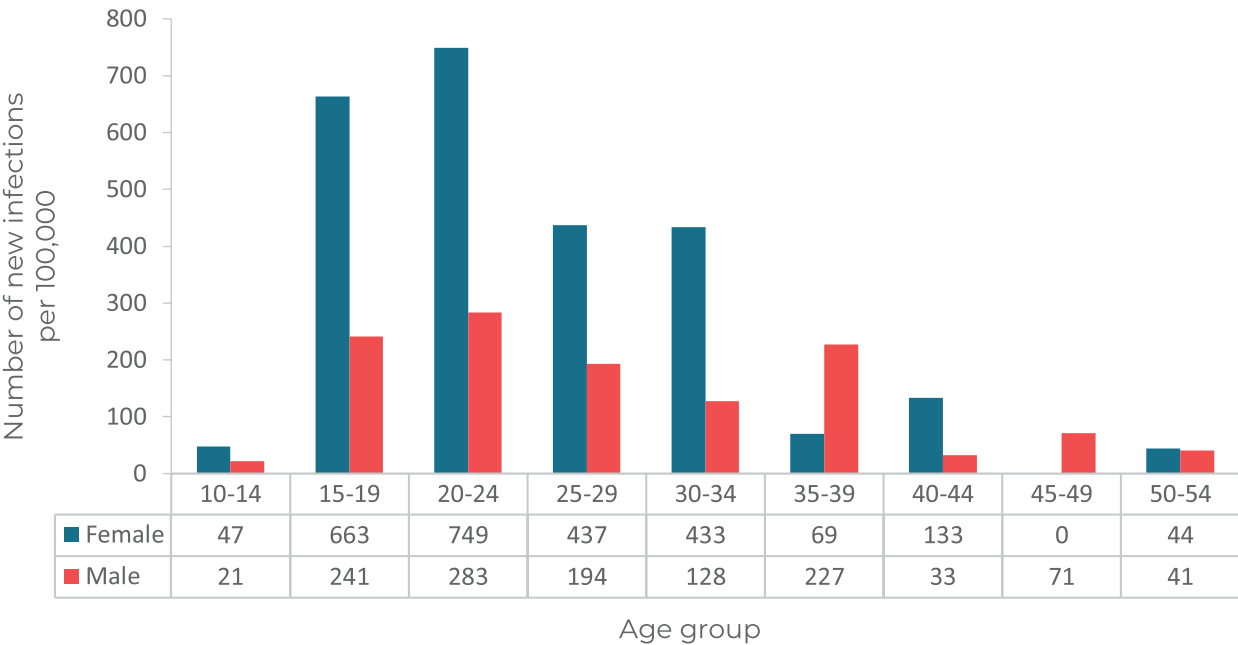
# 1.2.2. RISK FACTORS

## Age

Youths were at highest risk of gonorrhea infection in both Eeyou Istchee and in the general population of Quebec. Between 2016 and 2020:

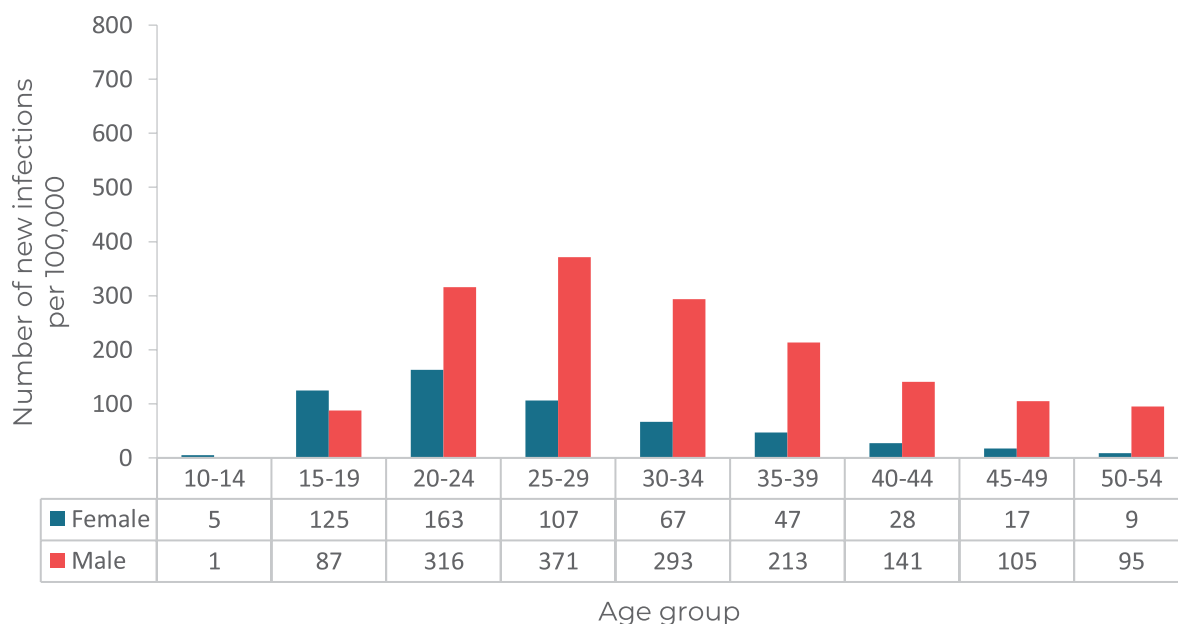
- In Eeyou Istchee, the age group at highest risk of gonorrhea for both men and women was 15 to 24 years (Figure 11).
- In the general population of Quebec, the age group at highest risk of gonorrhea for women was also 15 to 24 years. For men, the age group at highest risk was slightly older, at 20 to 29 years. (Figure 12).
- From 2016 to 2020, the average annual incidence rate of gonorrhea among youths aged 15 to 24 years in Eeyou Istchee was 2.6 times higher (95% CI [2.1,3.3]) than in the same age group in the rest of Quebec.

**Figure 11. Average annual incidence rates of reported gonorrhea infections per 100,000 people, by sex and age group,<sup>a</sup> Eeyou Istchee, 2016-2020**



<sup>a</sup> One case was excluded due to missing information on age.  
 Note: Incidence rates are presented per 100,000 person-years.  
 Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

**Figure 12. Average annual incidence rates of reported gonorrhea infections per 100,000 people, by sex and age group, Quebec, 2016-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

## Sex

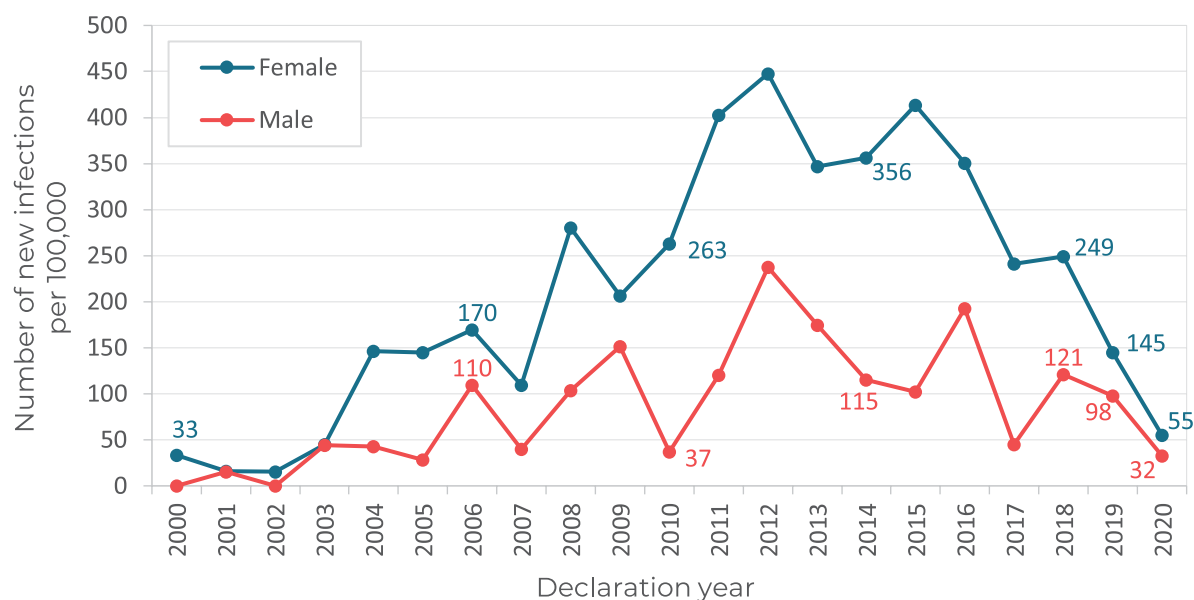
In Eeyou Istchee:

- As indicated in Figure 13, from around 2003 to 2020, the crude incidence rates of gonorrhea were noticeably higher among women compared to men.
- The number of women who tested positive for gonorrhea between 2016 and 2020 was approximately double the number of men who tested positive.
- More testing in women, including systematic testing of pregnant women for STBBIs, likely contributed to the higher incidence rates of gonorrhea among women compared to men (Table 2).

In the general population of Quebec, however:

- From around 2012 to 2020, men had noticeably higher crude incidence rates of reported gonorrhea compared to women (Figure 14).

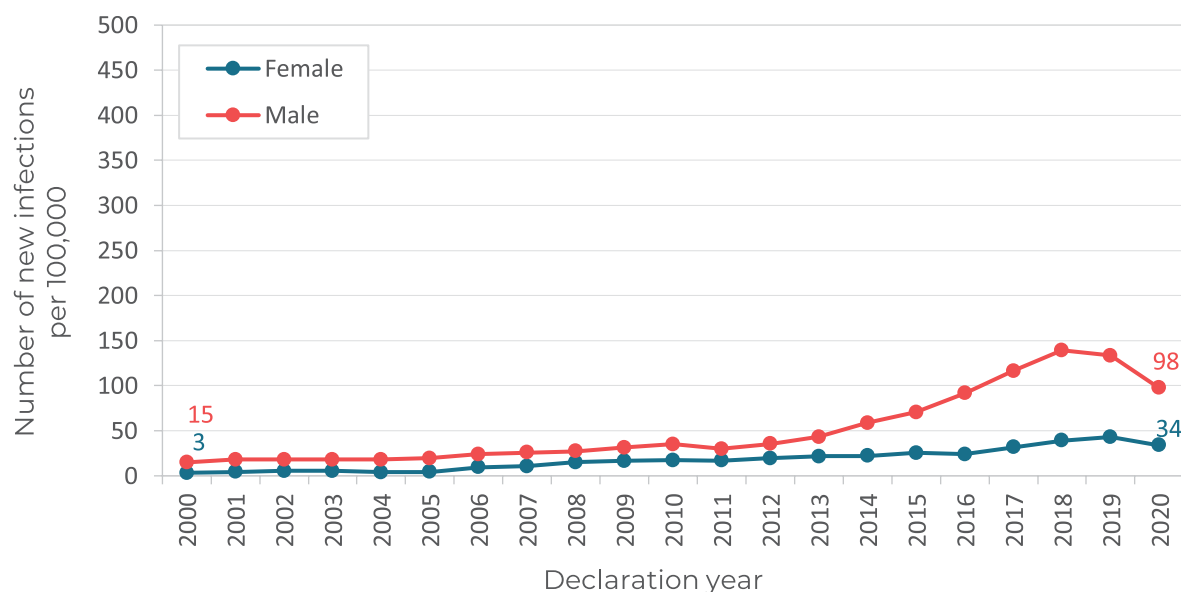
**Figure 13. Incidence rates of reported gonorrhea infections per 100,000 people, by year and sex, Eeyou Istchee, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

**Figure 14. Incidence rates of reported gonorrhea infections per 100,000 people, by year and sex, Quebec, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

## 1.2.3. PREVENTION

### Screening for gonorrhea and testing for resistant gonorrhea

In Eeyou Istchee, nearly all gonorrhea tests have been conducted using urine bio-samples via PCR technology for over a decade.\*

The PH Dept. recommended that all women with symptoms of gonorrhea, and/or a positive PCR test for gonorrhea, undergo cervical swab sampling for gonorrhea culture testing. Despite this, cervical swabs (in women) and ureteral swabs (in men) were infrequently taken for gonorrhea culture testing in the region.

In 2018-19, among the 53 reported cases with a positive PCR result for gonorrhea (for whom nominal information was available), only 7 (13%) also underwent gonorrhea culture testing. As a result, limited information is available regarding the epidemiology of antibiotic-resistant gonorrhea species in the region. Of the small number of gonorrhea culture reports from 2018-19 in Eeyou Istchee, none showed evidence of resistance to third-generation cephalosporins or to azithromycin. However, the reports indicated resistance to ciprofloxacin.

### Case and contact management

Based on available information since 2013, the PH Dept. supported CMCs with the prompt treatment of persons with lab-confirmed and/or symptomatic gonorrhea infection, and the timely management of their recent sexual contacts,<sup>†</sup> in accordance with up-to-date INESSS guidelines from 2012, 2017, and 2020.<sup>‡,3</sup>

Unlike with chlamydia infections, the available information did not indicate the presence of sustained community-based transmission of gonorrhea in most communities for most years. In fact, it appeared that in most communities in Eeyou Istchee, cases of gonorrhea infection occurred as sporadic outbreaks linked to sources outside the region.

Based on available literature, men with genital gonorrhea are usually more symptomatic than men with chlamydia,<sup>4</sup> and thus are more likely to seek testing and treatment. In the absence of more detailed regional data, this potential difference in symptom severity among men could have contributed to a more efficient control of gonorrhea outbreaks, with the number of gonorrhea cases dropping to 0 in most communities in certain years, as opposed to the continuous circulation of chlamydia in all communities over time.

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\* For more information about gonorrhea screening, see section 1.1.3. Prevention.

† As per a memorandum on the Surveillance and management of gonorrhea and other sexually transmitted infections in Eeyou Istchee, by Dr. Kianoush Dehghani, Public Health Physician (PH Dept., CBHSSJB), Dr. France Morin, Consultant Physician (PH Dept., CBHSSJB), and Patrice Larivée, Nurse Counselor in Sexual Health (PH Dept., CBHSSJB), last revised on November 6, 2018.

‡ For more information about gonorrhea treatment, see [Appendix B: Clinical Treatment Details](#).

# 1.3. COMPLICATIONS OF GENITAL CHLAMYDIA AND GONORRHEA

Pelvic inflammatory disease (PID), ectopic pregnancy\* and infertility are serious complications of untreated genital chlamydia and gonorrhea infection in women.<sup>5,6</sup> Considering the higher incidence rates of these STIs (especially chlamydia) among young women in Eeyou Istchee compared to the rest of Quebec, we assessed whether complications of these infections were also more common in the region.

Of the 3 complications listed above, more reliable data was available for ectopic pregnancy (*i.e.*, patients hospitalized with a primary or secondary diagnosis of ectopic pregnancy) in the MED-ECHO database in Quebec. As per Tables 4 and 5, between 2000 and 2020:

- The 10-year average annual incidence rates of ectopic pregnancy in Eeyou Istchee were not higher than those for the rest of Quebec.
- Although the crude incidence rates of reported chlamydia infections in Eeyou Istchee increased from 2000 to 2018 (Figure 2), the 10-year average annual incidence rate of ectopic pregnancy did not increase from the 2000-01 to 2009-10 period to the 2010-11 to 2019-20 period in Eeyou Istchee (Figure 15).
- Therefore, based on available information, higher incidence rates of chlamydia and gonorrhea infections among young women in Eeyou Istchee (compared to the rest of Quebec) did not appear to have resulted in higher incidence rates of ectopic pregnancy among these women (compared to those in the rest of Quebec).
- In the absence of more detailed information, one possible explanation for this finding is that the early identification and treatment of women with chlamydia and gonorrhea in CMCs could have contributed to the prevention of many ectopic pregnancies in Eeyou Istchee.

**Table 4. Number of ectopic pregnancies and average annual incidence rates of ectopic pregnancies per 1,000 pregnancies, by 10-year financial periods, Eeyou Istchee, 2000-01 to 2019-20**

| Financial period       | Number | 10-year average annual | 95% CI   |
|------------------------|--------|------------------------|----------|
| 2000-2001 to 2009-2010 | 32     | 8.3                    | 5.9-11.8 |
| 2010-2011 to 2019-2020 | 28     | 7.9                    | 5.5-11.5 |

Note: Financial year (April 1 to March 31) is used instead of calendar year (January 1 to December 31).  
Source: INSPQ Infocentre, PNS tab, February 2022 extraction.

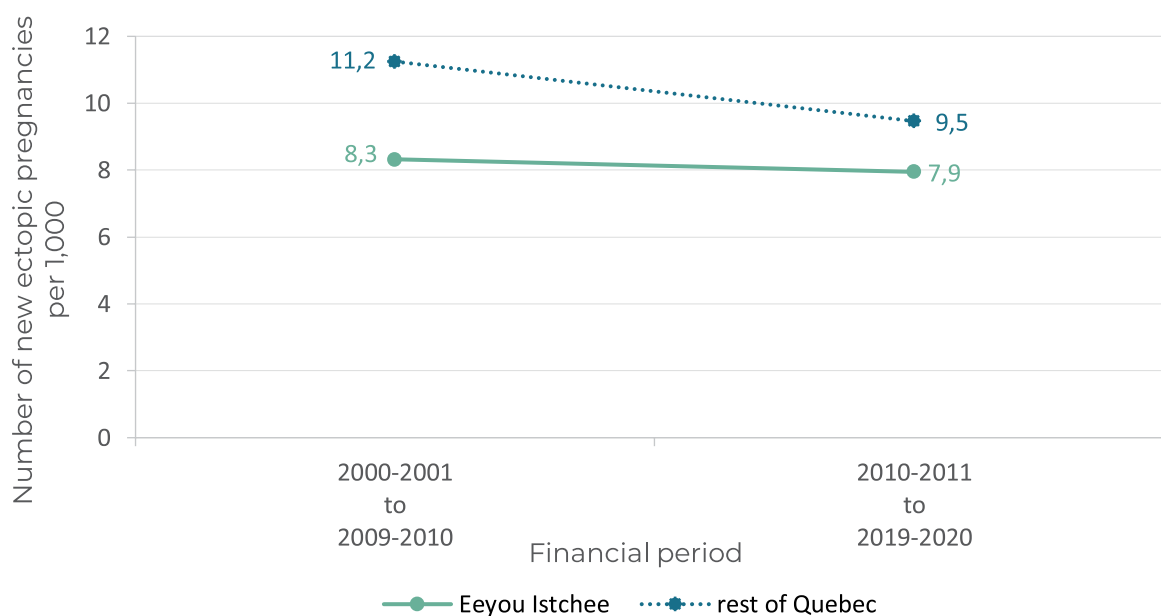
\* Untreated PID can cause scar tissue to develop in the fallopian tubes, which may lead to an ectopic pregnancy.

**Table 5.** Number of ectopic pregnancies and average annual incidence rates of ectopic pregnancies per 1,000 pregnancies, by 10-year financial periods, rest of Quebec, 2000-01 to 2019-20

| Financial period       | Number | 10-year average annual | 95% CI    |
|------------------------|--------|------------------------|-----------|
| 2000-2001 to 2009-2010 | 8,822  | 11.2                   | 11.0-11.5 |
| 2010-2011 to 2019-2020 | 7,909  | 9.5                    | 9.3-9.7   |

Note: Financial year (April 1 to March 31) is used instead of calendar year (January 1 to December 31).  
Source: INSPQ Infocentre, PNS tab, February 2022 extraction.

**Figure 15.** Average annual incidence rates of ectopic pregnancies per 1,000 pregnancies, by 10-year financial periods, Eeyou Istchee and rest of Quebec, 2000-01 to 2019-20



Note: Financial year (April 1 to March 31) is used instead of calendar year (January 1 to December 31).  
Source: INSPQ Infocentre, PNS tab, February 2022 extraction.

## 1.4. SYPHILIS

### 1.4.1. EPIDEMIOLOGY AND RISK FACTORS

Syphilis was not a commonly reported infectious disease (MADO) in Eeyou Istchee between 2000 and 2020. In fact, according to available MADO data from 1985 onward, the first reported case of syphilis in the region was in 2009.

From 2000 to 2020, a total of 8 cases of syphilis were reported to the PH Dept.

- The majority of these cases were men.
- The average age was around 31 years (ranging from 27 to 47 years).
- Fewer than 5 reported cases were not permanent residents of Eeyou Istchee, but were living in the region during their diagnosis.
- For those who were permanent residents of Eeyou Istchee, epidemiological investigations revealed that the source of infection was high risk heterosexual activity and sexual activity between men who have sex with men (MSM) in Montreal.

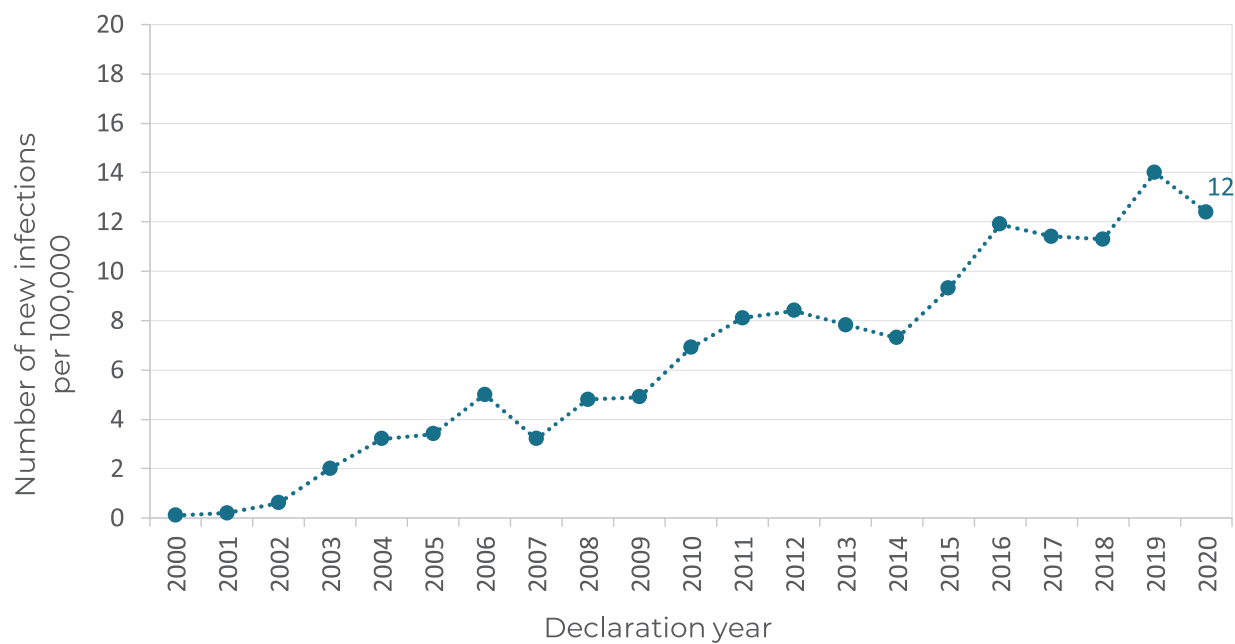
During this period, the crude incidence rates of syphilis did not rise in Eeyou Istchee, as was observed in the general population of Quebec (Figure 16). In fact, there were no reported cases of syphilis in Eeyou Istchee in most years. However, a few isolated cases were reported in distinct years, and there was 1 outbreak with fewer than 5 associated cases in 2 communities. During the outbreak, the index case and 100% of at-risk sexual contacts in Eeyou Istchee were identified, tested and treated,\* resulting in no related cases thereafter.

During the period of 2000 to 2020, syphilis was not detected in any pregnant women in Eeyou Istchee, and no cases of congenital syphilis were reported to the PH Dept.

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\* For more information about syphilis treatment, see [Appendix B: Clinical Treatment Details](#).

**Figure 16.** Crude incidence rates of reported infectious syphilis per 100,000 people by year, Quebec, 2000-2020



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

## 1.4.2. PREVENTION

### Screening

In Eeyou Istchee, at least since 2013, the PH Dept. has promoted routine screening for syphilis among individuals at risk,\* as per regional epidemiological data and the recommendations of the *Guide québécois de dépistage des ITSS* by the MSSS QC.<sup>1</sup> At-risk individuals included:

1. Persons with other STBBI diagnoses (*e.g.*, chlamydia or gonorrhea infection); and
2. Persons with a history of incarceration.

No information is available regarding the coverage of this opportunistic screening initiative among at-risk groups by local clinicians.

In addition, syphilis screening (at least once during pregnancy) has been systematically offered to all pregnant women in Eeyou Istchee for more than 2 decades, as part of their routine prenatal follow up.

From 2000 to 2020, there was a steady increase in the incidence of syphilis in the general population of Quebec (Figure 16). Moreover, the neighboring region of Nunavik had also been grappling with a persistent syphilis outbreak since 2016.<sup>7</sup> Due to the increased risk of syphilis transmission from other parts of Quebec and Nunavik, and to prevent congenital syphilis, the PH Dept. increased the frequency of recommended syphilis screening for pregnant women in Eeyou Istchee. Starting in 2017, the PH Dept. recommended that all pregnant women undergo syphilis screening at least once per trimester, or at least 3 times<sup>†</sup> during pregnancy. Based on available data, an estimated 88% of pregnant women in Eeyou Istchee who gave birth in 2020 were screened (at least once) for syphilis during their pregnancy.

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\* As per a memorandum on the Surveillance and management of gonorrhea and other sexually transmitted infections in Eeyou Istchee, by Dr. Kianoush Dehghani, Public Health Physician (PH Dept., CBHSSJB), Dr. France Morin, Consultant Physician (PH Dept., CBHSSJB), and Patrice Larivée, Nurse Counselor in Sexual Health (PH Dept., CBHSSJB), last revised on November 6, 2018.

† Additional screenings were recommended in the community of Whapmagoostui, due to its greater proximity to Nunavik and higher risk of congenital syphilis. Pregnant women in Whapmagoostui were recommended to be screened for syphilis twice during their third trimester (for a total of 4 screenings during pregnancy), as well as once within the first 2 weeks of their post-partum period.

# 1.5. HEPATITIS B

## 1.5.1. EPIDEMIOLOGY

From 2000 to 2020, a total of 21 cases of hepatitis B were reported to the PH Dept.

During the more recent 10-year period of 2011 to 2020, there were fewer than 5 cases of hepatitis B reported to the PH Dept.

- In Eeyou Istchee, the average annual crude incidence rate of reported hepatitis B was at fewer than 3 cases per 100,000 people (95% CI [1,7]) during this 10-year period.
- In the general population of Quebec, the average annual crude incidence rate of reported hepatitis B was around 11 cases per 100,000 people (95% CI [11,12]) during the same period.<sup>8</sup>

All reported cases from the period of 2011 to 2020 included individuals with chronic hepatitis B from the community of Waskaganish. These individuals likely acquired hepatitis B infection around birth but received their diagnosis or were reported to the PH Dept. many years later.

From 2011 to 2020, no acute cases of hepatitis B infection were reported to the PH Dept. There was no evidence of hepatitis B transmission within the 9 communities of Eeyou Istchee during this period.

## 1.5.2. HISTORICAL EPIDEMIOLOGY AND RISK FACTORS

Since the establishment of the reportable infectious disease (MADO) surveillance system in 1985, through 2020, a total of 50 cases of hepatitis B were reported to the PH Dept.

- 58% (n=29) of these cases were reported before 2000.

Of the 50 reported cases of hepatitis B, 78% (n=39) were originally from the community of Waskaganish.

- The majority or 54% (n=21) of the cases from Waskaganish were reported to the PH Dept. during the early years of MADO surveillance initiation, between 1985 and 1988.
- All individuals reported with hepatitis B from Waskaganish were born between 1921 and 1984. The great majority or 87% (n=34) were born between 1942 and 1977.
- 72% (n=28) of the reported cases from Waskaganish were men.

## PREVALENCE OF HEPATITIS B\*

In 1984, the PH Dept. carried out a household survey to estimate the burden of hepatitis B infection in Eeyou Istchee. Based on available information, the household survey had included a random sample of 681 Cree people aged 15 years or more (about 8% of the total regional population<sup>†</sup> at that time), who subsequently underwent testing for hepatitis B surface antigen (Hep B sAg) and hepatitis B surface antibody (Hep B sAb) using enzyme-linked immunosorbent assay (ELISA).

The survey showed that in 5 Cree communities, the prevalence of individuals testing positive for either Hep B sAg or Hep B sAb (indicating natural immunity<sup>‡</sup>) varied from 5 to 9.2%, with 0.5% testing positive for Hep B sAg (indicating active hepatitis B disease). In Waskaganish, however, 32.4% of people tested were positive for either Hep B sAg or Hep B sAb, and 6.7% of people tested were positive for Hep B sAg. At the time, age-specific prevalence of hepatitis B virus (HBV) surface markers in this community was the highest among individuals aged 40 to 49 years.

The reason for this higher prevalence of HBV infection in Waskaganish compared to other Cree communities remained unknown. According to available data, all persons with hepatitis B who were reported to the PH Dept. had evidence of chronic hepatitis B disease; therefore, they were likely infected perinatally, during infancy, or in early childhood.<sup>9</sup>

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\* As per a historical manuscript on the Prevalence of Hepatitis B surface antigen and antibody among the James Bay Cree Indians, Quebec, Canada, by Elizabeth Robinson, MDCM (Department of Community Health, Montreal General Hospital), Peter Foggin, PhD (Department of Geography, Université de Montréal), Anastasia Lyras, MSc (Research Institute, Montreal Children's Hospital), Elaine Mills, MD, PhD (Research Institute, Montreal Children's Hospital), and Robert Remis, MDCM (Bureau régional des maladies infectieuses, Montréal), from February 1989.

† In 1984, the total regional population was estimated at 8840 people.

‡ Immunization against HBV had not yet been started in the region in the early 1980s, hence, hepatitis B surface antibody was considered an indicator of "natural immunity."

### 1.5.3. PREVENTION

#### Vaccination

Hepatitis B vaccination became available in Quebec around 1983. Initially, the vaccine was only recommended for certain at-risk groups, including infants born to mothers with HBV infection, and sexual contacts and household members of people with hepatitis B.<sup>10</sup>

In Eeyou Istchee, however, due to the higher prevalence of hepatitis B in Waskaganish, the PH Dept. recommended and supported the implementation of a mass hepatitis B vaccination campaign for all residents of this community, in July and August of 1986, and in January of 1987. During this vaccination campaign, 82% of all residents of Waskaganish who were eligible to receive the vaccine were appropriately vaccinated. Additionally, the PH Dept. has also recommended and supported the implementation of an HBV vaccination program for neonates in Waskaganish since 1986. Likely due to these mass vaccination campaigns in Waskaganish, including the systematic vaccination of all newborns, no cases of hepatitis B have been reported among residents born after 1985.

In 1994, school-based vaccination of children in fourth grade was initiated in all of Quebec, which included all communities in Eeyou Istchee. Then, in 2013, systematic hepatitis B vaccination of all infants (at 2 months of age) was implemented in all of Quebec, again including all Eeyou Istchee communities.

Between 2016 and 2020, the estimated 5-year average coverage for at least 3 doses of the hepatitis B vaccine among 2-year-old children was around 81% in Eeyou Istchee, which was higher than the estimated average coverage for all of Quebec during the same period (Table 6). As per the objectives of the Programme national de santé publique du Québec (PNSP), the optimal coverage for all vaccines recommended for children aged 2 years or younger is at 95% (or greater).<sup>11</sup>

**Table 6. Hepatitis B vaccine coverage (≥3 doses) among 2-year-old children by year (including estimated 5-year average coverage), Eeyou Istchee, 2016-2020**

| Year           | Percentage (%) |
|----------------|----------------|
| 2016           | 73%            |
| 2017           | 82%            |
| 2018           | 83%            |
| 2019           | 80%            |
| 2020           | 87%            |
| 5-year average | 81%            |

Source: MSSS, Registre de vaccination du Québec.

## Screening

Since at least 2013, the PH Dept. has promoted systematic screening of all pregnant women for hepatitis B, as well as opportunistic screening and vaccination of individuals at higher risk of hepatitis B, as per the Protocole d'immunisation du Québec (PIQ).<sup>12</sup> Individuals at higher risk include:

1. Individuals with a history of other STBBIs;
2. Health care workers; and
3. Sexual contacts and household members of persons with hepatitis B disease.

No information is available regarding the coverage of opportunistic HBV screening by local clinicians for at-risk groups.

# 1.6. HEPATITIS C

## 1.6.1. EPIDEMIOLOGY

From 2000 to 2020, a total of 49 cases of hepatitis C were reported to the PH Dept.

During the more recent 10-year period of 2011 to 2020, there were 20 cases of hepatitis C reported to the PH Dept.

- In Eeyou Istchee, the average annual crude incidence rate of hepatitis C was around 11 cases per 100,000 people (95% CI [7,18]) during this 10-year period.
- In the general population of Quebec, the average annual crude incidence rate of reported hepatitis C was around 14 cases per 100,000 people (95% CI [13,14]) during the same period.

Between 2011 and 2020, no cases of acute hepatitis C were reported to the PH Dept.

## 1.6.2. HISTORICAL EPIDEMIOLOGY AND RISK FACTORS

Since 2016, effective treatment with direct-acting antiviral (DAA) medications has become increasingly accessible to patients with hepatitis C in Canada. The PH Dept. conducted a comprehensive review of all reported cases in Eeyou Istchee since 1985, aimed at assessing the prevalence of hepatitis C in the region, identifying probable risk factors, and streamlining access to DAA treatment for affected individuals. Listed below are a number of key epidemiological and clinical points based on this review.

Since the establishment of the reportable infectious disease (MADO) surveillance system in 1985, through 2020, there were 56 cases who screened positive for hepatitis C in Eeyou Istchee who were reported to the PH Dept.

- Of all reported cases, 40 (71%) were men.
- Of all reported cases, the great majority or 88% were reported after 2000. About 12% (n=7) of cases were reported before 2000, between 1996 and 1999. No cases of hepatitis C were reported to the PH Dept. before 1996.
- All cases were reported under the “hepatitis C without precision” nosological definition.<sup>13</sup>

Risk factor information was available for 21 of the 56 reported cases.

- Drug use was the most commonly reported risk factor. 20 out of 21 individuals (95%) reported a history of intra-nasal and/or intravenous drug use. Of these 20 individuals, 9 (45%) reported a history of intravenous drug use.
- 15 individuals (71%) reported a history of high-risk sexual activity\* and/or a history of other STIs.
- 8 individuals (38%) had a history of incarceration.
- Fewer than 5 individuals had received a blood transfusion before 1990.

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\* Defined as having: 1) sex with a partner with hepatitis C; 2) multiple sexual partners; or 3) a history of experiencing sexual assault.

### 1.6.3. CLINICAL OUTCOMES

Clinical outcome information was available for 30 of the 56 individuals initially reported with hepatitis C, and was collected during the period of 2016 to the fall of 2023.\*

- 11 individuals (37%) appeared to have had either a spontaneous resolution of their hepatitis C virus (HCV) infection, or a false positive original serology result for HCV.†
- Of the remaining 19 individuals (with a confirmed or probable diagnosis of chronic hepatitis C), 15 (79%) received DAA therapy and were successfully cured of hepatitis C.

### 1.6.4. PREVENTION

#### Screening

Throughout the years, the PH Dept. has promoted opportunistic screening for hepatitis C for individuals at risk, especially those with a history of intravenous or other drug use. No information is available regarding the coverage of this opportunistic HCV screening by local clinicians for at-risk individuals.

#### Case management

It has been well established that timely treatment with DAA medications minimizes complications associated with hepatitis C, notably liver cirrhosis and hepatocellular carcinoma, and lowers the risk of community-based transmission of the virus.<sup>14</sup> Therefore, since 2016, the Infectious Diseases team of the PH Dept. has supported local clinicians in the identification, assessment, and timely referral of individuals with hepatitis C for DAA therapy.

No vaccine is yet available for hepatitis C prevention.

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\* It should be noted that during this period, individuals with a history of hepatitis C who were initially found to be residing in the region may have subsequently passed away or relocated out of Eeyou Istchee.

† These individuals either had repeated HCV IgG that proved negative and/or hepatitis RNA that proved negative (with no history of treatment for hepatitis C).

# 1.7. HUMAN IMMUNODEFICIENCY VIRUS (HIV)

## 1.7.1. SURVEILLANCE

Between 2000 and 2020, HIV was not a declarable infectious disease (MADO) in Quebec. Therefore, there was no comprehensive, nominal and timely reporting to the PH Dept. to facilitate HIV case and contact management.

However, in 2002, the Institut national de santé publique du Québec (INSPQ) initiated non-nominal reporting of lab-confirmed cases of HIV to the PH Dept., corresponding to the postal code provided by the person during testing. The reports allowed for continuous surveillance of the population's health status, and included limited epidemiological information about the cases, such as:

1. Adult or child status;
2. Gender; and
3. The primary category\* of risk for HIV infection, provided to the Laboratoire de santé publique du Québec (LSPQ) by the respective clinicians who had prescribed the HIV test.<sup>15</sup>

## 1.7.2. EPIDEMIOLOGY

Based on the INSPQ's non-nominal reports to the PH Dept.:

Between 2003 and 2020, there were fewer than 10 individuals<sup>†</sup> with confirmed HIV reported to the PH Dept.

- In Eeyou Istchee, the average annual crude incidence rate of new HIV diagnoses<sup>‡</sup> was estimated at fewer than 2 cases per 100,000 people during this period.
- In the general population of Quebec, the average annual crude incidence rate of new HIV diagnoses was estimated at 3.8 cases per 100,000 people during the same period.

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\* Categories include: 1) men who have sex with men (MSM); 2) injection drug use (IDU); 3) MSM and IDU; 4) originally from an endemic country; 5) having a heterosexual partner at risk for HIV; 6) heterosexual without any known risk (risk of the sexual partner is unknown); 7) without any known risk; and 8) mother-child transmission.

† As per the LSPQ's report, Programme de surveillance de l'infection par le virus de l'immunodéficience humaine (VIH) au Québec – CAS CUMULATIFS avril 2002-juin 2021 – RÉGION DES TERRES-CRIES-DE-LA-BAIE-JAMES. Direct access to this report is restricted to designated professionals in the PH Dept.

‡ This average annual incidence rate estimate only included individuals with a new HIV diagnosis, who reported a primary residential address in Eeyou Istchee during their HIV testing.

### 1.7.3. RISK FACTORS

Between 2003 and 2020 in Eeyou Istchee:

- The majority of reported cases indicated Indigenous status.
- The majority of reported cases were men.
- Heterosexual sexual activity (with partners whose risk was known or unknown) was listed as an identified risk factor for the majority of cases. Other listed risk factors included MSM sexual activity, injection drug use, and mother-to-child transmission.
- Perinatal (vertical) transmission of HIV was not commonly reported before 2011. No cases were reported after 2011.

### 1.7.4. PREVENTION

#### Screening

At least since 2013, the PH Dept. has promoted HIV screening of individuals at risk,\* as per the *Guide québécois de dépistage des ITSS* by the MSSS QC.<sup>1</sup> This includes routine screening of:

1. Individuals who test positive for other STBBIs (including chlamydia and gonorrhea); and
2. Individuals with a history of incarceration.

No information is available regarding the coverage of this opportunistic HIV screening by local clinicians for at-risk individuals in Eeyou Istchee.

During the period of 2000 to 2020, the only systematic and population-based screening done for HIV was prenatal testing of pregnant women. Based on available data, an estimated 84% of pregnant women in Eeyou Istchee who gave birth in 2020 were screened at least once for HIV.

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\* As per a memorandum on the Surveillance and management of gonorrhea and other sexually transmitted infections in Eeyou Istchee, by Dr. Kianoush Dehghani, Public Health Physician (PH Dept., CBHSSJB), Dr. France Morin, Consultant Physician (PH Dept., CBHSSJB), and Patrice Larivée, Nurse Counselor in Sexual Health (PH Dept., CBHSSJB), last revised on November 6, 2018.

# 2 INVASIVE BACTERIAL DISEASES (IBDs)



## 2.1. SURVEILLANCE

Since the early 2000s, the PH Dept. has collaborated with the International Circumpolar Surveillance (ICS) program of the Public Health Agency of Canada (PHAC) for the surveillance of 4 invasive bacterial diseases (IBDs). This is in addition to the region's participation in Quebec's surveillance system for mandatory declarable infectious diseases (MADO), for the same 4 IBDs. Since its inception in 1999, the ICS program has been collecting data on 5 IBDs in Canada's peri-Arctic regions: invasive pneumococcal disease (IPD), invasive group A streptococcal (iGAS) disease, invasive group B streptococcal disease, invasive meningococcal disease (IMD), and invasive *Haemophilus influenzae* (iHi) disease.<sup>16</sup> According to the nosological definitions of disease used by the MSSS QC and the PHAC, an invasive bacterial infection occurs when the corresponding bacteria invades a normally sterile body site (*e.g.*, blood, deep tissue, cerebrospinal fluid).<sup>13,17,18</sup> Based on available ICS data, incidence rates of these 5 IBDs have been elevated among Indigenous peoples in countries with Arctic regions.<sup>19</sup>

Throughout the years, the PH Dept. has reported all IBDs in Eeyou Istchee to the ICS program, except for group B streptococcal disease, which is not a reportable disease (MADO) in Quebec. Data collected for IBD cases included laboratory results, risk factors, clinical information, vaccination status (if applicable), and demographic information (including age, sex and ethnicity) of affected individuals. Reports from the PH Dept. to the ICS did not include nominal information, the day\* of birth, or the community of residence of affected individuals.

Other mainly Indigenous jurisdictions in Northern Canada who participated in the ICS surveillance program for IBDs during this time period included: Yukon, Nunavut, Nunavik, Northern Labrador, and the Northwest Territories. In 2016, there were 162,267 people (0.4% of the total population of Canada) living in the 6 Canadian ICS jurisdictions. The population structure within these jurisdictions was mainly Indigenous (61%) and younger (only 7% were over the age of 64 years).<sup>16</sup> Therefore, the population of the Canadian ICS regions was socio-demographically more similar to the population of Eeyou Istchee, compared to the general populations of Quebec or Canada. This similarity made the ICS regions a suitable comparison for analyzing epidemiological trends and risk factors for IBDs in Eeyou Istchee over the years.

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\* Only the month and year of birth were reported (for age estimation), to minimize the possibility of identifying the individuals.

## 2.2. INVASIVE GROUP A STREPTOCOCCAL DISEASE (IGAS)

### 2.2.1. EPIDEMIOLOGY

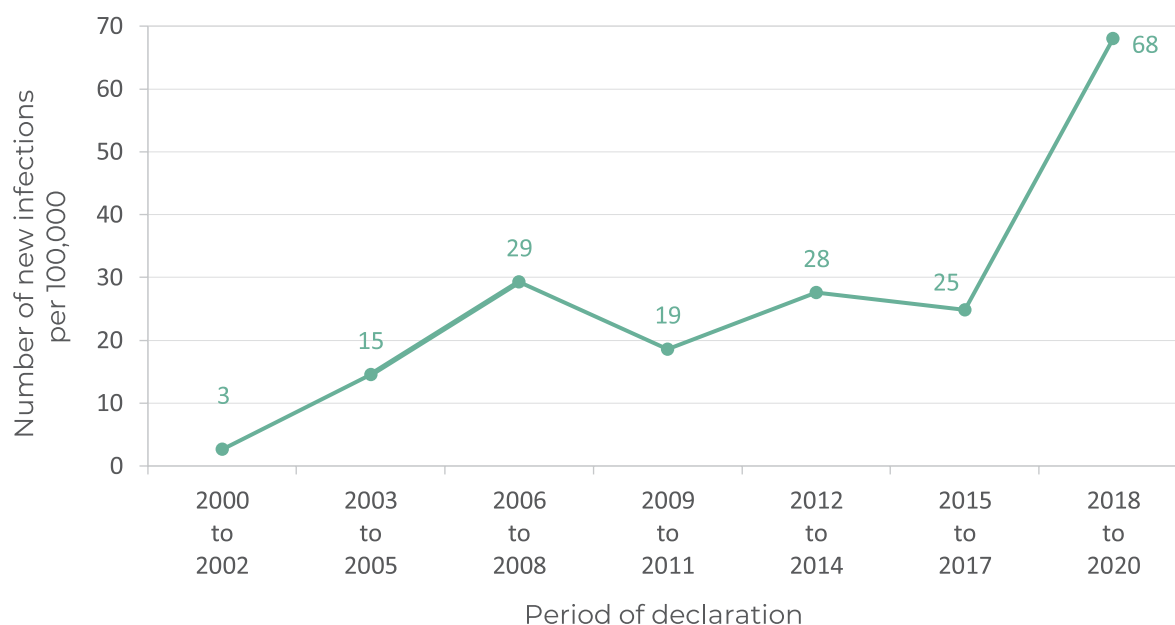
Between 2000 and 2020, a total of 93 cases of iGAS were reported to the PH Dept.

- The average annual crude incidence rate of reported iGAS in Eeyou Istchee was around 16 cases per 100,000 people from 2000 to 2010, and around 39 cases per 100,000 people from 2011 to 2020.

Figure 17 illustrates a progressive increase in the average annual crude incidence rates of reported iGAS in Eeyou Istchee since 2000, with a sharp peak around 2018\*

- In Eeyou Istchee, the average annual crude incidence rate of reported iGAS during the period of 2018 to 2020 was about 2.7 times higher (95% CI [1.4,5.6]) than the incidence during the period of 2015 to 2017.
- In the mainly Indigenous ICS regions of Northern Canada and in the general population of Canada, the average annual crude incidence rates of iGAS also increased from 2000 to 2020 (Figures 18 and 19).

**Figure 17. Average annual crude incidence rates of reported iGAS infections per 100,000 people by 3-year periods, Eeyou Istchee, 2000-2020**



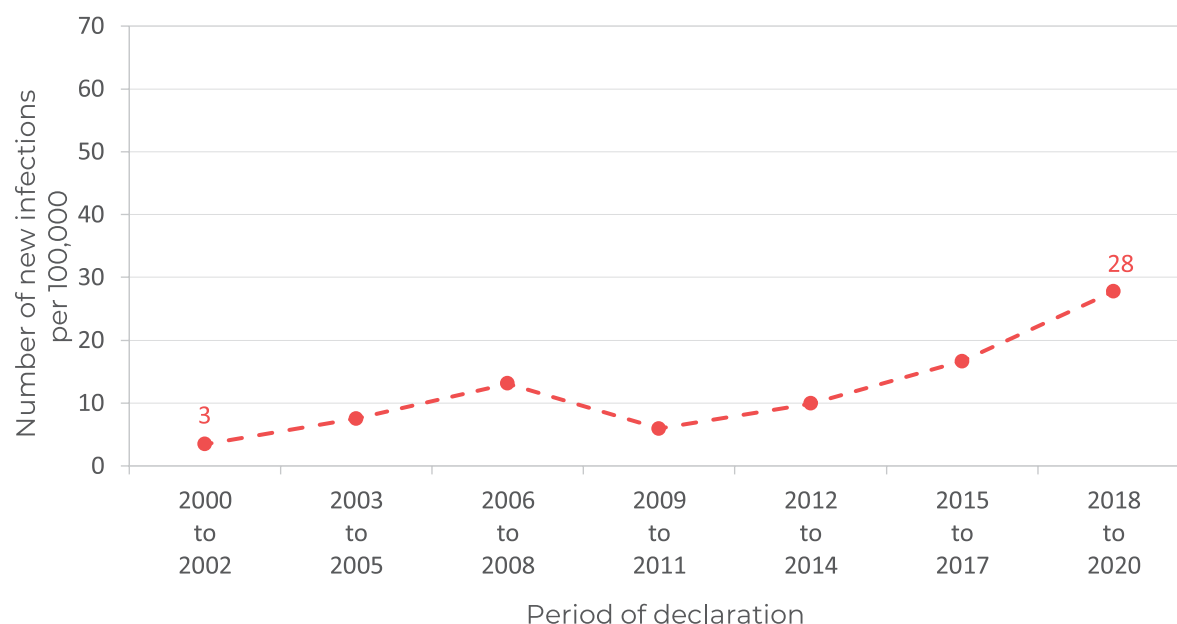
Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

Statistics Canada, annual population estimates, July 1st 2000 to 2020.

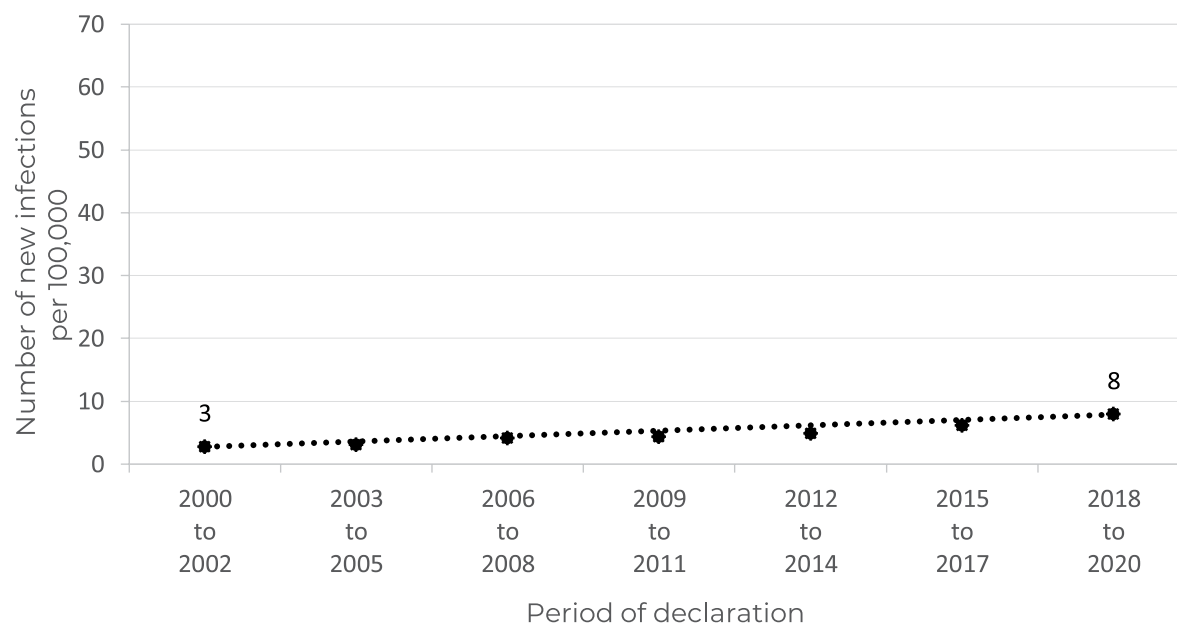
\* This peak in 2018 can be seen in [Figure 44 in Appendix C](#), which illustrates the trend in the crude incidence rates of iGAS in Eeyou Istchee from 2011 to 2020.

**Figure 18. Average annual crude incidence rates of reported iGAS infections per 100,000 people by 3-year periods, Canadian ICS Regions, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.  
Source: International Circumpolar Surveillance network (ICS) database.

**Figure 19. Average annual crude incidence rates of reported iGAS infections per 100,000 people by 3-year periods, Canada, 2000-2020**

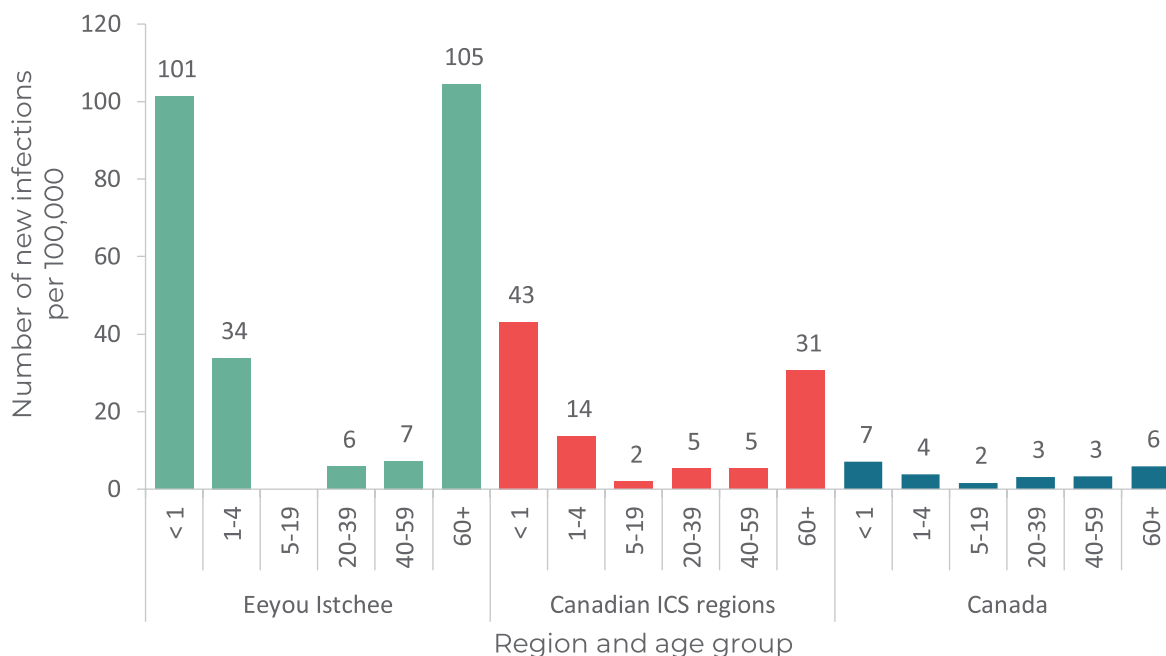


Note: Incidence rates are presented per 100,000 person-years.  
Sources: CNDSS, Public Health Agency of Canada;

Indigenous populations in Canada, the United States, Australia, and New Zealand have had significantly higher incidence rates of iGAS compared to their respective general populations, according to various studies and surveillance reports.<sup>20-23</sup> Figures 20 and 21 show the average annual incidence rates of iGAS by age group in Eeyou Istchee, compared to the Canadian ICS regions and the general population of Canada, during the 11-year period of 2000 to 2010, and the 10-year period of 2011 to 2020, respectively.

- For infants under 1 year old, the average annual incidence rate of reported iGAS between 2011 and 2020 in Eeyou Istchee (at 144 cases per 100,000 people) was about 15 times higher (95% CI [5,36]) than the incidence in the rest of Canada (Figure 21). Although the average annual incidence rate of reported iGAS between 2011 and 2020 among infants in Eeyou Istchee was about 2.5 times higher (95% CI [0.7,7.4]) than the incidence in the rest of the Canadian ICS regions, this difference was not statistically significant.
- For older adults aged 60 years or more, the average annual incidence rate of reported iGAS between 2011 and 2020 in Eeyou Istchee (at 162 cases per 100,000 people) was about 18 times higher (95% CI [11,26]) than the incidence in the rest of Canada, and about 3.9 times higher (95% CI [2.3,6.3]) than the incidence in the rest of the Canadian ICS regions (Figure 21).

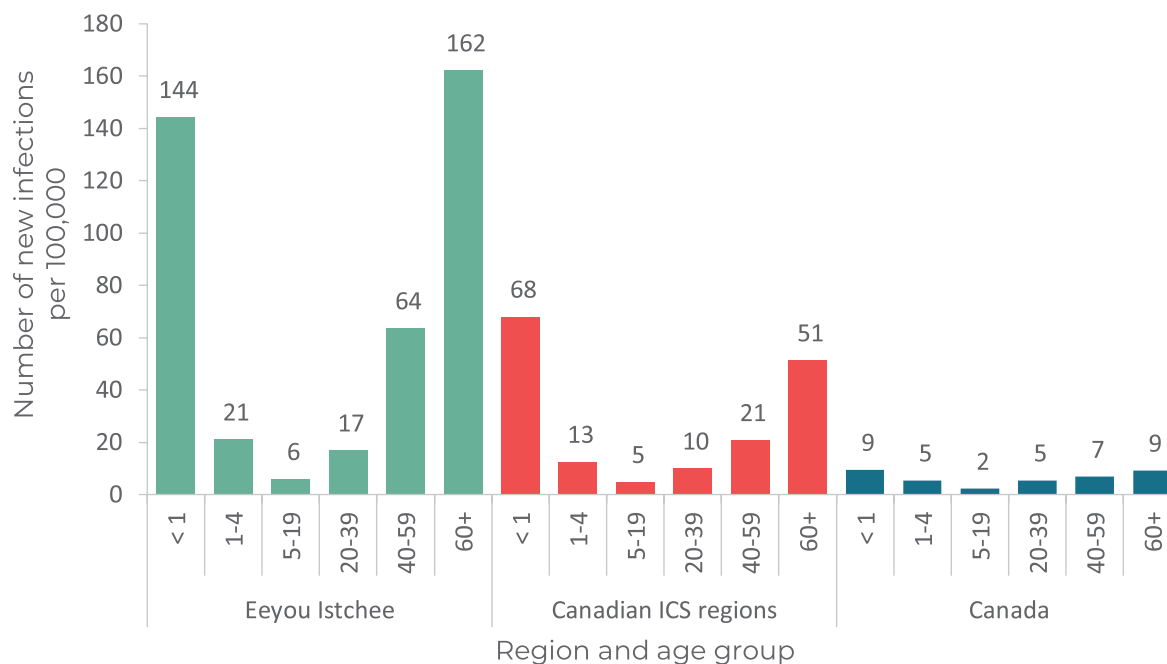
**Figure 20. 11-year average annual incidence rates of reported iGAS infections per 100,000 people, by region and age group, Eeyou Istchee, Canadian ICS regions, and Canada, 2000-2010**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041); International Circumpolar Surveillance network (ICS) database; CNDSS, Public Health Agency of Canada; Statistics Canada, annual population estimates, July 1st 2000 to 2020.

**Figure 21. 10-year average annual incidence rates of reported iGAS infections per 100,000 people, by region and age group, Eeyou Istchee, Canadian ICS regions, and Canada, 2011-2020**



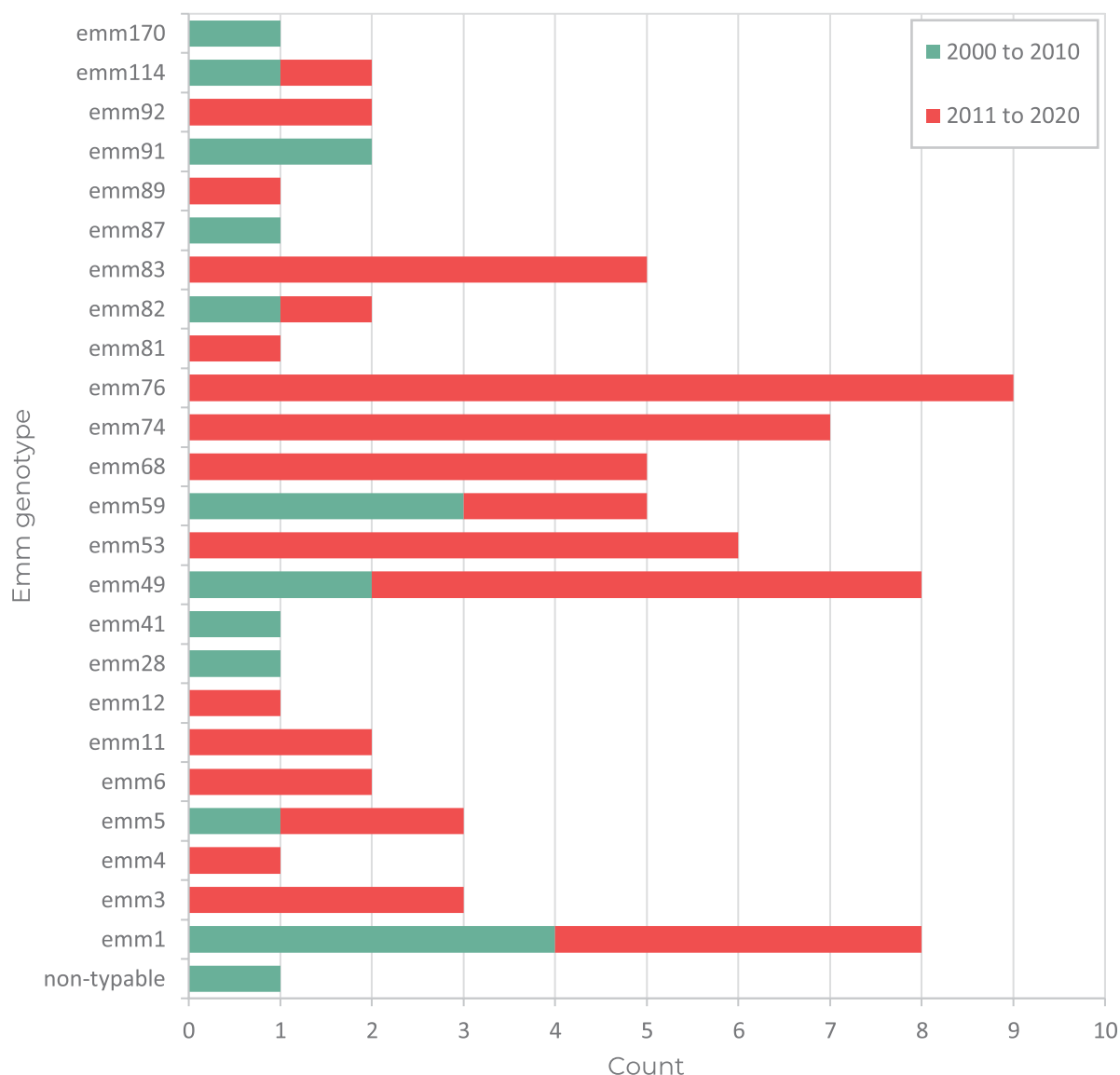
Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041); International Circumpolar Surveillance network (ICS) database; CNDSS, Public Health Agency of Canada; Statistics Canada, annual population estimates, July 1st 2000 to 2020.

Regional data showed that between 2000 and 2020 in Eeyou Istchee, certain emm types (mainly emm76, emm74, emm53, emm49, and emm1) were more prevalent than other emm types (Figure 22).

- Certain prevalent emm types (including emm76, emm74, emm68, and emm53) seemed to have newly emerged in the region after 2011 (Figure 22).
- Epidemiological data suggested that these more prevalent emm types could have been transmitted across communities via carriers, and contributed to the eventual emergence of subsequent iGAS cases which appeared to have no spatial, temporal and/or social association.

**Figure 22. Number of reported iGAS infections by emm type, Eeyou Istchee, 2000-2010 and 2011-2020**



Note: 8 cases were excluded due to missing information on emm type, and 5 cases are missing from the International Circumpolar Surveillance network (ICS) database.  
Source: International Circumpolar Surveillance network (ICS) database.

More detailed epidemiological information was available from public health investigations of iGAS cases during the more recent period of 2013 to 2020.

- Based on available information during this 8-year period, cases of iGAS in Eeyou Istchee appeared to have occurred sporadically, and no outbreaks of iGAS were identified. At times, cases of iGAS with the same emm type were associated in time and/or place, but no social links could be established between them during public health investigations.

## 2.2.2. RISK FACTORS

### Age

As shown in Figures 20 and 21, older adults aged 60 years or more and infants under 1 year old had the highest risk of iGAS during the periods of 2000 to 2010 and 2011 to 2020, in Eeyou Istchee and in the ICS regions of Canada.

### Chronic medical conditions

Based on limited studies, a high prevalence of chronic health conditions (*e.g.*, diabetes) and unfavourable socioeconomic factors (*e.g.*, overcrowded housing) can be risk factors for a higher incidence of iGAS in Indigenous populations.<sup>21</sup>

- In Eeyou Istchee, during the 21-year period of 2000 to 2020, data on chronic health conditions was available for 85 cases of iGAS. Of these, about 51% (n=43) had diabetes, and about 27% (n=23) had chronic kidney disease.\*
- No other individual-level information was available regarding the socioeconomic risk factors of affected persons in Eeyou Istchee.

## 2.2.3. CLINICAL OUTCOMES

Between 2000 and 2020:

- The majority of iGAS cases (of all ages) with an identified infectious focus (vs. those with bacteremia and no identified focus) presented with cellulitis (52%), followed by septic arthritis (16%), then pneumonia (with or without empyema; 15%). Necrotizing fasciitis due to iGAS was not a common clinical presentation, with fewer than 5 reported cases during this 21-year period.
- Cellulitis was the most common clinical presentation among infants under 1 year old (78%) and older adults aged 60 years or more (47%) with iGAS.
- 89% of all iGAS cases in Eeyou Istchee were hospitalized, compared to 87% of iGAS cases in the Canadian ICS regions.
- 8 persons died of iGAS in Eeyou Istchee, for a 21-year case fatality rate of around 9%. The iGAS-related case fatality rate for Eeyou Istchee was the same as the iGAS-related case fatality rate reported in the Canadian ICS regions.

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\* As identified by the combination of variables of “renal failure,” “kidney dialysis,” and “nephrotic syndrome” on ICS investigation forms.

## 2.2.4. PREVENTION

### Post-exposure prophylaxis treatment of close contacts

During the period of 2000 to 2020, no vaccine was available for iGAS. The only preventive measure, recommended by the MSSS QC, was to provide antibiotic post-exposure prophylaxis (PEP) to close contacts of patients with evidence of severe iGAS. The MSSS QC defines “severe” iGAS cases as those involving meningitis, pneumonia, toxic shock, necrotizing fasciitis, or death related to iGAS. However, it should be noted that the occurrence of iGAS disease among close contacts of a confirmed case is uncommon.<sup>24</sup> The effectiveness of providing PEP to contacts in preventing secondary cases of iGAS has not yet been established.<sup>25</sup>

During the more recent 5-year period of 2016 to 2020, there were 45 cases of iGAS reported to the PH Dept. in Eeyou Istchee. Public health investigations were conducted for all (100%) of these cases using ICS standard questionnaires. Of the 45 reported cases, 11 (about 24%) had evidence of severe iGAS disease. For 8 (about 73%) of these 11 cases,\* the PH Dept. recommended timely<sup>†</sup> prophylactic antibiotic treatment to their close contacts, as per MSSS QC guidelines from 2007.<sup>‡,26</sup>

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\* For 3 cases with severe iGAS disease, challenges related to the COVID-19 pandemic or the short duration of time between diagnosis and death prevented the timely management of contacts.

† For close contacts of a severe iGAS case, antibiotic prophylaxis is recommended within 7 days from the last infectious contact with the case, as per MSSS QC guidelines from 2007.

‡ For more information about iGAS treatment, see [Appendix B: Clinical Treatment Details](#).

## 2.3. INVASIVE HAEMOPHILUS INFLUENZAE (IHI) DISEASE

### 2.3.1. EPIDEMIOLOGY

Historically, the highest reported incidence rates of iHi disease in the world have been among Indigenous children in Australia and North America.<sup>27</sup> In Eeyou Istchee, quality iHi surveillance data (including serotype information) has been available since 2007.

Between 2007 and 2020, a total of 25 cases of iHi disease (of all serotypes) were reported to the PH Dept.

- The average annual crude incidence rate of reported iHi (of all serotypes) in Eeyou Istchee was at 11 cases per 100,000 people during this 14-year period.

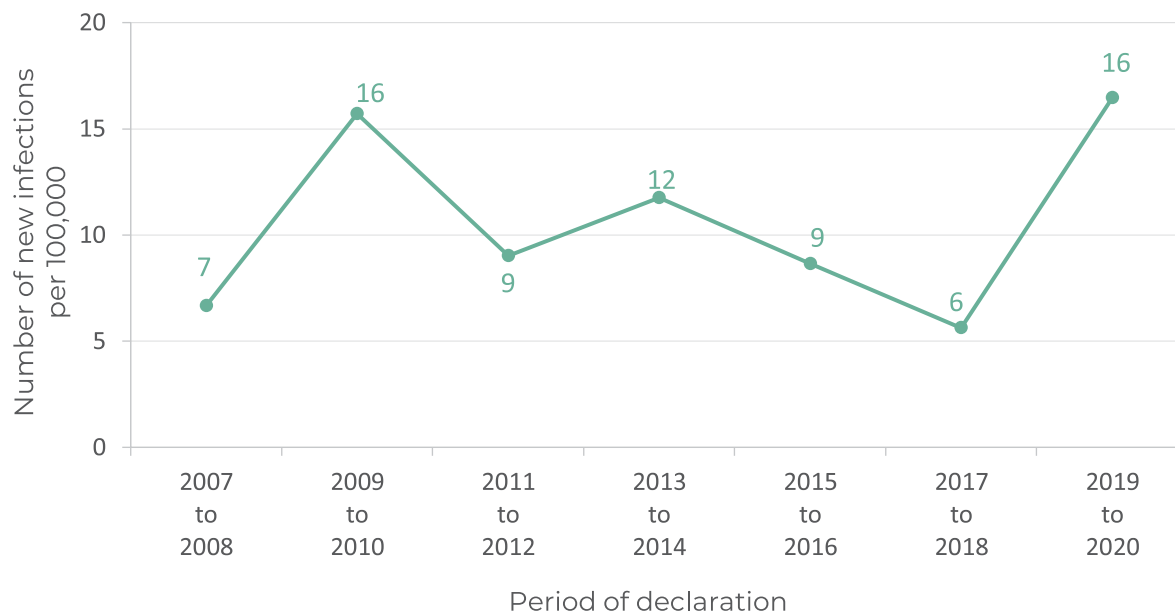
Serotype information was available for 24 of the 25 reported cases.

- In Eeyou Istchee, the great majority or 83% (n=20) of iHi cases were of serotype a, and the remaining 17% (n=4) had non-typeable (non-capsulated) iHi.
- In the Canadian ICS regions, iHi of serotype a accounted for about 65% of all iHi cases during the same period.

The average annual crude incidence rates of reported iHi fluctuated during this 14-year period in Eeyou Istchee, but did not show any clear increasing trend over time (Figure 23 and 24).

- In the Canadian ICS regions, the trend in the average annual crude incidence rates of reported iHi also fluctuated from 2007 to 2020, with no overall increasing trend (Figure 25).
- In contrast, in the general population of Canada, the trend in the average annual crude incidence rates of reported iHi appeared to have been more stable, with a steady but gradual increase over the same period (Figure 26).

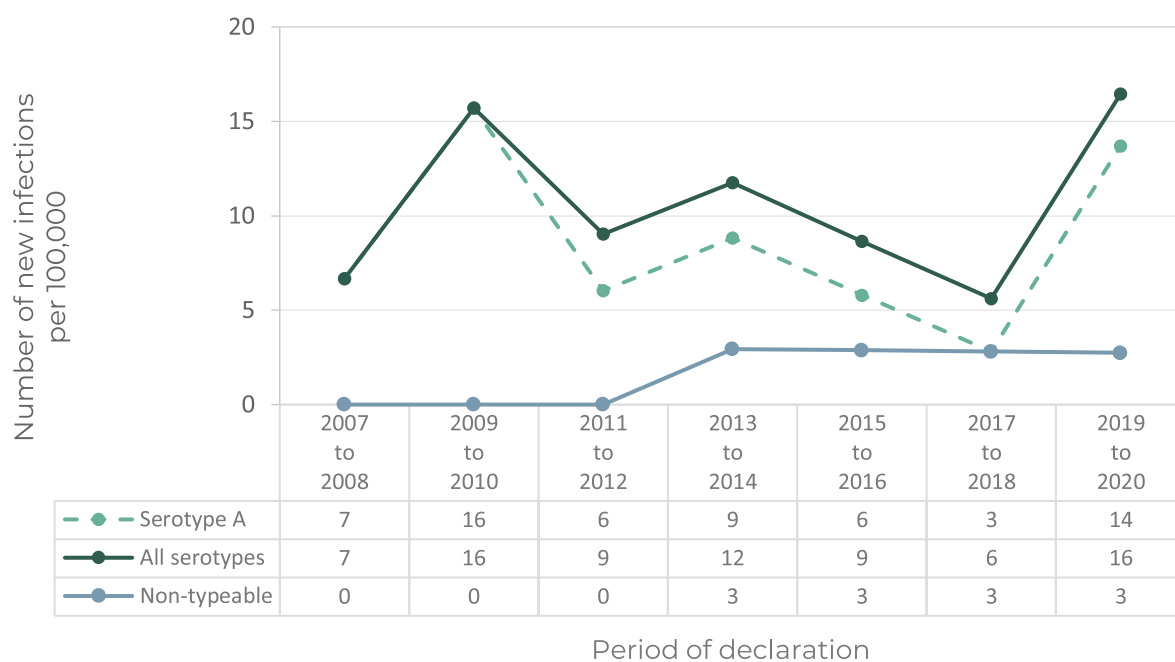
**Figure 23. Average annual crude incidence rates of reported iHi infections (all serotypes) per 100,000 people by 2-year periods, Eeyou Istchee, 2007-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; International Circumpolar Surveillance network (ICS) database; ISQ, estimations et projections de population comparables (1996-2041).

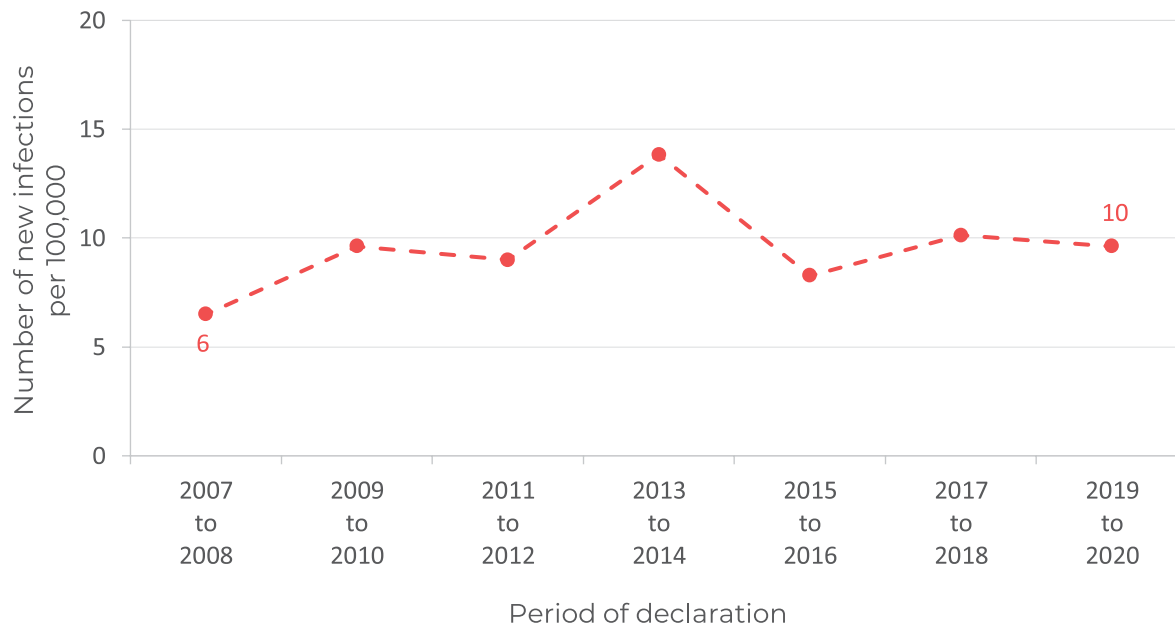
**Figure 24. Average annual crude incidence rates of reported iHi infections per 100,000 people, by 2-year periods and serotype, Eeyou Istchee, 2007-2020**



Note: Incidence rates are presented per 100,000 person-years.

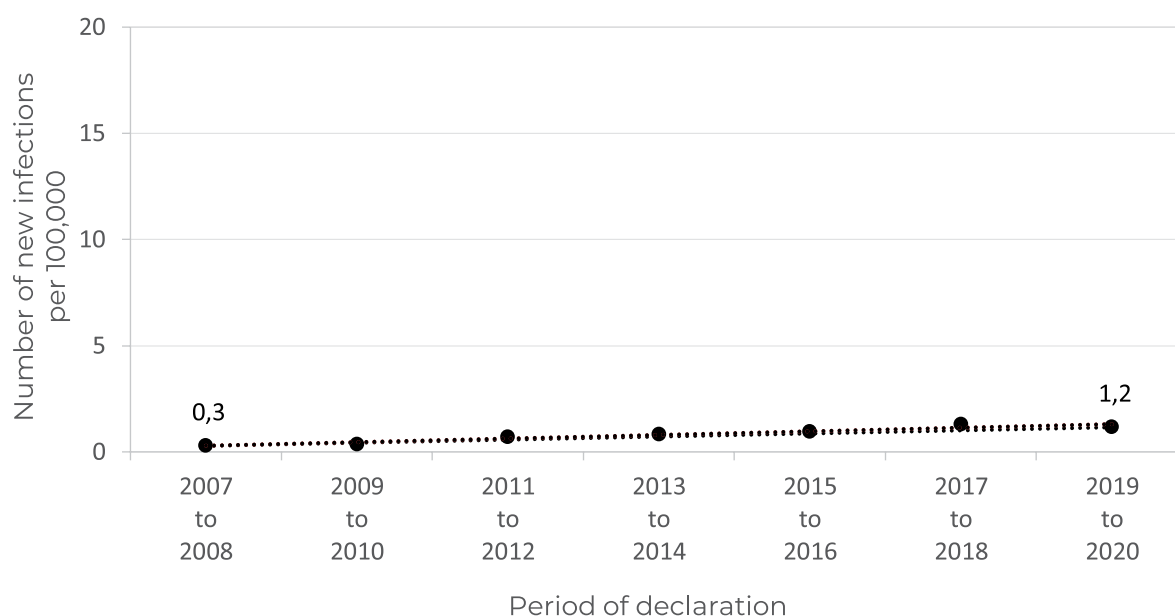
Sources: SI-GMI, extracted from the Infocentre; International Circumpolar Surveillance network (ICS) database; ISQ, estimations et projections de population comparables (1996-2041).

**Figure 25.** Average annual crude incidence rates of reported iHi infections (all serotypes) per 100,000 people by 2-year periods, Canadian ICS regions, 2007-2020



Note: Incidence rates are presented per 100,000 person-years.  
Source: International Circumpolar Surveillance network (ICS) database.

**Figure 26.** Average annual crude incidence rates of reported iHi infections (all serotypes) per 100,000 people by 2-year periods, Canada, 2007-2020



Note: Incidence rates are presented per 100,000 person-years.  
Sources: CNDSS, Public Health Agency of Canada; Statistics Canada, annual population estimates, July 1st 2000 to 2020.

The large majority of iHi cases from 2007 to 2020 in Eeyou Istchee appeared sporadically.

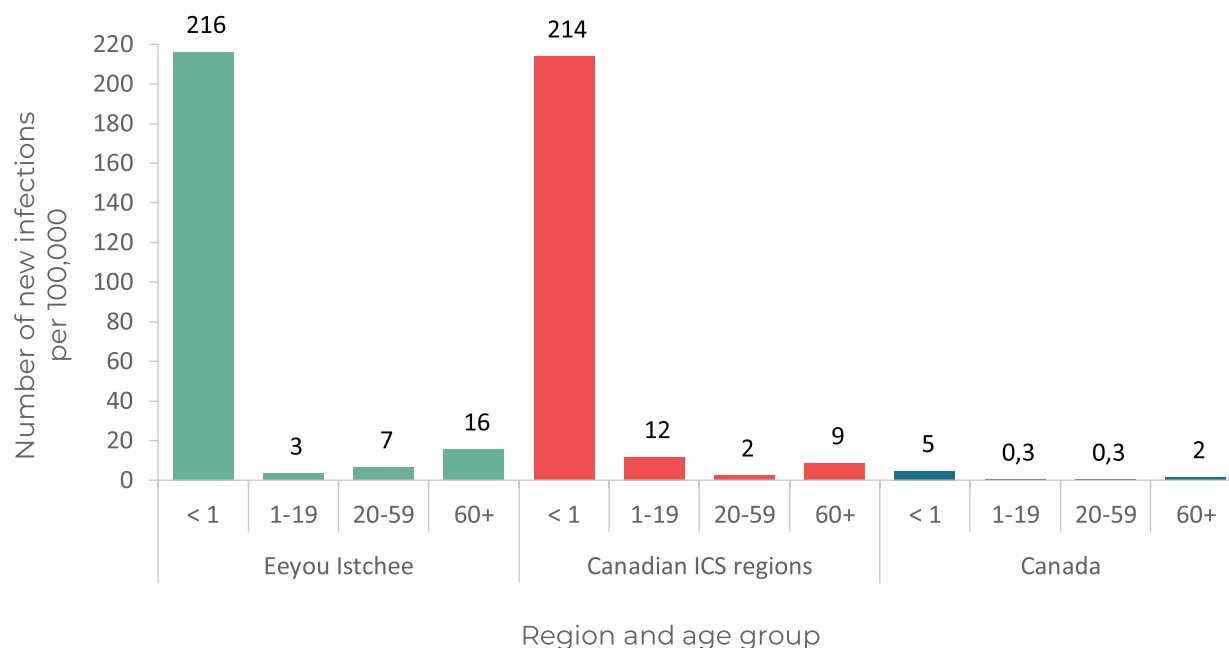
- For instance, 1 case occurred several weeks after another case in the same community, and of the same serotype, but no social link could be established between them.
- On a different occasion, 2 cases with social links in the same community both developed severe invasive *Haemophilus influenza* type a (Hia) disease, but with a gap of several months between their cases. Later, Whole Genome Sequencing (WGS) analysis of their Hia species at the National Microbiology Laboratory (NML) showed genotypic differences, suggesting that no direct transmission had occurred between them.

Indigenous populations in Canada have had higher incidence rates of iHi compared to the general population, according to previous studies. Since the widespread introduction of the *Haemophilus influenzae* type b (Hib) conjugate vaccine in the 1990s, certain Indigenous populations in Canada and the U.S. have experienced significantly higher incidence rates of iHi type a (particularly among children under 2 years old), compared to the general populations of these countries.<sup>27,28</sup> The determinants of increased iHi and invasive Hia incidence rates in Indigenous populations are not fully understood, although some studies suggest that unfavourable socioeconomic factors in Indigenous communities (e.g., overcrowded housing) and lower prevalence of breastfeeding may have contributed to this higher burden of iHi disease.<sup>29,30</sup>

Between 2007 and 2020:

- For infants under 1 year old, the average annual incidence rate of reported iHi (of all serotypes) in Eeyou Istchee (at 216 cases per 100,000 people) was about 48 times higher (95% CI [24,87]) than the incidence in the rest of Canada (Figure 27). In contrast, the average annual incidence rate of reported iHi among infants in Eeyou Istchee was almost the same (95% CI [0.5,1.9]) as the incidence in the rest of the Canadian ICS regions.
- For older adults aged 60 years or more, the average annual incidence rate of reported iHi (of all serotypes) in Eeyou Istchee (at 16 cases per 100,000 people) was about 10 times higher (95% CI [2,30]) than the incidence in the rest of Canada (Figure 27). Although the average annual incidence rate of reported iHi among older adults in Eeyou Istchee was about 2.0 times higher (95% CI [0.4,6.8]) than the incidence in the rest of the Canadian ICS regions, this difference was not statistically significant.

**Figure 27. 14-year average annual incidence rates of reported iHi infections (all serotypes) per 100,000 people, by region and age group, Eeyou Istchee, Canadian ICS regions, and Canada, 2007-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041);

International Circumpolar Surveillance network (ICS) database; CNDSS, Public Health Agency of Canada;

Statistics Canada, annual population estimates, July 1st 2000 to 2020.

## 2.3.2. RISK FACTORS

Age has been well-established as a biological risk factor for developing iHi disease, according to previous studies.<sup>30–32</sup> Between 2007 and 2020:

- Infants under 1 year old had, by far, the highest average annual incidence rates of reported iHi in Eeyou Istchee, in the Canadian ICS regions, and in the general population of Canada (Figure 27). In Eeyou Istchee, all infants with reported iHi had serotype a bacteria.
- Older adults aged 60 years or more had the second-highest average annual incidence rates of reported iHi in Eeyou Istchee, and in the general population of Canada (Figure 27).
- In Eeyou Istchee, the average annual incidence rate of iHi among older adults aged 60 years or more was much lower (by about 13.5 times) than the incidence among infants under 1 year old (Figure 27). Older adults accounted for 3 out of 4 cases of non-typeable iHi, but were not affected by serotype a.

### 2.3.3. CLINICAL OUTCOMES

- In Eeyou Istchee, 55% of infants under 1 year old with iHi (all of whom had serotype a) presented with meningitis. In fact, iHi of serotype a was the most common etiology for bacterial meningitis among infants in Eeyou Istchee during the period of 2007 to 2020.
  - Although follow-up data is not available for all children affected by iHi type a, several of those with a history of invasive Hia meningitis were known to have experienced short-term (*e.g.*, seizures) and/or long-term (*e.g.*, sensorineural deafness) health complications.
- Of all individuals who developed iHi disease from 2007 to 2020, 29% had meningitis (all due to serotype a, and among children under 2 years old), 17% had septic arthritis (all due to serotype a), and 25% had pneumonia.
- All older adults (aged 60 years or more) who were diagnosed with iHi disease had non-typeable serotype and presented with a principal diagnosis of pneumonia with concurrent bacteremia.
- The iHi-related (of all serotypes) hospitalization rate during the period of 2007 to 2020 in Eeyou Istchee was around 96%,\* compared to around 89% in the Canadian ICS regions.
- Moreover, the iHi-related case fatality rate during the same period was at 8.7%\* in Eeyou Istchee, compared to 9.4% in the Canadian ICS regions.

### 2.3.4. PREVENTION

#### Vaccination

In Quebec, vaccination of newborns for Hib began in 1988 with the polysaccharide vaccine, which was later replaced by the conjugate vaccine in 1992.<sup>10</sup>

Between 2016 and 2020, the estimated 5-year average coverage for the Hib conjugate vaccine (at least 3 doses) among 2-year-old children was around 93% in Eeyou Istchee, which was higher than the corresponding coverage for all of Quebec (Table 7). As per the objectives of the PNSP, the optimal coverage for all vaccines recommended for 2-year-old children is at 95% (or greater).<sup>11</sup>

Likely as a result of the regional Hib vaccination program, there have been fewer than 5 reported cases of iHi type b since 2000 in Eeyou Istchee, with no cases reported since 2007. However, no vaccine is available yet for prevention of iHi type a.

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\* In Eeyou Istchee, hospitalization and case fatality information were available for 23 individuals with iHi during the period of 2007 to 2020.

**Table 7.** *Haemophilus influenzae* type b vaccine coverage ( $\geq 3$  doses) among 2-year-old children by year (including estimated 5-year average coverage), Eeyou Istchee, 2016-2020

| Year           | Percentage (%) |
|----------------|----------------|
| 2016           | 88%            |
| 2017           | 94%            |
| 2018           | 95%            |
| 2019           | 93%            |
| 2020           | 94%            |
| 5-year average | 93%            |

Source: MSSS, Registre de vaccination du Québec.

## Post-exposure prophylaxis treatment of close contacts

At the time this report was finalized, there were no evidence-based interventions for preventing iHi disease due to serotype a or other non-b serotypes.

As per the recommendations of the American Academy of Pediatrics (AAP) and the MSSS QC, antibiotic PEP has been recommended to all close contacts of cases of invasive Hia disease in Eeyou Istchee since 2020.<sup>\*,33</sup> However, the short and long-term effectiveness of this PEP in preventing secondary cases and in reducing the prevalence of community-based carriage of Hia is unknown.

A safe and effective vaccine for Hia is needed to reduce the burden of this disease in Indigenous communities, especially among children under 5 years old. A novel conjugate vaccine for Hia had been developed and was pending clinical trials at the time this report was finalized.

\* For more information about iHi post-exposure prophylaxis, see [Appendix B: Clinical Treatment Details](#).

## 2.4. INVASIVE PNEUMOCOCCAL DISEASE (IPD)

### 2.4.1. EPIDEMIOLOGY

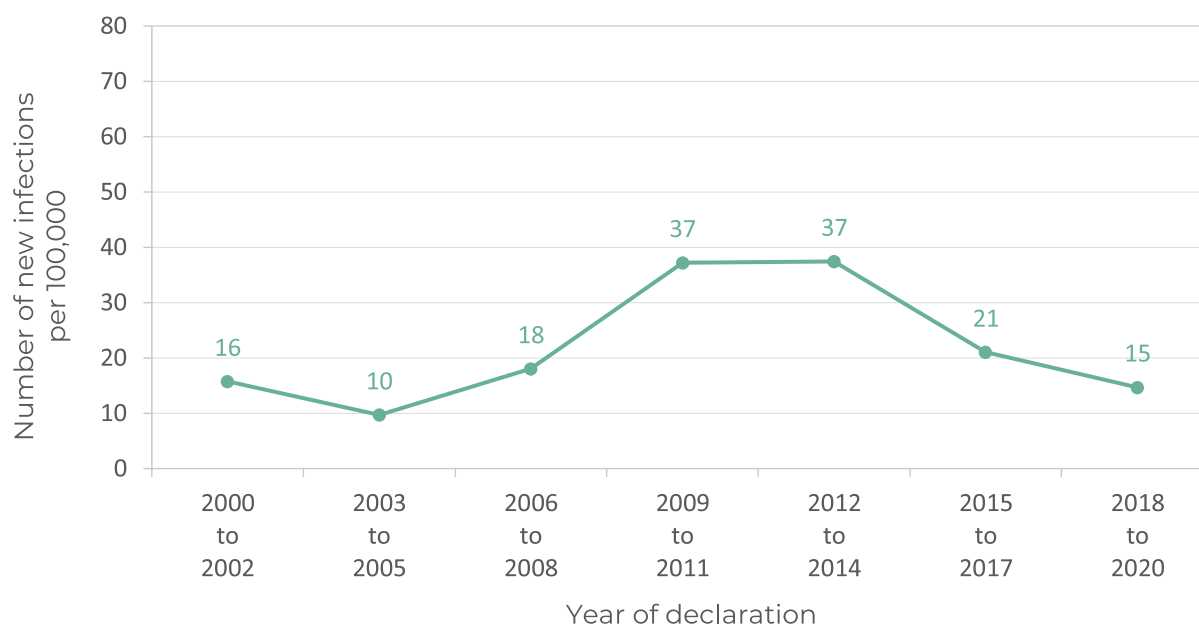
From 2000 to 2020, a total of 74 cases of IPD were reported to the PH Dept.

- The average annual crude incidence rate of reported IPD in Eeyou Istchee was at 21 cases per 100,000 people from 2000 to 2010, and at 24 cases per 100,000 people from 2011 to 2020.

As illustrated in Figures 28, 29, and 30, the trends in reported IPD incidence between 2000 and 2020 that were observed in Eeyou Istchee, in the Canadian ICS regions, and in the general population of Canada were all distinct from one another.

- In Eeyou Istchee, the average annual crude incidence rates of reported IPD increased steadily from the period of 2003-05 to the period of 2009-11, followed by a decline from the period of 2012-14 to the period of 2018-20.

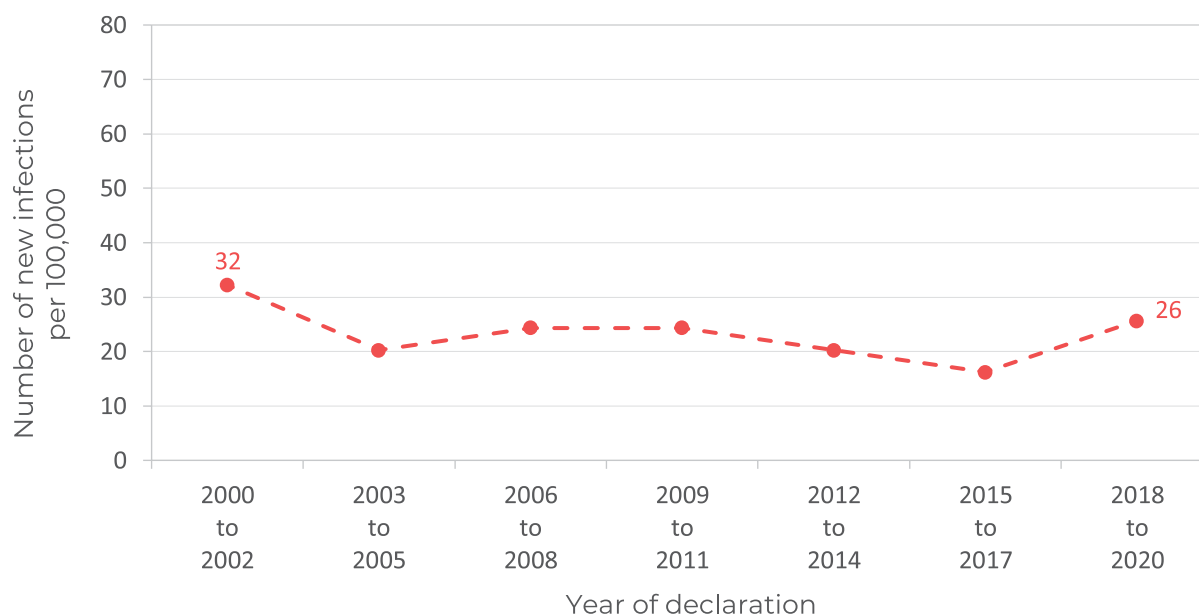
**Figure 28. Average annual crude incidence rates of reported IPD per 100,000 people by 3-year periods, Eeyou Istchee, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.

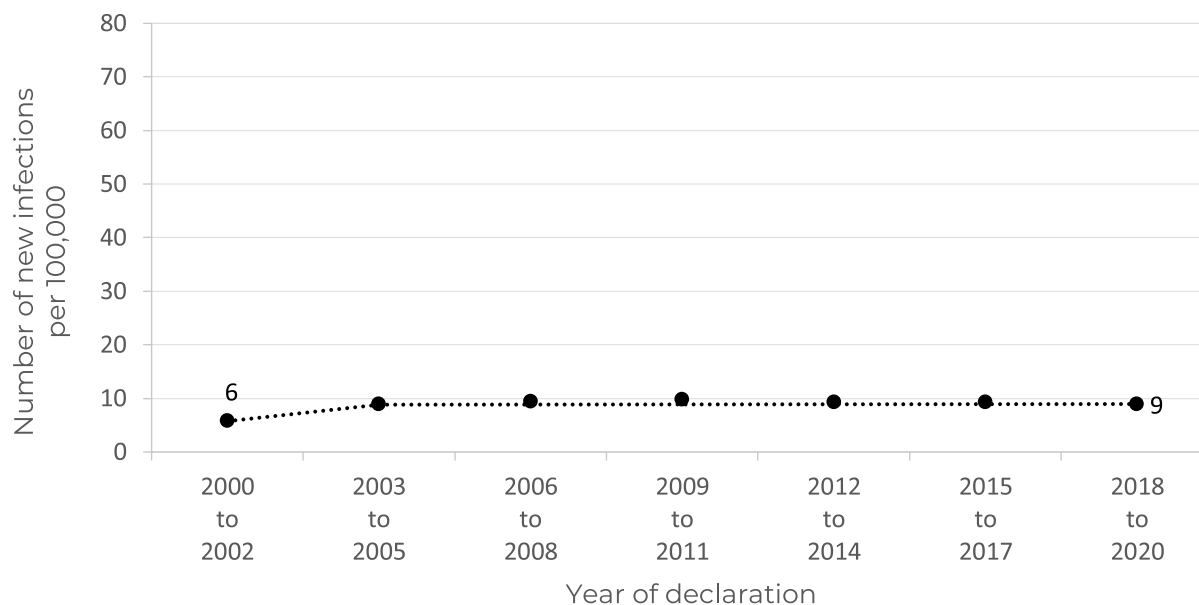
Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

**Figure 29. Average annual crude incidence rates of reported IPD per 100,000 people by 3-year periods, Canadian ICS regions, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.  
Sources: International Circumpolar Surveillance network (ICS) database.

**Figure 30. Average annual crude incidence rates of reported IPD per 100,000 people by 3-year periods, Canada, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.  
Sources: CNDSS, Public Health Agency of Canada; Statistics Canada, annual population estimates, July 1st 2000 to 2020.

Dating back to at least 2000, incidence rates of IPD in Indigenous populations in Canada have been higher than in their non-Indigenous counterparts.<sup>19,34–36</sup> Between 2011 and 2020:

- For young children under 5 years old, the average annual incidence rate of reported IPD in Eeyou Istchee (at 62 cases per 100,000 people) was about 5.1 times higher (95% CI [2.5,9.1]) than the incidence in the rest of Canada. In contrast, the average annual incidence rate of reported IPD among young children in Eeyou Istchee was similar (95% CI [0.5,2.1]) to the incidence in the rest of the Canadian ICS regions (Figure 32).
- For older adults aged 60 years or more, although the average annual incidence rate of reported IPD between 2011 and 2020 in Eeyou Istchee (at 27 cases per 100,000 people) was about 1.3 times higher (95% CI [0.4,3.4]) than the incidence in the rest of Canada (at 20 cases per 100,000 people), and about 35% lower (95% CI [0.2,1.7]) than the incidence in the rest of the Canadian ICS regions (Figure 32), neither of these differences were statistically significant.

Since 2013, the PH Dept. has investigated all reported cases of IPD in Eeyou Istchee using the standard ICS questionnaire.

- Based on available information from public health investigations (including serotype results, and temporal, spatial and social links), there was no evidence of secondary cases or outbreaks of IPD in Eeyou Istchee from 2013 to 2020. Genotypic data for IPD cases was not available during this period.
- During the more recent 5-year period of 2016 to 2020, the identified pneumococcal serotypes\* included: 22F, 11A, 33F, 9N, 7F, 3, 14, 19F, 8, 15A, and 23B. There were fewer than 5 cases per serotype, and no single serotype predominated during this period.

## 2.4.2. RISK FACTORS

Age is a notable biological risk factor for IPD.<sup>37</sup>

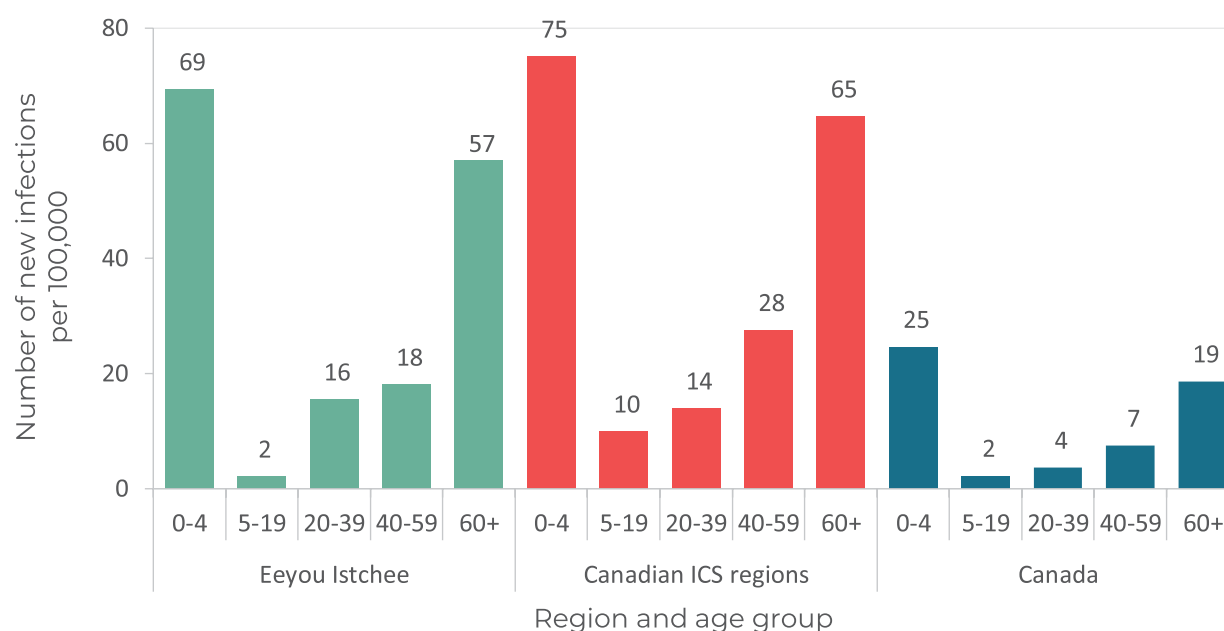
Between 2000 and 2010:

- In Eeyou Istchee, children under 5 years old had the highest average annual incidence rate of reported IPD (at 69 cases per 100,000 people), followed by older adults aged 60 years or more (at 57 cases per 100,000 people; Figure 31).
- The Canadian ICS regions and the general population of Canada exhibited a similar age distribution of IPD cases, with the highest burden observed in children under 5 years old, followed by older adults aged 60 years or more (Figure 31).

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\* Serotype information was available for about 94% of all reported IPD cases during the period of 2016 to 2020.

**Figure 31. Average annual incidence rates of reported IPD per 100,000 people, by region and age group, Eeyou Istchee, Canadian ICS regions, and Canada, 2000-2010**



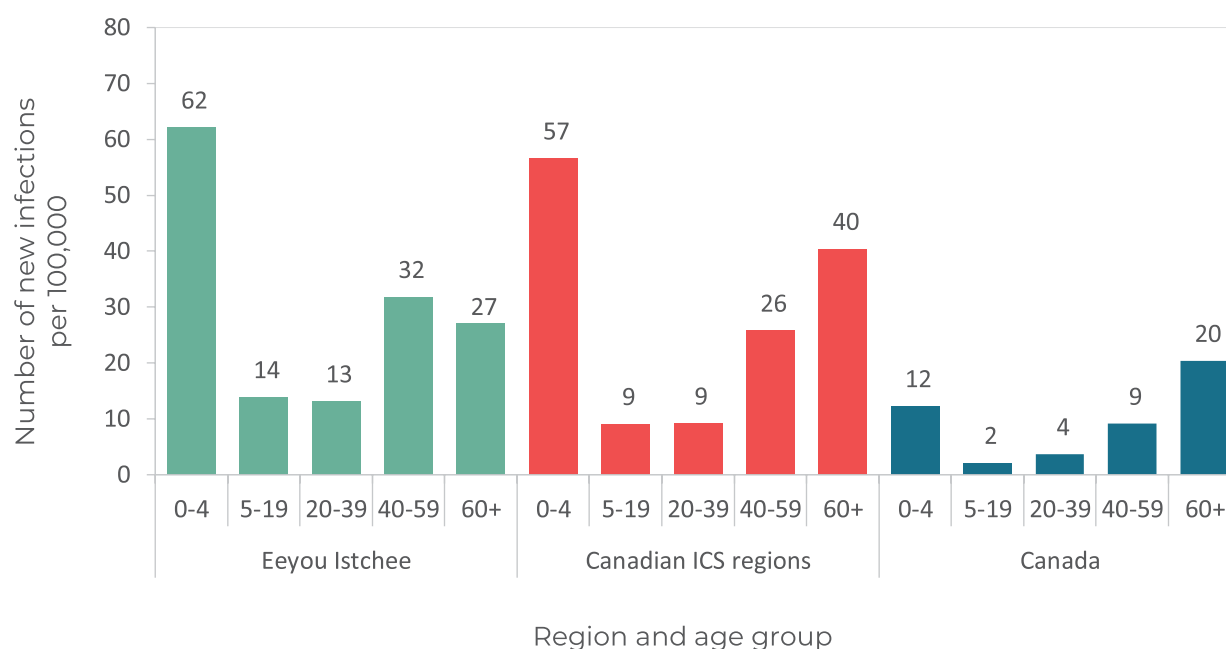
Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041); International Circumpolar Surveillance network (ICS) database; CNDSS, Public Health Agency of Canada; Statistics Canada, annual population estimates, July 1st 2000 to 2020.

Between 2011 and 2020:

- In Eeyou Istchee, children under 5 years old had the highest average annual incidence rate of reported IPD (at 62 cases per 100,000 people). However, the age group with the second highest average annual incidence rate of IPD in Eeyou Istchee during this period was attributed to adults aged 40 to 59 years (at 32 cases per 100,000 people), diverging from the previous 11-year period when older adults aged 60 years or more held the second highest incidence (Figure 32).
- In the Canadian ICS regions, children under 5 years old also had the highest average annual incidence rate of reported IPD (at 57 cases per 100,000 people) during this period, followed by older adults aged 60 years or more (at 40 cases per 100,000 people).
- In the general population of Canada, older adults aged 60 years or more appeared to have the highest average annual incidence rate of IPD (at 20 cases per 100,000 people) during this period, followed by children under 5 years old (at 12 cases per 100,000 people; Figure 32).

**Figure 32. Average annual incidence rates of reported IPD per 100,000 people, by region and age group, Eeyou Istchee, Canadian ICS regions, and Canada, 2011-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041); International Circumpolar Surveillance network (ICS) database; CNDSS, Public Health Agency of Canada; Statistics Canada, annual population estimates, July 1st 2000 to 2020.

### 2.4.3. CLINICAL OUTCOMES

Between 2000 and 2020:

- For young children under 5 years old with IPD, pneumonia (with or without empyema) with bacteremia was the most common clinical presentation, accounting for 41% of all cases, followed by pneumococcal meningitis. Nonetheless, pneumococcal meningitis among young children was not common, with fewer than 5 cases during this 21-year period.
- For adults aged 40 years or more with IPD, pneumonia (with or without empyema) with bacteremia was by far the most common clinical presentation, accounting for about 69% of all cases.
- The great majority or about 87%\* of individuals with IPD from Eeyou Istchee were hospitalized, compared to about 84% of individuals with IPD from the Canadian ICS regions.
- The estimated case fatality rate for IPD in Eeyou Istchee was 4.2%\*, compared to around 9% in the Canadian ICS regions.

\* In Eeyou Istchee, hospitalization and case fatality information were available for 71 individuals with IPD during the period of 2000 to 2020.

## 2.4.4. PREVENTION

### Vaccination

In Eeyou Istchee, systematic vaccination of infants (starting at 2 months of age) with the conjugate pneumococcal vaccine began around 2002.<sup>10</sup> Between 2016 and 2020, the estimated 5-year average coverage for the conjugate pneumococcal vaccine (at least 3 doses\*) among 2-year-old children was around 94% in Eeyou Istchee, which was higher than the corresponding coverage for all of Quebec (Table 8). As per the objectives of the PNSP, the optimal coverage for all vaccines recommended for 2-year-old children is at 95% (or greater).<sup>11</sup>

It should be noted that from 2016 to 2020 in Eeyou Istchee, about 33% of IPD cases (for whom serotype information was available†) had disease due to serotypes included in the Prevnar-13 conjugate vaccine (serotypes 7F, 3, 14, 19F).‡ Of those 33%, none were children under 5 years old.

**Table 8. Conjugate pneumococcal vaccine coverage (≥3 doses) among 2-year-old children by year (including estimated 5-year average coverage), Eeyou Istchee, 2016-2020**

| Year           | Percentage (%) |
|----------------|----------------|
| 2016           | 93%            |
| 2017           | 95%            |
| 2018           | 96%            |
| 2019           | 93%            |
| 2020           | 94%            |
| 5-year average | 94%            |

Source: MSSS, Registre de vaccination du Québec.

\* The PIQ recommends 4 doses of conjugate pneumococcal vaccine for children aged 1 year or younger living in the regions of Eeyou Istchee or Nunavik, and 3 doses for children aged 1 year or younger living elsewhere in Quebec.<sup>38</sup>

† Serotype information was missing for 1 case with meningitis who had a positive PCR for *S. pneumoniae* in their CSF sample, on which serotyping was not done.

‡ 1 case who had received 4 doses of Prevnar-13 by the age of 1 year later developed IPD due to serotype 3, representing a case of vaccine failure.

## 2.5. INVASIVE MENINGOCOCCAL DISEASE (IMD)

### 2.5.1. EPIDEMIOLOGY

Between 2000 and 2020, IMD due to *Neisseria meningitidis* was not common in Eeyou Istchee, with fewer than 5 cases reported to the PH Dept. during this 21-year period.

- The majority of those reported with IMD in Eeyou Istchee were children aged 2 years or younger.
  - Of the children aged 2 years or younger affected with IMD, 67% had meningitis, while 33% presented with bacteremia (with no apparent focus of infection). All cases were caused by *Neisseria meningitidis* of serogroup B.
- None of the reported cases of IMD were linked to each other, and no IMD outbreak was identified in Eeyou Istchee during this 21-year period.

### 2.5.2. CLINICAL OUTCOMES

- All cases of IMD were hospitalized.
- No IMD-related deaths were reported during this period in Eeyou Istchee.

### 2.5.3. PREVENTION

Vaccination: Since around 2001, the monovalent conjugate meningococcal serogroup C vaccine (Men-C-C) has been offered to all children aged 12 to 24 months\* in Quebec and Eeyou Istchee. Between 2016 and 2020, the estimated 5-year average coverage for the Men-C-C vaccine (at least 1 dose) among 2-year-old children was around 92% in Eeyou Istchee, which was higher than the corresponding coverage for all of Quebec (Table 9). As per the PNSP's objective, the optimal coverage for all vaccines recommended for children aged 2 years or younger is at 95% (or greater).<sup>11</sup>

It should be noted that until 2020, systematic vaccination of children and others with the conjugate meningococcal serogroup B vaccine (MenB) and the conjugate meningococcal serogroups ACWY vaccine (MenACWY) was not recommended by the PIQ. The PIQ only recommended free-of-charge vaccination with MenB and MenACWY for individuals at risk of developing severe disease. At-risk individuals included:

1. Persons with certain immunocompromising conditions;
2. Persons at increased risk of exposure (e.g., lab workers); and
3. Contacts of IMD cases (of serogroup B, or serogroups A, C, W or Y).<sup>39,40</sup>

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\* From around 2001 to 2019, the Men-C-C vaccine was offered to children at 12 months of age. Since 2020, the vaccine has been offered to children at 18 months of age, as per the PIQ.

**Table 9.** Monovalent conjugate C meningococcal (Men-C-C) vaccine coverage (≥1 dose) among 2-year-old children by year (including estimated 5-year average coverage), Eeyou Istchee, 2016-2020

| Year           | Percentage (%) |
|----------------|----------------|
| 2016           | 90%            |
| 2017           | 92%            |
| 2018           | 92%            |
| 2019           | 91%            |
| 2020           | 93%            |
| 5-year average | 92%            |

Source: MSSS, Registre de vaccination du Québec.

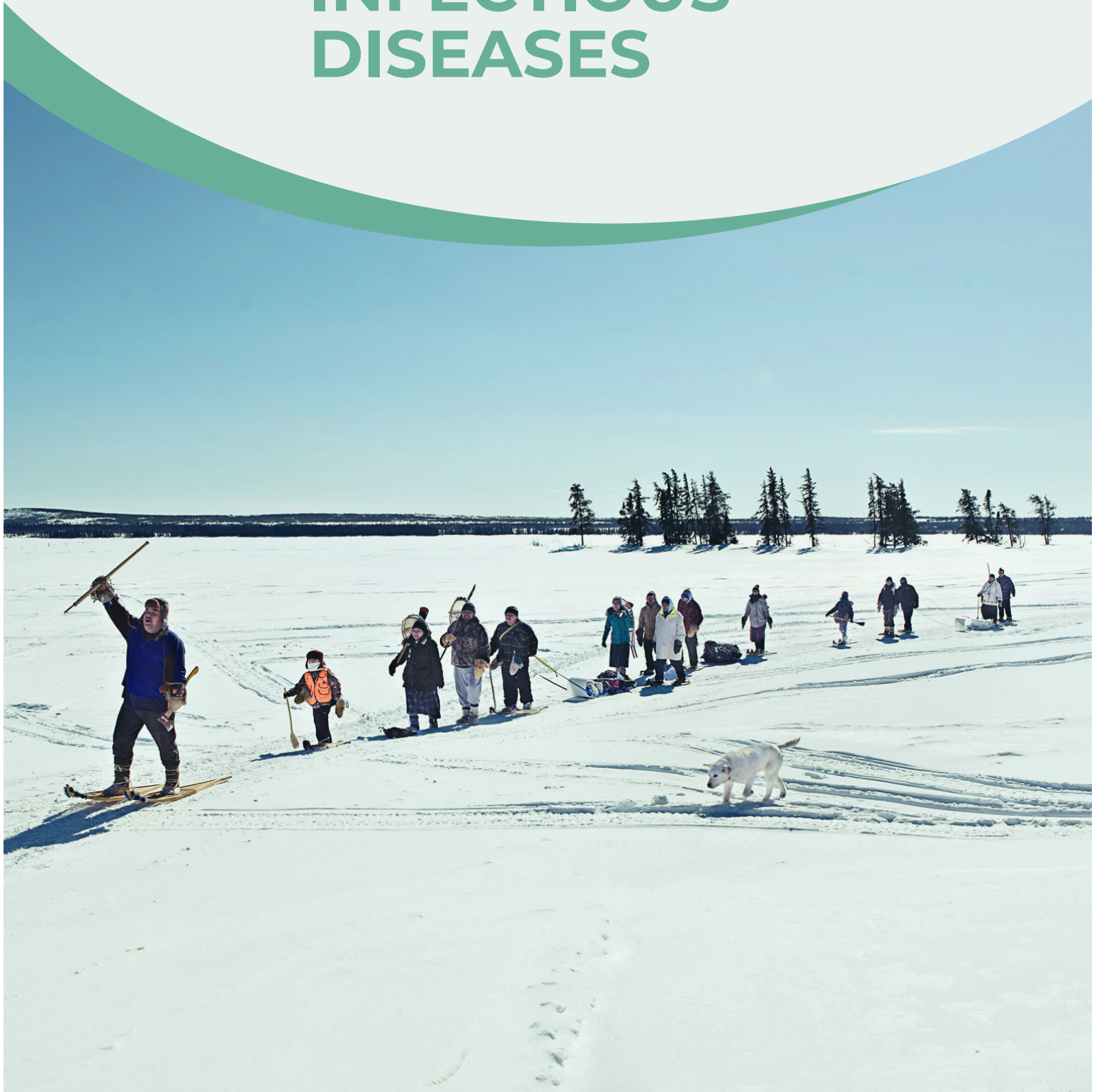
## Post-exposure prophylaxis treatment of close contacts

During the more recent 10-year period of 2011 to 2020, there were fewer than 5 cases of IMD (all were serogroup B) reported in Eeyou Istchee. The cases with IMD presented with bacteremia, with no evidence of meningitis or other apparent focus of infection. The cases had not received vaccination for meningococcal serogroups C or B. Within 24 hours of case declaration, all close contacts were identified and offered PEP with appropriate antibiotics and vaccination, as per MSSS QC guidelines.\* All close contacts (100%) successfully completed their PEP with antibiotics and 2 doses of the MenB vaccine, as per PIQ recommendations.

\* For more information about IMD post-exposure prophylaxis, see [Appendix B: Clinical Treatment Details](#).

# 3

## OTHER VACCINE- PREVENTABLE INFECTIOUS DISEASES



## 3.1. MEASLES, RUBELLA, TETANUS, DIPHTHERIA, AND POLIOMYELITIS

### 3.1.1. EPIDEMIOLOGY

Between 2000 and 2020 in Eeyou Istchee, no cases of measles, rubella, poliomyelitis, tetanus, or diphtheria were reported to the PH Dept.

### 3.1.2. PREVENTION

#### Vaccination

Population-based vaccination of infants for measles, mumps, rubella, tetanus, diphtheria, pertussis, and poliomyelitis began in Quebec and Eeyou Istchee before 1980.<sup>41</sup> Table 10 summarizes the estimated 5-year average coverage for 2-year-old children in Eeyou Istchee during the period of 2016 to 2020 for the measles, mumps and rubella, polio, and diphtheria, pertussis and tetanus vaccines, as per PIQ guidelines. According to the objectives of the PNSP, the optimal coverage for all vaccines recommended for children aged 2 years or younger is at 95% (or greater).<sup>11</sup>

The estimated 5-year average coverage for attenuated live measles vaccination (at least 2 doses of the measles, mumps, and rubella vaccine) among 2-year-old children was estimated at around 82% in Eeyou Istchee, which was higher than the corresponding coverage for all of Quebec (Table 10). According to the World Health Organization (WHO), “coverage of 95% or greater of 2 doses of measles-containing vaccine is needed to create herd immunity in order to protect communities and achieve and maintain measles elimination.”<sup>42</sup> Discussions with the Immunization team of the PH Dept. suggested that the suboptimal estimated coverage of measles vaccination (2 doses) among 2-year-old children in Eeyou Istchee was likely attributed to logistical issues, such as delayed vaccination and delayed entry of vaccination status in the vaccine registry. In fact, the estimated 5-year average coverage for 2 doses of the measles vaccine was significantly higher among older children in their fourth year of primary school, at a coverage of approximately 99% for the school years of 2015-16 to 2019-20 (Table 11).

The 5-year average coverage for polio vaccination (at least 3 doses of the combined tetanus, diphtheria, pertussis, and polio vaccine) among 2-year-old children was around 93% in Eeyou Istchee, which was higher than the corresponding coverage for all of Quebec (Table 10).

**Table 10.** Vaccine coverage among 2-year-old children, by year (including estimated 5-year average coverage) and type of vaccine, Eeyou Istchee, 2016-2020

| Vaccine                                       | 2016 | 2017 | 2018 | 2019 | 2020 | 5-year average |
|-----------------------------------------------|------|------|------|------|------|----------------|
| Measles (≥2 doses)                            | 81%  | 80%  | 82%  | 80%  | 85%  | 82%            |
| Mumps and Rubella (≥1 dose)                   | 91%  | 93%  | 93%  | 91%  | 94%  | 93%            |
| Polio (≥3 doses)                              | 88%  | 94%  | 96%  | 94%  | 94%  | 93%            |
| Diphtheria, Pertussis, and Tetanus (≥3 doses) | 88%  | 94%  | 96%  | 94%  | 94%  | 93%            |

Source: MSSS, Registre de vaccination du Québec.

**Table 11.** Measles vaccine coverage (≥2 doses) among grade 4 primary school students by school year (including estimated 5-year average coverage), Eeyou Istchee, 2015-16 to 2019-20

| School year    | Percentage (%) |
|----------------|----------------|
| 2015-2016      | 99%            |
| 2016-2017      | 99%            |
| 2017-2018      | 99%            |
| 2018-2019      | 99%            |
| 2019-2020      | 99%            |
| 5-year average | 99%            |

Source: MSSS, Registre de vaccination du Québec.

## 3.2. MUMPS

### 3.2.1. EPIDEMIOLOGY

Mumps was not a commonly reported infectious disease in Eeyou Istchee before 2010. No cases of mumps were reported to the PH Dept. between 2000 and 2008, and fewer than 5 cases were reported in 2009. In 2010, the region experienced a widespread mumps outbreak. Following the outbreak, no cases of mumps were reported between 2011 and 2020 in Eeyou Istchee.

#### OUTBREAK OF MUMPS

In 2010, a total of 449 cases of mumps were reported to the PH Dept.

- The great majority or 77% of reported cases were adults (aged 18 years or more), and 23% were children aged 5 to 17 years. No cases were reported among children under 5 years old.
- Cases were reported from all communities in Eeyou Istchee.
- Based on available information, there were no case fatalities related to mumps.\*

The outbreak was temporally linked to a widespread epidemic of mumps in Quebec.<sup>43–45</sup>

Nevertheless, in 2010, mumps cases in Eeyou Istchee accounted for about 66% of all reported cases in Quebec.<sup>44</sup> All cases from Quebec whose samples were sent for genotypic analysis at the NML were identified as having genotype G, which was similar to virus strains associated with mumps outbreaks elsewhere in Canada, New York, and the United Kingdom around the same time period.<sup>44,46</sup>

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\* As per email communication with Dr. Robert Carlin, Family Physician (McGill University), on June 5, 2024.

### 3.2.2. PREVENTION

#### Vaccination

Between 2016 and 2020, the estimated 5-year average coverage for attenuated live mumps and rubella vaccination (at least 1 dose of the measles, mumps, and rubella vaccine) among 2-year-old children in Eeyou Istchee was around 93%, which was higher than the corresponding coverage for all of Quebec (Table 10). As per the objectives of the PNSP, the optimal coverage for all vaccines recommended for 2-year-old children is at 95% (or greater).<sup>11</sup>

## 3.3. PERTUSSIS

### 3.3.1. EPIDEMIOLOGY

From 2000 to 2020, a total of 16 confirmed cases of pertussis were reported to the PH Dept. in Eeyou Istchee. Cases were reported at intervals of 1 to 6 years.

During the more recent 10-year period of 2011 to 2020, a total of 9 lab-confirmed cases of pertussis were reported in Eeyou Istchee.

- Epidemiological investigations of pertussis cases did not reveal a source of infection. All reported cases were associated with small clusters of pertussis (1 to 3 lab-confirmed and/or clinical cases) due to household transmission, with not everyone in the household having lab-confirmed pertussis but still exhibiting clinical symptoms (clinical cases).
- The great majority or 89% of all lab-confirmed cases were children under 12 years old. Fewer than 5 of these cases were infants under 1 year old.
  - Of the children who were eligible for vaccination by age, 86% were adequately vaccinated for pertussis, as per the PIQ.
  - Based on available information,\* the only case requiring hospitalization was a newborn infant who was not yet eligible for vaccination.

### 3.3.2. CLINICAL OUTCOMES

- There were no reported mortalities associated with pertussis during the period of 2011 to 2020.

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\* Hospitalization information was not available for 2 cases.

### 3.3.3. PREVENTION

#### Vaccination

As indicated in Table 10, the estimated 5-year average coverage for pertussis vaccination (at least 3 doses of the tetanus, diphtheria, pertussis, and polio vaccine) among 2-year-old children was around 93% in Eeyou Istchee, which was higher than the corresponding coverage for all of Quebec. As per the objectives of the PNSP, the optimal coverage for all vaccines recommended for 2-year-old children is at 95% (or greater).<sup>11</sup>

Despite relatively high vaccination coverage among children 2 years or younger, sporadic cases of pertussis continued to occur in Eeyou Istchee throughout the years. One explanation, based on available information including from the PIQ, is that immunity provided by the acellular pertussis vaccine can wane over time, to make older children and adults especially susceptible to pertussis infections.<sup>47</sup>

#### Case and contact management

Since at least 2013, the PH Dept. has recommended immediate isolation and appropriate antibiotic therapy for all confirmed cases of pertussis and their symptomatic contacts, as per MSSS QC guidelines.<sup>\*,48</sup>

The MSSS QC's guidelines recommend PEP for asymptomatic close contacts only if the index case's milieu involves people at risk of complicated pertussis disease.<sup>48</sup> People at risk include:

1. Infants under 2 months old who were either born prematurely and/or their mother was under-vaccinated for pertussis;
2. Infants aged 2 to 5 months;
3. Under-vaccinated infants aged 6 to 11 months; and
4. Under-vaccinated pregnant women during their last 4 weeks of gestation.

However, due to socioeconomic risk factors (*e.g.*, overcrowded housing and frequent multi-generational social gatherings in enclosed spaces) in Eeyou Istchee, the PH Dept. recommended antibiotic PEP for close contacts of all lab-confirmed cases with pertussis during the period of 2016 to 2020. Moreover, during the management of pertussis cases and their close contacts, the opportunity was taken to offer pertussis vaccination to all eligible contacts, according to PIQ guidelines. While there is no evidence that post-exposure vaccination protects individuals with recent exposure from developing pertussis, the goal of these vaccinations was to protect them against future exposures to pertussis.

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\* For more information about pertussis treatment and post-exposure prophylaxis, see [Appendix B: Clinical Treatment Details](#).

# 4 ENTERIC INFECTIOUS DISEASES



# 4.1. BACTERIAL ENTERIC DISEASES

## 4.1.1. EPIDEMIOLOGY

Between 2000 and 2020, the most commonly reported declarable enteric\* infectious disease in Eeyou Istchee by far was salmonellosis.

- From 2011 to 2020, a total of 72 cases of salmonellosis were reported to the PH Dept. in Eeyou Istchee, with an average annual crude incidence rate of around 41 cases per 100,000 people (95% CI [33,52]).
- In the general population of Canada, the average annual crude incidence rate of salmonellosis was around 19 cases per 100,000 people (95% CI [19,19]) during the same period.
- Based on available information from epidemiological investigations during the period of 2013 to 2020 in Eeyou Istchee, no reported cases of salmonellosis were caused by *Salmonella* Typhi or *Salmonella* Paratyphi.

## OUTBREAK OF SALMONELLA

While small clusters of linked cases with bacterial gastroenteritis due to *Salmonella* or *Campylobacter* were periodically reported, larger outbreaks† of these infections were rarely reported between 2013‡ and 2020.

In the summer of 2013, 10 cases of gastroenteritis, all due to the same species of *Salmonella enterica* subspecies *enterica* serogroup B (serotype O 4 5 12:H i:H and lysotype 193),§ were found to be linked to a single community food feast. The epidemiological investigation indicated that person-to-person contact, either directly, or indirectly through food preparation by symptomatic people, was likely the main mode of transmission during this outbreak. Of the 10 reported cases associated with this outbreak, 2 required short-term hospitalization and there were no related case fatalities.

\* Enteric pathogens typically enter the body through the mouth. They are acquired through consumption of contaminated food and water, as well as by contact with animals or their environments, by contact with the feces of an infected person, or through other means.

† Outbreaks involving more than 5 cases who are linked epidemiologically.

‡ Data from epidemiological investigations of enteric infectious diseases has been available since 2013.

§ This specific *Salmonella* species was found to be resistant to multiple antibiotics (including ampicillin, cephalothin, cefazoline, cefoxitin, amikacin, gentamycin, and tobramycin), and had intermediate sensitivity to nitrofurantoin.

The second most commonly reported declarable enteric infectious disease in Eeyou Istchee was campylobacteriosis.

- From 2011 to 2020, a total of 12 cases of *Campylobacter* infection were reported to the PH Dept. in Eeyou Istchee, with an average annual crude incidence rate of around 7 cases per 100,000 people (95% CI [4,12]).
- In the general population of Canada, the average annual crude incidence rate of *Campylobacter* infection was around 27 cases per 100,000 people (95% CI [27,27]) during the same period.

Shigellosis was a rarely reported bacterial enteric infectious disease in Eeyou Istchee.

- Between 2000 and 2020, there were fewer than 5 reported cases of shigellosis, all of which occurred before 2018.
- Figure 33 shows the trend in the average annual incidence rates (by 3-year periods) of 3 notifiable bacterial enteric infections (salmonellosis, shigellosis, and campylobacteriosis) in Eeyou Istchee during the period of 2000 to 2020. The average annual incidence rates over these years were comparable between Eeyou Istchee and the general population of Canada (Figures 33 and 34).

**Figure 33. Average annual incidence rates of reported bacterial enteric infections<sup>a</sup> per 100,000 people by 3-year periods, Eeyou Istchee, 2000-2020**

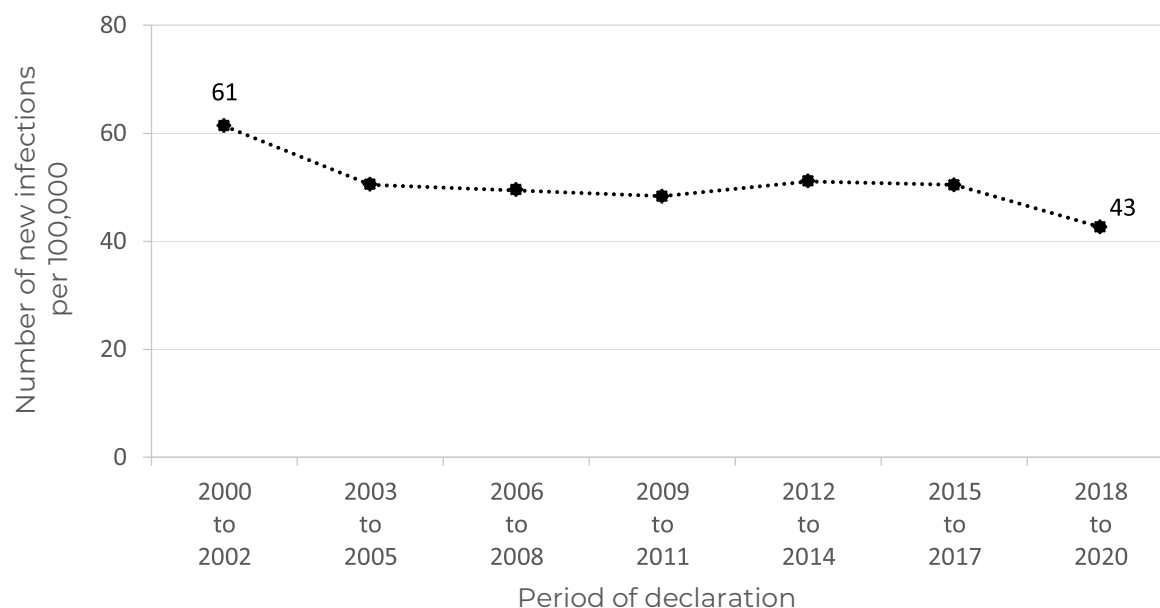


<sup>a</sup> Campylobacteriosis, salmonellosis and shigellosis.

Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

**Figure 34. Average annual incidence rates of reported bacterial enteric infections<sup>a</sup> per 100,000 people by 3-year periods, Canada, 2000-2020**



<sup>a</sup> Campylobacteriosis, salmonellosis and shigellosis.

Note: Incidence rates are presented per 100,000 person-years.

Sources: CNDSS, Public Health Agency of Canada; Statistics Canada, annual population estimates, July 1st 2000 to 2020.

## 4.1.2. CLINICAL OUTCOMES

- Between 2013 and 2020 in Eeyou Istchee, most reported cases of *Salmonella*- or *Campylobacter*-related gastroenteritis were not hospitalized.
- No related deaths were reported to the PH Dept.

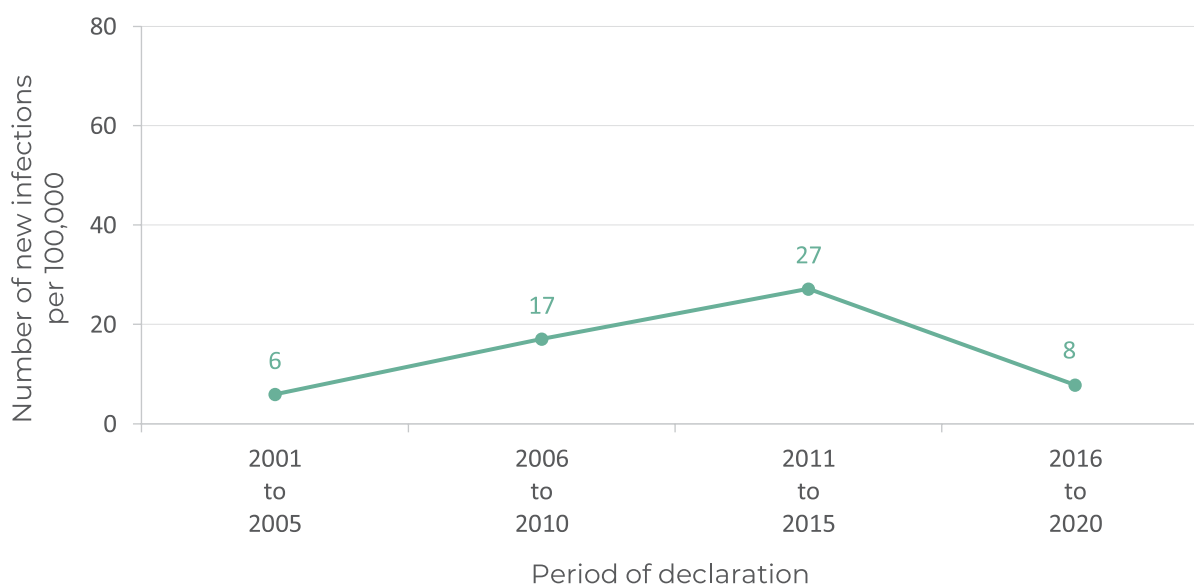
## 4.2. PARASITIC ENTERIC DISEASES

### 4.2.1. EPIDEMIOLOGY

Between 2000 and 2020, declarable parasitic enteric infections were not commonly reported in Eeyou Istchee.

- Figure 35 shows the trend in the average annual incidence rates (by 5-year periods) of 2 notifiable parasitic enteric infections (giardiasis and cryptosporidiosis) in Eeyou Istchee during the period of 2001 to 2020. Overall, the average annual incidence rates of these parasitic infections appeared comparable between Eeyou Istchee and the general population of Canada during this period, even though their temporal trends differed slightly (Figures 35 and 36).

**Figure 35. Average annual incidence rates of reported parasitic enteric infections<sup>a</sup> per 100,000 people by 5-year periods, Eeyou Istchee, 2001-2020**

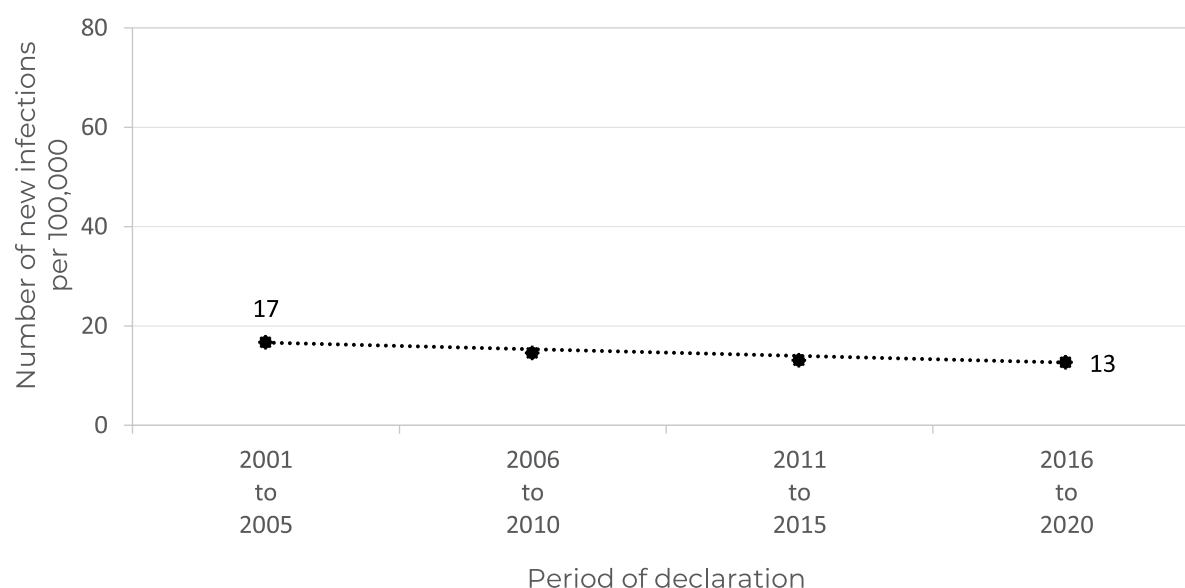


<sup>a</sup> Giardiasis and cryptosporidiosis.

Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

**Figure 36. Average annual incidence rates of reported parasitic enteric infections<sup>a</sup> per 100,000 people by 5-year periods, Canada, 2001-2020**



<sup>a</sup> Giardiasis and cryptosporidiosis.

Note: Incidence rates are presented per 100,000 person-years.

Sources: CNDSS, Public Health Agency of Canada; Statistics Canada, annual population estimates, July 1st 2000 to 2020.

Giardiasis was the most commonly reported declarable parasitic enteric infection in the region.

- From 2011 to 2020, a total of 13 cases of giardiasis were reported to the PH Dept. in Eeyou Istchee, with an average annual crude incidence rate of around 7 cases per 100,000 people (95% CI [4,13]).
- In the general population of Canada, the average annual crude incidence rate of giardiasis was around 10 cases per 100,000 people (95% CI [10,10]) during the same period.

Other reported parasitic enteric infections included amebiasis and cryptosporidiosis:

- Amebiasis\* was not a commonly reported enteric disease in Eeyou Istchee, with 6 cases reported between 2000 and 2013, and no cases reported between 2014 and 2020.
- Cryptosporidiosis was not commonly reported in Eeyou Istchee, with fewer than 5 cases reported before 2013. In 2013, however, there were 12 reported cases of cryptosporidiosis. Fewer than 5 cases were reported between 2014 and 2015, and no cases were reported between 2016 and 2020.

\* For the general population of Canada, amebiasis was added to the notifiable disease list in 1927 and removed after 1999.<sup>49</sup>

## OUTBREAK OF CRYPTOSPORIDIOSIS

In 2013, a total of 12 cases of cryptosporidiosis were reported to the PH Dept. from 5 different communities in Eeyou Istchee.

- Of the 12 reported cases, 5 (42%) occurred within a single community in Eeyou Istchee. These cases were linked to an outbreak in a local daycare, affecting children aged 2 years or younger, as well as staff.
- Of all reported cases, fewer than 5 were children aged 2 years or younger.
- Of all reported cases, fewer than 5 were hospitalized, some of whom were immunocompromised persons. There were no fatalities associated with this outbreak in Eeyou Istchee.
- The increased number of cases in Eeyou Istchee in 2013 was temporally linked to a widespread outbreak of cryptosporidiosis in the neighboring region of Nunavik, attributed to the *Cryptosporidium hominis* species (signifying transmission from humans rather than animals). Based on available information, 51 cases had been reported in Nunavik, with the highest incidence rate observed among children under 5 years old.<sup>50</sup> The outbreak investigation in Nunavik revealed that the source of infection likely originated from outside the region, with subsequent transmission occurring within and between communities through person-to-person contact.<sup>50</sup>

## 4.3. HEPATITIS A

### 4.3.1. EPIDEMIOLOGY

Between 2000 and 2020, no cases of acute hepatitis A infection were reported in Eeyou Istchee.

# 4.4. PREVENTION OF ENTERIC DISEASES

## Hepatitis A vaccination

Hepatitis A is a vaccine-preventable disease. In Quebec, hepatitis A vaccination has been available since 1999 and recommended for population groups at high risk of this infection. School-based vaccination of children in fourth grade, with combined hepatitis B and A vaccine, began in Quebec and Eeyou Istchee in 2008.<sup>10,51</sup> Since 2019, the PIQ has also recommended vaccinating all infants (under 1 year old) against hepatitis A.<sup>10</sup>

During the 2015-16 to 2019-20 school years in Eeyou Istchee, the estimated 5-year average coverage for hepatitis A vaccination (at least 1 dose) among fourth grade students was around 93%, which was higher than the corresponding coverage for all of Quebec (Table 12). As per the objectives of the PNSP, optimal hepatitis A vaccination coverage for children in their fourth year of primary school is at 90% (or greater).<sup>11</sup>

**Table 12.** Hepatitis A vaccine coverage (≥1 dose) among grade 4 primary school students by school year (including estimated 5-year average coverage), Eeyou Istchee, 2015-16 to 2019-20

| School year    | Percentage (%) |
|----------------|----------------|
| 2015-2016      | 93%            |
| 2016-2017      | 94%            |
| 2017-2018      | 95%            |
| 2018-2019      | 94%            |
| 2019-2020      | 91%            |
| 5-year average | 93%            |

Source: MSSS, Registre de vaccination du Québec.

## Semi-annual traditional food safety training\*

Since 2005, the PH Dept. has collaborated with Cree Elders, the Cree Trapper's Association (CTA), pathologists from the Université de Montréal, and the MAPAQ to provide a Cree program on Safe Food Handling with workshops for food handlers, hunters, and providers in Chisasibi. In 2012, the training was extended to Mistissini. In 2017, the Cree program on Safe Food Handling training further expanded to other communities and food service providers (including community feast organizers) in Eeyou Istchee.

The training is offered twice a year in Eeyou Istchee: once for coastal communities and once for inland communities. The 3-day training is based on Cree safe food handling methods that have been in existence and practised since time immemorial. It comprises sessions that focus on best practices for safe handling of wild game, food inspection, food handling and butchering, food transport, and storage. More than 500 Cree people, including hunters and food handlers have participated in this food safety training since its inception, through 2020.

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\* As per email communication with Lilian Kandiliotis, Dietician/Nutritionist (PH Dept., CBHSSJB), on September 20, 2023 (revised October 16, 2023).

# 5 RABIES PREVENTION



## 5.1. RISKY ANIMAL EXPOSURES

As per the MSSS QC's guidelines for Northern regions like Eeyou Istchee, animals at risk of rabies include:

1. Wild animals (*e.g.*, foxes) and community dogs that are unavailable for a 10-day observation period following a significant human exposure; and
2. Wild animals and community dogs that have suspected or confirmed rabies, based on symptoms or post-mortem laboratory results.<sup>52</sup>

According to these guidelines, significant exposures to rabies include:

3. Animal bites;
4. Animal scratches; and
5. Any form of contact between a person's mucous membranes or fresh wounds with an infected animal's saliva, nervous tissue, or cerebrospinal fluid (CSF).<sup>52,53</sup>

## 5.2. EPIDEMIOLOGY

- Since the establishment of the declarable infectious disease (MADO) surveillance system in 1985, no cases of human rabies have been reported in Eeyou Istchee.
- However, based on information from the INSPQ's animal rabies surveillance, rabies has been circulating among wild animals (including and especially among Arctic foxes) in the Northern Quebec regions of Nunavik and Eeyou Istchee.<sup>54–56</sup> Compared to most other regions in Quebec, community dogs in these Northern regions are more likely to encounter infected wild animals and thus are at higher risk of becoming infected with rabies.
- Dogs roam freely and unsupervised in Eeyou Istchee communities. Between 2000 and 2020, human injuries such as bites and scratches, which can carry risk of rabies transmission from potentially infected dogs to humans, were prevalent public health problems in all communities of Eeyou Istchee.
- In 2017, there were 2 community dogs in Whapmagoostui-Kuujuarapik that showed symptoms of and were diagnosed with rabies.<sup>57</sup> The first dog received lab confirmation\* post-mortem. The second dog was a contact of the first dog, developed symptoms, and received a clinical diagnosis by the MAPAQ veterinarian. The 2 rabid dogs did not bite or scratch anyone. Still, as an extra precaution as the dogs had been diagnosed with rabies, and considering the possibility for exposure to have occurred via contact with non-intact skin, the PH Dept. recommended rabies PEP to 6 individuals who had potentially been exposed to the diagnosed dogs' saliva, as per the PIQ.<sup>58,59</sup>

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\* A positive result from rabies fluorescent antibody testing on the dog's brain biopsy sample, at the Canadian Food Inspection Agency (CFIA) lab.

## 5.3. SURVEILLANCE

Due to the relatively high risk of rabies among wild animals and roaming community dogs, the PH Dept. implemented a regional reporting system in 2015 to monitor people's risky exposures to animals. The PH Dept. has requested that all CMCs promptly report any risky exposures to community dogs (and other animals at risk). This reporting system is voluntary and collects basic demographic information about persons affected by risky animal exposures.

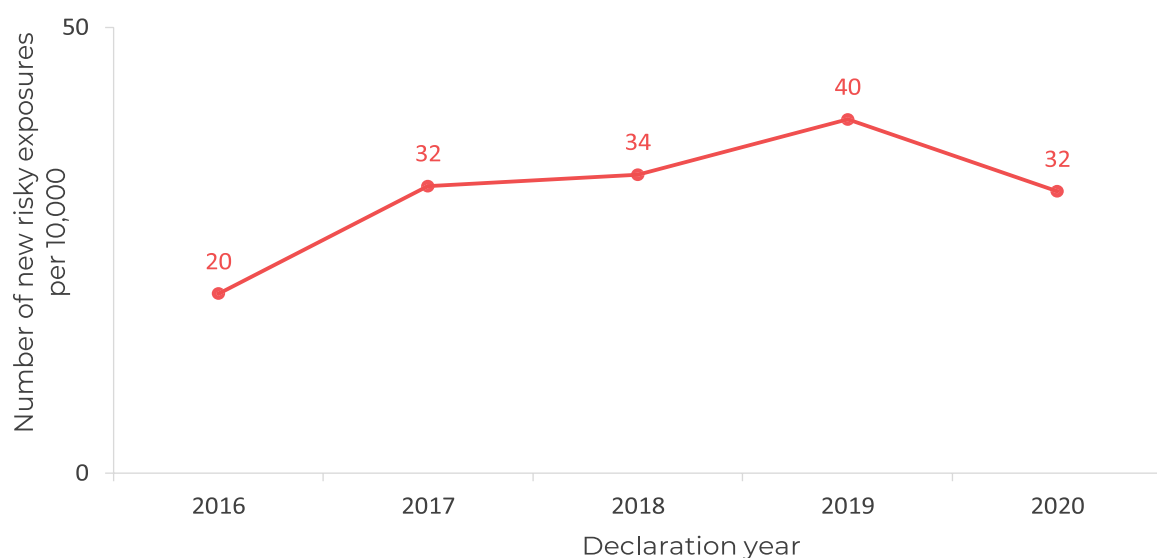
Based on information collected from this reporting system, during the 5-year period of 2016 to 2020:

- In total, there were 302 reports of human risky exposures to animals in Eeyou Istchee.
- Risky exposures to community dogs accounted for the great majority or 98% (n=295) of all risky exposures to animals.
- Among the various types of reported risky exposures to dogs, 86% (n=252) were dog bites, 10% (n=30) were scratches by dogs, and the remaining 4.4% (n=13) were risky exposures of the person's mucous membrane or non-intact skin to the dog's saliva.

Figure 37 shows the trend of reported cases of risky exposures to dog bites and scratches in Eeyou Istchee during the period of 2016 to 2020.

- Children (aged 18 years or younger) were at highest risk of being bitten or scratched by a dog (Figure 38). About 58% of persons affected by dog bites or scratches in Eeyou Istchee were children aged 18 years or younger.

**Figure 37. Crude incidence rates of reported risky exposures<sup>a</sup> to dogs per 10,000 people by year, Eeyou Istchee, 2016-2020**

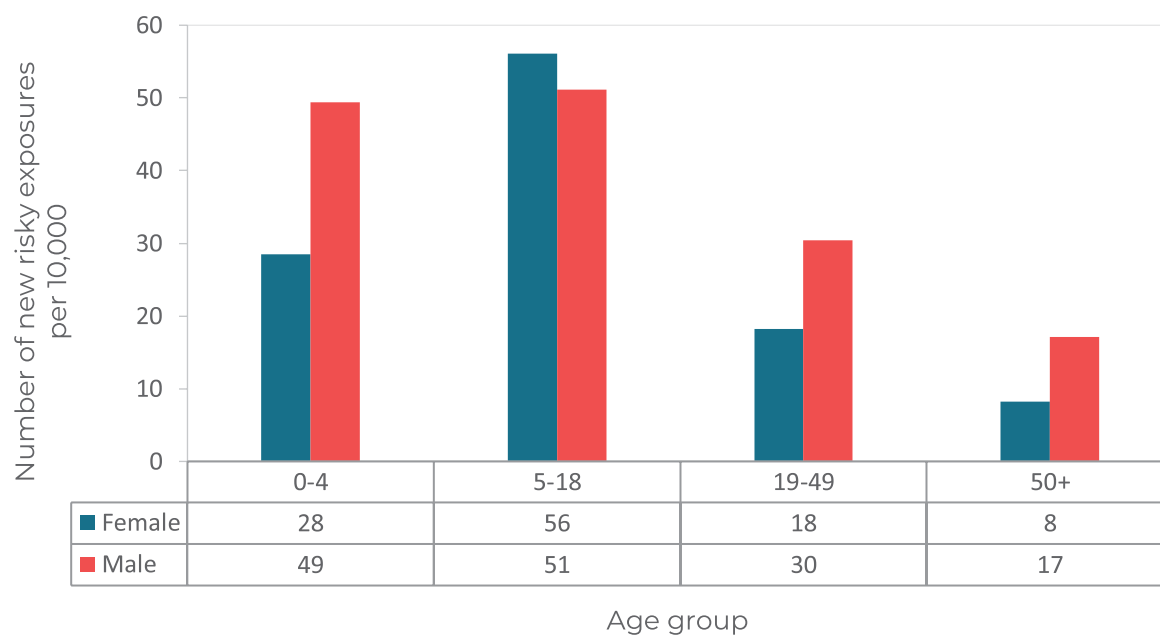


<sup>a</sup> Only dog bites and scratches are counted.

Note: Incidence rates are presented per 100,000 person-years.

Sources: CBHSSJB, Public Health Department, November 2022 extraction; ISQ, estimations et projections de population comparables (1996-2041).

**Figure 38. Average annual incidence rates of reported risky exposures<sup>a</sup> to dogs per 10,000 people, by sex and age group, Eeyou Istchee, 2016-2020**



<sup>a</sup> Only dog bites and scratches are counted.

Note: Incidence rates are presented per 100,000 person-years; One case was excluded due to missing information on sex.

Source: CBHSSJB, Public Health Department, November 2022 extraction; ISQ, estimations et projections de population comparables (1996-2041).

## 5.4. PREVENTION

### 5.4.1. PUBLIC HEALTH INTERVENTIONS

Between 2000 and 2020, veterinary services were unavailable in the communities of Eeyou Istchee. However, since the 1980s, MAPAQ has provided technical assistance to Cree communities through the Programme d'aide technique aux communautés nordiques, which aims to limit rabies transmission in Indigenous communities by protecting community dogs from rabies.<sup>60</sup> Under this program, MAPAQ supports community partners, such as public safety and dog control officers, when a 10-day observation is necessary for dogs that have bitten or scratched humans. During this observation period, MAPAQ offers basic guidance and telephone follow-up to respective dog owners and dog control officers. They also provide remote clinical guidance and logistical support for assessing sick dogs with symptoms that may be indicative of rabies, and facilitate the submission of deceased animals' heads to the Canadian Food Inspection Agency (CFIA) for rabies lab analysis, if needed. The program also includes support for community-based dog vaccination against rabies.

The CBHSSJB's voluntary regional reporting system for risky exposures to dogs (and other animals) promotes early collaboration among community partners (*i.e.*, dog owners, dog control officers, public safety officers, and clinicians) with the PH Dept. and MAPAQ. Local case management may involve:

1. Arranging 10-day observation periods for dogs that have bitten or scratched humans to rule out risk of rabies infection;
2. Providing early rabies PEP to individuals who experience a risky animal exposure, as indicated by the PIQ; and/or
3. Submitting euthanized or deceased animals' heads to the CFIA for rabies lab analysis, as necessary.

## 5.4.2. RABIES VACCINATION FOR COMMUNITY DOGS

MAPAQ's technical assistance program in Eeyou Istchee included local capacity building for rabies vaccination of dogs in Cree communities.\*<sup>60</sup> Under this initiative, MAPAQ veterinarians visited the communities of Eeyou Istchee annually, typically for a few days in the fall, to administer rabies vaccinations to dogs and to train partners in vaccination techniques, which enabled ongoing vaccination efforts throughout the year. Each year, MAPAQ also supplied all 9 Cree communities with free dog rabies vaccines and vaccination equipment.

Since 2017, the Faculty of Veterinary Medicine at the Université de Montréal has collaborated with MAPAQ on this vaccination program, taking over the annual community visits in the 2018-19 calendar year. In 2016 and 2018, veterinarians from MAPAQ or the Université de Montréal visited all 9 communities in Eeyou Istchee. In 2017, all communities except Nemaska and Wemindji were visited, and in 2019, all communities except Wemindji, Chisasibi, and Nemaska were visited. Due to COVID-19 travel restrictions in 2020, veterinarians did not visit Cree communities in person but provided remote support to local dog vaccinators. Due to the absence of a reliable local dog registry, the extent of rabies vaccination coverage among dogs in the communities of Eeyou Istchee is unknown.

## 5.4.3. RABIES PROPHYLAXIS FOR PEOPLE

### Post-exposure prophylaxis

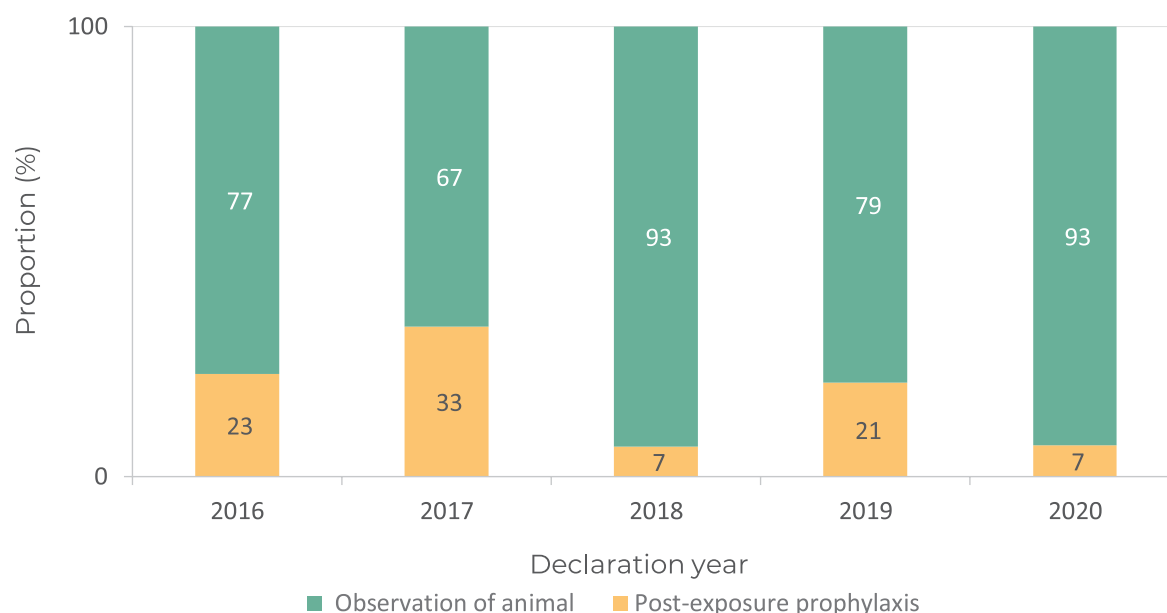
PEP with rabies immunoglobulin and rabies vaccination, as recommended by the PIQ, was advised for all individuals in Eeyou Istchee who had a significant exposure to an animal at risk of rabies.

From 2015 to 2020, CMCs were asked to report all risky exposures to community dogs in Eeyou Istchee to the local dog control officer, the PH Dept., and MAPAQ. If the dog was available for observation, the exposed individual did not receive rabies PEP unless the dog exhibited rabies-like symptoms during the 10-day observation period. According to Figure 39, the proportion of cases for whom rabies PEP was recommended to persons with risky exposures to dogs seemed to have generally decreased from 2016 to 2020. Improved collaboration among dog control officers, CMCs, the PH Dept., and MAPAQ could have contributed to this reduction in the need for rabies PEP.

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\* As per email communication with Dr. Alain Aspirault, Veterinarian (MAPAQ), on July 18, 2023.

**Figure 39. Percentage (%) of reported risky exposures<sup>a</sup> to dogs, by year and public health recommendations,<sup>b</sup> Eeyou Istchee, 2016-2020**



<sup>a</sup> Only dog bites and scratches are counted.

<sup>b</sup> Observation or post-exposure prophylaxis.

Note: Incidence rates are presented per 100,000 person-years.

Source: CBHSSJB, Public Health Department, November 2022 extraction.

## Pre-exposure prophylaxis

In 2017, the PH Dept. worked with the pharmacy team and the Director of Professional Services (DPS) of the CBHSSJB to recommend rabies pre-exposure vaccination for all frontline workers in Eeyou Istchee who handle dogs and other animals at risk of rabies, such as dog control officers and dog vaccinators. The DPS and the regional pharmacy team ensured that these frontline workers had access to rabies pre-exposure vaccination at no cost. However, a significant barrier to pre-exposure vaccination has been the relatively high turnover among community-level frontline workers. As of 2020, the rabies vaccination coverage of frontline workers remains unknown.

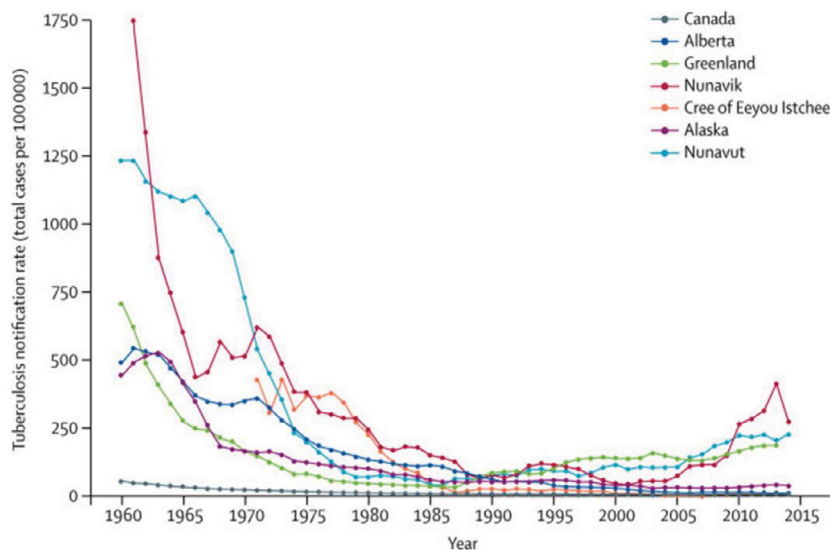
# 6 TUBERCULOSIS (TB)



# 6.1. EPIDEMIOLOGY

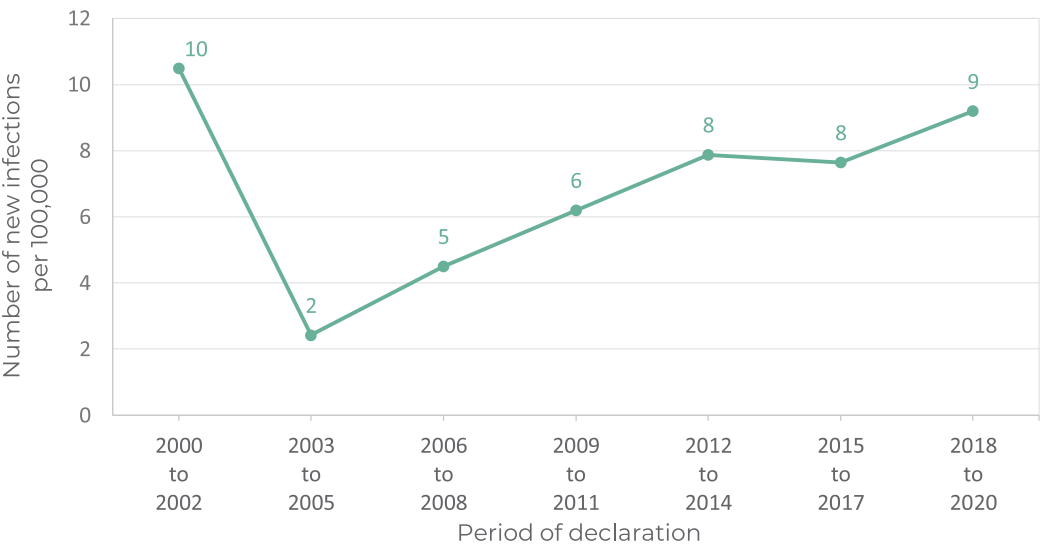
Since 1990, the crude incidence rates of reported TB in Eeyou Istchee have been well under 100 cases per 100,000 people. The burden of TB in Eeyou Istchee over the years has been lower than in many other Indigenous jurisdictions in Canada (Figures 40<sup>61</sup> and 41).

**Figure 40. Crude incidence rates of reported active TB per 100,000 people by year, 6 Indigenous populations and Canada, 1960-2014**



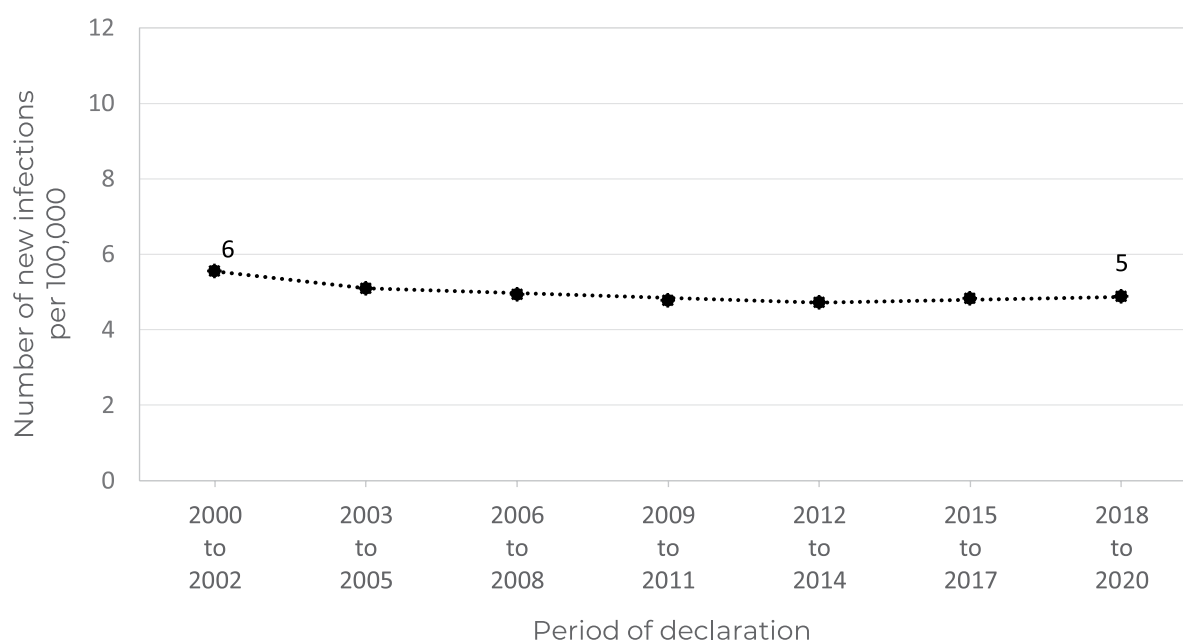
Source: Reproduced from Dehghani et al.<sup>61</sup>

**Figure 41. Average annual crude incidence rates of reported active TB per 100,000 people by 3-year periods, Eeyou Istchee, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.  
Sources: SI-GMI, extracted from the Infocentre;ISQ, estimations et projections de population comparables (1996-2041).

**Figure 42. Average annual crude incidence rates of reported active TB per 100,000 people by 3-year periods, Canada, 2000-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: CNDSS, Public Health Agency of Canada; Statistics Canada, annual population estimates, July 1st 2000 to 2020.

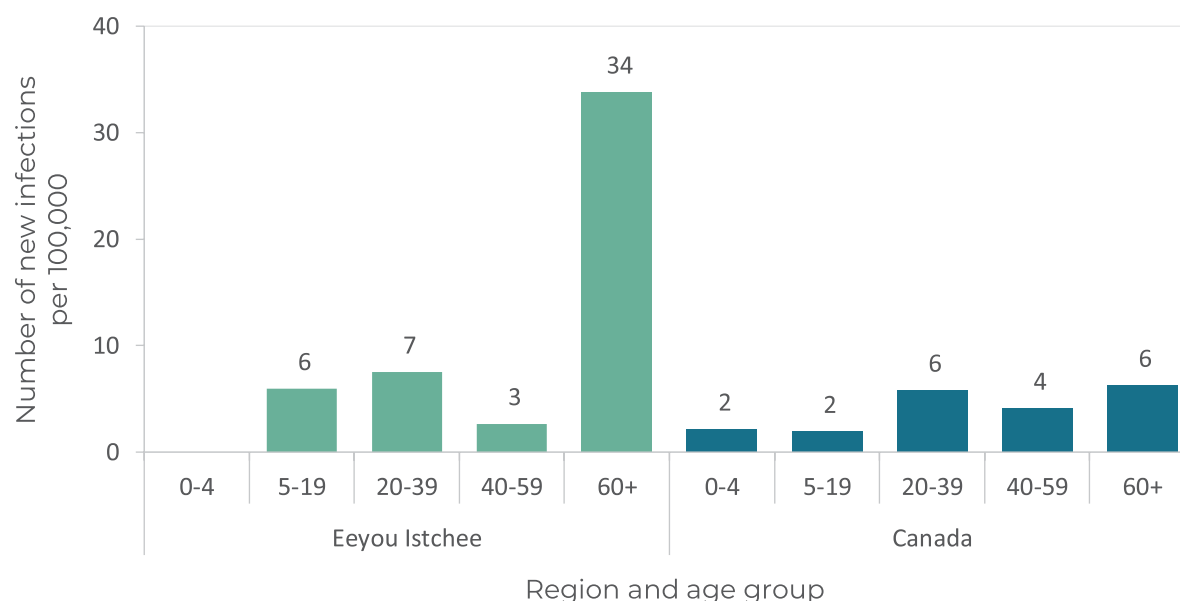
Between 2000 and 2020:

- In total, 23 cases of TB were reported to the PH Dept. during this 21-year period.
  - From 2000 to 2010, the 11-year average annual crude incidence rate of TB was at 6.4 cases per 100,000 people.
  - From 2011 to 2020, the 10-year average annual crude incidence rate of TB was at 7.5 cases per 100,000 people.
- Older age was the most prominent risk factor for TB in Eeyou Istchee. Older adults aged 60 years or more accounted for about 48% (n=11) of all cases of TB.
- During this 21-year period, there were no reported TB cases among children under 5 years in Eeyou Istchee, and fewer than 5 cases among children aged 5 to 18 years.
- There was no significant difference in TB incidence by sex, with women accounting for 52% of cases.

During the more recent 10-year period of 2011 to 2020:

- The average annual incidence rate of TB among older adults aged 60 years or more in Eeyou Istchee was about 5.4 times higher (95% CI [1.8,12.6]) than in the same age group in the rest of Canada.
- The difference in TB incidence rates between Eeyou Istchee and Canada was less pronounced in younger age groups (Figure 43).

**Figure 43. 10-year average annual incidence rates of reported active TB per 100,000 people, by region and age group, Eeyou Istchee and Canada, 2011-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041); CNDSS, Public Health Agency of Canada; Statistics Canada, annual population estimates, July 1st 2000 to 2020.

More detailed epidemiological information from regional public health investigations of individuals with TB and their priority contacts has been available since 2011.

Between 2011 and 2020 in Eeyou Istchee, 13 cases of TB were reported to the PH Dept., with an average annual TB incidence rate of around 7.5 cases per 100,000 people.

- During this period, 12 (92%) of the 13 cases of TB had a positive culture for TB (confirmed status). Only 1 individual, who was a household contact of a person with pulmonary TB, had a “probable” diagnosis of TB uveitis (a clinical diagnosis without microbiologic confirmation).
- All positive TB cultures proved sensitive to all first-line TB drugs. Therefore, there was no evidence of resistant TB.
- 12 individuals tested negative for HIV upon their TB diagnosis. No information was available about the HIV status of 1 person with a post-mortem TB diagnosis.
- 8 individuals (62%) had pulmonary TB, and 5 (38%) had extra-pulmonary TB (2 of these 5 later developed miliary TB with pulmonary involvement). Those with extra-pulmonary TB had spinal TB, TB lymphadenitis, TB uveitis, TB epididymitis, and TB peritonitis.

## 6.2. RISK FACTORS

### Advanced age

Compared to other age groups in Eeyou Istchee, older adults aged 60 years or more had the highest risk of TB, with an average annual incidence rate of 34 cases per 100,000 people (Figure 43).

- For the 13 reported cases of TB, the average age was around 40 years (ranging from 8 to 73 years).
- 9 of the 13 were source cases, and the rest were close contacts who developed secondary TB.
- All 9 source cases were adults, with an average age of around 52 years (ranging from 23 to 73 years).

### History of known exposure to TB

The great majority or 92% (12 out of 13) of all reported cases of TB had a known history of exposure to a relative with TB.

- Overall, all close contacts who developed secondary TB did so within the first year of their exposure to their respective source cases.
- None of the 9 individuals who were identified as TB source cases had a recent (in the 2 years preceding their diagnosis) history of TB exposure. These cases were presumed to be reactivations of TB infections acquired many years earlier.
- 8 of the 9 source cases had a known, distant (more than 5 years) history of exposure to a relative with TB. Of these 8 cases, 5 had a known diagnosis of under-treated latent TB infection (LTBI).

### Chronic medical conditions

- Of the 13 reported cases of TB, 7 (54%) had type II diabetes.
- Other common chronic conditions included alcohol use disorder and chronic renal disease. The majority of those with chronic renal disease had end-stage renal disease requiring hemodialysis.
- Other risk factors, including immunosuppressive therapy, liver cirrhosis, and smoking, were identified in individual cases of TB.

## 6.3. CLINICAL OUTCOMES

- Between 2011 and 2020, 69% (n=9) of TB cases were hospitalized.
- 1 person who had been diagnosed with TB died before they completed their TB treatment, for an estimated 10-year case fatality rate of 7.7%.

## 6.4. PREVENTION

### 6.4.1. CASE MANAGEMENT

Between 2011 and 2020, 12 out of 13 cases of TB (92%) were started on appropriate TB treatment,\* as per the *Canadian Tuberculosis Standards*.<sup>63</sup> The 1 individual who was not started on TB treatment had been diagnosed post-mortem.

- All individuals who were started on TB treatment, whose treatment outcome is known (n=11)<sup>†</sup> completed their treatment without default. None experienced treatment failure or relapse.
- All individuals with pulmonary TB (or extra-pulmonary TB with pulmonary involvement) who completed TB treatment (n=8)<sup>‡</sup> were closely supervised during their treatment through patient-centred and locally feasible strategies, including: regular home visits by CMC staff,<sup>§</sup> regular telephone calls or text messages by clinic staff, pill administration by a trusted household member, or a combination of these.
- All 8 individuals with pulmonary TB had a repeat negative sputum culture at 2 or more months after initiating treatment, and were therefore considered cured.<sup>64</sup>

### 6.4.2. CONTACT TRACING AND MANAGEMENT

Between 2011 and 2020, contact tracing was indicated and done for 9 (69%) of the 13 TB cases who were persons aged 10 years or more with pulmonary TB (or miliary TB with pulmonary involvement).

- In total, 307 priority contacts\*\* were identified for all 9 cases, averaging 34 contacts per case.
- Of the identified priority contacts who lived in Eeyou Istchee, prophylaxis treatment\*\*\* was recommended to 41 individuals with evidence of LTBI. Based on available information, 25 (61%) of these at-risk contacts completed the recommended LTBI treatment.

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\* Treatment Initiation is a standard performance indicator for evaluating TB programs, as per the U.S. Centers for Disease Control and Prevention (CDC).<sup>62</sup>

† Of the 12 individuals who started TB treatment, the treatment outcome for 1 individual is unknown because they moved away during their course of treatment. This individual had a negative sputum culture for TB at 2 months.

‡ Of the 10 individuals with a history of pulmonary TB (or extra-pulmonary TB with pulmonary involvement), 1 did not complete treatment because they had been diagnosed with TB post-mortem, and 1 moved away during the course of treatment so their treatment outcome is unknown.

§ Home visits were primarily conducted during the initial 2 months of TB treatment.

\*\* Priority contacts were identified as per the guidelines of the *Canadian Tuberculosis Standards* (7th edition).<sup>65</sup>

\*\*\*For more information about LTBI treatment, see [Appendix B: Clinical Treatment Details](#).

## 6.5. HISTORICAL PUBLIC HEALTH INTERVENTIONS

### 6.5.1. ACTIVE CASE FINDING WITH CHEST X-RAY (CIRCA 1946 TO 1977; 1981 TO CIRCA 1986)

Community-based, active TB case finding using chest X-ray screening was initiated in coastal communities by the Government of Canada around 1946 and continued until around 1977.<sup>66</sup> Following the establishment of the Community Health Department of the CBHSSJB, a more systematic, active TB case finding program was introduced in 1981 in all coastal and inland communities (of which there were 8 at the time\*) in Eeyou Istchee. The program targeted:

1. All individuals aged 35 years or more; and
2. All individuals with a positive tuberculin skin test (TST).

From this population-based chest X-ray screening that targeted people aged 35 years or more in the 8 communities:

1. 4748 individuals were targeted in 1981, for a coverage rate of approximately 67%;
2. 3989 individuals were targeted in 1982, for a coverage rate of approximately 58%; and
3. 3330 individuals were targeted in 1983, for a coverage rate of approximately 82%.<sup>67</sup>

Although some information suggests that population-based chest X-ray screening continued for a few years after 1983 (likely until around 1986), details about the program and its coverage in the years following 1983 are not available.<sup>66,67</sup>

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\* The ninth community of Ouje-Bougoumou was founded in the 1990s.

## 6.5.2. POPULATION-BASED LTBI SCREENING AND TREATMENT (1981 TO CIRCA 1986)

Population-based screening and treatment of people with LTBI was initiated in all 8 coastal and inland communities in Eeyou Istchee in 1981, by the newly formed Community Health Department of the CBHSSJB.<sup>67</sup> The program targeted:

1. All individuals under 35 years old;
2. All individuals with an abnormal chest X-ray, suggestive of LTBI; and
3. Priority contacts of TB cases.

From this population-based LTBI screening program that targeted people under 35 years old in the 8 communities:

1. 5753 individuals were targeted in 1981, for a coverage rate of approximately 39%;
2. 5753 individuals were targeted in 1982, for a coverage rate of approximately 63%; and
3. 5933 individuals were targeted in 1983, for a coverage rate of approximately 43%.<sup>67</sup>

Individuals with evidence of LTBI were offered treatment with daily isoniazid (INH) for 9 to 12 months. Individuals taking LTBI treatment were mainly followed by Cree community health workers.<sup>67,68</sup> Based on available information, an estimated 9 to 11% of the population of Eeyou Istchee completed 9 months of INH therapy during this period.<sup>69</sup>

The program continued until around 1986 with a limited scope, however, details about the program and its coverage in the years following 1983 are not available.<sup>66,67</sup>

### 6.5.3. SENTINEL AND TARGETED SCREENING FOR LTBI (SINCE 1987)

After 1987, the systematic LTBI screening strategy in Eeyou Istchee shifted its focus to sentinel screening for TB infection, initially among preschool children (1-year-old to kindergarten aged) and children in their first year of secondary school. Beginning in 1990, the target population became children in sixth grade only. Eventually, due to consistently low incidence of TB in the region, absence of community-based transmission, low prevalence of positive TSTs in children, and following consultations with TB experts at the McGill University Health Centre (MUHC), this population-based screening program for school-aged children was discontinued in 2014.

Since 2015, LTBI screening and treatment has been recommended for the following at-risk groups:

1. Individuals with recent TB exposure, including:
  - a. Recent TB contacts; and
  - b. Persons with a history of incarceration.
2. Individuals at risk of TB reactivation, including:
  - a. Persons with end-stage renal disease;
  - b. Persons living with HIV;
  - c. Persons awaiting solid-organ transplantation;
  - d. Persons on immunosuppressive therapy (in particular, on tumor necrosis factor alpha inhibitors); and
  - e. Persons with immunosuppressive conditions.

Moreover, in Quebec, certain drug and alcohol rehabilitation programs require clients to undergo LTBI screening tests. As a result, numerous individuals in the region have been screened under these circumstances over the years.

Apart from LTBI screening during the management of contacts of new TB cases, which was coordinated by the PH Dept., other LTBI screening initiatives conducted by local clinicians were typically opportunistic. Information on the coverage of the target population is not available.

## 6.5.4. BCG VACCINATION (CIRCA 1946 TO 2004)

Vaccination of infants with Bacille Calmette-Guérin (BCG) is known to protect against miliary (disseminated) or meningeal TB in jurisdictions with high incidence of TB.<sup>70</sup> In Eeyou Istchee, BCG vaccination of infants was initiated by transient medical teams in 1946, although details about the program's scale and coverage are not available.<sup>71,72</sup> A more systematic program for BCG vaccination of infants in all 8 communities was instituted by the Community Health Department of CBJSSJB in 1980. This program achieved an average annual coverage rate of around 92% during its early years, from 1980 to 1983.<sup>67</sup>

In 2004, the National Advisory Committee on Immunization (NACI) recommended against routine BCG vaccination of First Nations/Inuit infants in Canada. This recommendation followed reports to the PHAC of fatal cases of disseminated BCG infection among First Nations/Inuit infants, which were linked to BCG vaccination.<sup>70,73</sup> The NACI recommended that BCG vaccination should be administered to newborns in First Nations and Inuit communities, or other communities where:

1. The average annual rate of smear-positive pulmonary TB is greater than 15 cases per 100,000 population, or the average annual rate of culture-positive pulmonary TB is greater than 30 cases per 100,000 population during the previous 3 years; or
2. The annual risk of TB infection is higher than 0.1%; or
3. Early identification and treatment of LTBI is not available.<sup>74</sup>

Based on available information, there have been no reported cases of disseminated BCG infection in Eeyou Istchee.<sup>73</sup> As TB incidence fell below thresholds specified by the NACI, systematic BCG vaccination of infants in Eeyou Istchee was discontinued in 2004.

Of note, no cases of TB, including miliary (disseminated) or meningeal TB, were reported between 2000 and 2020 in infants and children under 5 years old in Eeyou Istchee.

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# APPENDICES



# APPENDIX A

## METHODOLOGICAL NOTES

### TARGET POPULATION

Unless otherwise specified, the statistics in this report refer to all individuals residing in Eeyou Istchee. Eeyou Istchee corresponds to Health Region 18 of the Quebec health and social services network and includes 9 Cree communities.

Coastal communities include: Waskaganish, Eastmain, Wemindji, Chisasibi and Whapmagoostui.

Inland communities include: Oujé-Bougoumou, Mistissini, Waswanipi and Nemaska.

### CASE DEFINITIONS, DETECTION, AND REPORTING

The validation and classification of cases were conducted according to the MSSS QC's nosological definitions\* in effect for the periods covered.

The data presented in the report pertain to cases that have been detected and reported. Cases must have been linked to healthcare services to be detected and reported. Since some infections are frequently asymptomatic, many cases remain undetected and therefore unreported. Consequently, the analysis of reported cases does not capture all infections contracted by the population. For this report, all analyzes are based on new declarations received rather than new infections acquired.

### DATA EXTRACTION

The data for this report was obtained from the following sources: Fichier commun dépersonnalisé du registre central des maladies à déclaration obligatoire (Fichier MADO), Système d'information et de gestion des maladies infectieuses (SI-GMI), the Canadian Notifiable Disease Surveillance System (CNDSS), the International Circumpolar Surveillance (ICS), the Quebec Vaccination Registry, Maintenance et exploitation des données pour l'étude de la clientèle hospitalière (MED-ECHO), public health investigations, Care4, Omnitech Labs, the regional voluntary reporting system for risky exposure to animals, and publicly available surveillance data from relevant health authorities and scientific articles.

### Fichier MADO and SI-GMI†

The report used data from the Fichier MADO covering the period from January 1, 2000 to December 31, 2013. SI-GMI data was used for the period from January 1, 2014 to December 31, 2020. Both sources of information were used to produce statistics on notifiable diseases.

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\* For more information about the case definitions used, see the MSSS QC's guide, *Surveillance des maladies à déclaration obligatoire au Québec - Définitions nosologiques - Maladies d'origine infectieuse - 12e édition - Mise à jour juillet 2019*.

† For a detailed description of this database, see the MSSS QC's page, *Maladies à déclaration obligatoire (MADO) et signalements en santé publique*.

## CNDSS\*

For this report, CNDSS data from 2000 to 2020 were extracted to produce statistics on notifiable diseases, and to compare Eeyou Istchee with the general population of Canada. This comparison was particularly important when data for the general population of Quebec was unavailable for the period under review.

## ICS†

Data extracted from the ICS was used to produce statistics on invasive bacterial diseases, and to compare Eeyou Istchee with Canadian ICS regions for the period from 2000 to 2020.

## Quebec Vaccination Registry‡

Data on vaccination coverage was extracted from 2016 to 2020 to calculate vaccination coverage for certain vaccine-preventable notifiable diseases. To assess early childhood vaccination coverage for children under 5, we used data for children at 2 years of age. For children aged 5 to 18, we used school-based vaccination coverage data for children in primary grade 4.

## MED-ECHO§

Hospitalization data was extracted for the 2000-01 to 2019-20 financial years (April 1 to March 31) to produce statistics on sexually transmitted and blood borne infections (STBBI) related complications. MED-ECHO data is available only by financial years.

## Regional voluntary reporting system for risky animal exposures\*\*

Data from 2016 to 2020 was extracted from the regional voluntary reporting system to produce statistics on risky exposures to dogs.

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\* For a detailed description of this database, see the PHAC's page, [Notifiable Diseases Online](#).

† For more information about this database, see section 2.1. [Surveillance](#).

‡ For a detailed description of this database, see the MSSS QC's page, [Registre de vaccination du Québec](#).

§ For a detailed description of this database, see the MSSS QC's page, [Sources de données et métadonnées](#).

\*\* For more information about this database, see sections [5.3. Surveillance](#) and [5.4. Prevention](#).

## ANALYSES OF DATA

The descriptive analysis of surveillance data uses the following frequency or comparative measures: number of cases, proportion, incidence rate, incidence ratio, and standardized incidence ratio. When pertinent, analyses were conducted by sex, age group, and geographical jurisdiction. For a few notifiable diseases, analyses were conducted using other stratification variables, such as serotype, M protein gene (emm type), chronic medical conditions, and clinical manifestations and severity. For tuberculosis, the average number of priority contacts per each case of respiratory TB was estimated.

When possible and appropriate, certain indicators have been calculated by aggregating the data into periods covering several years, in order to reduce the random variations caused by small numbers. The indirect standardization method and the calculation of age-specific incidence rates were used to correct for age structure differences when comparing incidence rates across different populations.

### Incidence rate

This refers to the number of new cases reported of a disease occurring in a specified time period, divided by the population at risk for developing the disease (*i.e.*, the population that does not have the disease).

- **Numerator:** The numerator refers to the number of cases reported and entered in the various data sources mentioned above, during the reference period.
- **Denominator:** The population figures used to calculate incidence rates for the Quebec health regions were taken from the Institut de la statistique du Québec (ISQ). The ISQ maintains a continuous record of comparable population data consisting of the population estimates series (1996-2021) and the population projections series (2022-2041), last updated in April 2021. For the general population of Canada and the Canadian ICS regions, population figures from Statistics Canada were used. All incidence rates were calculated per 100,000 person-years, except for risky exposures to dogs and ectopic pregnancies, which were calculated per 10,000 person-years and per 1,000 pregnancies, respectively.
- **Confidence intervals:** 95% confidence intervals were calculated following the methodology outlined by the Institut national de santé publique du Québec (INSPQ).

### Rate ratio

In this report, rate ratios (RR) and 95% confidence intervals were calculated using a Poisson model to compare the incidence rates in Eeyou Istchee to those in the rest of Quebec, the rest of Canada or the rest of Canadian ICS regions. Rates for the “rest of” these regions were estimated using data from their general populations, but with data from Eeyou Istchee excluded.

### Age-adjusted incidence rate and standardized incidence ratio

When appropriate, the indirect standardization method was used to standardize incidence rates. This method was preferred because of the instability of the incidence rates caused by the small numbers of cases, and because of the need to compare Eeyou Istchee with the rest of Quebec and rest of Canada, which have different age structures. Age-adjustments were performed by using Eeyou Istchee’s age-specific incidence rates and applying them to Quebec’s age structure. Additionally, to facilitate comparisons, the reciprocal of the standardized incidence ratio (SIR) was calculated following the indirect age adjustment.

# APPENDIX B

## CLINICAL TREATMENT DETAILS

### CHLAMYDIA

Based on available information, between 2013 and 2020 in Eeyou Istchee, the majority of chlamydia cases and their eligible contacts were treated with a single dose of azithromycin (1g), as per INESSS recommendations from 2012 and 2017.<sup>75</sup> Although the INESSS began recommending a 7-day course of doxycycline (100mg twice a day) as the first-line treatment for genital/rectal/oral chlamydia in 2020, most clinicians in the region still opted for single-dose azithromycin treatment in most patients for practical reasons.<sup>3</sup>

### GONORRHEA

Based on available information, most clinicians in Eeyou Istchee treated cases of gonorrhea and their eligible contacts with single doses of oral cefixime (800mg) and oral azithromycin (1g recommended in 2012 and 2017, vs. 2g in 2020), as per INESSS guidelines for treating genital or rectal gonorrhea. In 2017, the INESSS recommended a single intramuscular injection dose of ceftriaxone (250mg) as the first-line treatment when there was evidence of oral exposure. In 2020, a single intramuscular injection dose of ceftriaxone (250mg) became the recommended first-line treatment for all genital/rectal/oral cases of gonorrhea and their contacts.<sup>3</sup>

### SYPHILIS

Since at least 2013, all cases of syphilis in Eeyou Istchee have been treated with at least 1 dose of Bicillin L-A 2.4 million units IM ASAP, with additional doses in pregnant women (at least 2 doses) and in persons with late latent syphilis or syphilis of unknown stage (3 doses). All at-risk sexual contacts of syphilis cases, pending their lab results, were offered at least 1 dose of Bicillin L-A 2.4 million units IM ASAP (an “epidemiological dose”), as per INESSS guidelines from 2016.<sup>76</sup>

### INVASIVE GROUP A STREPTOCOCCUS (iGAS)

A 10-day course of daily antibiotic therapy with first-generation cephalosporins (mainly cephalexin or cefadroxil) was recommended for at-risk contacts of iGAS cases, in accordance with the MSSS QC’s 2007 guidelines (updated in 2012).<sup>\*,26</sup>

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\* For more information about recommended antibiotics and dosing for iGAS, see page 71 of the MSSS QC’s *Guide d’intervention - Les infections invasives à streptocoque du groupe A (mise à jour 2007)*.

## INVASIVE HAEMOPHILUS INFLUENZAE (iHi)

Extrapolating from available evidence on preventing invasive Hib disease, since 2018, the American Academy of Pediatrics (AAP) has recommended daily rifampin for 4 days as the first-line treatment for at-risk close contacts of invasive Hia cases.<sup>77</sup> As per AAP and MSSS QC guidelines, the most commonly recommended antibiotic PEP therapies in Eeyou Istchee were either: daily rifampin for 4 days, or a single dose of intramuscular injectable ceftriaxone.<sup>\*,33</sup> The preferred course of treatment depended on various factors, such as a history of allergies and feasibility considerations.

## INVASIVE MENINGOCOCCAL DISEASE (IMD)

Daily oral rifampin (twice a day) for 2 days was generally recommended for children under 18 years old, whereas a single dose of oral ciprofloxacin was generally recommended for adults aged 18 years or more, in accordance with MSSS QC guidelines.<sup>†,78</sup>

## PERTUSSIS

Based on available information from 2013 to 2020 in Eeyou Istchee, most cases of pertussis and their at-risk contacts were treated with daily oral azithromycin for 5 days, in accordance with MSSS QC guidelines.<sup>‡,48</sup>

## LATENT TUBERCULOSIS INFECTION (LTBI)

Until 2015, the primary recommended regimen for LTBI treatment in Eeyou Istchee was 9 months of daily isoniazid (INH). In 2015, the primary recommended regimen for LTBI treatment by the PH Dept. was changed to 4 months (120 doses) of daily rifampin (4R) in children and adults, based on available studies and the guidelines of the *Canadian Tuberculosis Standards*.<sup>79–82</sup>

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\* For more information about recommended antibiotics and dosing for iHi, see pages 8-9 of the MSSS QC's *Fiche technique pour la gestion des cas et des contacts - Infections invasives causées par la bactérie *Haemophilus influenzae* de type B (Hib) - Mise à jour décembre 2016*.

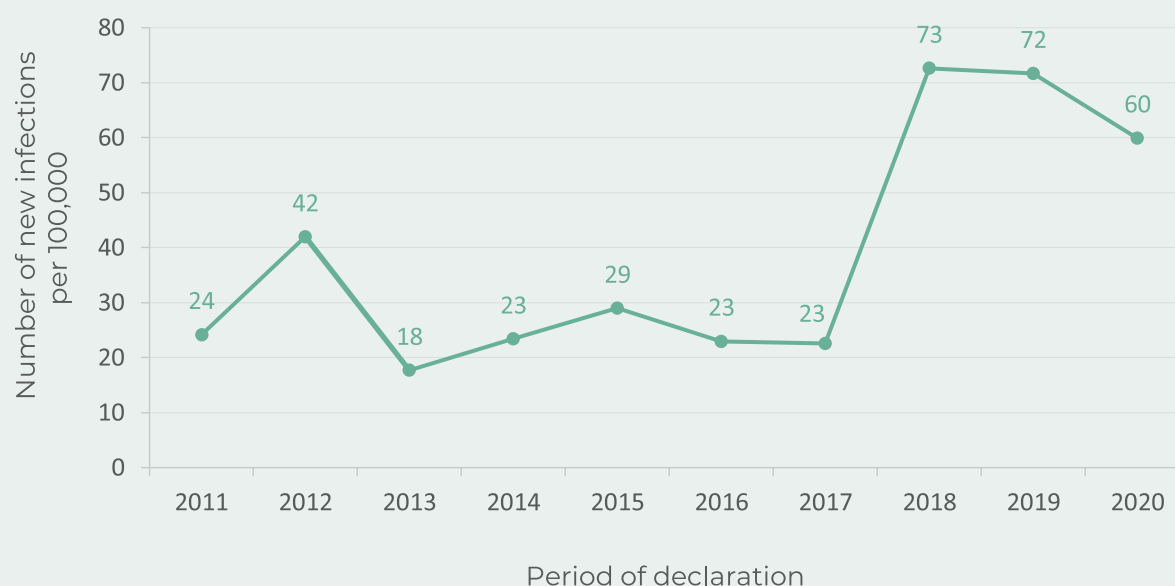
† For more information about recommended antibiotic PEP and vaccination for at-risk contacts of IMD cases, see pages 8-10 of the MSSS QC's *Guide d'intervention - Les infections invasives à méningocoque*.

‡ For more information about recommended antibiotic treatment and PEP for pertussis cases and their at-risk asymptomatic contacts, including first- and second-line antibiotic choices and dosing, see page 31 of the MSSS QC's *Guide d'intervention - La coqueluche - mise à jour octobre 2019*. For more information about the MSSS QC's recommended indications for PEP for close contacts of pertussis cases, see pages 11-12, 35, and 39 of the *Guide d'intervention - La coqueluche - mise à jour octobre 2019*.

## APPENDIX C

### ADDITIONAL FIGURES

**Figure 44. Crude incidence rates of reported iGAS infections per 100,000 people by year, Eeyou Istchee, 2011-2020**



Note: Incidence rates are presented per 100,000 person-years.

Sources: SI-GMI, extracted from the Infocentre; ISQ, estimations et projections de population comparables (1996-2041).

Statistics Canada, annual population estimates, July 1st 2000 to 2020.



