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ENHANCED EPIDEMIOLOGICAL SUMMARY

Pertussis in Ontario: January 1 - November 30, 2024

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This report includes the most current information available from Ontario's integrated Public Health Information System (iPHIS) as of **December 9, 2024.**

Introduction

This report describes the epidemiology of pertussis disease activity in Ontario between January and November 2024, including case characteristics and case counts/incidence rates by age group and geography. Trends over time for the years 2007 to 2023 are also included.

Pertussis is an endemic disease in Ontario characterized by low level activity and occasional cyclical increases every 2-6 years.[1,2] Pertussis is underdiagnosed and underreported in Ontario and is a common and often unrecognized cause of persistent cough in adolescents and adults.[1,3] Pertussis is of most concern for infants as they are at the highest risk of severe disease.

Pertussis cases greatly declined during the COVID-19 pandemic. As the pertussis-causing bacteria (*Bordetella pertussis*) is transmitted via person-to-person respiratory droplets generated through coughing or sneezing, it was expected that COVID-19 public health measures such as reduced contacts, physical distancing and masking would have an impact on transmission. However, it was not known to what extent the observed case decline was due to public health measures and possible changes in healthcare seeking behaviours, testing, case reporting, case follow up or other unknown factors.

Ontario has two routine immunization programs for pertussis.[4] The primary childhood series includes four doses given between two and 18 months of age with booster doses given at four, 14 and 24 years of age. There is also a program for pregnant people with vaccine administration offered in every pregnancy, ideally between 27 to 32 weeks of gestation. Pertussis vaccines may also be publicly funded as part of an outbreak response if indicated. Additional information on pertussis immunization can be found in Public Health Ontario's Immunization Data Tool[5]. This tool presents Ontario's immunization surveillance data, including immunization coverage for school-aged children and vaccine safety data.

Overview

- Ontario has experienced a significant and widespread increase of pertussis activity in 2024, the highest observed since 2007.
- As of December 9, 2024, there were 1,634 cases (1,396 confirmed and 238 probable) of pertussis reported in Ontario between January 1 and November 30, 2024. The year-to-date 2024 incidence rate is 10.2 cases per 100,000 population (Figure 1).

- Monthly case counts trended upward between March and November 2024, with cases peaking in July. Although case counts are gradually declining since the July 2024 peak, monthly counts from May through November have been above the five-year pre-pandemic average plus two standard deviations (Figure 2).
- The majority of cases were among children (Table 1) and consistent with previous years, the highest age group-specific rates in 2024 are among the youngest age group (<1 year) and 10-14 year olds (74.2 and 55.2 per 100,000, respectively). All age group-specific rates have exceeded their respective five year pre-pandemic average rates (Figure 3).
- The 1,634 cases were identified from 33 of Ontario's 34 public health units (Figure 4).

Trends Over Time

- The case count and rate in 2024 are the highest that have been observed during the surveillance period of 2007-2024; with 1,634 cases identified (10.2 cases per 100,000 population).
- Annual trends in pertussis case counts and rates have fluctuated greatly over time (Figure 1) which is consistent with the cyclical nature of pertussis.
- Ontario had the lowest recorded case counts and rates during the height of the COVID-19 pandemic (2020-2021), with case counts and rates being particularly low for 2021 (n=16, 0.1 cases per 100,000 population).
- Case counts and rates began to increase again in 2022, similar to pre-pandemic trends.

Case Characteristics

- Females accounted for 56.4% (921/1,634) of all cases in 2024 (Table 1).
- Cases ranged in age from 1 week to 89 years with a median age of 13 years.
- Most cases (n=1,186; 72.6%) were under the age of 18 and 115 (7.0%) cases were less than one year of age (Table 1).
- The 10-14 year old age group had the highest number of cases with 450, representing 27.5% of all pertussis cases reported to date.
- All age group-specific rates have exceeded their respective five year pre-pandemic average rates (Figure 3). The highest age group-specific rates in 2024 so far are among the youngest age group (<1 year) and 10-14 year olds, which are consistent with previous years.

Immunization Status

- A total of 72.3% (n=1,182) of cases had immunization status documented in iPHIS (Table 1). Of these:
  - 426 cases (26.1%) were unimmunized.
  - 756 cases (46.3%) were immunized with at least one dose of pertussis-containing vaccine prior to disease onset.
- The previously immunized cases received between one and seven doses of pertussis-containing vaccines prior to disease onset (Table 2).
  - The median time between receiving the most recent pertussis-containing vaccine dose and pertussis disease was 8 years (range 2 weeks to 58 years).

Severity

- Overall, 65 cases (4.0%) had a documented hospitalization in iPHIS (Table 1). Forty-five of the hospitalizations were among cases aged less than 18 years including 32 cases less than one year of age (range 2-51 weeks of age).
  - Five hospitalized cases were admitted to the ICU. Four cases were under one year of age and the fifth case was in an adult aged 50-64 years.
  - Two deaths were reported. Both deaths occurred in hospitalized adult cases.
- There were also 191 cases (11.7%) with a documented emergency department visit (i.e., without an inpatient hospitalization). A total of 133 (69.6%) of these cases were among children (median age 9 years, range 4 weeks to 17 years).

Geography

- Cases were reported from 33 public health units (Figure 4).
- Although Toronto Public Health (n=220), Ottawa Public Health (n=181) and York Region Public Health (n=117) had high case counts, they had comparatively low rates of 6.8, 16.1 and 9.2 cases per 100,000 population, respectively.
- Eastern Ontario Health Unit had a high case count (n=156) along with the highest rate of 68.4 per 100,000 population, followed by Porcupine Health Unit with a rate of 50.3 cases per 100,000 population.

Table 1: Characteristics of pertussis cases: Ontario, January-November 2024

Table 1A: Classification

Case Characteristics (n=1,634)	n	%
Confirmed	1,396	85.4
Probable	238	14.6

Table 1B: Gender

Case Characteristics (n=1,634)	n	%
Female	921	56.4
Male	708	43.3

Table 1C: Age

Case Characteristics (n=1,634)	n	%
<1 year	115	7.0
1-4 years	198	12.1
5-9 years	250	15.3
10-14 years	450	27.5
15-19 years	209	12.8
20-49 years	281	17.2
50-64 years	81	5.0
≥65 years	50	3.1

Table 1D: Hospitalized

Case Characteristics (n=1,634)	n	%
Hospitalized (all cases)	65	4.0
< 1 year old	32	-
1-4 years	6	-
5-9 years	2	
10-14 years	3	-
15-19 years	2	
20-49 years	7	-
50-64 years	5	-
≥65 years	8	-
Deaths	**2**	-

Table 1E: Immunization Status

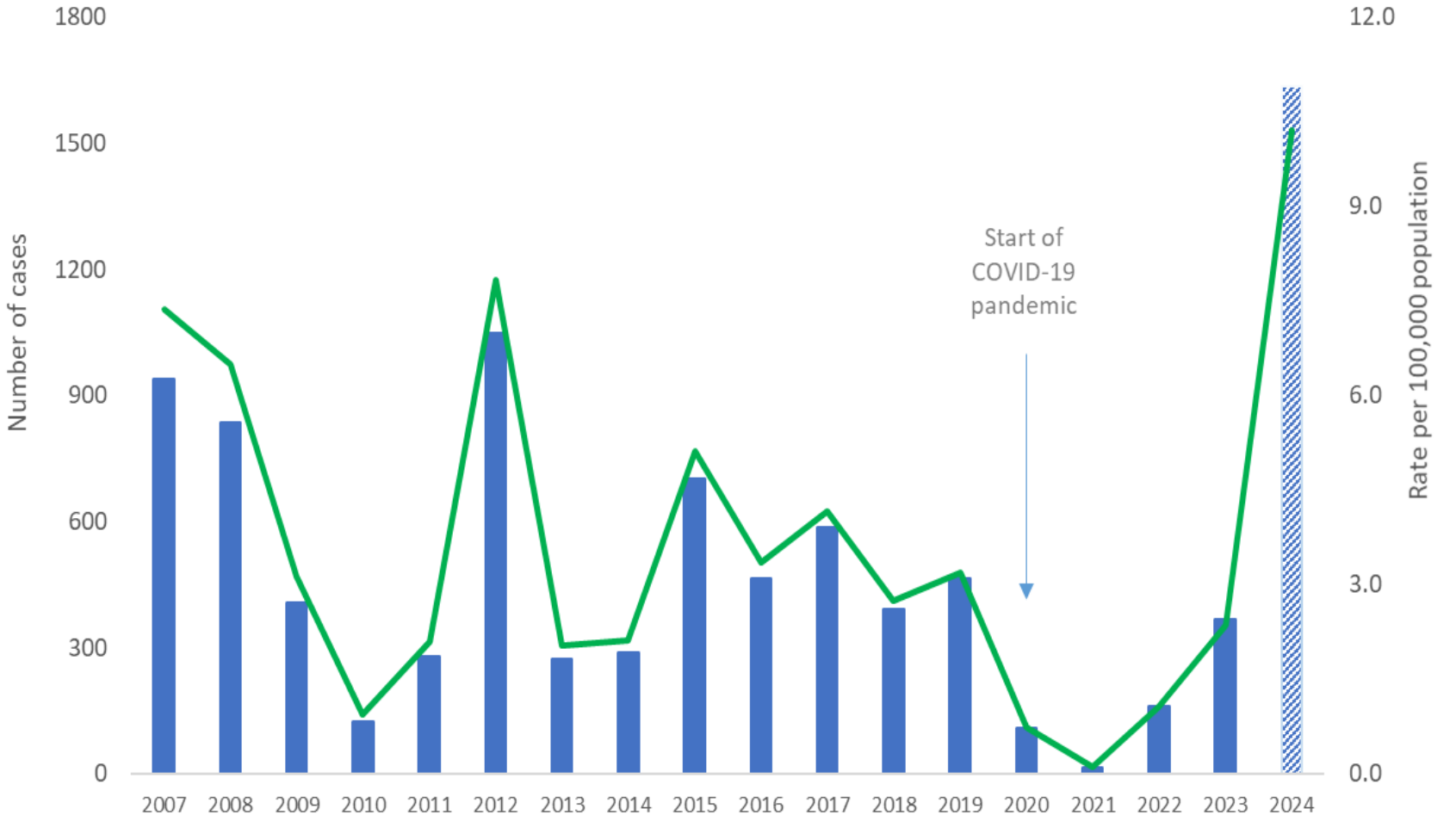
Case Characteristics (n=1,634)	n	%
Not documented (i.e., unknown)	452	27.7
Unimmunized	426	26.1
Immunized	756	46.3

Table 2: Number of Pertussis Cases Who Were Immunized Prior to Onset* and Number of Doses Received, by Age Group: Ontario, January- November 2024

	# Immunized Cases	# Doses Received	
Age group	**n**	**median**	**range**
< 1 year	13	1	1-3
1-4 years	40	4	1-5
5-9 years	110	5	1-5
10-14 years	313	5	1-6
15-19 years	145	5	1-6
20-49 years	117	5	1-7
50-64 years	12	1	1-5
65 years	6	1	1-4

*Vaccine dose(s) considered valid when received at least two weeks prior to disease onset.

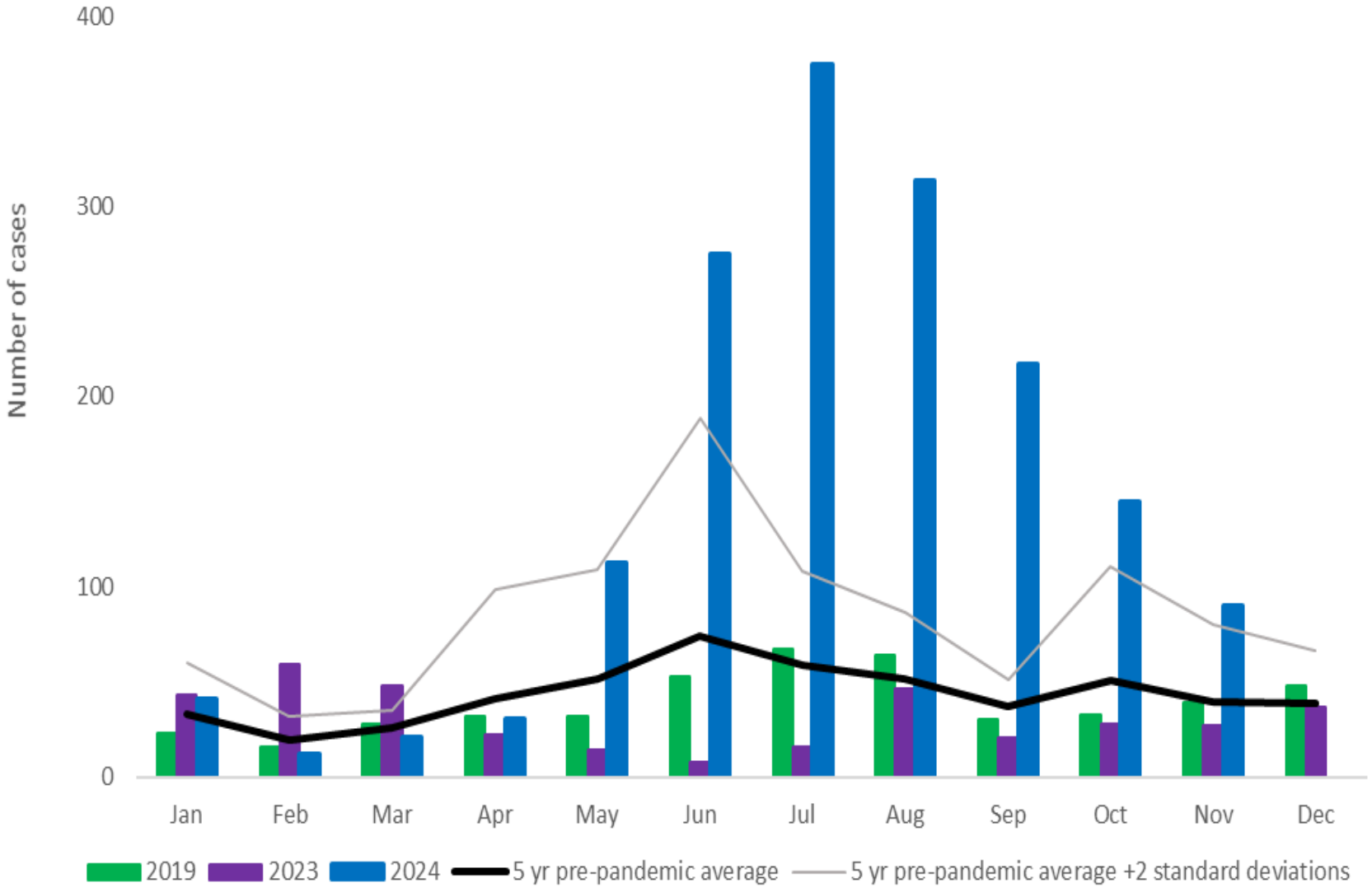
Figure 1: Pertussis Case Counts and Incidence Rates per 100,000 Population: Ontario, 2007–2024*



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cases	935	837	406	124	279	1,044	273	287	700	464	586	388	462	110	16	162	369	1,634
Rate	7.3	6.5	3.1	0.9	2.1	7.8	2.0	2.1	5.1	3.3	4.2	2.7	3.2	0.7	0.1	1.1	2.4	10.2

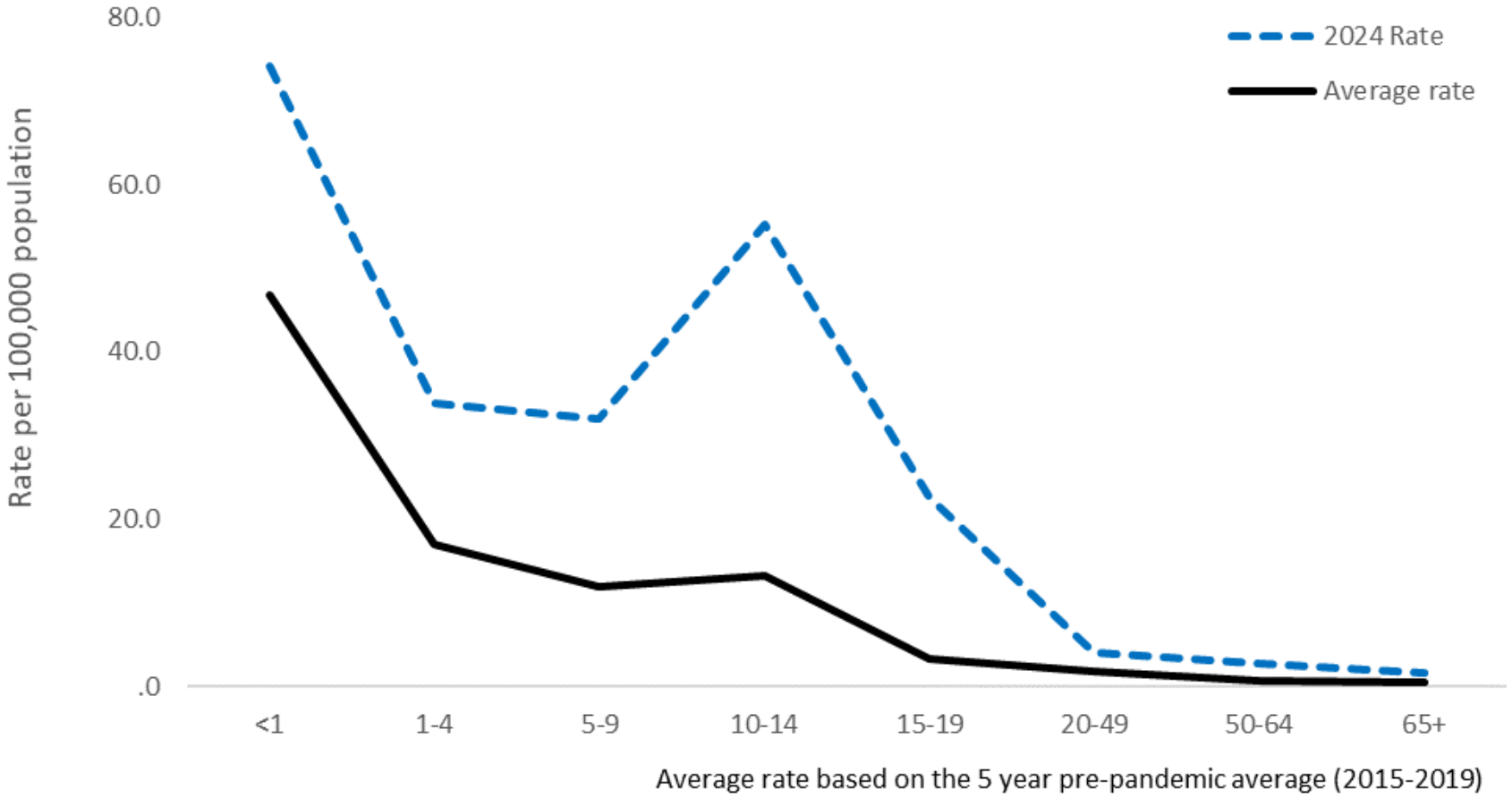
*January-November, 2024

Figure 2: Number of Pertussis Cases by Month: Ontario, 2019, 2023 & 2024* and Pre-Pandemic 5-year Average (2015-2019)



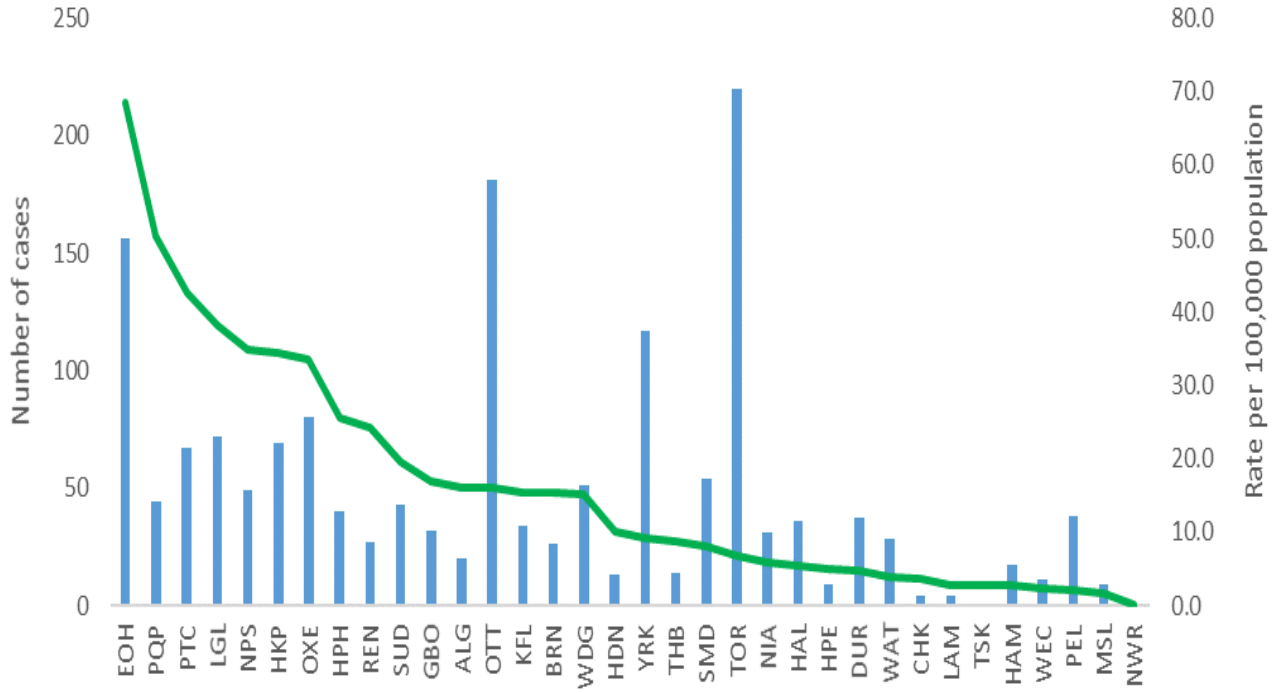
*January- November, 2024

Figure 3: Pertussis Incidence Rates per 100,000 Population by age group: Ontario, January - November 2024



	<1	1-4	5-9	10-14	15-19	20-49	50-64	65+
2024 rate	74.2	33.9	32.1	55.2	22.7	4.1	2.7	1.7
5 year pre-pandemic average rate	46.9	17.0	11.9	13.3	3.4	1.8	0.7	0.5

Figure 4: Public Health Unit-Specific Pertussis Incidence Rates and Cases: Ontario, January - November, 2024



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 December 9, 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 data were sourced from:

- Population estimates 2007-2022: Population Reporting. Population estimates county/municipality, 1986-2022 [data file]. Ottawa ON: Statistics Canada, Government of Canada [producer]; Toronto, ON: Ontario. Ministry of Health, IntelliHealth Ontario [distributor]; [data extracted 2024 Jun 10].
- Population projection 2023-2024: Population Reporting. Population Projections Public Health Unit, 2023-2046 [data file]. Toronto ON: Ministry of Finance [producer]; Toronto, ON: Ontario. Ministry of Health, IntelliHealth Ontario [distributor]; [data extracted 2024 Jun 10].

Data Caveats

- **Data reported for 2020-2022 should be interpreted with caution. Both testing and iPHIS data entry practices were likely impacted by the COVID-19 pandemic response.**
- Only pertussis cases meeting the confirmed and probable case classification as listed in the Ontario MOH surveillance case definitions are included in the reported case counts.[2]
    - 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.[6]
- Cases of pertussis 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.
- Incidence rates were calculated per 100,000 population.
- The five-year pre-pandemic average and five-year pre-pandemic average plus two standard deviations were used to provide a historical context to pertussis cases in Ontario. They were based on the years 2015-2019 inclusive.
- To determine immunization status of cases, only documented doses of a pertussis vaccine product administered at least 14 days prior to disease onset were included.
- To be considered as a valid 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".

References

1. National Advisory Committee on Immunization; Public Health Agency of Canada. Pertussis (whooping cough) vaccines: Canadian immunization guide [Internet]. Evergreen ed. Ottawa, ON: Government of Canada; 2018 [updated 2018 Mar; cited 2024 Jul 15]. Part 4, Immunizing agents. Available from: https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines/page-15-pertussis-vaccine.html
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