Public Health Ontario | Santé publique Ontario

ENHANCED EPIDEMIOLOGICAL SUMMARY

Invasive Meningococcal Disease (IMD) in Ontario: January 1, 2023 to December 31, 2023

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Introduction

This report describes the epidemiology of invasive meningococcal disease (IMD) in Ontario in 2023, including case characteristics and case counts/incidence rates by serogroup, age and geography. Trends over time for the years 2000 to 2023 are also included.

Ontario has two publicly funded routine vaccination programs for IMD: a monovalent meningococcal conjugate C vaccine (Men-C-C) program for children (typically administered at 1 year of age; implemented in 2005) and a quadrivalent meningococcal conjugate vaccine (Men-C-ACYW) program for adolescents (typically administered in grade 7; implemented in 2009).[1] Meningococcal vaccines are also publicly funded for certain high risk groups, including Men-C-ACYW vaccines for high risk groups aged 9 months and older and meningococcal B (4CMenB) vaccines for high risk groups 2 months to 17 years of age.[1] 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 **May 30, 2024**.

Highlights

Overview

- In 2023, there were 30 confirmed cases of IMD reported in Ontario (30 confirmed, 0 probable) (Table 1).
  - Males accounted for 56.7% of all cases in 2023 (Table 1).
  - The majority of cases (86.6%) were among adolescents and adults aged 15 years and older: 13.3% of cases were 15-19 years of age, 16.7% were 20-24 years of age, 20.0% were 25-49 years of age, 13.3% were 50-64 years of age, and 23.3% were 65 years of age and older (Table 1).
- Eleven cases (36.7%) in 2023 were serogroup B, seven (23.3%) were serogroup W, six (20.0%) were serogroup C, three (3.8%) were serogroup Y, two (6.7%) were not groupable/typeable, and one (3.3%) had insufficient specimen volume for serogroup determination (Table 1, Figure 1).

- Fifteen cases (50.0%) in 2023 had known immunization status: eight (53.3%) were unimmunized prior to disease onset and seven (46.7%) were immunized with a meningococcal vaccine that provided protection against serogroup(s) other than that responsible for their infection (Table 1).
- Hospitalization was reported for 28 cases (93.3%) in 2023 (Table 1).
- A total of three (10.0%) fatal outcomes were reported in 2023 (serogroups C, W and Y), all among adults aged 20 years and older (Table 1).

Trends Over Time

- Overall during the surveillance period of 2000-2023, 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).
  - In 2023 IMD case reporting increased above what was observed in 2020-2022, albeit still below pre-pandemic five-year average (2015-2019) case counts/rates (Figure 2).
- When examining monthly trends, there were several months in 2023 (April, May, July, November and December) where IMD case counts were above the pre-pandemic five-year average, and one month (November) where the IMD case count exceeded the pre-pandemic five-year average plus two standard deviations (Figure 3).
- Since 2000, there has been an overall decrease in the incidence rates of IMD serogroups B, C and Y, while cases of serogroup A have remained rare (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]

Age

- In 2023, IMD incidence rates were highest among the 15-19 (0.46 per 100,000 individuals), 20-24 (0.46 per 100,000 individuals) and 1-4 (0.35 per 100,000 individuals) year age groups (Table 3).
  - For the 1-4 and 15-19 year age groups the incidence rate of serogroup B was highest (0.35 per 100,000 individuals for both age groups), while for the 20-24 year age group the incidence rates of serogroups B and W were highest (0.18 per 100,000 individuals for both serogroups) (Table 3).

Geography

- In 2023, IMD cases were reported from 15 PHUs, with the greatest number from Toronto Public Health (n=6) and the highest incidence rates from Kingston, Frontenac and Lennox & Addington Public Health (1.40 per 100,000 individuals), Thunder Bay District Health Unit (1.27 per 100,000 individuals) and Northwestern Health Unit (1.23 per 100,000 individuals) (Table 4).

- Four of the six cases reported from Toronto Public Health were serogroup B (Table 4); three occurred from February-April and one occurred in September. Cases included one child, one adolescent and two adults. Additional laboratory typing demonstrated that the case isolates were the result of different strains, suggesting they represented sporadic cases, rather than the circulation of a single outbreak strain.
- In November and December, four serogroup B cases occurred in the adjacent public health units of Kingston, Frontenac and Lennox & Addington Public Health and Hastings Prince Edward Public Health (Table 4). All four cases were in young adults. Additional laboratory typing determined that the case isolates were genetically unrelated.

Overview

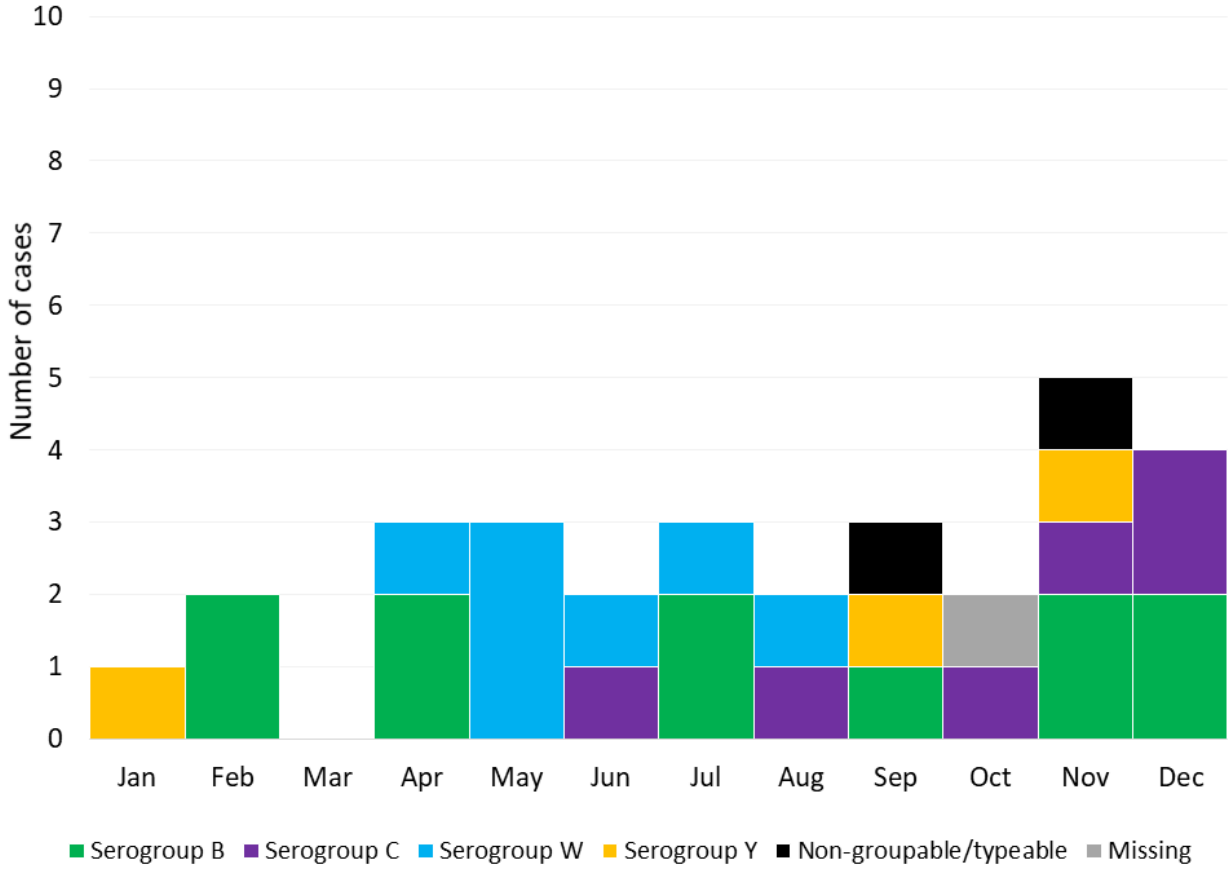
Table 1. Characteristics of IMD cases: Ontario, 2020-2023 and pre-pandemic 5-year period (2015-2019)

Case Characteristics	2023	2022	2021	2020	Pre-pandemic 5-year period (2015-2019)
Classification (N, %)					
Confirmed	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)	1 (4.6)	2 (1.2)
Gender (N, %)					
Female	13 (43.3)	12 (46.2)	6 (60.0)	6 (27.3)	80 (49.4)
Male	17 (56.7)	14 (53.9)	4 (40.0)	16 (72.7)	82 (50.6)
Age (years) (N, %)					
<1	0 (0.0)	1 (3.9)	1 (10.0)	1 (4.6)	17 (10.5)
1-4	2 (6.7)	0 (0.0)	0 (0.0)	2 (9.1)	6 (3.7)
5-9	1 (3.3)	1 (3.9)	0 (0.0)	0 (0.0)	4 (2.5)
10-14	1 (3.3)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.2)
15-19	4 (13.3)	3 (11.5)	2 (20.0)	2 (9.1)	13 (8.0)
20-24	5 (16.7)	1 (3.9)	1 (10.0)	5 (22.7)	15 (9.3)
25-49	6 (20.0)	11 (42.3)	4 (40.0)	3 (13.6)	31 (19.1)
50-64	4 (13.3)	7 (26.9)	1 (10.0)	8 (36.4)	38 (23.5)
65+	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)

Case Characteristics	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)
B	11 (36.7)	10 (38.5)	5 (50.0)	10 (45.5)	57 (35.2)
C	6 (20.0)	7 (26.9)	0 (0.0)	1 (4.5)	12 (7.4)
W	7 (23.3)	8 (30.8)	5 (50.0)	3 (13.6)	33 (20.4)
Y	3 (10.0)	1 (3.8)	0 (0.0)	6 (27.3)	52 (32.1)
Non-groupable/ typeable	2 (6.7)	0 (0.0)	0 (0.0)	1 (4.5)	1 (0.6)
Other	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.9)
Missing	1 (3.3)	0 (0.0)	0 (0.0)	1 (4.5)	4 (2.5)
Immunization status (N, %)					
Immunized against serogroup responsible for infection*	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	6 (3.7)
Immunized against different serogroup(s)	7 (23.3)	5 (19.2)	0 (0.0)	4 (18.2)	8 (4.9)
Unimmunized	8 (26.7)	7 (26.9)	6 (60.0)	6 (27.3)	82 (50.6)
Unknown	15 (50.0)	14 (53.9)	4 (40.0)	12 (54.6)	66 (40.7)
Hospitalizations (N, %)	28 (93.3)	24 (92.3)	9 (90.0)	21 (95.5)	150 (92.6)
Deaths (N, %)	3 (10.0)	3 (11.5)	1 (10.0)	2 (9.1)	18 (11.1)
Total (N, %)	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.

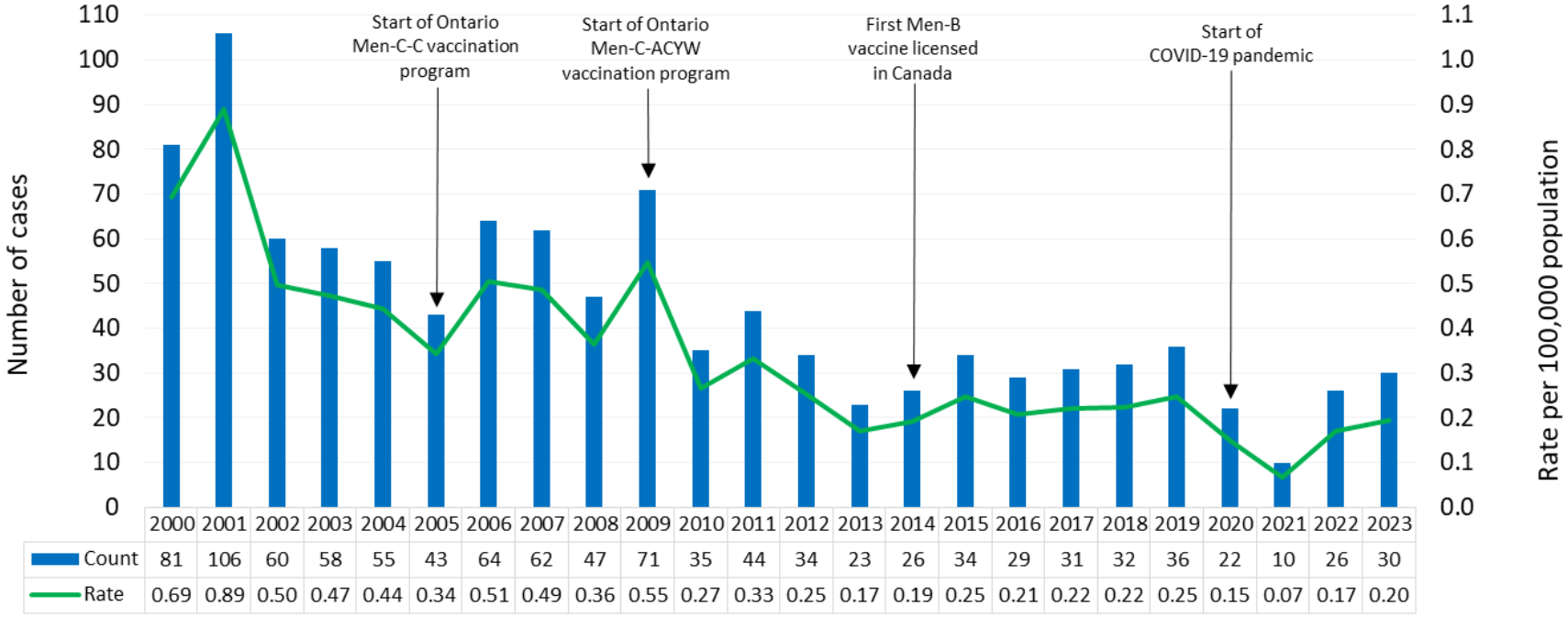
Figure 1. Number of IMD cases by month and serogroup: Ontario, 2023



Note: The case with the missing serogroup had insufficient specimen volume for serogroup determination.

Trends Over Time

Figure 2. Number of IMD cases and incidence rates per 100,000 population: Ontario, 2000-2023



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
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
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	0.20

Figure 3. Number of IMD cases by month: Ontario, 2020-2023 and pre-pandemic 5-year average (2015-2019)

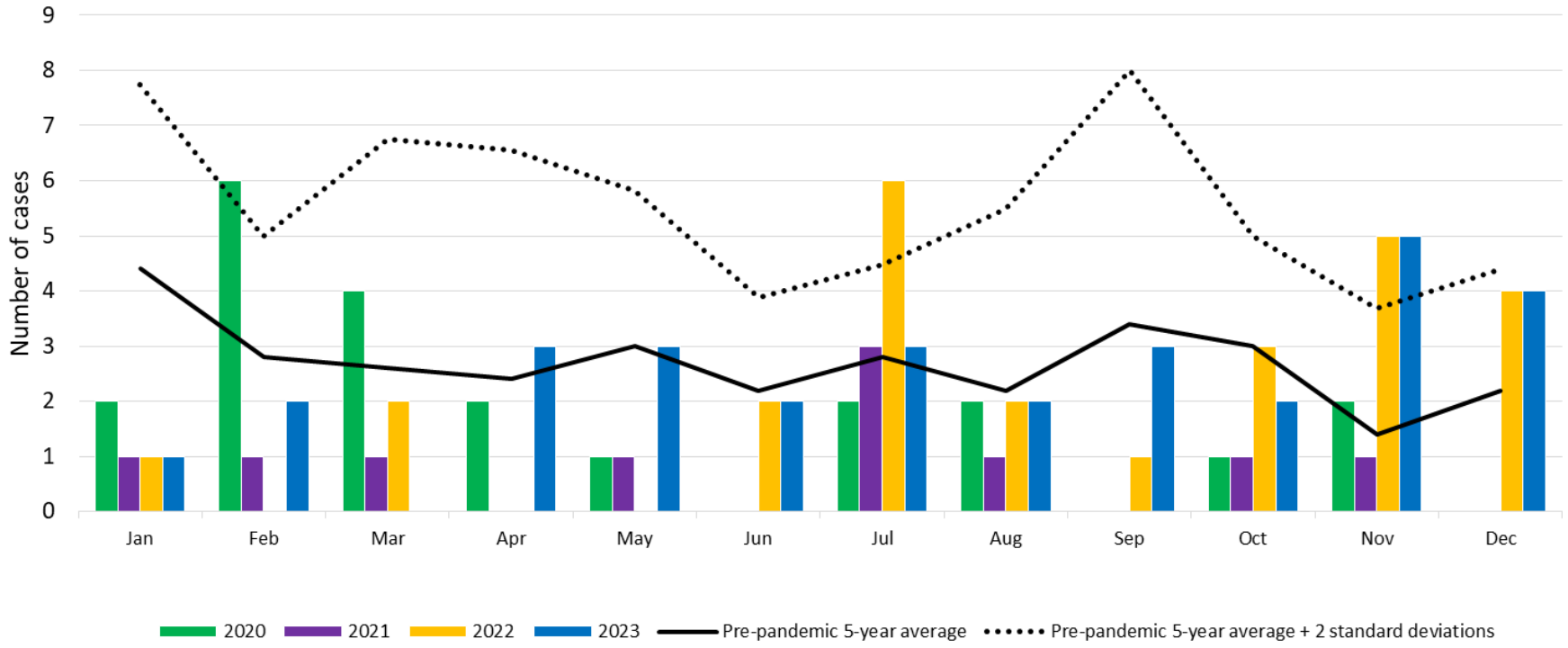


Figure 4. Incidence rates of IMD cases per 100,000 population by vaccine-preventable serogroup: Ontario, 2000-2023

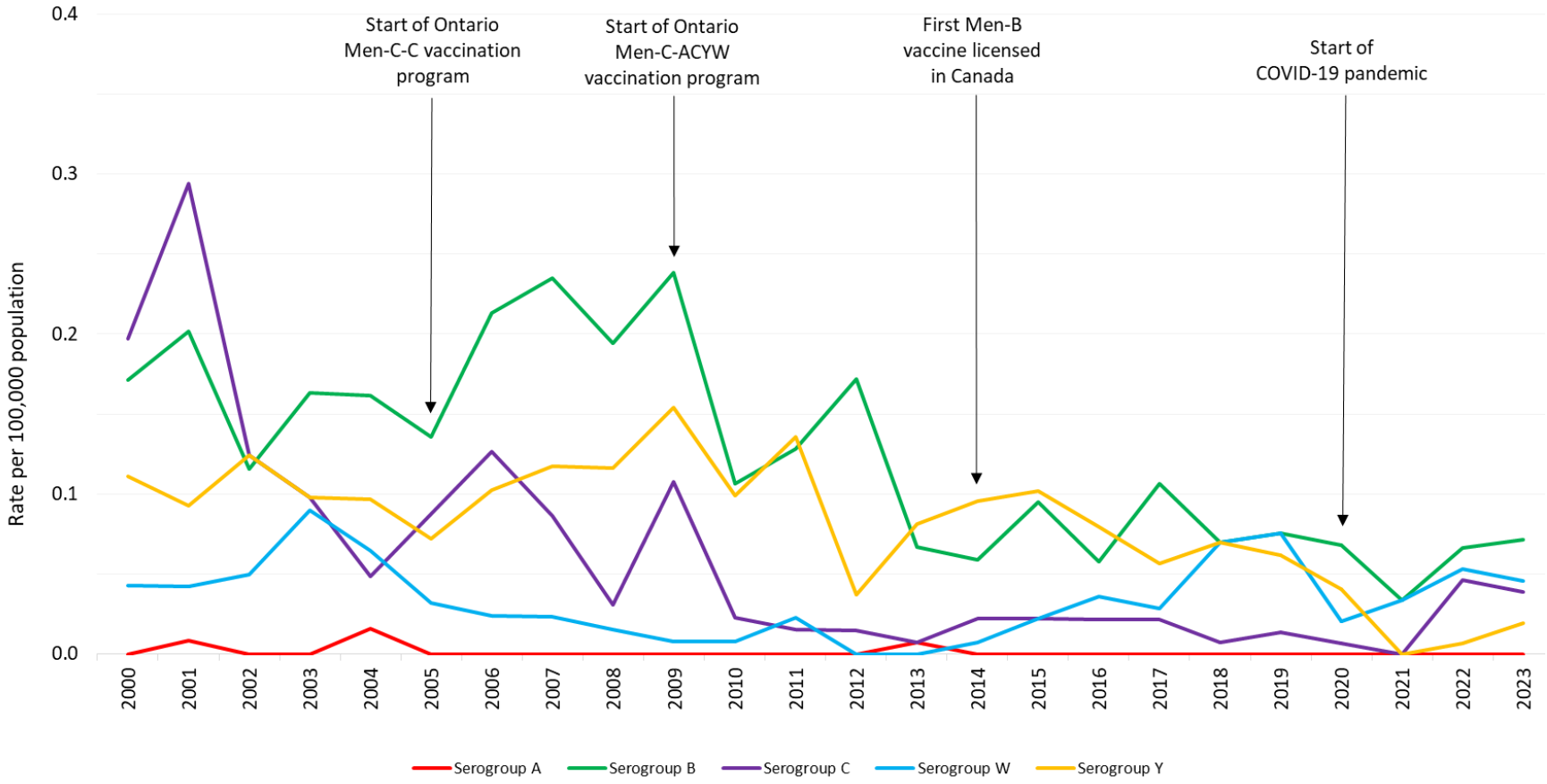


Table 2. Number of IMD cases and incidence rates per 100,000 population by serogroup and year: Ontario, 2000-2023

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)
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)

Year	Serogroup A	Serogroup B	Serogroup C	Serogroup W	Serogroup Y	Non-groupable/ typeable	Other serogroup	Missing serogroup	Total
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 (0.05)	3 (0.02)	2 (0.01)	0 (0.00)	1 (0.01)	30 (0.20)

Age

Table 3. Number of IMD cases and incidence rates per 100,000 population by serogroup and age: Ontario, 2023

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)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
1-4	0 (0.00)	2 (0.35)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.35)
5-9	0 (0.00)	1 (0.13)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.13)
10-14	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.12)	1 (0.12)
15-19	0 (0.00)	3 (0.35)	0 (0.00)	0 (0.00)	1 (0.12)	0 (0.00)	0 (0.00)	0 (0.00)	4 (0.46)
20-24	0 (0.00)	2 (0.18)	0 (0.00)	2 (0.18)	0 (0.00)	1 (0.09)	0 (0.00)	0 (0.00)	5 (0.46)
25-49	0 (0.00)	1 (0.02)	1 (0.02)	3 (0.06)	1 (0.02)	0 (0.00)	0 (0.00)	0 (0.00)	6 (0.11)
50-64	0 (0.00)	1 (0.03)	2 (0.07)	1 (0.03)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	4 (0.13)
65+	0 (0.00)	1 (0.03)	3 (0.10)	1 (0.03)	1 (0.03)	1 (0.03)	0 (0.00)	0 (0.00)	7 (0.24)

Geography

Table 4. Number of IMD cases and incidence rates per 100,000 population by serogroup and public health unit: Ontario, 2023

Public Health Unit	Serogroup A	Serogroup B	Serogroup C	Serogroup W	Serogroup Y	Non-groupable/ typeable	Other serogroup	Missing serogroup	Total
Durham Region Health Department	0 (0.00)	1 (0.13)	0 (0.00)	2 (0.27)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	3 (0.40)
City of Hamilton Public Health Services	0 (0.00)	0 (0.00)	1 (0.17)	0 (0.00)	1 (0.17)	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.33)
Hastings Prince Edward Public Health	0 (0.00)	1 (0.56)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.56)	2 (1.13)
Kingston, Frontenac and Lennox & Addington Public Health	0 (0.00)	3 (1.40)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	3 (1.40)
Northwestern Health Unit	0 (0.00)	1 (1.23)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (1.23)
Ottawa Public Health	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.09)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.09)
Peel Public Health	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.06)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.06)
Renfrew County and District Health Unit	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.91)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.91)
Eastern Ontario Health Unit	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.45)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.45)

Public Health Unit	Serogroup A	Serogroup B	Serogroup C	Serogroup W	Serogroup Y	Non-groupable/ typeable	Other serogroup	Missing serogroup	Total
Public Health Sudbury & Districts	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.48)	0 (0.00)	0 (0.00)	1 (0.48)
Thunder Bay District Health Unit	0 (0.00)	1 (0.63)	1 (0.63)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	2 (1.27)
Region of Waterloo Public Health and Emergency Services	0 (0.00)	0 (0.00)	1 (0.15)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.15)
Windsor-Essex County Health Unit	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.23)	1 (0.23)	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.46)
York Region Public Health	0 (0.00)	0 (0.00)	2 (0.16)	1 (0.08)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	3 (0.24)
Toronto Public Health	0 (0.00)	4 (0.13)	1 (0.03)	0 (0.00)	0 (0.00)	1 (0.03)	0 (0.00)	0 (0.00)	6 (0.19)

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 May 30, 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

Ontario population estimate data were sourced from Statistics Canada:

- Population estimate 2000: population reporting [data file]. Toronto, ON: Ontario. Ministry of Health, IntelliHealth Ontario [distributor]; 2019 Nov 26 [data extracted 2019 Nov 26].
- Statistics Canada. Population estimates 2001-2022. Ottawa, ON: Government of Canada; 2023 Mar 2 [extracted 2023 Mar 13]. Table 17-10-0134-01: estimates of population (2016 census and administrative data), by age group and sex for July 1st, Canada, provinces, territories, health regions (2018 boundaries) and peer groups [Internet]. Available from: https://doi.org/10.25318/1710013401-eng
- Population projection 2023: Population Reporting. Population Projections Public Health Unit, 2022-2046 [data file]. Toronto, ON: Ontario. Ministry of Finance [producer]; Toronto, ON: Ontario. Ministry of Health, IntelliHealth Ontario [distributor];2023 May 10 [data extracted 2023 May 10].

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.[4]
    - 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.
    - PHO'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.[5]
- 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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