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ENHANCED EPIDEMIOLOGICAL SUMMARY

Invasive Meningococcal Disease in Ontario: 2024

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Introduction

This report describes the epidemiology of invasive meningococcal disease (IMD) in Ontario in 2024, including case characteristics and case counts/incidence rates by serogroup, age and geography. Trends over time for the years 2000 to 2024 are also included.

Ontario has two publicly funded routine immunization programs for IMD[1]:

1. Monovalent meningococcal conjugate C vaccine (Men-C-C) program for children (typically administered at 1 year of age; implemented in 2005)
2. Quadrivalent meningococcal conjugate vaccine (Men-C-ACYW) program for adolescents (typically administered in grade 7; implemented in 2009)

Meningococcal vaccines are also publicly funded for certain high risk groups including[1]:

- Men-C-ACYW vaccines for high risk groups aged 9 months and older
- Meningococcal B (4CMenB) vaccines for high risk groups 2 months to 17 years of age

Meningococcal vaccines may additionally be publicly funded for post-exposure prophylaxis and as part of an outbreak response, if indicated.

This report includes the most current information available from Ontario's integrated Public Health Information System (iPHIS) as of **July 11, 2025**.

Highlights

Overview

- In 2024, there were 39 confirmed cases of IMD reported in Ontario (39 confirmed, 0 probable) (Table 1).
  - The majority of cases (84.6%) were among adolescents and adults aged 15 years and older: 15.4% of cases were 15–19 years of age, 5.1% were 20–24 years of age, 20.5% were 25–49 years of age, 10.3% were 50–64 years of age, and 33.3% were 65 years of age and older (Table 1).
  - Males accounted for 53.8% of all cases in 2024 (Table 1).
- Sixteen cases (41.0%) in 2024 were serogroup W, eight (20.5%) were serogroup B, eight (20.5%) were serogroup Y, six (15.4%) were serogroup C, and one (2.6%) was serogroup E (Table 1, Figure 1).

- Twenty-four cases (61.5%) in 2024 had known immunization status. Of these, 19 (79.2%) were unimmunized prior to disease onset, four (16.7%) were immunized with a meningococcal vaccine that provided protection against serogroup(s) other than that responsible for their infection, and one (4.2%) was immunized with a meningococcal vaccine that provided protection against the serogroup responsible for their infection (Table 1).
- All but one case (97.4%) were reported as hospitalized in 2024 (Table 1).
- A total of six (15.4%) fatal outcomes were reported in 2024 (three serogroup C and three serogroup W) among four adults aged 20 years and older, one adolescent aged 15–19 years, and one child aged 1–4 years (Table 1).

Trends Over Time

- Overall during the surveillance period of 2000–2024, case counts and rates of IMD decreased in Ontario (Figure 2).
  - This trend was most notable during the first two years of the COVID-19 pandemic (2020 and 2021) with Ontario having its lowest recorded case counts/rates in the past 24 years: IMD case reporting declined with an approximate one-third reduction in 2020 and two-thirds reduction in 2021, as compared to pre-pandemic five-year average (2015–2019) case counts/rates (Figure 2).
  - However, since 2022, IMD case reporting has shown an increasing trend, and in 2024 the case count/rate was similar to the pre-pandemic five-year average (2015–2019) case counts/rates (Figure 2).
- When examining monthly trends, there were several months in 2024 (February to May, November and December) where IMD case counts exceeded the pre-pandemic five-year average, and two months (May and December) where the IMD case count exceeded the pre-pandemic five-year average plus two standard deviations (Figure 3).
- Trends by serogroup show an overall decrease in the incidence rates of IMD serogroups B, C and Y since 2000, while the last case of serogroup A in Ontario was reported in 2013 (Figure 4, Table 2).
  - The decline in serogroups C and Y likely relates to the implementation of the Men-C-C and Men-C-ACYW vaccination programs in 2005 and 2009, respectively.[2]
  - Prior to the pandemic there was an observed trend towards increasing incidence of serogroup W in Ontario (Figure 4, Table 2), particularly in older adults and consistent with trends observed across Canada linked to the emergence of a hypervirulent strain.[3] Post-pandemic, incidence of serogroup W in adults has increased again.

Age

- In 2024, IMD incidence rates were highest among the under 1 (0.71 per 100,000 individuals), 1–4 (0.70 per 100,000 individuals), and 15–19 (0.66 per 100,000 individuals) year age groups (Table 3).
  - For the under 1 year age group the incidence rate of serogroup Y was highest (0.71 per 100,000 individuals), while for the 1–4 year age group the incidence rate of serogroup B was highest (0.35 per 100,000 individuals) (Table 3).
  - Incidents rates of IMD among adolescents and young adults 15–24 years have also been of recent interest due an increasing number of cases in this age group over the last 10 years. For adolescents in 2024, the incident rates of serogroup B and serogroup Y were highest (0.22 per 100,000 individuals for both serogroups) (Table 3). For young adults in 2024, the incident rate of serogroup B was highest (0.17 per 100,000 individuals).

Geography

- In 2024, IMD cases were reported from 17 public health units (PHUs), with the greatest number from Toronto Public Health (n=17) (Table 4). The highest incidence rates were from Eastern Ontario Health Unit (0.86 per 100,000 individuals) and Northeastern Public Health (0.81 per 100,000 individuals), however, the overall number of cases in these PHUs was small (n=2 and n=1, respectively).
- Ten of the 17 cases reported from Toronto Public Health were serogroup W (Table 4). Additional laboratory typing demonstrated that seven of the ten case isolates were caused by the same strain (serotype 2a, subtype P1.2,5, ST-11, ET-37 not ET-15), and through whole genome sequencing, they were determined to be closely genetically related to a Hajj strain sublineage isolated from cases in the UK, USA and France, and associated with travel to the Kingdom of Saudi Arabia (KSA).[4]
    - The cluster of seven cases occurred in April and May, including one child and six adults. None of the cases reported a history of travel. An epidemiological link was identified between two of the cases.
- The case isolate of one serogroup B case from South East Health Unit that occurred in February 2024 (Table 4) was determined to be genetically related to the case isolate of another serogroup B case from South East Health Unit that occurred in December 2023. However, no epidemiological link was identified between the cases.

Overview

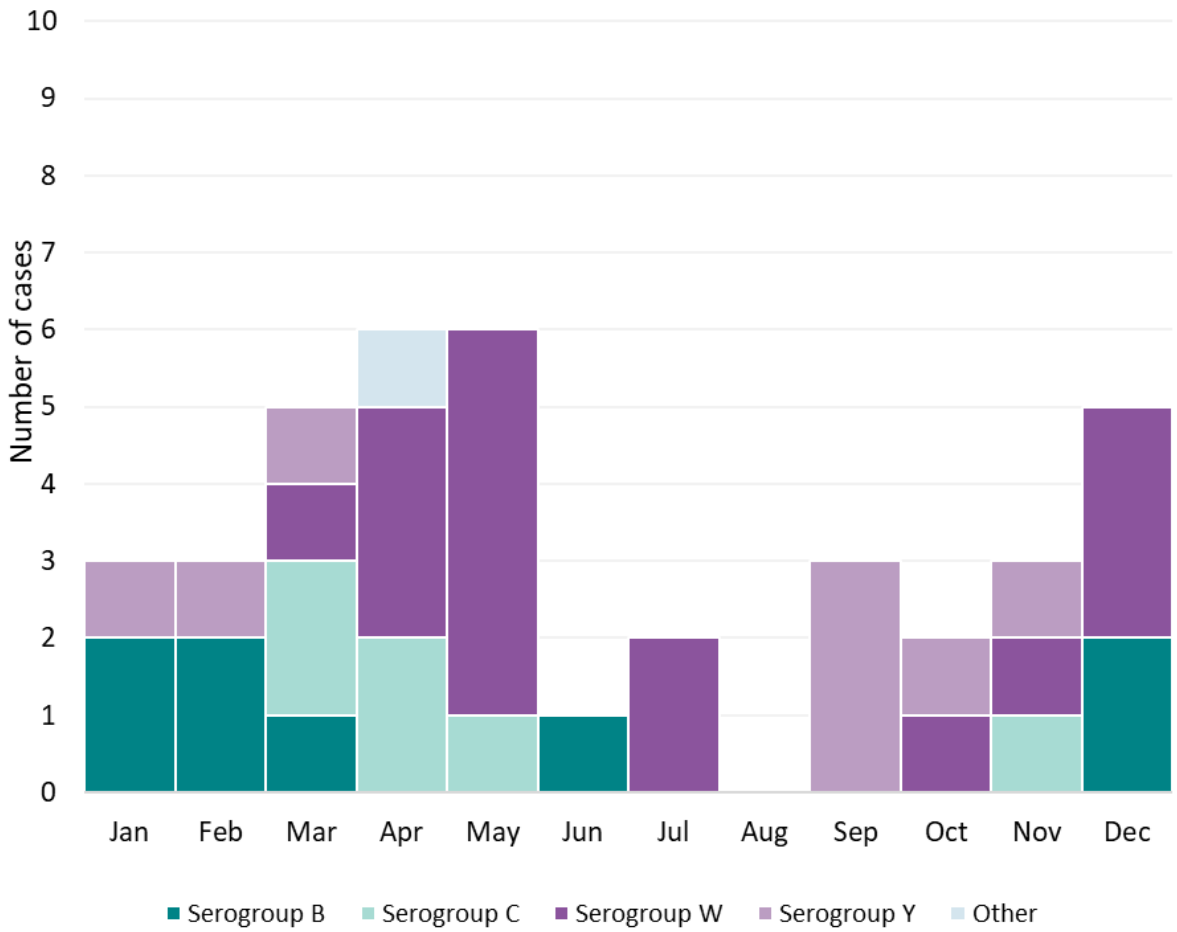
Table 1: Characteristics of IMD Cases by Year

Case Characteristics	2024	2023	2022	2021	2020	Pre-pandemic 5-year period (2015–2019)
Classification (N, %)						
Confirmed	39 (100.0)	30 (100.0)	26 (100.0)	10 (100.0)	21 (95.5)	160 (98.8)
Probable	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.6)	2 (1.2)
Gender (N, %)						
Female	18 (46.2)	13 (43.3)	12 (46.2)	6 (60.0)	6 (27.3)	80 (49.4)
Male	21 (53.8)	17 (56.7)	14 (53.9)	4 (40.0)	16 (72.7)	82 (50.6)
Age (years) (N, %)						
<1	1 (2.6)	0 (0.0)	1 (3.9)	1 (10.0)	1 (4.6)	17 (10.5)
1–4	4 (10.3)	2 (6.7)	0 (0.0)	0 (0.0)	2 (9.1)	6 (3.7)
5–9	1 (2.6)	1 (3.3)	1 (3.9)	0 (0.0)	0 (0.0)	3 (1.9)
10–14	0 (0.0)	1 (3.3)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.2)
15–19	6 (15.4)	4 (13.3)	3 (11.5)	2 (20.0)	2 (9.1)	13 (8.0)
20–24	2 (5.1)	5 (16.7)	1 (3.9)	1 (10.0)	5 (22.7)	15 (9.3)
25–49	8 (20.5)	6 (20.0)	11 (42.3)	4 (40.0)	3 (13.6)	31 (19.1)
50–64	4 (10.3)	4 (13.3)	7 (26.9)	1 (10.0)	8 (36.4)	38 (23.5)
65+	13 (33.3)	7 (23.3)	2 (7.7)	1 (10.0)	1 (4.6)	36 (22.2)
Missing	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.6)

Case Characteristics	2024	2023	2022	2021	2020	Pre-pandemic 5-year period (2015–2019)
Serogroup (N, %)						
A	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
B	8 (20.5)	11 (36.7)	10 (38.5)	5 (50.0)	10 (45.5)	57 (35.2)
C	6 (15.4)	6 (20.0)	7 (26.9)	0 (0.0)	1 (4.5)	12 (7.4)
W	16 (41.0)	7 (23.3)	8 (30.8)	5 (50.0)	3 (13.6)	33 (20.4)
Y	8 (20.5)	3 (10.0)	1 (3.8)	0 (0.0)	6 (27.3)	52 (32.1)
Non-groupable/typeable	0 (0.0)	2 (6.7)	0 (0.0)	0 (0.0)	1 (4.5)	1 (0.6)
Other	1 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.9)
Missing	0 (0.0)	1 (3.3)	0 (0.0)	0 (0.0)	1 (4.5)	4 (2.5)
Immunization status (N, %)						
Immunized against serogroup responsible for infection*	1 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	6 (3.7)
Immunized against different serogroup(s)	4 (10.3)	7 (23.3)	5 (19.2)	0 (0.0)	4 (18.2)	8 (4.9)
Unimmunized	19 (48.7)	8 (26.7)	7 (26.9)	6 (60.0)	6 (27.3)	82 (50.6)
Unknown	15 (38.5)	15 (50.0)	14 (53.9)	4 (40.0)	12 (54.6)	66 (40.7)
Hospitalizations (N, %)	38 (97.4)	28 (93.3)	24 (92.3)	9 (90.0)	21 (95.5)	150 (92.6)
Deaths (N, %)	6 (15.4)	3 (10.0)	3 (11.5)	1 (10.0)	2 (9.1)	18 (11.1)
Total (N, %)	**39 (100.0)**	**30 (100.0)**	**26 (100.0)**	**10 (100.0)**	**22 (100.0)**	**162 (100.0)**

*For example, individuals immunized against serogroup responsible for infection would include individuals that received a Men-C-ACYW vaccine, but had an onset of IMD caused by serogroup A, C, Y or W at least 14 days after immunization

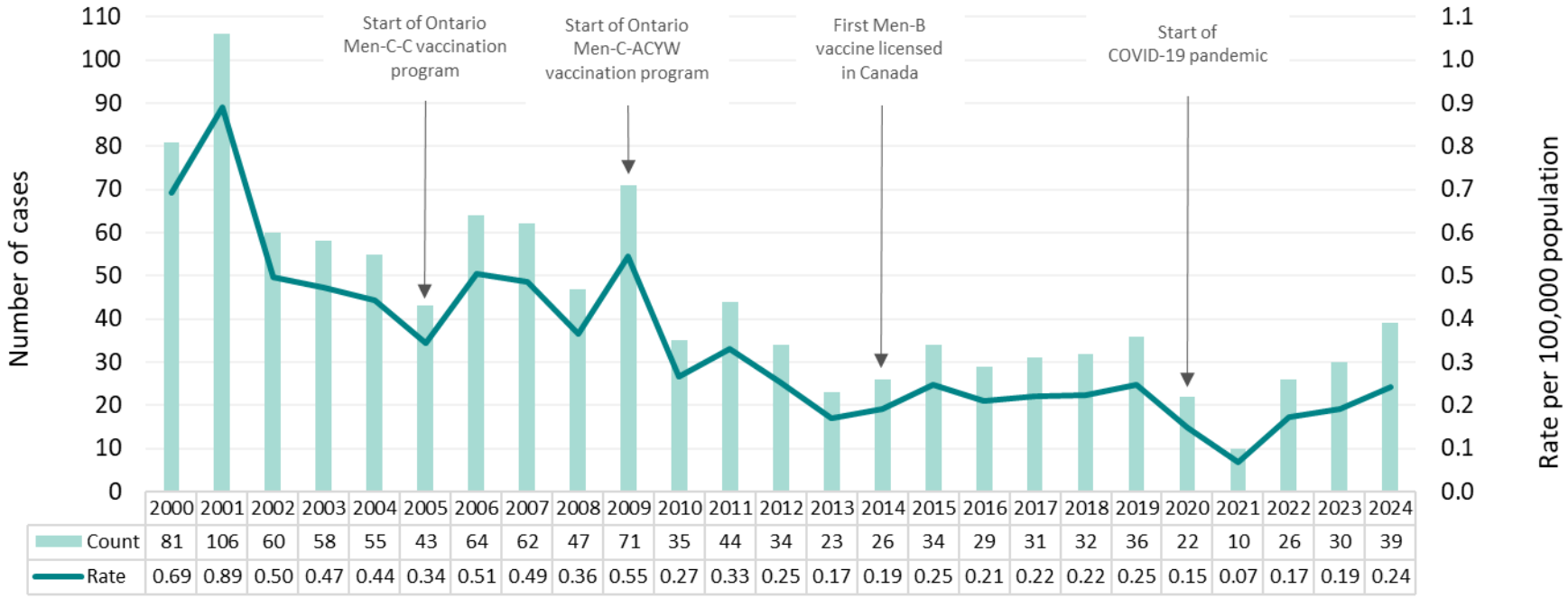
Figure 1: Number of IMD Cases by Month and Serogroup for 2024



Note: The case with 'Other' serogroup was serogroup E

Trends Over Time

Figure 2: Number of IMD Cases and Incidence Rates per 100,000 Population



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Count	81	106	60	58	55	43	64	62	47	71	35	44	34	23	26	34	29	31	32	36	22	10	26	30	39
Rate	0.69	0.89	0.50	0.47	0.44	0.34	0.51	0.49	0.36	0.55	0.27	0.33	0.25	0.17	0.19	0.25	0.21	0.22	0.22	0.25	0.15	0.07	0.17	0.19	0.24

Figure 3: Number of IMD Cases by Month

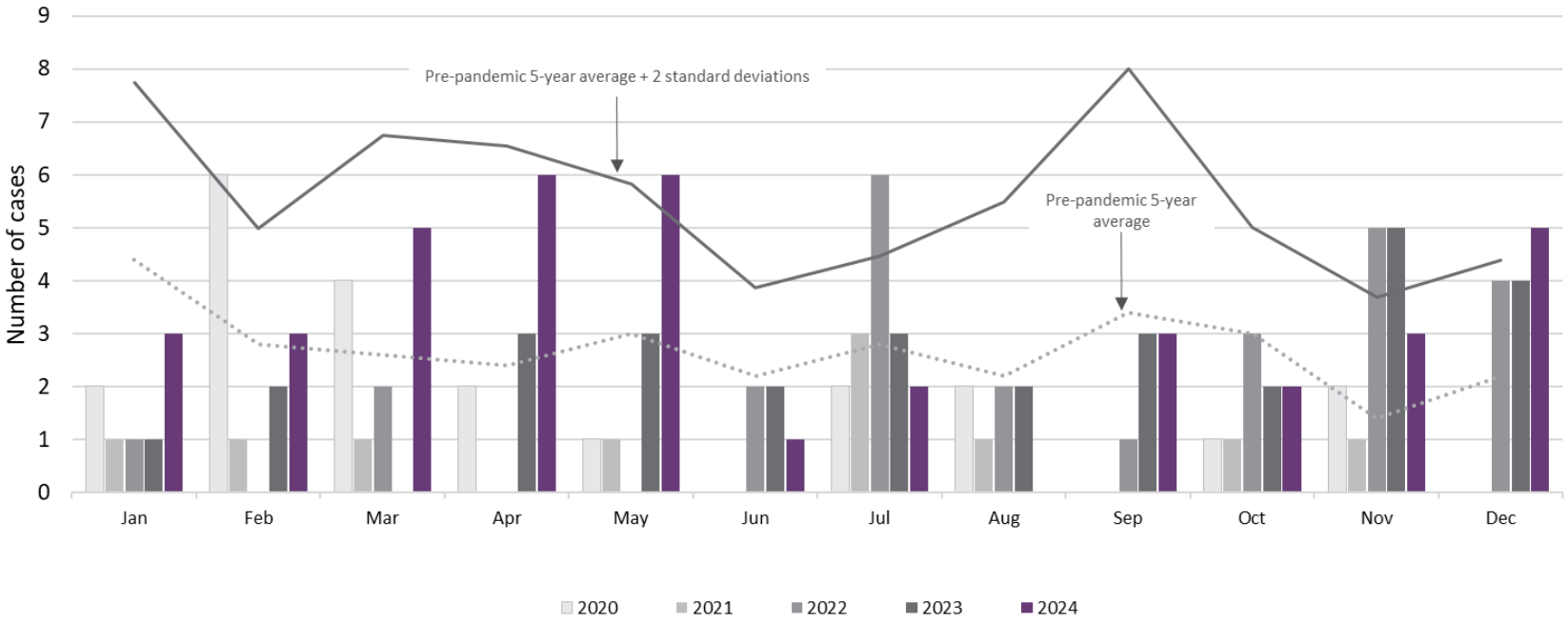


Figure 4: Incidence Rates of IMD Cases per 100,000 Population by Vaccine-Preventable Serogroup

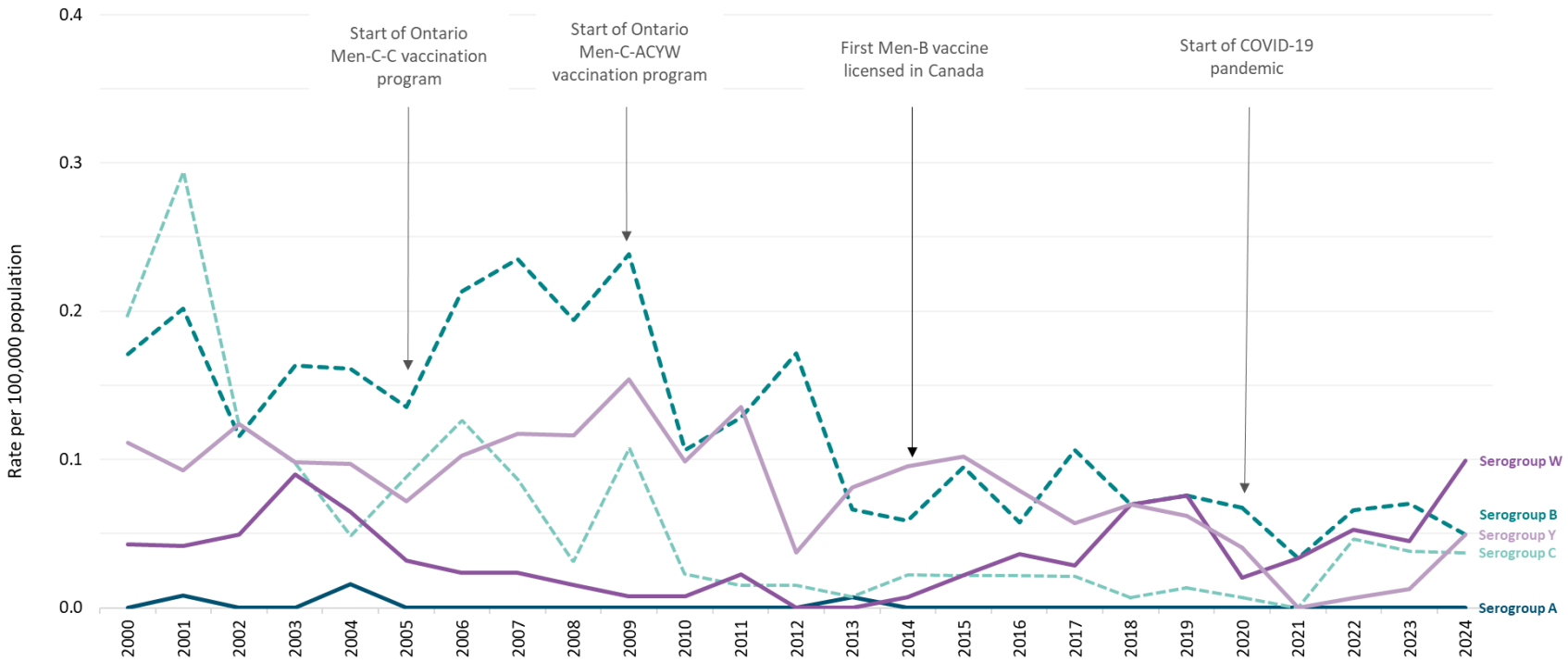


Table 2: Number of IMD Cases and Incidence Rates per 100,000 Population by Serogroup and Year

Year	Serogroup A	Serogroup B	Serogroup C	Serogroup W	Serogroup Y	Non-groupable/ typeable	Other serogroup	Missing serogroup	Total
2000	0 (0.00)	20 (0.17)	23 (0.20)	5 (0.04)	13 (0.11)	20 (0.17)	0 (0.00)	0 (0.00)	**81 (0.69)**
2001	1 (0.01)	24 (0.20)	35 (0.29)	5 (0.04)	11 (0.09)	30 (0.25)	0 (0.00)	0 (0.00)	**106 (0.89)**
2002	0 (0.00)	14 (0.12)	15 (0.12)	6 (0.05)	15 (0.12)	10 (0.08)	0 (0.00)	0 (0.00)	**60 (0.50)**
2003	0 (0.00)	20 (0.16)	12 (0.10)	11 (0.09)	12 (0.10)	3 (0.02)	0 (0.00)	0 (0.00)	**58 (0.47)**
2004	2 (0.02)	20 (0.16)	6 (0.05)	8 (0.06)	12 (0.10)	7 (0.06)	0 (0.00)	0 (0.00)	**55 (0.44)**
2005	0 (0.00)	17 (0.14)	11 (0.09)	4 (0.03)	9 (0.07)	2 (0.02)	0 (0.00)	0 (0.00)	**43 (0.34)**
2006	0 (0.00)	27 (0.21)	16 (0.13)	3 (0.02)	13 (0.10)	5 (0.04)	0 (0.00)	0 (0.00)	**64 (0.51)**
2007	0 (0.00)	30 (0.24)	11 (0.09)	3 (0.02)	15 (0.12)	1 (0.01)	0 (0.00)	2 (0.02)	**62 (0.49)**
2008	0 (0.00)	25 (0.19)	4 (0.03)	2 (0.02)	15 (0.12)	0 (0.00)	0 (0.00)	1 (0.01)	**47 (0.36)**
2009	0 (0.00)	31 (0.24)	14 (0.11)	1 (0.01)	20 (0.15)	1 (0.01)	0 (0.00)	4 (0.03)	**71 (0.55)**
2010	0 (0.00)	14 (0.11)	3 (0.02)	1 (0.01)	13 (0.10)	0 (0.00)	0 (0.00)	4 (0.03)	**35 (0.27)**
2011	0 (0.00)	17 (0.13)	2 (0.02)	3 (0.02)	18 (0.14)	0 (0.00)	1 (0.01)	3 (0.02)	**44 (0.33)**
2012	0 (0.00)	23 (0.17)	2 (0.01)	0 (0.00)	5 (0.04)	0 (0.00)	0 (0.00)	4 (0.03)	**34 (0.25)**
2013	1 (0.01)	9 (0.07)	1 (0.01)	0 (0.00)	11 (0.08)	0 (0.00)	0 (0.00)	1 (0.01)	**23 (0.17)**
2014	0 (0.00)	8 (0.06)	3 (0.02)	1 (0.01)	13 (0.10)	0 (0.00)	0 (0.00)	1 (0.01)	**26 (0.19)**
2015	0 (0.00)	13 (0.09)	3 (0.02)	3 (0.02)	14 (0.10)	0 (0.00)	1 (0.01)	0 (0.00)	**34 (0.25)**

Year	Serogroup A	Serogroup B	Serogroup C	Serogroup W	Serogroup Y	Non-groupable/ typeable	Other serogroup	Missing serogroup	Total
2016	0 (0.00)	8 (0.06)	3 (0.02)	5 (0.04)	11 (0.08)	1 (0.01)	0 (0.00)	1 (0.01)	**29 (0.21)**
2017	0 (0.00)	15 (0.11)	3 (0.02)	4 (0.03)	8 (0.06)	0 (0.00)	1 (0.01)	0 (0.00)	**31 (0.22)**
2018	0 (0.00)	10 (0.07)	1 (0.01)	10 (0.07)	10 (0.07)	0 (0.00)	1 (0.01)	0 (0.00)	**32 (0.22)**
2019	0 (0.00)	11 (0.08)	2 (0.01)	11 (0.08)	9 (0.06)	0 (0.00)	0 (0.00)	3 (0.02)	**36 (0.25)**
2020	0 (0.00)	10 (0.07)	1 (0.01)	3 (0.02)	6 (0.04)	1 (0.01)	0 (0.00)	1 (0.01)	**22 (0.15)**
2021	0 (0.00)	5 (0.03)	0 (0.00)	5 (0.03)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**10 (0.07)**
2022	0 (0.00)	10 (0.07)	7 (0.05)	8 (0.05)	1 (0.01)	0 (0.00)	0 (0.00)	0 (0.00)	**26 (0.17)**
2023	0 (0.00)	11 (0.07)	6 (0.04)	7 (0.04)	2 (0.01)	2 (0.01)	0 (0.00)	2 (0.01)	**30 (0.19)**
2024	0 (0.00)	8 (0.05)	6 (0.04)	16 (0.10)	8 (0.05)	0 (0.00)	1 (0.01)	0 (0.00)	**39 (0.24)**

Age

Table 3: Number of IMD Cases and Incidence Rates per 100,000 Population by Serogroup and Age for 2024

Age (years)	Serogroup A	Serogroup B	Serogroup C	Serogroup W	Serogroup Y	Non-groupable/ typeable	Other serogroup	Missing serogroup	Total
<1	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.71)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.71)**
1–4	0 (0.00)	2 (0.35)	0 (0.00)	1 (0.17)	1 (0.17)	0 (0.00)	0 (0.00)	0 (0.00)	**4 (0.70)**
5–9	0 (0.00)	1 (0.12)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.12)**
10–14	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**0 (0.00)**
15–19	0 (0.00)	2 (0.22)	0 (0.00)	1 (0.11)	2 (0.22)	0 (0.00)	1 (0.11)	0 (0.00)	**6 (0.66)**
20–24	0 (0.00)	2 (0.17)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**2 (0.17)**
25–49	0 (0.00)	0 (0.00)	3 (0.05)	5 (0.09)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**8 (0.14)**
50–64	0 (0.00)	1 (0.03)	0 (0.00)	2 (0.07)	1 (0.03)	0 (0.00)	0 (0.00)	0 (0.00)	**4 (0.13)**
65+	0 (0.00)	0 (0.00)	3 (0.10)	7 (0.24)	3 (0.10)	0 (0.00)	0 (0.00)	0 (0.00)	**13 (0.44)**

Note: The case with 'Other' serogroup was serogroup E

Geography

Table 4: Number of IMD Cases and Incidence Rates per 100,000 Population by Serogroup and Public Health Unit for 2024

Public Health Unit	Serogroup A	Serogroup B	Serogroup C	Serogroup W	Serogroup Y	Non-groupable/ typeable	Other serogroup	Missing serogroup	Total
City of Hamilton Public Health Services	0 (0.00)	1 (0.16)	1 (0.16)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**2 (0.32)**
Durham Region Health Department	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.13)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.13)**
Eastern Ontario Health Unit	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.43)	1 (0.43)	0 (0.00)	0 (0.00)	0 (0.00)	**2 (0.86)**
Grand Erie Public Health	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.33)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.33)**
Halton Region Public Health	0 (0.00)	0 (0.00)	2 (0.30)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**2 (0.30)**
Middlesex-London Health Unit	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.17)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.17)**
Niagara Region Public Health	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.19)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.19)**
Northeastern Public Health	0 (0.00)	1 (0.81)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.81)**
Ottawa Public Health	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.17)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**2 (0.17)**
Peel Public Health	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.06)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.06)**
Region of Waterloo Public Health and Paramedic Services	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.14)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.14)**
South East Health Unit	0 (0.00)	3 (0.49)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**3 (0.49)**

Public Health Unit	Serogroup A	Serogroup B	Serogroup C	Serogroup W	Serogroup Y	Non-groupable/ typeable	Other serogroup	Missing serogroup	Total
Southwestern Public Health	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.42)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.42)**
Toronto Public Health	0 (0.00)	2 (0.06)	3 (0.09)	10 (0.31)	2 (0.06)	0 (0.00)	0 (0.00)	0 (0.00)	**17 (0.52)**
Wellington-Dufferin-Guelph Public Health	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.30)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.30)**
Windsor-Essex County Health Unit	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.21)	0 (0.00)	**1 (0.21)**
York Region Public Health	0 (0.00)	1 (0.08)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	**1 (0.08)**

Notes:

- The case with 'Other' serogroup was serogroup E
- As of January 1, 2025, Brant County Health Unit and Haldimand-Norfolk Health Unit have merged into Grand Erie Public Health; Hastings and Prince Edward Counties Health Unit, Kingston, Frontenac and Lennox and Addington Health Unit and Leeds, Grenville and Lanark District Health Unit have merged into South East Health Unit; Porcupine Health Unit and Timiskaming Health Unit have merged into Northeastern Public Health; and Haliburton, Kawartha, Pine Ridge District Health Unit and Peterborough County-City Health Unit have merged into Haliburton Kawartha Northumberland Peterborough Health Unit. As of September 11, 2025, Haliburton Kawartha Northumberland Peterborough Health Unit has been renamed to Lakelands Public Health.

Technical Notes

Data Sources

Case Data

- The data for this report were based on information entered in the Ontario Ministry of Health (MOH) integrated Public Health Information System (iPHIS) database as of July 11, 2024.
- iPHIS is a dynamic disease reporting system that allows ongoing updates to previously entered data. As a result, data extracted from iPHIS represent a snapshot at the time of extraction and may differ from previous or subsequent reports.

Ontario Population Data

- Population estimate 2000: Population reporting [data file]. Toronto, ON: Ontario. Ministry of Health, IntelliHealth Ontario [distributor]; 2019 Nov 26 [extracted 2019 Nov 26].
- Population estimates 2001-2024: Statistics Canada. Table 17-10-0157-01: Population estimates, July 1, by health region and peer group, 2023 boundaries [Internet]. Ottawa, ON: Government of Canada; 2025 Feb 19 [extracted 2025 Feb 21]. Available from: https://doi.org/10.25318/1710015701-eng

Data Caveats

- **Data reported for 2020–2022 should be interpreted with caution. Both testing and iPHIS data entry practices may have been impacted by the COVID-19 pandemic response.**
- Only IMD cases meeting the confirmed and probable case classification as listed in the Ontario MOH surveillance case definitions are included in the reported case counts.[5]
    - Changes to provincial surveillance case definitions and disease classifications have occurred over the years and thus may impact the analysis of trends over time. Cases are classified in iPHIS based on the Ontario MOH surveillance case definitions in use at the time the case was identified.
    - Public Health Ontario's technical report *Factors Affecting Reporting Diseases in Ontario: Case Definition Changes and Associated Trends 1991-2016* and its associated appendix provide more detailed information on this topic.[6]
- Cases of IMD are reported based on the Episode Date, which is an estimate of the onset date of disease for a case. In order to determine this date, the following hierarchy exists in iPHIS: Onset Date > Specimen Collection Date > Lab Test Date > Reported Date.
    - For example: If an Onset Date exists, it will be used as the Episode Date. If Onset Date is not available, then the next available date in the hierarchy (i.e., Specimen Collection Date) will be used, and so on.
- Case counts by geography are based on the diagnosing health unit (DHU). DHU refers to the case's public health unit of residence at the time of illness onset or report to public health and not necessarily the location of exposure.
    - Cases for which the DHU was reported as 'MOHLTC' (to signify a case that is not a resident of Ontario) were excluded from this analysis.

- Cases for which the Disposition Status was reported as ‘ENTERED IN ERROR’, ‘DOES NOT MEET DEFINITION’, ‘DUPLICATE-DO NOT USE’, or any variation on these values, were excluded from this analysis.
- Cases with missing serogroup information were either probable cases, cases where serotyping was not performed, or cases where serogroup information was not recorded in iPHIS.
- To determine immunization status of cases, only documented doses of a meningococcal vaccine product administered at least 14 days prior to disease onset were included.
- To be considered as a valid case hospitalization, a case must have a hospital admission date that is no more than 60 days prior to disease onset or 90 days post disease onset.
- To be considered as a fatal case outcome, a case must have a death recorded that is not classified as “reportable disease was unrelated to cause of death”.

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