Public Health Ontario | Santé publique Ontario

ENHANCED EPIDEMIOLOGICAL SUMMARY

# Pertussis in Ontario: January 1 - August 31, 2024

**Published: September 2024**

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

## Introduction

This report describes the epidemiology of pertussis disease activity in Ontario between January and August 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.

## Overview

- As of September 9, 2024, there were 1,016 cases (885 confirmed and 131 probable) of pertussis reported in Ontario between January 1 and August 31 2024. The year-to-date 2024 incidence rate is 6.3 cases per 100,000 population (Figure 1).
- Monthly case counts trended upward between March and August 2024. Most recently, the monthly counts in May, June, July and August of this year were above the five-year pre-pandemic average plus two standard deviations for these months (Figure 2).

- The majority of cases were among children (Table 1) and consistent with previous years, the highest age group-specific rate in 2024 is among the youngest age group (<1 year) (45.8 per 100,000). All other age group-specific rates have exceeded their respective five year pre-pandemic average rates (Figure 3).
- The 1,016 cases were identified from 33 of Ontario's 34 public health units (Figure 4).

## Trends over Time

- Annual trends in pertussis case counts and rates have fluctuated greatly over time (Figure 1).
- During the surveillance period of January 2007 to August 2024, the case count and rate was highest in 2012 with 1,044 cases identified (7.8 cases per 100,000 population).
- 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.
- Between January and August 2024, there have been 1,016 cases of pertussis reported (6.3 cases per 100,000 population). This is the highest case count observed in Ontario since 2012 and is likely to exceed this by the end of 2024.

## Case Characteristics

- Females accounted for 56.5% (574/1,016) 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=745; 73.3%) were under the age of 18 and 71 (7.0%) of cases were less than one year of age (Table 1).
- The 10-14 year old age group had the highest number of cases with 308, representing 30.3% of all pertussis cases reported to date.
- The highest age group-specific rate in 2024 so far is among the youngest age group (<1 year) which is consistent with previous years. Age group-specific rates for all persons one year of age and older have exceeded their respective five year pre-pandemic average rates (Figure 3).

## Immunization Status

- A total of 64.8% (n=658) of cases had immunization status documented in iPHIS (Table 1). Of these:
  - 278 cases (42.2%) were unimmunized.
  - 380 cases (57.8%) 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 3 weeks to 45 years).

# Severity

- Overall, 41 cases (4.0%) had a documented hospitalization in iPHIS (Table 1). Twenty-nine of the hospitalizations were among cases aged less than 18 years including 20 cases less than one year of age (range 2-38 weeks of age).
  - Two hospitalized cases were admitted to the ICU. Both cases were in children under one year of age.
  - One death was reported in a hospitalized adult case.
- There were also 111 cases with a documented emergency department visit (i.e., without an inpatient hospitalization). A total of 79 (71.2%) of these cases were among children (median age 9 years, range 2 months to 17 years).

# Geography

- Cases were reported from 33 public health units (Figure 4).
- Although Toronto Public Health (n=119), Ottawa Public Health (n=115) and York Region Public Health (n=83) had high case counts, they had comparatively low rates of 3.7, 10.2 and 6.5 cases per 100,000 population, respectively.
- Eastern Ontario Health Unit had a high case count (n=93) along with the highest rate of 39.9 per 100,000 population, followed by Peterborough Public Health and North Bay Parry Sound District Health Unit with rates of 36.2 and 29.2 cases per 100,000 population, respectively.

**Table 1. Characteristics of pertussis cases: Ontario, January-August 2024**

**Table 1A: Classification**

| Case Characteristics (n=1,016) | n | % |
|---|---|---|
| Confirmed | 885 | 87.1 |
| Probable | 131 | 12.9 |

**Table 1B: Gender**

| Case Characteristics (n=1,016) | n | % |
|---|---|---|
| Female | 574 | 56.5 |
| Male | 439 | 43.2 |

**Table 1C: Age**

| Case Characteristics (n=1,016) | n | % |
|---|---|---|
| <1 year | 71 | 7.0 |
| 1-4 years | 112 | 11.0 |
| 5-9 years | 151 | 14.9 |
| 10-14 years | 308 | 30.3 |
| 15-19 years | 126 | 12.4 |
| 20-49 years | 163 | 16.0 |
| 50-64 years | 48 | 4.7 |
| ≥65 years | 37 | 3.6 |

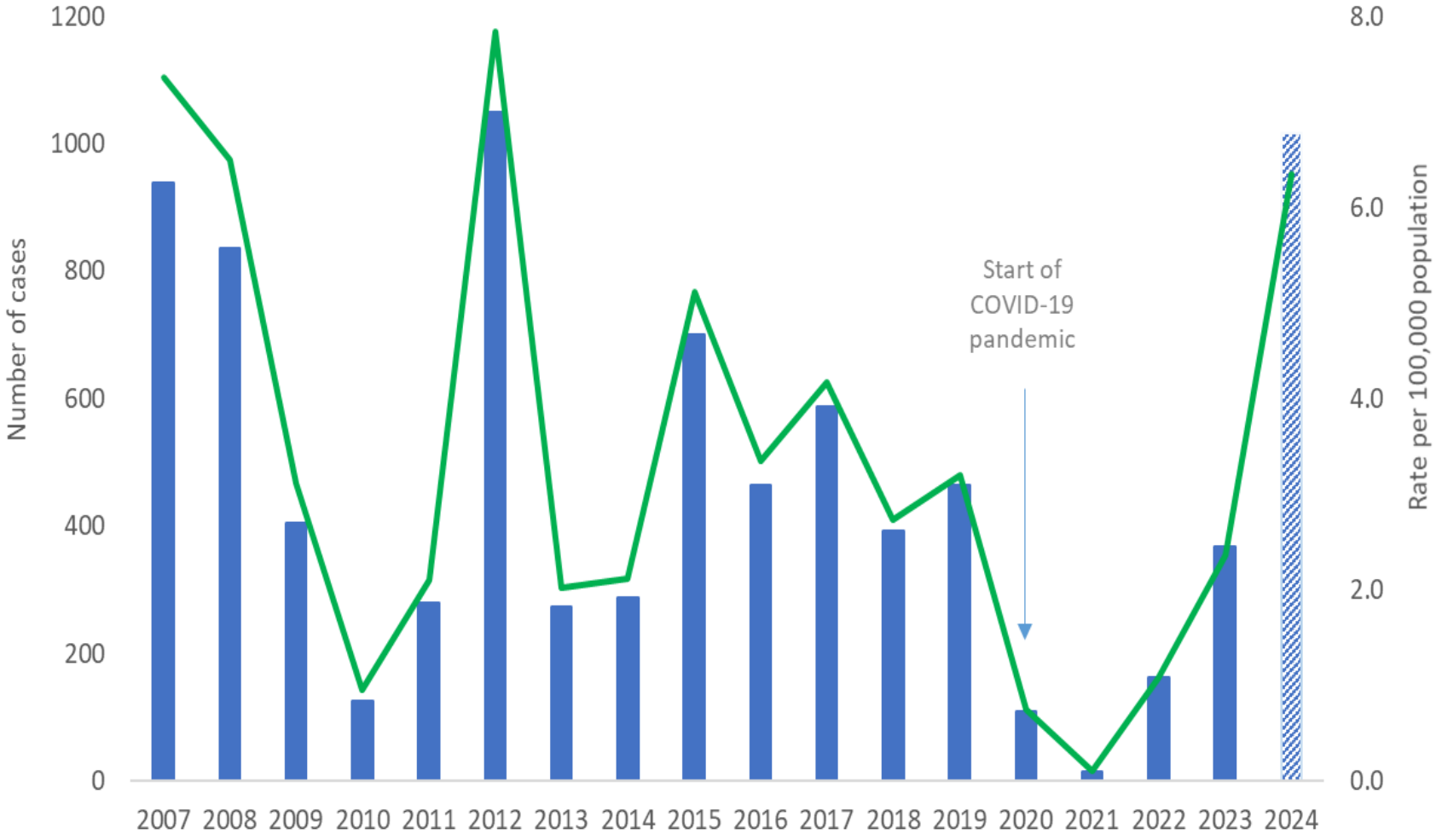
**Table 1D: Hospitalized**

| Case Characteristics (n=1,016) | n | % |
|---|---|---|
| Hospitalized (all cases) | 41 | 4.0 |
| < 1 year old | 20 | - |
| 1-4 years | 5 | - |
| 5-9 years | 0 | |
| 10-14 years | 3 | - |
| 15-19 years | 1 | |
| 20-49 years | 4 | - |
| 50-64 years | 2 | - |
| ≥65 years | 6 | - |
| **Deaths** | **1** | - |

**Table 1E: Immunization Status**

| Case Characteristics (n=1,016) | n | % |
|---|---|---|
| Not documented (i.e., unknown) | 358 | 35.2 |
| Unimmunized | 278 | 27.4 |
| Immunized | 380 | 37.4 |

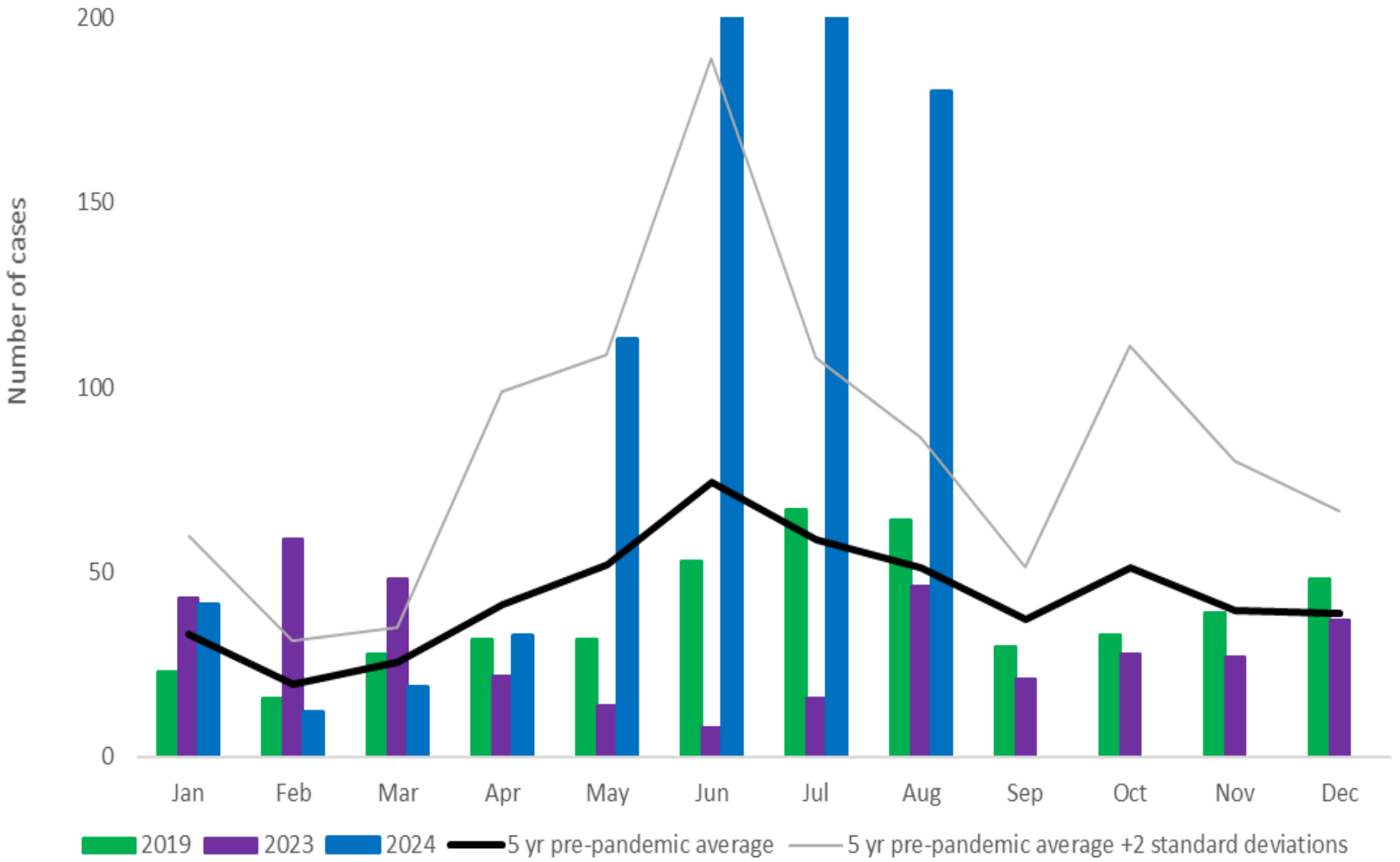
**Figure 1. Pertussis case counts and incidence rates per 100,000 population: Ontario, 2007–2024***




| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cases | 935 | 837 | 406 | 124 | 279 | 1044 | 273 | 287 | 700 | 464 | 586 | 388 | 462 | 110 | 16 | 162 | 369 | 1,016 |
| 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 | 6.3 |

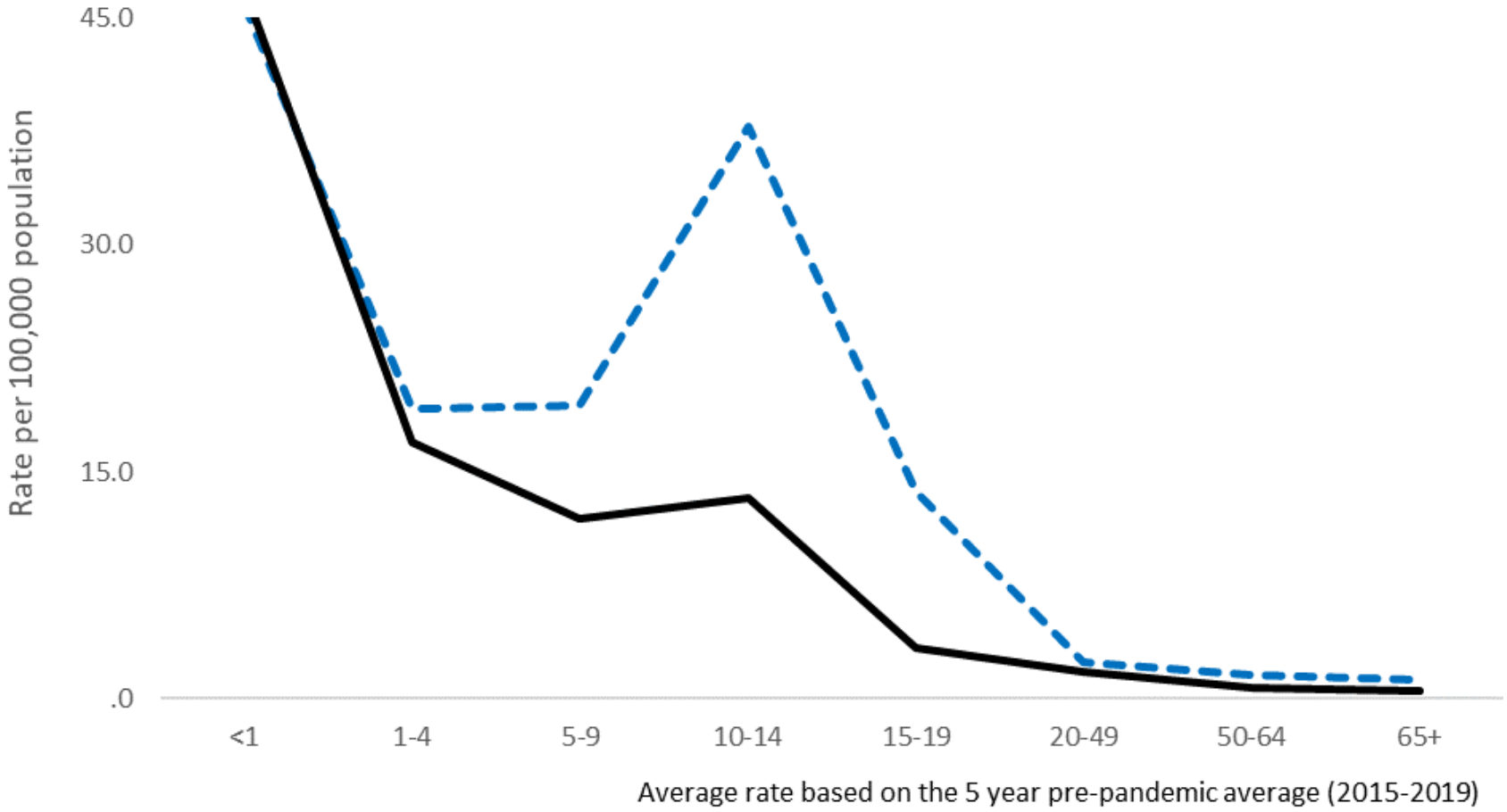
*January-August, 2024

**Figure 2. Number of pertussis cases by month: Ontario, 2019, 2023 & 2024* and pre-pandemic 5-year average (2015-2019)**




*January-August, 2024

**Figure 3: Pertussis incidence rates per 100,000 population by age group: Ontario, January-August 2024**



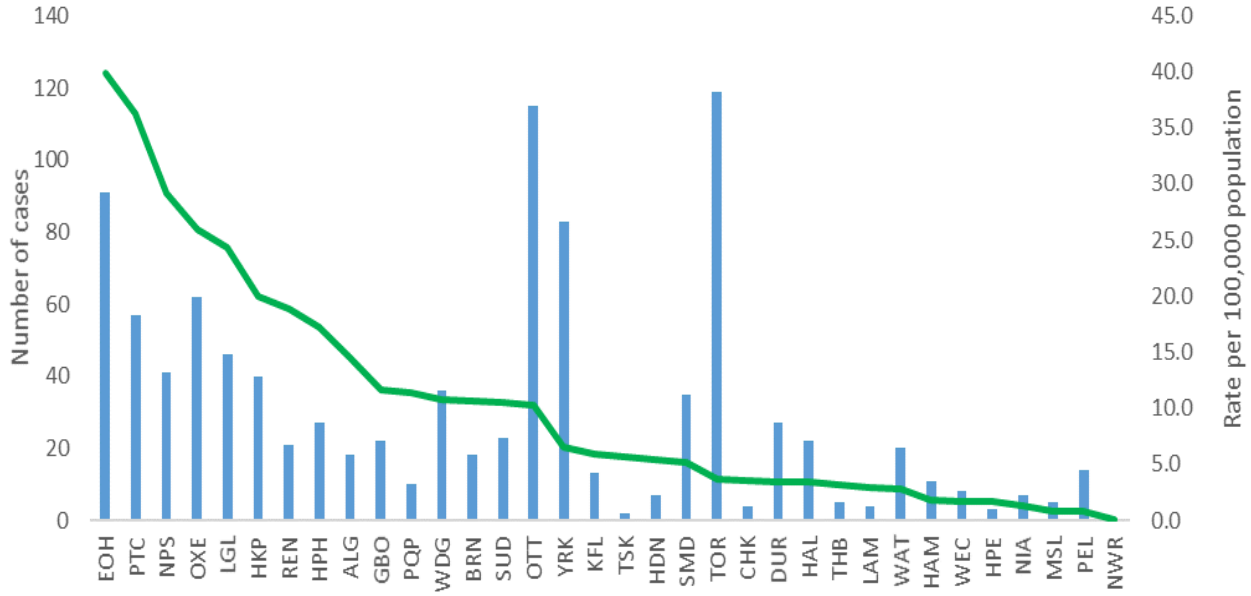

| | <1 | 1-4 | 5-9 | 10-14 | 15-19 | 20-49 | 50-64 | 65+ |
|---|---|---|---|---|---|---|---|---|
| 2024 rate | 45.8 | 19.2 | 19.4 | 37.8 | 13.7 | 2.4 | 1.6 | 1.2 |
| 5 year pre-pandemic average rate | 46.9 | 17.0 | 11.9 | 13.3 | 3.4 | 1.8 | 0.7 | 0.5 |

**Table 2: Number of pertussis cases who were immunized prior to onset*, doses received and time since last dose, by age group: Ontario, January-August 2024**

| | # Immunized Cases | # Doses Received | |
|---|---|---|---|
| **Age group** | **n** | **median** | **range** |
| < 1 year | 5 | 1 | 1-3 |
| 1-4 years | 4 | 4 | 3-4 |
| 5-9 years | 11 | 5 | 1-5 |
| 10-14 years | 71 | 5 | 1-6 |
| 15-19 years | 28 | 5 | 1-6 |
| 20-49 years | 18 | 4 | 1-7 |
| 50-64 years | 1 | 2 | 1-5 |
| 65 years | 3 | 1 | 1-4 |

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

**Figure 4: Public health unit-specific rates and cases: Ontario, January-August, 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 September 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 estimate data were sourced from Statistics Canada:

- 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.[5]
- 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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3. Ebell MH, Marchello C, Callahan M. Clinical diagnosis of Bordetella pertussis infection: a systematic review. J Am Board Fam Med. 2017;30(3): 308-19. Available from: https://doi.org/10.3122/jabfm.2017.03.160330
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## Citation

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