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Reportable Disease Trends in Ontario

2014

Technical Report
April 2016

Public Health Ontario

Public Health Ontario is a Crown corporation dedicated to protecting and promoting the health of all Ontarians and reducing inequities in health. Public Health Ontario links public health practitioners, frontline health workers and researchers to the best scientific intelligence and knowledge from around the world.

Public Health Ontario provides expert scientific and technical support to government, local public health units and health care providers relating to the following:

- communicable and infectious diseases
- infection prevention and control
- environmental and occupational health
- emergency preparedness
- health promotion, chronic disease and injury prevention
- public health laboratory services

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Reportable Disease Trends in Ontario

2014

Contributing authors

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Acknowledgements

Public Health Ontario wishes to express their sincere appreciation for the effort and dedication demonstrated by Ontario's 36 public health units in collecting and reporting data on reportable diseases. We also thank our PHO colleagues from CDEPR, IPAC, Analytic Services, Communications, Library Services, and the Public Health Ontario Laboratory for their collaboration in the development, review, and interpretation of the reportable disease trends presented here.

April 2016

Disclaimer

This document was developed by Public Health Ontario (PHO). PHO provides scientific and technical advice to Ontario's government, public health organizations and health care providers. PHO's work is guided by the current best available evidence.

PHO assumes no responsibility for the results of the use of this document by anyone.

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Introduction

Colleagues,

I am extremely pleased to present Public Health Ontario's Reportable Disease Trends in Ontario Report for 2014. Consistent with our legislative object 6(d) "to develop, collect, use, analyse and disclose data, including population health, surveillance and epidemiological data, across sectors, including human health, environmental, animal, agricultural, education, community and social services and housing sectors, in a manner that informs and enhances healthy public policy and public health planning, evaluation and action"[1] and Public Health Ontario's Strategic Direction #2 "Accelerate integrated population health monitoring", this Report summarizes and provides context to infectious diseases in Ontario. While there are limitations in the data such as the extent to which Reportable Diseases are captured in the integrated Public Health Information System (iPHIS) and through the Public Health Ontario Laboratory, and the fact that not all infectious diseases that impact Ontarians are reportable, the Report provides both insights into the burden of illness of various infectious diseases in Ontario, and flags infectious disease trends of particular concerns. Two examples of the latter are the rise in sexually transmitted illnesses such as gonorrhea and syphilis, partially among men who have sex with men; and the continued activity of vaccine preventable diseases such as measles, mumps and pertussis.

This report provides a wealth of data but our Strategic Direction #2 goes beyond the presentation of data in its present form. Through the development of novel presentation and analytic tools such as interactive web reports we aspire to enhance the reader's understanding of data trends, their relationships to geography and demographics, and their application to enable public health actions in future PHO reports.

We hope this report is useful and meets the needs of public health and health care organizations and providers. We would be happy to receive your comments at **cdepr@oahpp.ca**.

Sincerely,

Dr. Brian Schwartz, MD, MSc, CCFP (EM), FCFP
Chief, Communicable Disease, Emergency Preparedness and Response
Public Health Ontario

[1] Health Protection and Promotion Act, R.S.O. 1990, c. H.7. Available from: http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90h07_e.htm

About this report

The 2014 Reportable Disease Trends in Ontario report contributes to the provincial infectious diseases surveillance system, serving as an outlet for the dissemination of information on reportable disease epidemiology in Ontario.

The objectives of this report are:

- To summarize infectious diseases in Ontario in 2014, and where applicable, compare to historical trends.
- To describe the epidemiology of infectious diseases in Ontario for a public health audience, specifically public health units (PHUs) and the Ministry of Health and Long-Term Care (MOHLTC), using various surveillance data sources available to PHO such as the integrated Public Health Information System (iPHIS) and Public Health Ontario Laboratory data.

The scope of this report is limited to reportable diseases under Regulation 559/91 pursuant to the Health Protection and Promotion Act (HPPA), R.S.O 1990. This report provides a brief descriptive analysis of the reportable diseases with a focus on 2014 cases, along with brief commentary, interpretation, and references to other related PHO products.

Reportable disease chapters are presented in alphabetical order.

Data in this report may differ from previously published or future reports, as iPHIS is a dynamic disease reporting system that allows ongoing updates to data previously entered. As a result, data extracted from iPHIS represent a snapshot at the time of extraction and may differ from previous or subsequent reports. Discrepancies in disease counts and rates provided in this report and other published data may exist due to:

- Enhanced data cleaning for this report for select analyses, such as the linkage of iPHIS and laboratory data and subsequent reconciliation in iPHIS
- Late reporting
- Local and/or provincially-led data cleaning initiatives
- Differences in data extraction dates.

Where such variability exists, data provided in other PHO surveillance products (e.g., Monthly Infectious Diseases Surveillance Report) or published research may be more appropriate sources depending on how the methodology, data caveats, and/or extraction dates align with the intended use of the data. For more information on the data used for this report, please refer to the Technical Notes.

The 2014 report is also available in an interactive format, which provides quick, at-a-glance highlights of the full content presented in this document. Both versions of the report are available on PHO's website.

We welcome your comments and suggestions regarding the 2014 report to help us make future editions more useful to you. Please contact the Communicable Diseases, Emergency Preparedness and Response (CDEPR) department at CDEPR@oahpp.ca.

List of acronyms

AEFI - Adverse events following immunization

AFP - Acute flaccid paralysis

AIDS - Acquired immunodeficiency syndrome

CDEPR - Communicable Diseases, Emergency Preparedness and Response

CDI - *Clostridium difficile* infection

CJD - Creutzfeldt-Jakob disease

CJDSS - Canadian CJD Surveillance System

CRS - Congenital rubella syndrome

DHU - Diagnosing health unit

FFI - Fatal Familial Insomnia

GBS - Group B streptococcal disease (neonatal)

GSS - Gerstmann-Sträussler-Scheinker Syndrome

Hib - *Haemophilus influenzae* type B

HIV - Human immunodeficiency virus

HPPA - Health Protection and Promotion Act

HPS - Hantavirus pulmonary syndrome

HUS - Hemolytic uremic syndrome

iGAS - Invasive group A streptococcal disease

IMD - Invasive meningococcal disease

IPD - Invasive pneumococcal disease

iPHIS - integrated Public Health Information System

IPV - Inactivated polio vaccine

MCC - Meningococcal C conjugate vaccine

MCV4 - Meningococcal conjugated vaccine

MDR-TB - Multidrug-resistant tuberculosis (TB)

MMR vaccine - Measles, mumps, rubella vaccine

MMRV vaccine - Measles, mumps, rubella, varicella vaccine

MOHLTC - Ministry of Health and Long-Term Care

MSM - Men who have sex with men

NAAT - Nucleic acid amplification testing

ONBOIDS - Ontario Burden of Infectious Disease Study

PCR - Polymerase chain reaction

PCV - Pneumococcal conjugate vaccine

PHAC - Public Health Agency of Canada

PAHO - Pan American Health Organization

PHO - Public Health Ontario

PHOL - Public Health Ontario Laboratory

PHU - Public health unit

PPV - Pneumococcal polysaccharide vaccine

RDIS - Reportable Diseases Information System

SARS - Severe acute respiratory syndrome

STEC - Shiga toxin-producing *E. coli*

STI - Sexually transmitted infections

TB - Tuberculosis

VHFs - Viral hemorrhagic fevers

VTEC - Verotoxin-producing *E. coli* infections

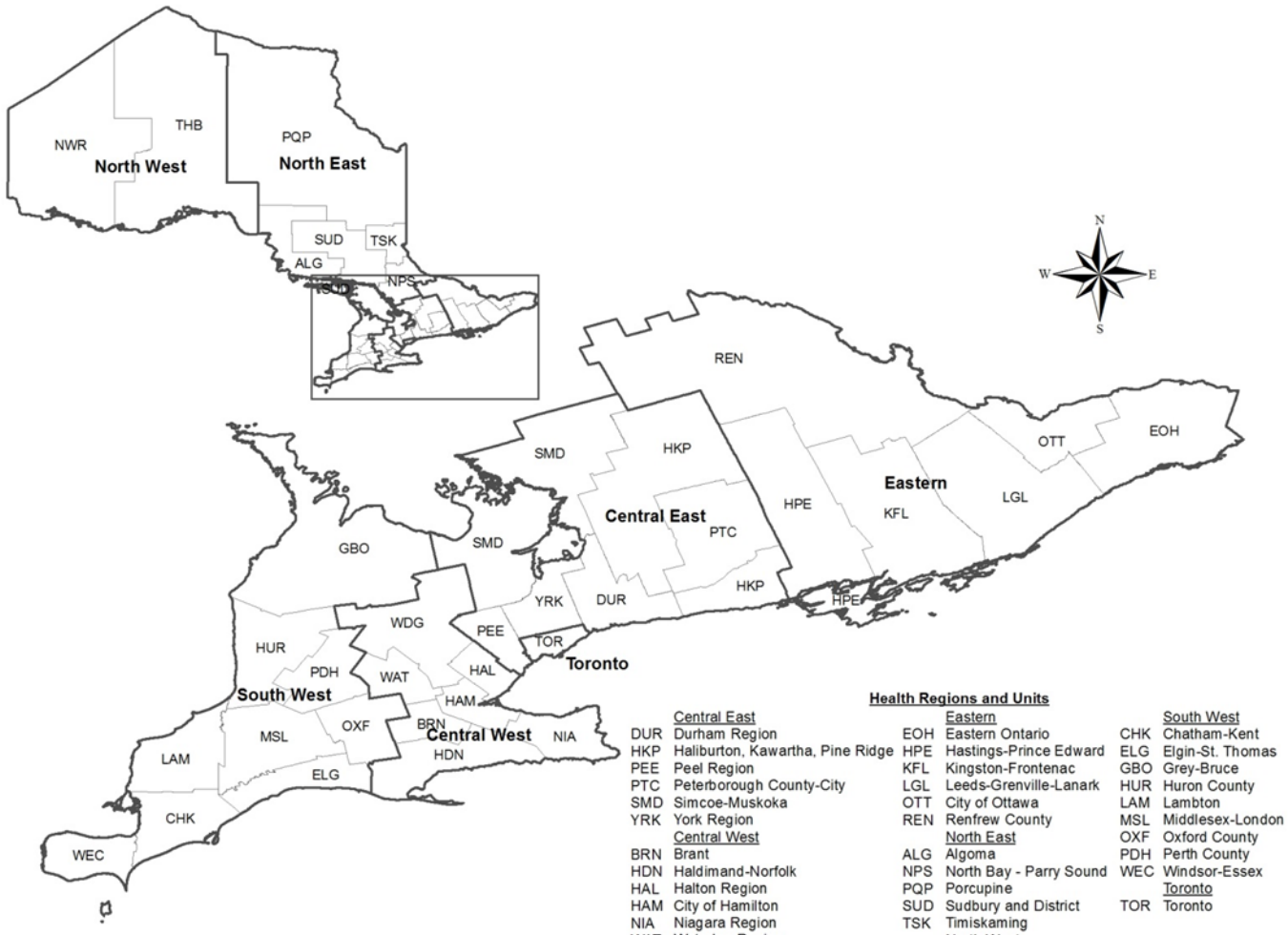
WHO - World Health Organization

WNV - West Nile virus

XDR-TB - Extensively drug-resistant tuberculosis (TB)

Ontario's public health units and regions

As depicted in the map below, there are 36 public health units (PHUs) in Ontario, which are grouped into health regions. The table on the following page also provides a reference to PHU abbreviations used in this report.



Health Regions and Units

	Central East		Eastern		South West
DUR	Durham Region	EOH	Eastern Ontario	CHK	Chatham-Kent
HKP	Haliburton, Kawartha, Pine Ridge	HPE	Hastings-Prince Edward	ELG	Elgin-St. Thomas
PEE	Peel Region	KFL	Kingston-Frontenac	GBO	Grey-Bruce
PTC	Peterborough County-City	LGL	Leeds-Grenville-Lanark	HUR	Huron County
SMD	Simcoe-Muskoka	OTT	City of Ottawa	LAM	Lambton
YRK	York Region	REN	Renfrew County	MSL	Middlesex-London
	Central West		North East	OXF	Oxford County
BRN	Brant	ALG	Algoma	PDH	Perth County
HDN	Haldimand-Norfolk	NPS	North Bay - Parry Sound	WEC	Windsor-Essex
HAL	Halton Region	PQP	Porcupine		Toronto
HAM	City of Hamilton	SUD	Sudbury and District	TOR	Toronto
NIA	Niagara Region	TSK	Timiskaming		
WAT	Waterloo Region		North West		
WDG	Wellington-Dufferin-Guelph	NWR	Northwestern		
		THB	Thunder Bay		

Public health units and regions

Public Health Units and Regions	Abbreviation
NORTH WEST	
Thunder Bay District	THB
Northwestern	NWR
NORTH EAST	
Algoma	ALG
North Bay Parry Sound District	NPS
Porcupine	PQP
Sudbury & District	SUD
Timiskaming	TSK
EASTERN	
Eastern Ontario	EOH
City of Ottawa	OTT
Hastings & Prince Edward Counties	HPE
Kingston, Frontenac and Lennox & Addington	KFL
Leeds, Grenville and Lanark District	LGL
Renfrew County and District	REN
CENTRAL EAST	
Durham Region	DUR
Haliburton, Kawartha, Pine Ridge	HKP
Peel Region	PEE
Peterborough County-City	PTC
Simcoe Muskoka District	SMD
York Region	YRK

Public Health Units and Regions	Abbreviation
TORONTO	
Toronto	TOR
SOUTH WEST	
Chatham-Kent	CHK
Elgin-St. Thomas	ELG
Grey Bruce	GBO
Huron County	HUR
Lambton County	LAM
Middlesex-London	MSL
Oxford County	OXF
Perth District	PDH
Windsor-Essex County	WEC
CENTRAL WEST	
Brant County	BRN
City Of Hamilton	HAM
Haldimand-Norfolk	HDN
Halton Region	HAL
Niagara Region	NIA
Waterloo Region	WAT
Wellington-Dufferin-Guelph	WDG

Chapter 1.

Acquired immunodeficiency syndrome and human immunodeficiency virus infection

General overview for 2014: Human Immunodeficiency Virus (HIV)

Incidence and comparison to Canada (Figure 1-1): In 2014, 745 cases of HIV were reported in Ontario, corresponding to a reported rate of 5.5 cases per 100,000 population. A general decrease in the reported rate of HIV has been observed since 2006. Provincial rates have been lower than the Canadian rates from 2008 onwards.

Age and sex (Figure 1-2): In 2014, males accounted for 81.2% (605/745) of reported HIV cases in Ontario. The reported rate among males (9.1 cases per 100,000 population) in 2014 was more than four times higher compared to the reported rate among females (2.0 cases per 100,000 population; data not shown). Overall, cases ranged from less than 1 to 77 years of age. Among both males and females, the reported rate of HIV was highest among those in the 30 to 39 years age group.

Geographic distribution (Map 1-1): Cases of HIV were reported in 30 public health units, with 54.8% of cases (408/745) reported in Toronto. The public health units reporting the highest rates of HIV in Ontario in 2014 were Toronto, Middlesex-London, and City of Ottawa, with 14.7, 7.1, and 6.2 cases per 100,000 population, respectively.

Deaths: Eight of the HIV cases reported in 2014 were fatal; however, two of these cases were not recorded in iPHIS as having Acquired Immunodeficiency Syndrome (AIDS). It is possible that these cases had an AIDS indicative disease and that this information was not captured in iPHIS.

Additional methodological issues

There are several challenges associated with HIV surveillance. The annual count of HIV cases is made up of cases that are reported to public health units in Ontario during the year. This does not reflect when the cases acquired their HIV infection, which may have occurred considerably earlier than the time of testing/diagnosis. Anonymous testing for HIV also presents challenges for surveillance. HIV rates may be underestimated as anonymous test results are not consistently entered in iPHIS. On the other hand, HIV rates may be overestimated in some jurisdictions when individuals travel outside of their own public health unit of residence to seek anonymous testing, with cases being reported in the health unit jurisdiction providing the anonymous testing. This may also result in duplication of case counts when nominal confirmatory tests are entered in iPHIS for cases previously entered as anonymously tested cases.

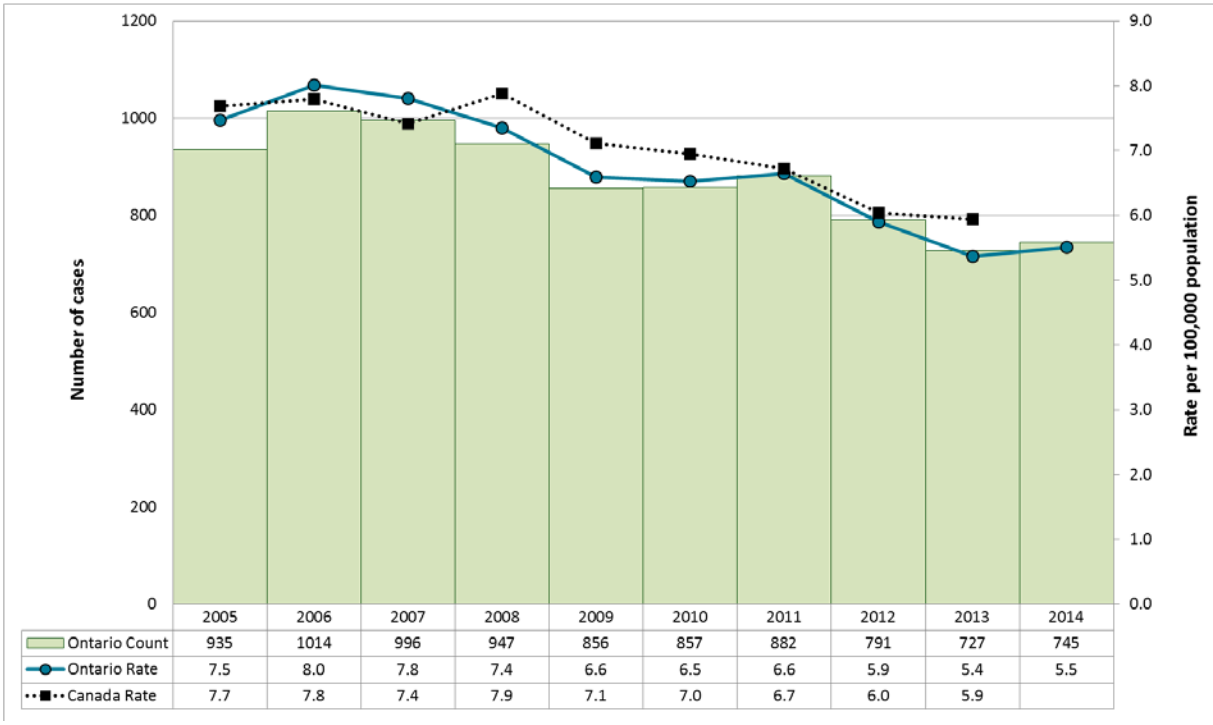
If an HIV case is reported in a given year and progresses to/is diagnosed with AIDS in the same year, that person will be counted in both the HIV and AIDS case counts. Consequently, counts of HIV and AIDS are not mutually exclusive in this report and cannot be combined.

If a death takes place after public health units have completed follow-up of a HIV case, the information may not be reported to the public health unit, resulting in the death not being recorded in iPHIS. Therefore data on HIV deaths as reported in iPHIS may not reflect true counts.

Additional sources of information

- Ontario HIV Epidemiologic Monitoring Unit at the Dalla Lana School of Public Health, University of Toronto
- The Ontario HIV Treatment Network
- The Ontario HIV Epidemiology and Surveillance Initiative

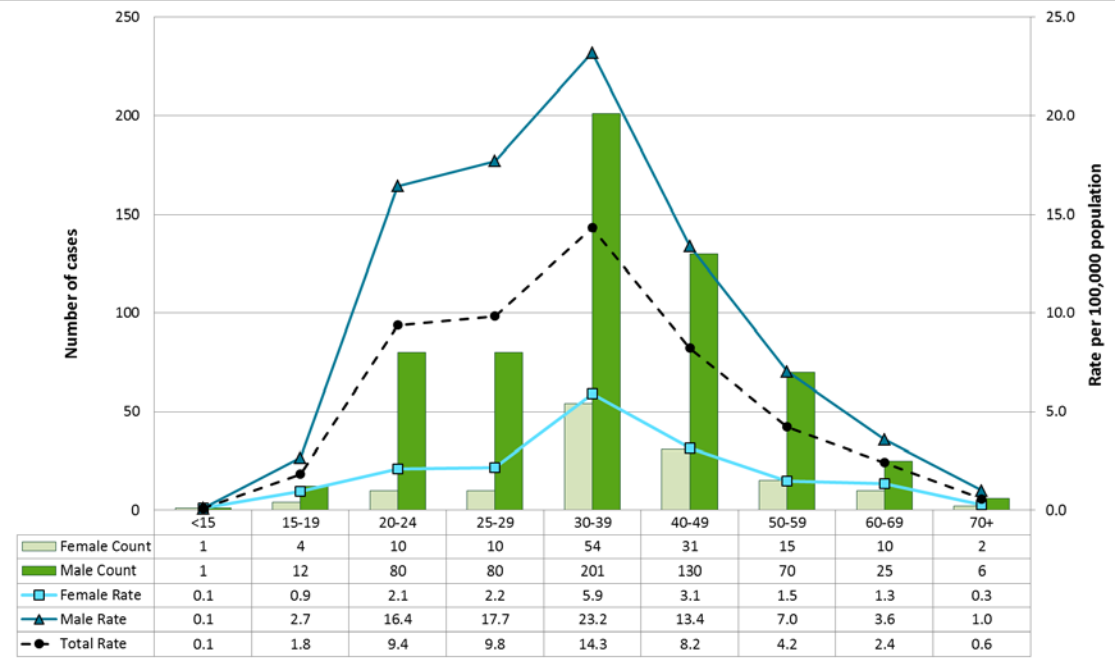
Figure 1-1. Reported cases and rates of HIV: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	935	1014	996	947	856	857	882	791	727	745
Ontario Rate	7.5	8.0	7.8	7.4	6.6	6.5	6.6	5.9	5.4	5.5
Canada Rate	7.7	7.8	7.4	7.9	7.1	7.0	6.7	6.0	5.9	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

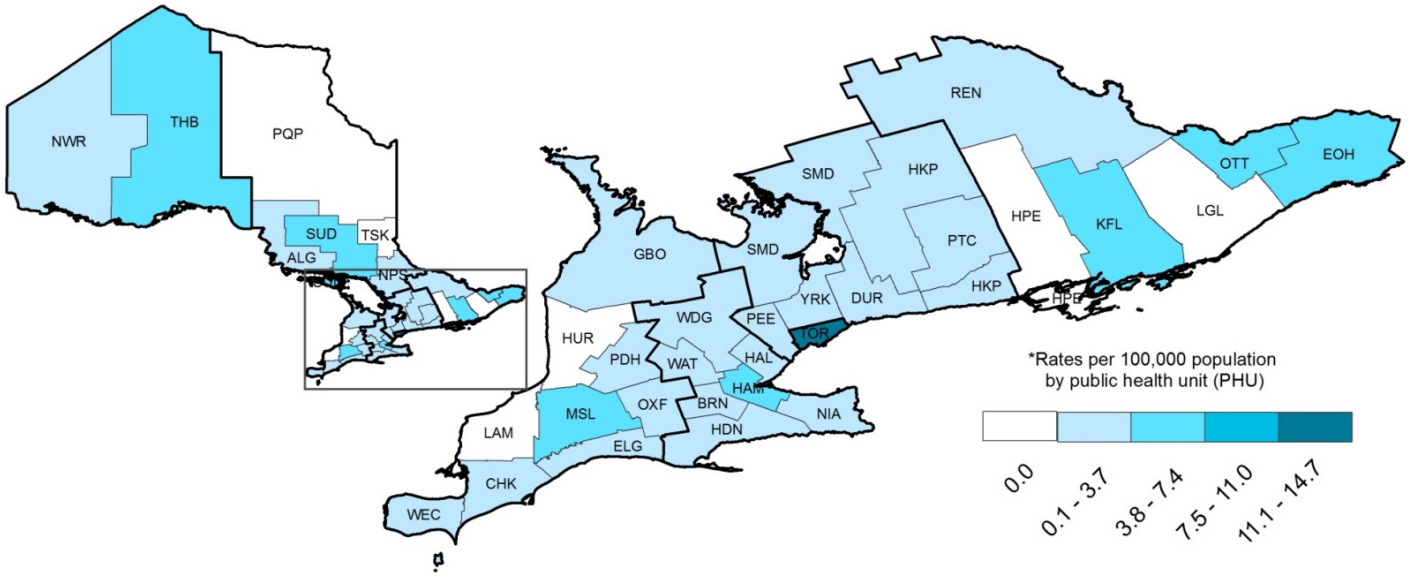
Figure 1-2. Reported rates of HIV by age and sex: Ontario, 2014



	<15	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	1	4	10	10	54	31	15	10	2
Male Count	1	12	80	80	201	130	70	25	6
Female Rate	0.1	0.9	2.1	2.2	5.9	3.1	1.5	1.3	0.3
Male Rate	0.1	2.7	16.4	17.7	23.2	13.4	7.0	3.6	1.0
Total Rate	0.1	1.8	9.4	9.8	14.3	8.2	4.2	2.4	0.6

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes three cases of unknown age and/or sex.

Map 1-1. Reported rates of HIV by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	3	2.6
BRN	4	2.8
CHK	1	0.9
DUR	16	2.5
ELG	3	3.3
EOH	8	3.9
GBO	2	1.2
HAL	20	3.7
HAM	25	4.6
HDN	2	1.8
HKP	1	0.6
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	9	4.5
LAM	0	0.0
LGL	0	0.0
MSL	33	7.1
NIA	8	1.8
NPS	4	3.1
NWR	2	2.5
OTT	58	6.2
OXF	1	0.9
PDH	1	1.3
PEE	52	3.7
PQP	0	0.0
PTC	4	2.9

PHU	Cases (n)	*Rates
REN	1	0.9
SMD	14	2.6
SUD	12	6.0
THB	7	4.5
TOR	408	14.7
TSK	0	0.0
WAT	4	0.7
WDG	9	3.2
WEC	13	3.2
YRK	20	1.8
Ontario	**745**	**5.5**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

General overview for 2014: Acquired Immunodeficiency Syndrome (AIDS)

Incidence and comparison to Canada (Figure 1-3): In 2014, there were 71 newly diagnosed cases of AIDS reported in Ontario, corresponding to an incidence rate of 0.5 cases per 100,000 population. Despite a degree of annual variability, the overall incidence rate of reported AIDS cases decreased between 2005 and 2014, from a high of 1.7 cases per 100,000 population in 2005 to a low of 0.5 cases per 100,000 population in 2014. In 2014, the HIV diagnoses of 74.6% (53/71) of AIDS cases were reported to public health units during the same year of, after, or less than 30 days prior to their diagnoses with AIDS (data not shown). These data suggest that a substantial proportion of AIDS cases may not have had previous knowledge of their HIV infection, and that the infection had progressed to the point of diagnosis with an AIDS indicative disease. However, some of these cases may have been screened for HIV anonymously or outside of Ontario prior to 2014.

Age and sex (Figure 1-4): In 2014, males accounted for 76.1% (54/71) of reported AIDS cases in Ontario. The incidence rate among males (0.8 cases per 100,000 population) was four times higher than the incidence rate among females (0.2 cases per 100,000 population; data not shown). Reported cases of AIDS ranged in age from 18 to 71 years. The incidence rate of AIDS was highest among both males and females in the 30 to 49 year age groups.

Geographic distribution (Map 1-2): In 2014, newly diagnosed cases of AIDS were reported in 17 of Ontario's public health units, with the largest proportion of cases (38.0%, 27/71) reported in Toronto. The highest incidence rates were reported by Thunder Bay District, Northwestern, and Elgin-St. Thomas public health units, with 3.9, 2.5, and 2.2 cases per 100,000 population, respectively. The high rates observed in these public health units are likely the result of low case counts in jurisdictions with relatively small populations.

Deaths: Eight cases diagnosed with AIDS in Ontario in 2014 were reported as fatal.

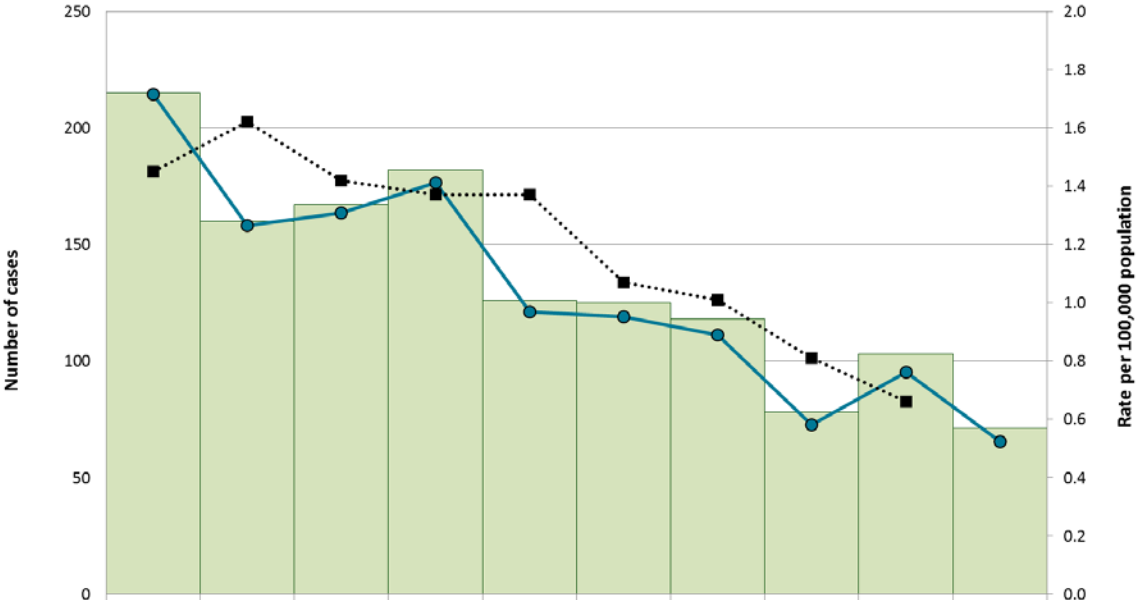
Additional methodological issues

The number of AIDS cases reported to public health units is likely an underestimate of the true incidence of AIDS in a given year. With the widespread use of effective and well-tolerated anti-retroviral therapies and effective treatments for AIDS indicative diseases, AIDS-related complications such as multiple or recurrent bacterial infections, esophageal candidiasis, chronic herpes simplex, Kaposi's sarcoma, and others can be successfully treated.[1] Although these AIDS indicative diseases may have historically been diagnosed in the later stages of HIV infection, ultimately leading to death, they may currently be successfully treated before the HIV-infected person is reported as a case of AIDS to a public health unit. In addition, there may be a perception among clinicians that some of these AIDS indicative diseases, in light of current and effective therapies, are not always indicative of disease progression to AIDS. If death due to AIDS occurs after a public health unit has completed follow-up with the case, the death may not be reported to the public health unit or recorded in iPHIS.

Additional sources of information

- Ontario HIV Epidemiologic Monitoring Unit at the Dalla Lana School of Public Health, University of Toronto
- The Ontario HIV Treatment Network

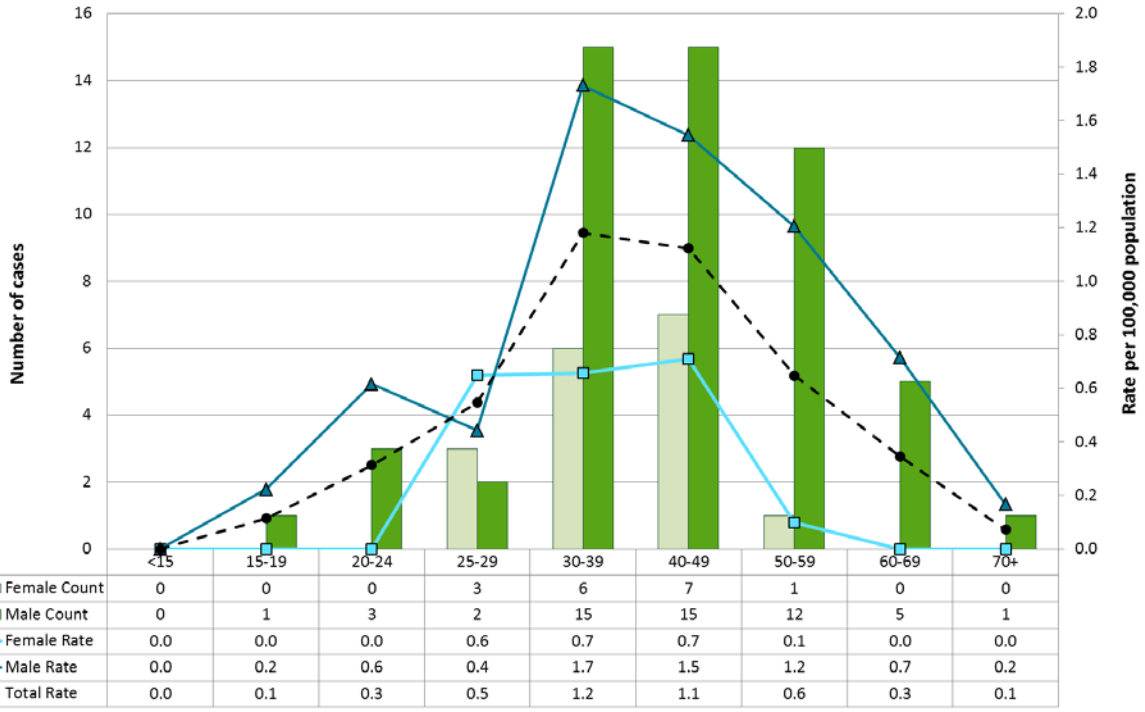
Figure 1-3. Incidence of AIDS: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	215	160	167	182	126	125	118	78	103	71
Ontario Rate	1.7	1.3	1.3	1.4	1.0	1.0	0.9	0.6	0.8	0.5
Canada Rate	1.5	1.6	1.4	1.4	1.4	1.1	1.0	0.8	0.7	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2014/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.
Note: Quebec did not report AIDS cases to Public Health Agency of Canada (PHAC) from 2004-2012 and Newfoundland did not report AIDS cases to PHAC from 2009-2012; the populations of these provinces were removed prior to national rate calculation for the years they did not report.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

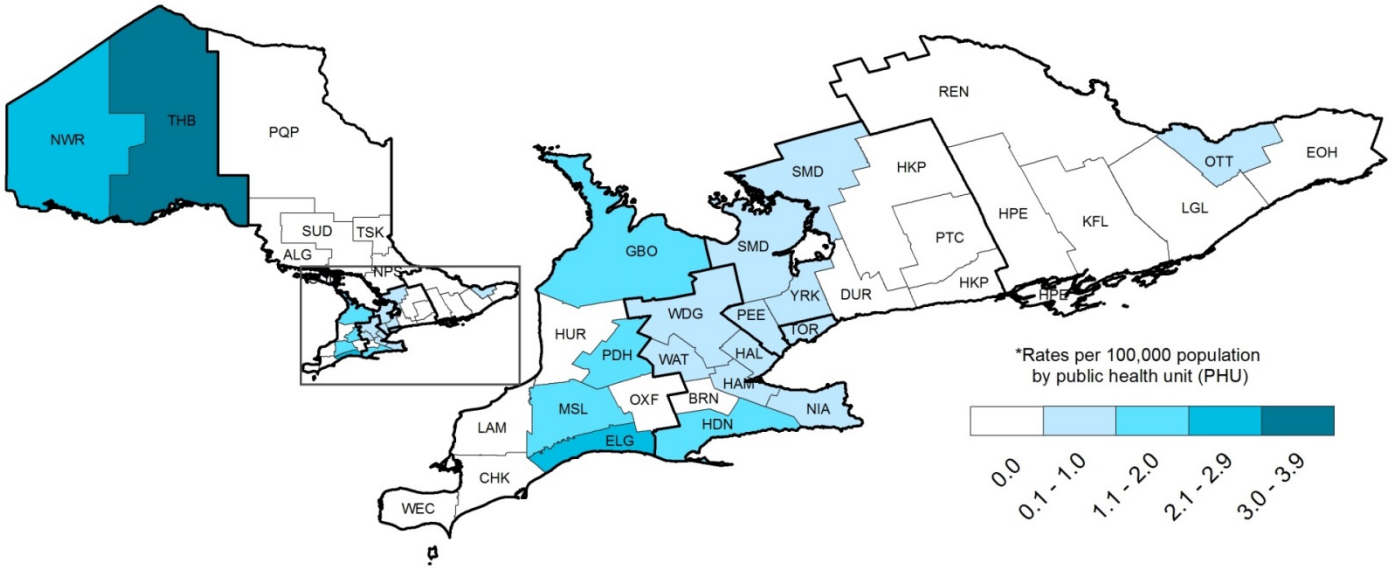
Figure 1-4. Incidence of AIDS by age and sex: Ontario, 2014



	<15	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	0	0	0	3	6	7	1	0	0
Male Count	0	1	3	2	15	15	12	5	1
Female Rate	0.0	0.0	0.0	0.6	0.7	0.7	0.1	0.0	0.0
Male Rate	0.0	0.2	0.6	0.4	1.7	1.5	1.2	0.7	0.2
Total Rate	0.0	0.1	0.3	0.5	1.2	1.1	0.6	0.3	0.1

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Map 1-2. Incidence of AIDS by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	0	0.0
CHK	0	0.0
DUR	0	0.0
ELG	2	2.2
EOH	0	0.0
GBO	2	1.2
HAL	2	0.4
HAM	3	0.5
HDN	2	1.8
HKP	0	0.0
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	0	0.0
LAM	0	0.0
LGL	0	0.0
MSL	5	1.1
NIA	1	0.2
NPS	0	0.0
NWR	2	2.5
OTT	3	0.3
OXF	0	0.0
PDH	1	1.3
PEE	5	0.4
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	2	0.4
SUD	0	0.0
THB	6	3.9
TOR	27	1.0
TSK	0	0.0
WAT	2	0.4
WDG	2	0.7
WEC	0	0.0
YRK	4	0.4
Ontario	**71**	**0.5**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03]

Chapter 2.

Acute flaccid paralysis

General overview for 2014

Acute flaccid paralysis (AFP) is a clinical syndrome consisting of a set of symptoms. It can result from a variety of different causes, including but not limited to infectious agents.[2] AFP surveillance is conducted to rule out poliovirus as the causative agent as part of efforts to maintain Canada's polio-free certification status.[3] Global surveillance indicators for certification include the detection of at least one AFP case in every 100,000 children less than 15 years of age. AFP has been nationally notifiable in Canada since 1996 and was made reportable in Ontario on December 4, 2013.[2] Cases of all ages were briefly reportable in Ontario from October 2, 2014 to April 22, 2015 during a period of enhanced surveillance for enterovirus D68 (EV-D68) (discussed further below). Only cases under 15 years of age, as per the national case definition,[4] are included in this chapter.

Incidence and comparison to Canada: In 2014 there were 13 confirmed cases of AFP reported in children less than 15 years of age in Ontario, representing an incidence rate of 0.6 cases per 100,000 population less than 15 years of age. National incidence rates of AFP ranged from a high of 1.1 cases per 100,000 population less than 15 years of age in 2009 to a low of 0.6 per 100,000 population less than 15 years of age in 2012. Historical data for Ontario is unavailable for comparison as AFP was not reportable until December 2013.

Age and sex (Figure 2-1): Cases were between 2 to 13 years of age, with a median age of 8 years. The highest age-specific incidence rate was observed among those 5-9 years of age (0.8 cases per 100,000 population). Overall, eight (61.5%) of the cases were males.

Causative agent (Table 2-1): Information relating to the detection of a causative agent was entered for 11 of the 13 cases (84.6%). Of these, the most common causative agent was enterovirus/echovirus (27.3%). Based on data entered into iPHIS, the number of AFP cases who underwent laboratory testing to rule out poliovirus as the causative agent could not be determined.

Immunization: Polio-related immunization information was entered for nine of the 13 cases (69.2%). Among these cases, four (44.4%) were reported to have received five doses of polio-containing vaccine. The other five cases (55.6%) were reported to have received four doses of polio-containing vaccine. Eight cases were considered up to date for their age.

Hospitalizations and deaths: Ten of the 13 cases (76.9%) were reported as hospitalized. None of the cases had a fatal outcome.

Highlights

The reporting of 22 AFP cases among children less than 15 years of age in Ontario in 2014 would have been required in order to meet the global indicator for AFP surveillance (i.e., detecting at least one AFP case in every 100,000 children less than 15 years of age). We have fallen short of this indicator by 9 cases.

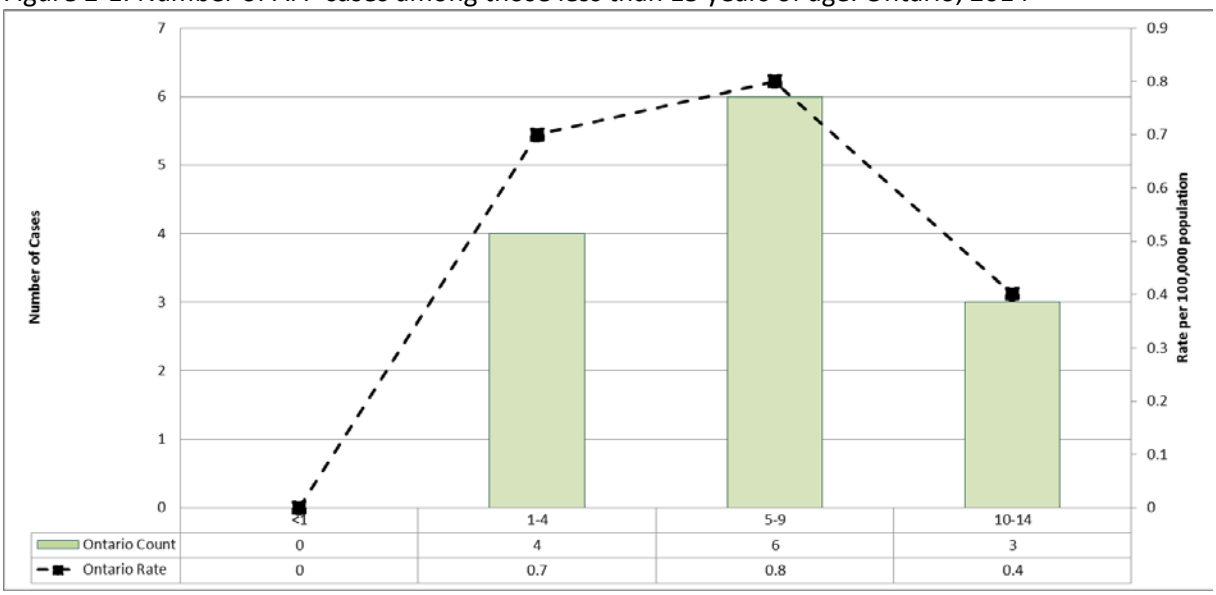
In the late summer of 2014, the United States Center for Disease Control and Prevention began investigating reports of children who had developed acute flaccid myelitis in association with EV-D68.[5] The identification of EV-D68 in multiple states and several provinces in the early fall of 2014 triggered enhanced surveillance for EV-D68 in Canada and Ontario. In Ontario, the PHO Laboratory conducts enhanced surveillance on a subset of patients with recent respiratory specimens to monitor the virus.[6] In addition, the age restriction of the AFP case definition was removed to prompt the reporting of AFP cases of all ages, during the period of enhanced reporting (October 2, 2014 to April 22, 2015). In addition to the cases mentioned above, four cases of AFP were reported in individuals 15 years of age and older between October and December 2014. A few children in

Canada, including Ontario, with acute muscle weakness or paralysis tested positive for EV-D68.[6] The family of enteroviruses, which includes poliovirus, is known to be associated with neurologic symptoms.[6]

Additional sources of information

- PHO Grand Rounds: The road to polio eradication: Maintaining Canada's polio-free certification through surveillance for acute flaccid paralysis
- Ontario Ministry of Health and Long-Term Care. Infectious Disease Protocol, 2015. Appendix B: Provincial case definitions for reportable diseases.

Figure 2-1. Number of AFP cases among those less than 15 years of age: Ontario, 2014



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Table 2-1. AFP cases by cause: Ontario, 2014

Cause	Cases	
	n	%
Enterovirus/Echovirus	3	23.1
Guillain-Barré syndrome[a]	3	23.1
Rhinovirus	1	7.7
Transverse myelitis[b]	2	15.4
Unspecified	4	30.8
Total	**13**	**100.0**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Note: a. Guillain-Barré syndrome includes both infectious and non-infectious causes.
b. Transverse myelitis includes both infectious and non-infectious causes.

Chapter 3.

Amebiasis

General overview for 2014

Incidence and comparison to Canada (Figure 3-1): Amebiasis is caused by the parasite *Entamoeba histolytica*. In 2014, there were 108 confirmed cases and 640 probable cases of amebiasis reported in Ontario, representing a combined incidence rate of 5.5 cases per 100,000 population. The annual number of cases has been relatively steady since 2007. No comparable national data are available because amebiasis is not a nationally notifiable disease.

Age and sex (Figure 3-2): The highest incidence rates were observed in the 40-49 and 30-39 year age groups (9.1 cases per 100,000 population and 8.9 cases per 100,000 population, respectively). Amebiasis mostly affects young to middle-aged adults.[7] Males were disproportionately affected, accounting for 75.3% of all amebiasis cases reported in 2014.

Seasonal trends (Figure 3-3): Amebiasis is reported throughout the year with no notable seasonal trends.

Geographic distribution (Map 3-1): The highest incidence rates were reported by Toronto (14.4 cases per 100,000 population), City of Ottawa (7.8 cases per 100,000 population), and Peel Region (7.4 cases per 100,000 population).

Hospitalizations and deaths: Hospitalization was reported for 0.9% (7/748) of cases and one death was reported.

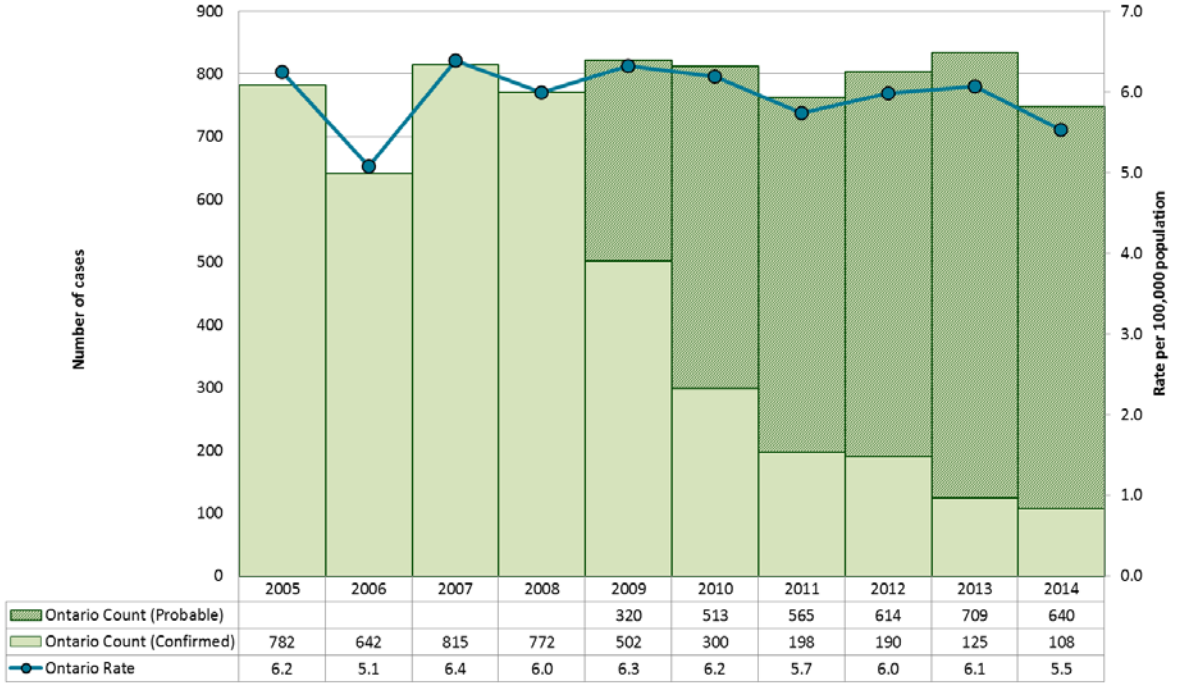
Additional methodological issues

In early 2009, the provincial case definition for amebiasis was revised to include both confirmed and probable cases. The probable case definition applies when it is not possible to differentiate between *E. histolytica* and *E. dispar* (the non-pathogenic organism of the same genus). While the 2009 change in case definition did not have an impact on the total number of cases reported annually, the number of confirmed cases has been lower than the number of probable cases reported in each subsequent year.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, May 2015 edition (Volume 4, Issue 5)

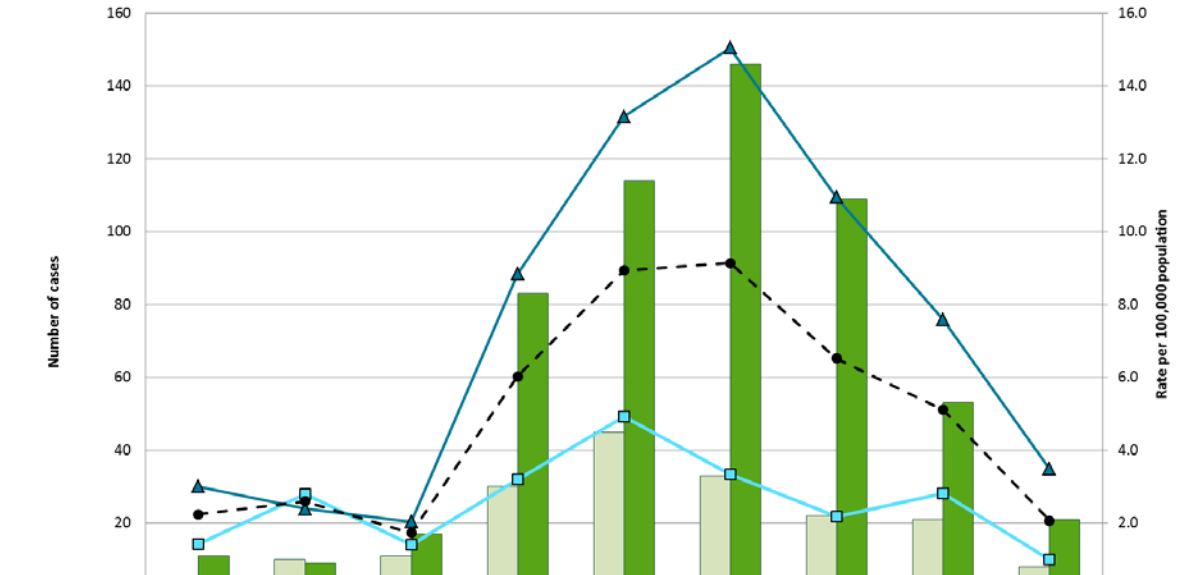
Figure 3-1. Incidence of confirmed and probable amebiasis: Ontario, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count (Probable)					320	513	565	614	709	640
Ontario Count (Confirmed)	782	642	815	772	502	300	198	190	125	108
Ontario Rate	6.2	5.1	6.4	6.0	6.3	6.2	5.7	6.0	6.1	5.5

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Incidence rates for Ontario are based on confirmed and probable cases.

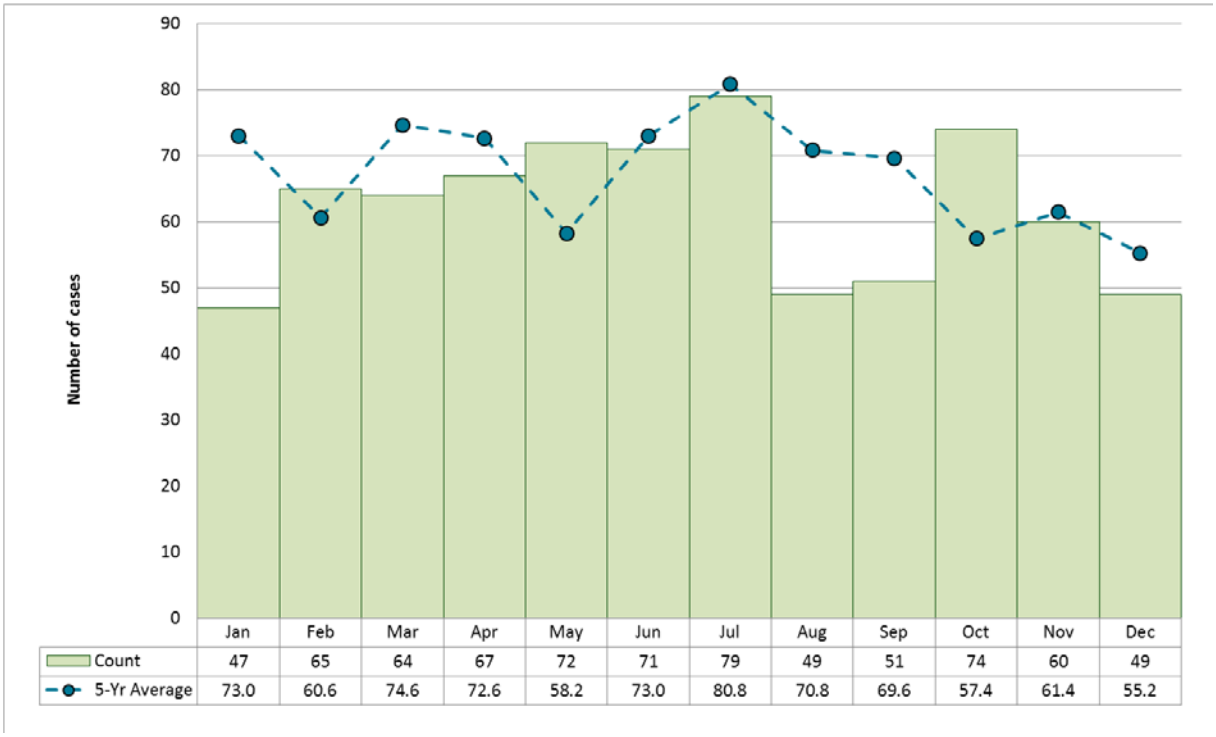
Figure 3-2. Incidence of amebiasis by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	5	10	11	30	45	33	22	21	8
Male Count	11	9	17	83	114	146	109	53	21
Female Rate	1.4	2.8	1.4	3.2	4.9	3.3	2.2	2.8	1.0
Male Rate	3.0	2.4	2.0	8.8	13.2	15.0	10.9	7.6	3.5
Total Rate	2.2	2.6	1.7	6.0	8.9	9.1	6.5	5.1	2.1

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

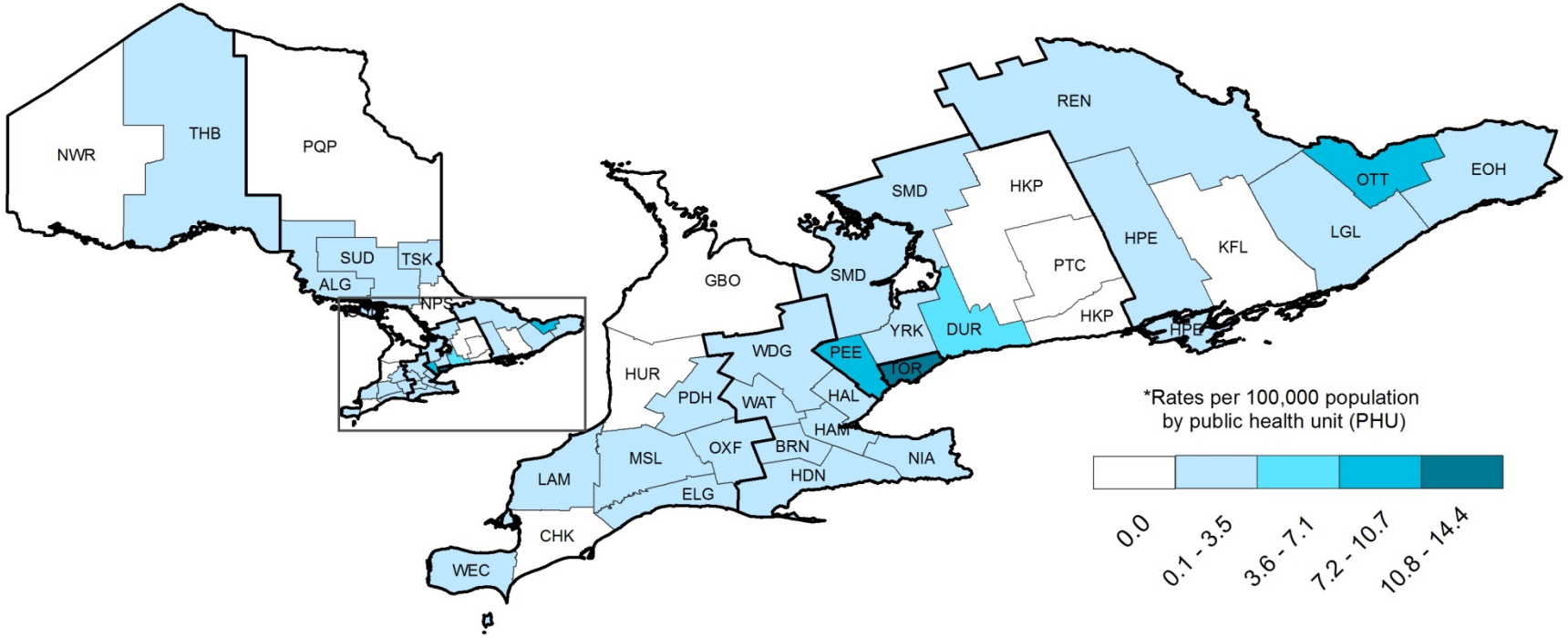
Figure 3-3. Number of amebiasis cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	47	65	64	67	72	71	79	49	51	74	60	49
5-Yr Average	73.0	60.6	74.6	72.6	58.2	73.0	80.8	70.8	69.6	57.4	61.4	55.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 3-1. Incidence of amebiasis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	1	0.9
BRN	5	3.5
CHK	0	0.0
DUR	24	3.7
ELG	1	1.1
EOH	4	2.0
GBO	0	0.0
HAL	19	3.5
HAM	13	2.4
HDN	2	1.8
HKP	0	0.0
HPE	2	1.2
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	0	0.0
LAM	3	2.3
LGL	2	1.2
MSL	11	2.4
NIA	15	3.4
NPS	0	0.0
NWR	0	0.0
OTT	73	7.8
OXF	1	0.9
PDH	1	1.3
PEE	103	7.4
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	1	0.9
SMD	11	2.1
SUD	1	0.5
THB	1	0.6
TOR	398	14.4
TSK	1	2.9
WAT	17	3.2
WDG	4	1.4
WEC	10	2.5
YRK	24	2.2
Ontario	**748**	**5.5**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03

Chapter 4.

Anthrax

General overview for 2014

No cases of anthrax were reported in Ontario in 2014. No human cases have been reported in Ontario since electronic reporting began in 1991.

Chapter 5.

Botulism

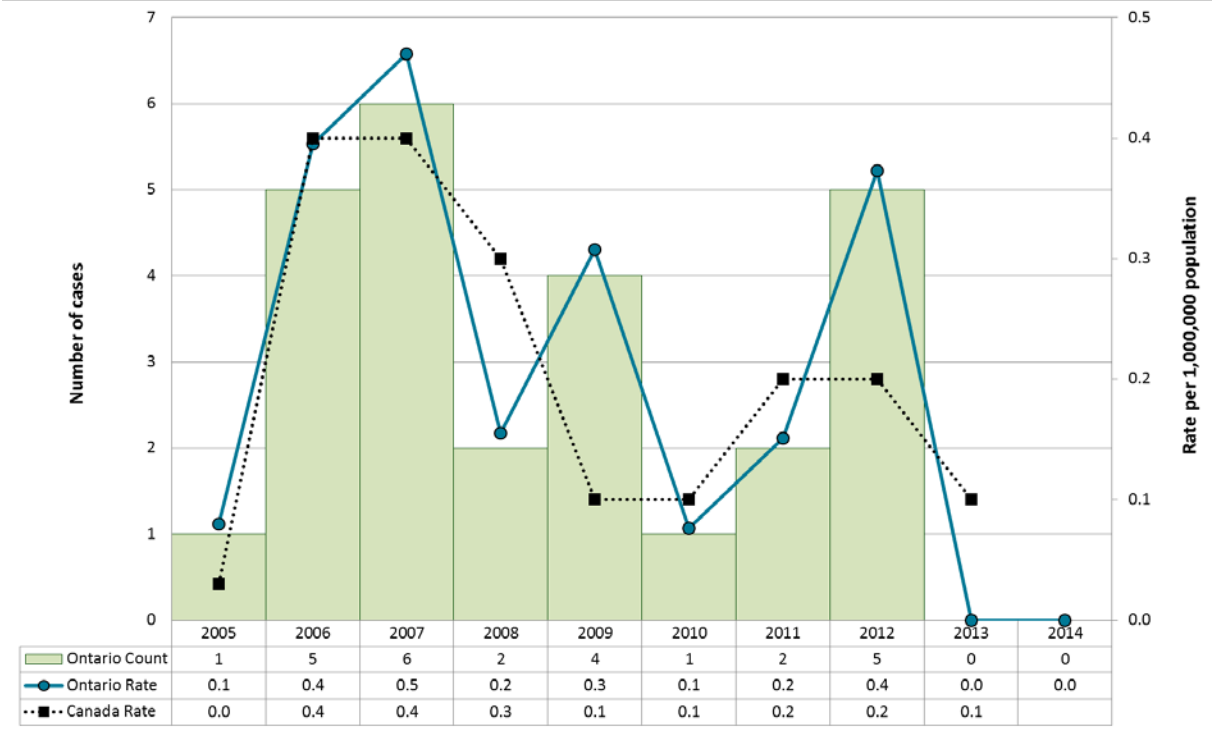
General overview for 2014

Incidence (Figure 5-1): No cases of botulism were reported in Ontario in 2014, nor were there any reported cases in 2013. Between 2005 and 2012, 26 cases of botulism were reported in the province. There was no discernible trend in incidence over this time period.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, April 2013 edition (Volume 2, Issue 4)
- The Ministry of Health and Long-Term Care's Botulism Guide for Health Care Professionals, September 2013
- Outbreak of Type E Foodborne Botulism Linked to Traditionally Prepared Salted Fish in Ontario, Canada

Figure 5-1. Incidence of botulism: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	1	5	6	2	4	1	2	5	0	0
Ontario Rate	0.1	0.4	0.5	0.2	0.3	0.1	0.2	0.4	0.0	0.0
Canada Rate	0.0	0.4	0.4	0.3	0.1	0.1	0.2	0.2	0.1	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2014/07/10]; national data available up to 2013.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Chapter 6.

Brucellosis

General overview for 2014

Incidence and comparison to Canada (Figure 6-1): In 2014, there were two confirmed cases of brucellosis reported in Ontario, corresponding to an incidence rate of 0.1 cases per 1,000,000 population. One case was travel-related. Since 2005, there have been 48 confirmed cases of brucellosis reported in Ontario. From 2005 to 2013, rates in Ontario have been comparable to national rates and have ranged from 0.1 to 0.8 cases per 1,000,000 population.

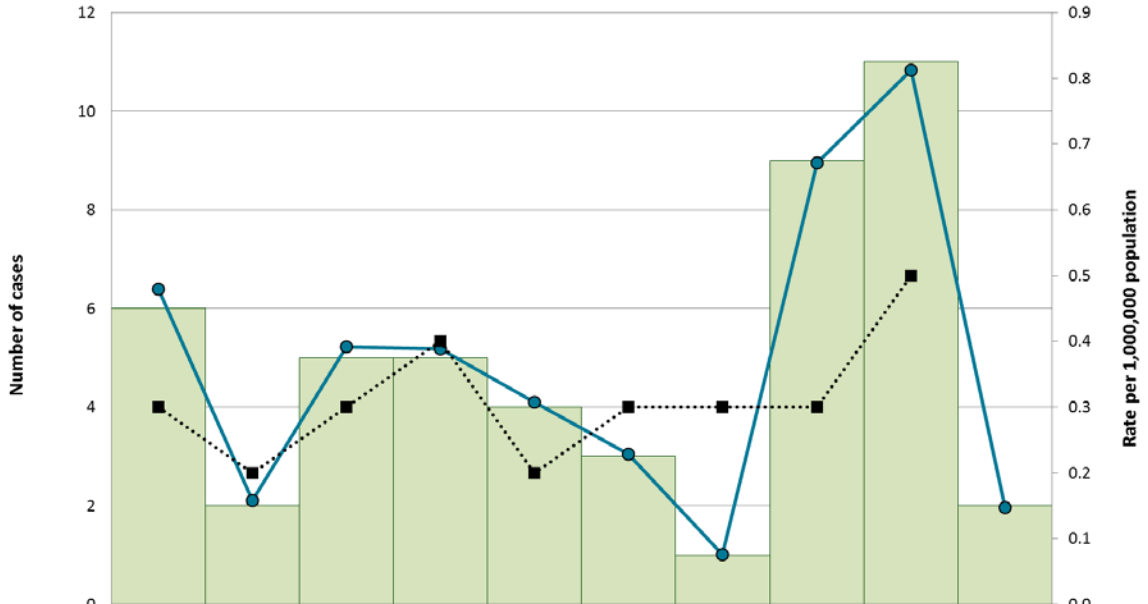
Highlights

Livestock in Canada have been declared brucellosis free since 1985.[8] Although cases of brucellosis in Ontario are generally travel-related, there is a low endemic risk of acquisition within the province. Twenty-one of the 22 cases reported from 2012 to 2014 provided information on travel outside of the province. Of these cases, 76.2% (16/21) were travel-related.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, May 2013 edition (Volume 2, Issue 5)

Figure 6-1. Incidence of brucellosis: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	6	2	5	5	4	3	1	9	11	2
Ontario Rate	0.5	0.2	0.4	0.4	0.3	0.2	0.1	0.7	0.8	0.1
Canada Rate	0.3	0.2	0.3	0.4	0.2	0.3	0.3	0.3	0.5	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Chapter 7.

Campylobacter enteritis

General overview for 2014

Incidence and comparison to Canada (Figure 7-1): In 2014, there were 3,782 confirmed cases of *Campylobacter* enteritis in Ontario, representing an incidence rate of 27.9 cases per 100,000 population. From 2005 to 2013, annual incidence rates for *Campylobacter* enteritis in Ontario have been comparable to the Canadian rates.

Age and sex (Figure 7-2): The highest incidence rates of *Campylobacter* enteritis were observed among the 0-4 year age group (36.0 per 100,000 population), followed by the 20-29 year age group (34.2 per 100,000 population), and the 60-69 year age group (33.7 per 100,000 population). Incidence rates were higher in males compared to females across all age groups. These age- and sex-specific trends have also been observed in other jurisdictions.[9]

Seasonal trends (Figure 7-3): *Campylobacter* enteritis occurs throughout the year, but tends to follow a seasonal pattern. In 2014, 65.3% (2,470/3,782) of cases were reported from June to November.

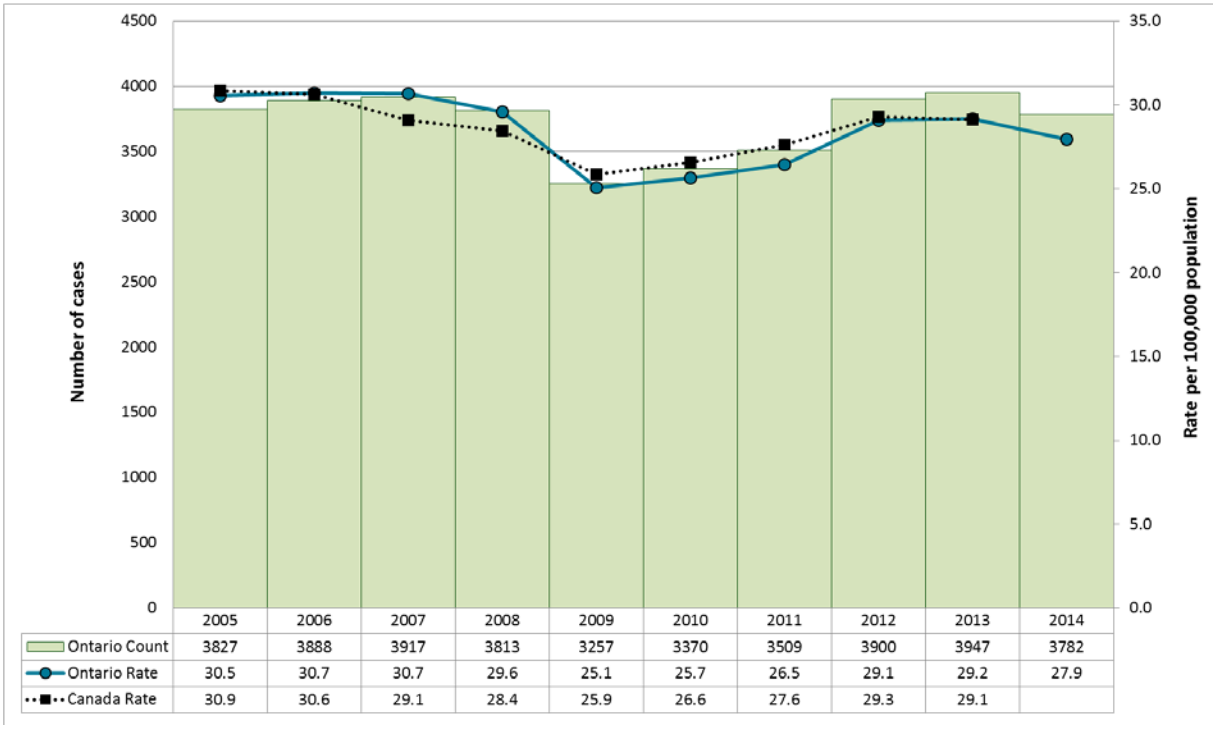
Geographic distribution (Map 7-1): The highest incidence rates were reported in Perth District (64.2 cases per 100,000 population), Huron County (47.9 cases per 100,000 population), and Grey Bruce (43.6 cases per 100,000). These public health units encompass rural farming communities where there is a higher likelihood of contact with farm animals and their environments, two well-documented risk factors for *Campylobacter* enteritis.[10] Due to larger populations, the highest number of cases were reported in Toronto (963 cases), York Region (388 cases), and Peel Region (327 cases), which together represented 44.4% (1,678/3,782) of *Campylobacter* enteritis cases in 2014.

Hospitalizations and deaths: Hospitalization was reported for 5.7% (215/3,782) of cases and death was reported for 0.2% (6/3,782) of cases.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, June 2015 edition (Volume 4, Issue 6)

Figure 7-1. Incidence of *Campylobacter* enteritis: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	3827	3888	3917	3813	3257	3370	3509	3900	3947	3782
Ontario Rate	30.5	30.7	30.7	29.6	25.1	25.7	26.5	29.1	29.2	27.9
Canada Rate	30.9	30.6	29.1	28.4	25.9	26.6	27.6	29.3	29.1	

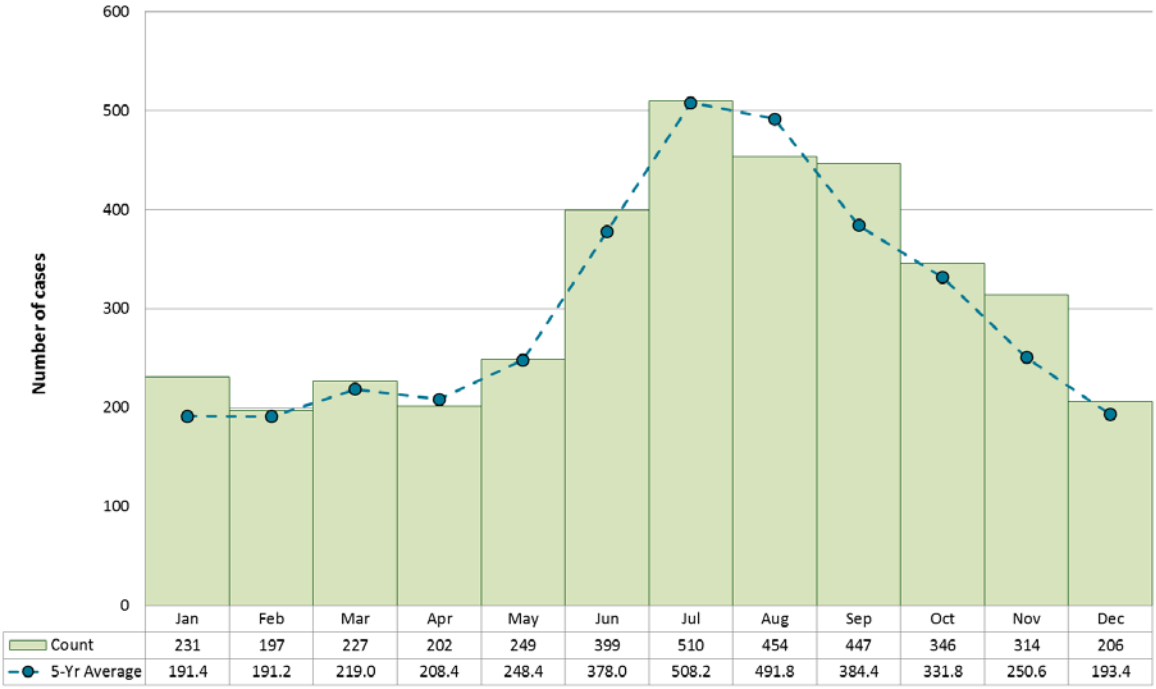
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

Figure 7-2. Incidence of *Campylobacter* enteritis by age and sex: Ontario, 2014

	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	101	54	115	314	219	206	228	220	206
Male Count	157	83	201	328	268	257	316	268	239
Female Rate	28.9	15.1	14.6	33.5	24.0	20.9	22.5	29.4	25.8
Male Rate	42.8	22.1	24.1	34.9	30.9	26.5	31.7	38.3	39.7
Total Rate	36.0	18.7	19.5	34.2	27.4	23.7	27.1	33.7	31.8

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03
Note: Excludes two cases of unknown sex.

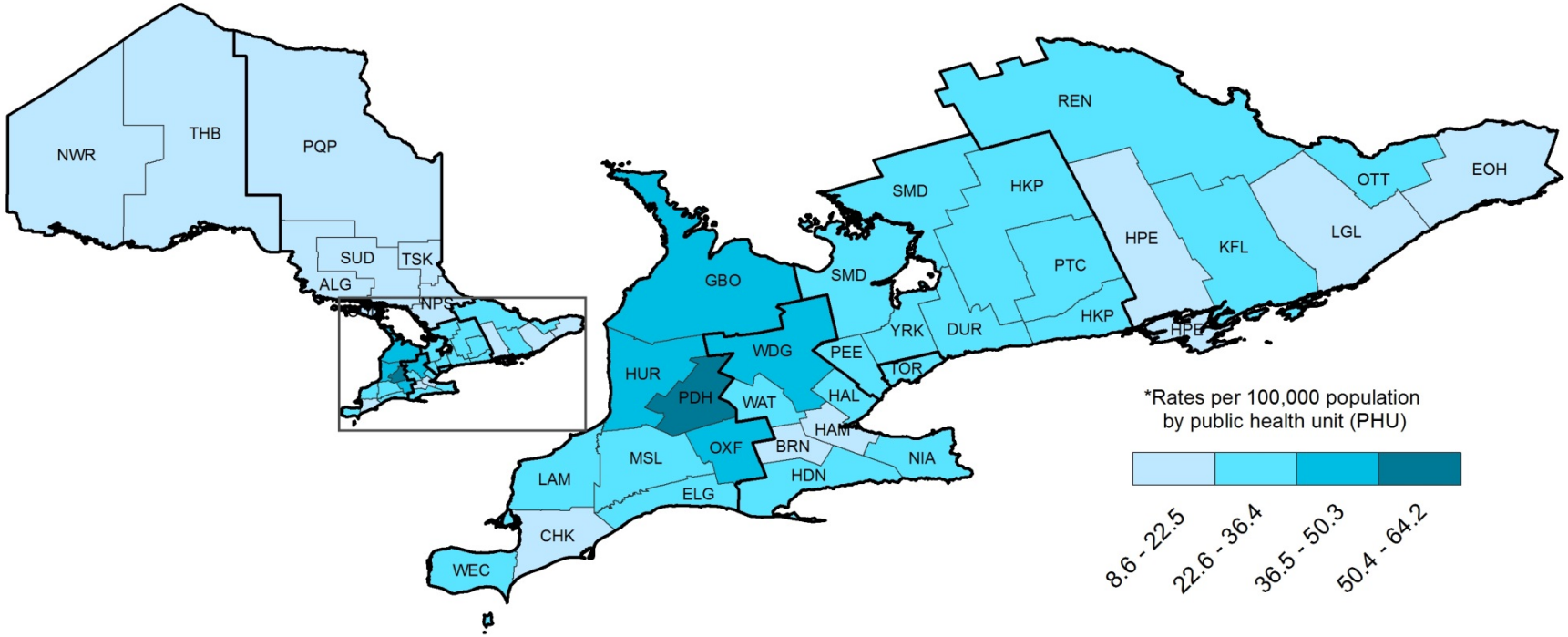
Figure 7-3. Number of *Campylobacter* enteritis cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	231	197	227	202	249	399	510	454	447	346	314	206
5-Yr Average	191.4	191.2	219.0	208.4	248.4	378.0	508.2	491.8	384.4	331.8	250.6	193.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 7-1. Incidence of Campylobacter enteritis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	21	18.0
BRN	20	14.0
CHK	16	15.1
DUR	192	29.8
ELG	22	24.3
EOH	42	20.5
GBO	71	43.6
HAL	128	23.7
HAM	120	22.0
HDN	37	33.7
HKP	57	31.8
HPE	29	17.7
HUR	28	47.9

PHU	Cases (n)	*Rates
KFL	50	25.0
LAM	35	26.9
LGL	28	16.5
MSL	112	24.3
NIA	130	29.2
NPS	15	11.7
NWR	7	8.6
OTT	224	24.0
OXF	45	40.6
PDH	50	64.2
PEE	327	23.6
PQP	10	11.5
PTC	32	23.0

PHU	Cases (n)	*Rates
REN	24	22.8
SMD	132	24.7
SUD	24	12.0
THB	34	21.9
TOR	963	34.7
TSK	3	8.7
WAT	156	29.2
WDG	114	40.9
WEC	96	23.9
YRK	388	35.1
Ontario	**3782**	**27.9**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03

Chapter 8.

Chancroid

General overview for 2014

Incidence and comparison to Canada: Chancroid is a very rare disease in Canada. In 2014, there were no cases of chancroid reported. The most recent case in Ontario was reported in 1997.

Chapter 9.

Chlamydia

General overview for 2014

Incidence and comparison to Canada (Figure 9-1): Chlamydia is the most frequently reported sexually transmitted infection (STI) and reportable disease in Ontario. In 2014, 35,933 confirmed cases of chlamydia were reported in Ontario, representing an incidence rate of 265.4 cases per 100,000 population. Most chlamydia infections are asymptomatic, so reported incidence underestimates the true population incidence.[11] Between 2005 and 2011, chlamydia incidence rates increased 57.3% from 174.6 cases per 100,000 population to 274.6 cases per 100,000 population. The incidence rate remained stable from 2011 to 2012, declined slightly in 2013, and increased again in 2014. Changes in the incidence of reported chlamydia cases in Ontario may be explained, in part, by changes in screening practices and testing methods.[12,13] Chlamydia incidence rates in Ontario have been consistently lower than the Canadian rates for the period 2005 to 2013.

Age and sex (Figure 9-2): In 2014, 61.0% of reported chlamydia cases in Ontario occurred in females (21,905/35,933). The reported incidence rate of chlamydia in 2014 was also higher in females (317.9 cases per 100,000 population) compared to males (210.6 cases per 100,000 population) (data not shown). Rates were highest in both males (1,009.0 cases per 100,000 population) and females (1,773.4 cases per 100,000 population) in the 20-24 years age group. The reported incidence rates for both sexes decreased with age following their peak in this age group.

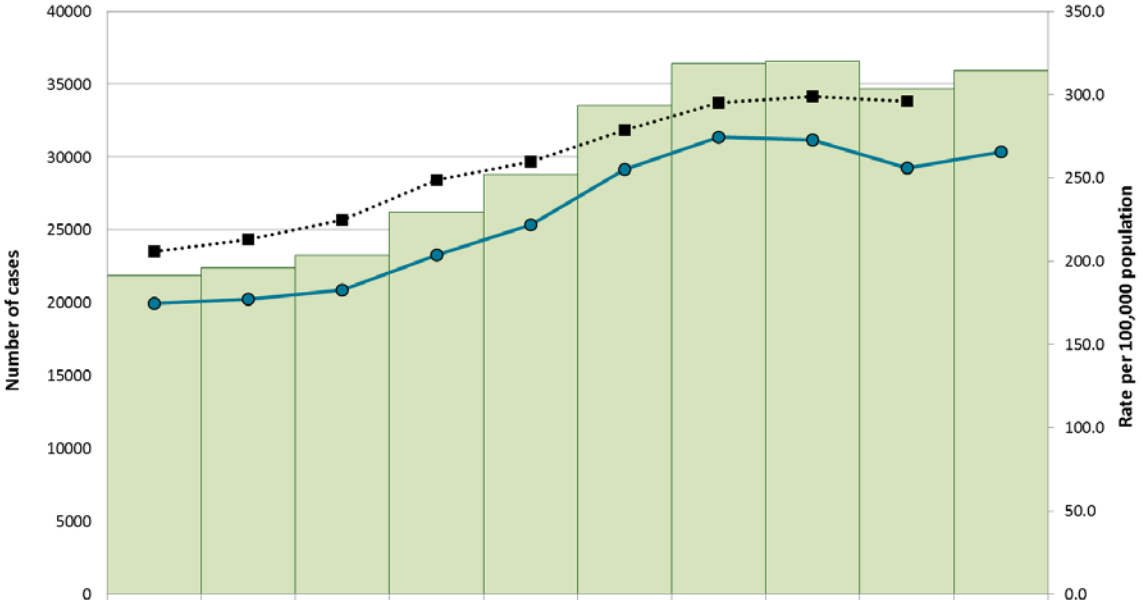
Laboratory data (Figure 9-3): Based on testing performed at the Public Health Ontario Laboratory (PHOL), the percentage of nucleic acid amplification tests (NAAT) positive for chlamydia (from cervical, urethral and urine specimens) each month in 2014 was relatively steady, with an overall percent positivity of 6.0% (15,863/266,350) for the year. There were fewer NAAT tests for chlamydia performed at PHOL in 2014 than in 2012 or 2013 (266,350 versus 288,452 and 269,530, respectively). This decrease occurred after changes to Ontario's cervical cancer screening guidelines in 2012;[13] however, the majority of chlamydia testing in Ontario is completed at private laboratories and temporal trends should be interpreted with caution. Despite decreases in the number of tests performed, the percent positivity has remained at 6.0%, possibly indicating similar levels of transmission.

Geographic distribution (Map 9-1): Incidence rates of reported chlamydia cases were highest in the northwest region. Northwestern Public Health Unit had the highest rate at 723.6 cases per 100,000 population, followed by Porcupine and Thunder Bay District, with rates of 539.3 and 477.4 cases per 100,000 population, respectively. While the highest rates were in these northern public health units, the top three public health units in terms of number of cases reported were Toronto (9,936 cases; 358.5 cases per 100,000), Peel Region (3,311 cases; 238.6 cases per 100,000), and City of Ottawa (2,581 cases; 276.2 cases per 100,000), which together accounted for 44.0% of cases in Ontario in 2014.

Additional methodological issues

Due to the occurrence of asymptomatic infections, cases of chlamydia are often undetected and, as a result, under-reported to public health units. Asymptomatic infections occur frequently and are more common in females than in males.[11] Despite the absence of symptoms, those infected are still able to transmit chlamydia to their sexual contacts.

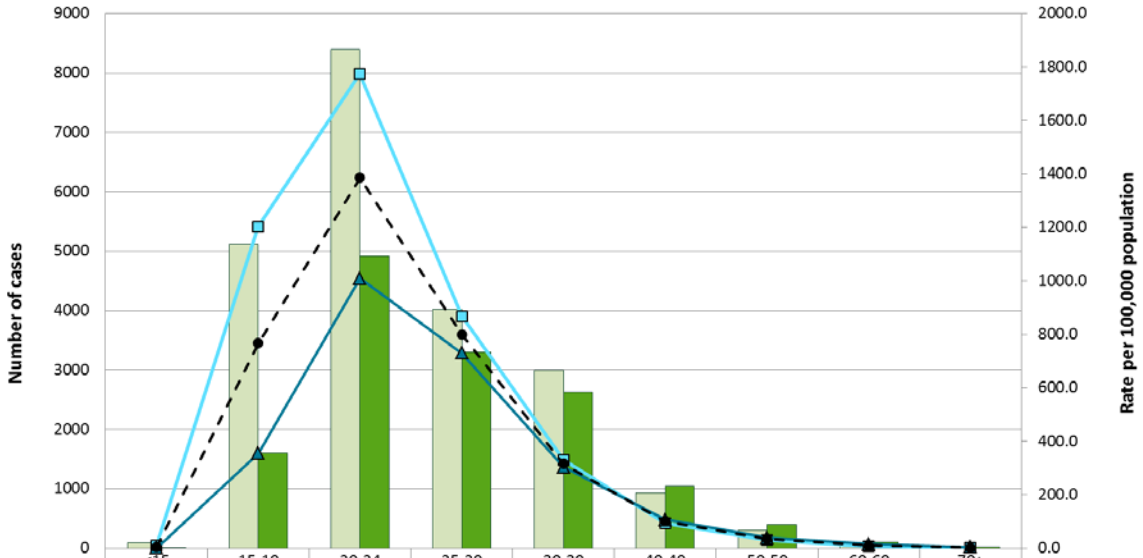
Figure 9-1. Incidence of chlamydia: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	21877	22410	23297	26215	28820	33511	36424	36566	34669	35933
Ontario Rate	174.6	177.0	182.5	203.5	221.7	255.1	274.6	272.6	256.1	265.4
Canada Rate	205.95	212.86	224.84	248.79	259.59	278.55	295.14	298.72	295.76	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

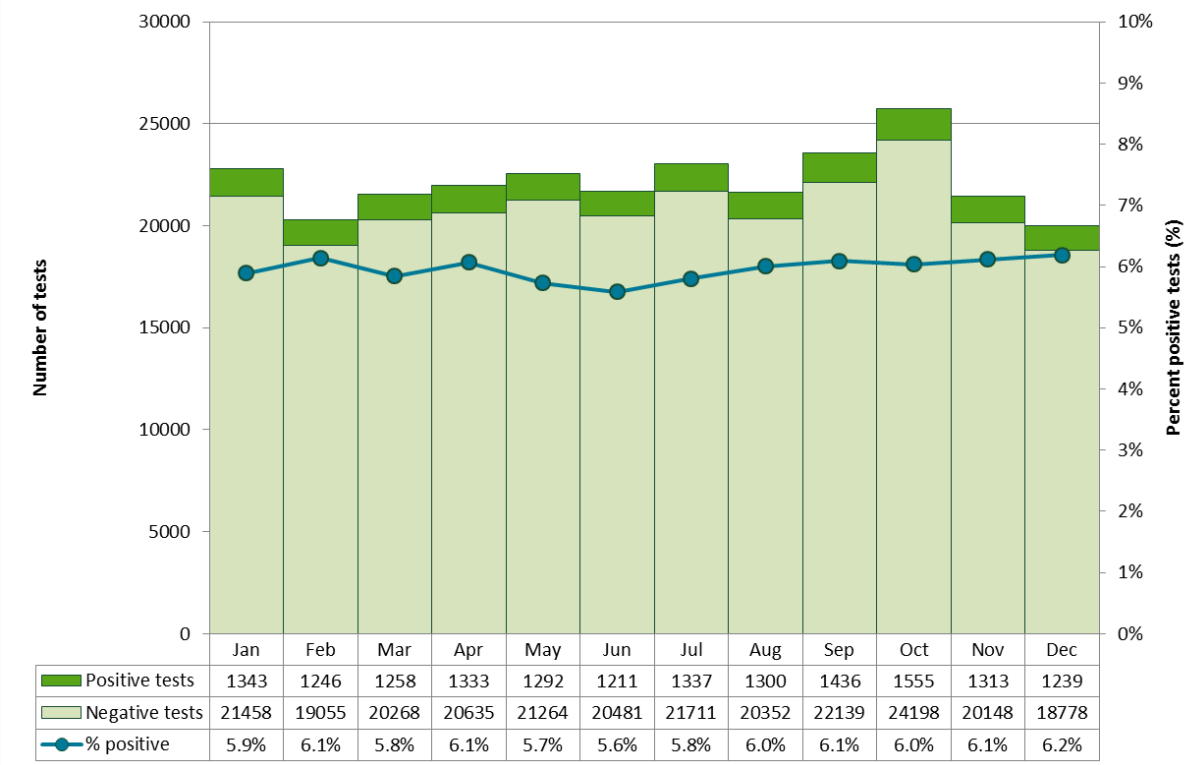
Figure 9-2. Incidence of chlamydia by age and sex: Ontario, 2014



	<15	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	91	5122	8393	4018	2995	930	300	48	8
Male Count	5	1602	4912	3300	2629	1040	391	103	21
Female Rate	8.5	1203.1	1773.4	868.2	328.2	94.2	29.6	6.4	1.0
Male Rate	0.4	355.4	1009.0	730.1	303.5	107.2	39.3	14.7	3.5
Total Rate	4.4	767.2	1385.8	800.0	316.2	100.6	34.4	10.4	2.1

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes 25 cases of unknown age and/or sex.

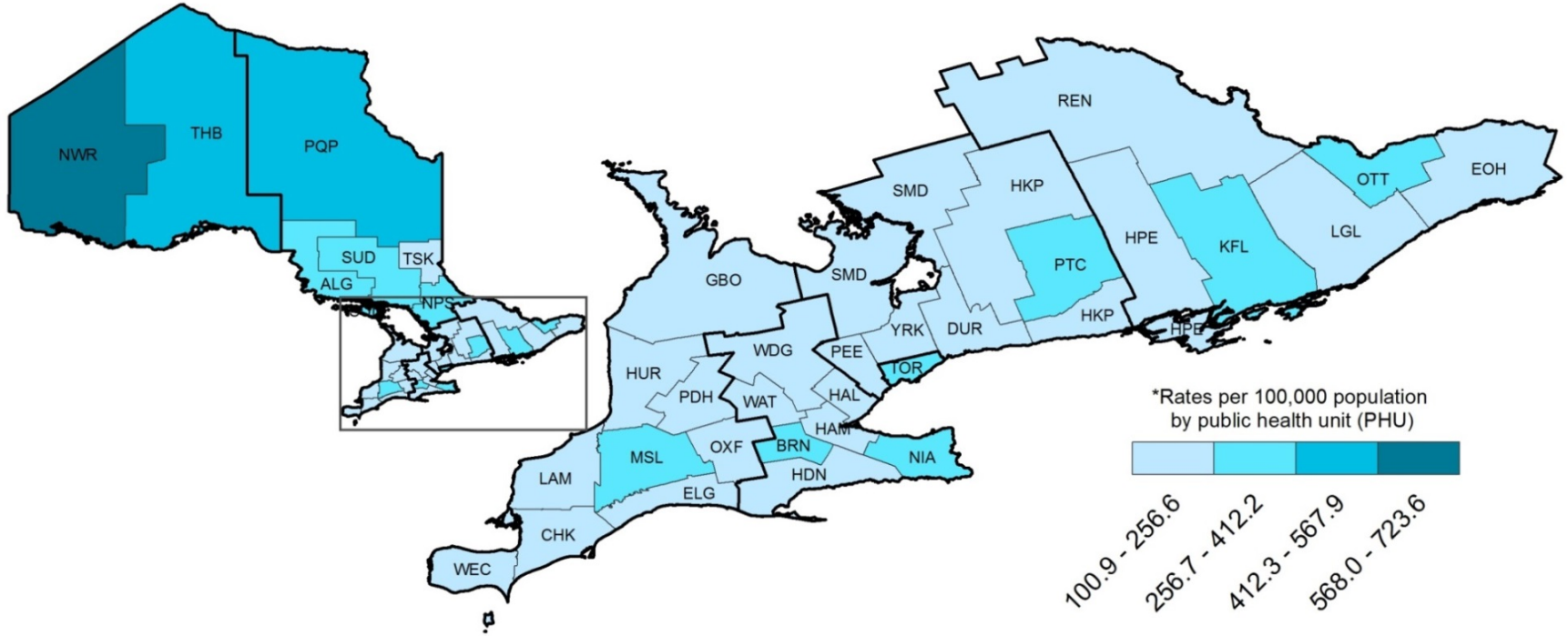
Figure 9-3. Number and percent of positive chlamydia tests by month: PHOL, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Positive tests	1343	1246	1258	1333	1292	1211	1337	1300	1436	1555	1313	1239
Negative tests	21458	19055	20268	20635	21264	20481	21711	20352	22139	24198	20148	18778
% positive	5.9%	6.1%	5.8%	6.1%	5.7%	5.6%	5.8%	6.0%	6.1%	6.0%	6.1%	6.2%

Ontario Cases: Public Health Ontario Laboratory (PHOL), STI Online, extracted [2015/09/21].
Note: Data only include tests performed at PHOL.

Map 9-1. Incidence of chlamydia by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	336	288.3
BRN	371	259.9
CHK	233	220.4
DUR	1486	230.4
ELG	156	172.6
EOH	495	241.8
GBO	280	172.0
HAL	819	151.8
HAM	1368	250.7
HDN	190	172.9
HKP	239	133.5
HPE	354	216.6
HUR	59	100.9

PHU	Cases (n)	*Rates
KFL	799	400.2
LAM	244	187.3
LGL	352	208.0
MSL	1469	318.1
NIA	1172	263.2
NPS	385	300.7
NWR	587	723.6
OTT	2581	276.2
OXF	177	159.9
PDH	142	182.2
PEE	3311	238.6
PQP	468	539.3
PTC	374	269.1

PHU	Cases (n)	*Rates
REN	263	249.7
SMD	1264	236.7
SUD	608	304.4
THB	741	477.4
TOR	9936	358.5
TSK	83	239.9
WAT	1266	236.7
WDG	612	219.7
WEC	854	212.4
YRK	1859	168.1
Ontario	**35933**	**265.4**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03]

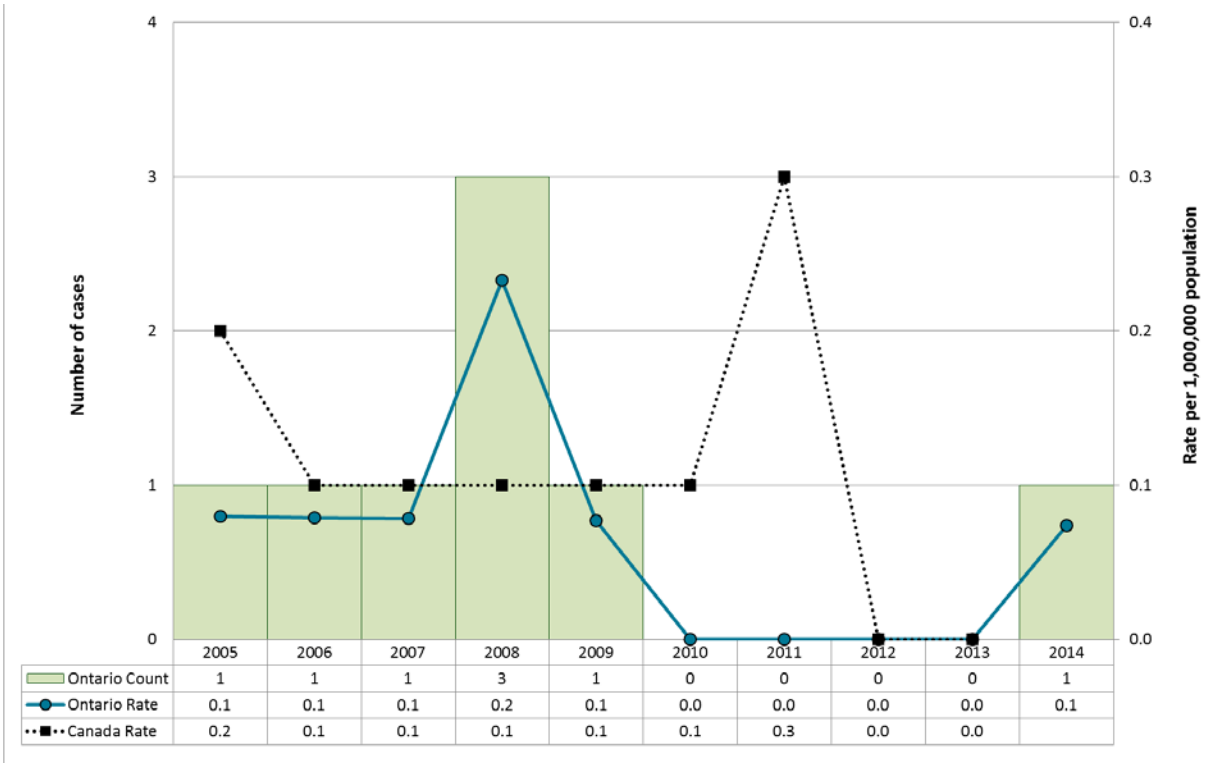
Chapter 10.

Cholera

General overview for 2014

Incidence (Figure 10-1): One case of cholera was reported in Ontario in 2014. Since 2005, eight cases have been reported in the province. All eight cases were travel-related.

Figure 10-1. Incidence of cholera: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	1	1	1	3	1	0	0	0	0	1
Ontario Rate	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.1
Canada Rate	0.2	0.1	0.1	0.1	0.1	0.1	0.3	0.0	0.0	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Chapter 11.

Clostridium difficile infection outbreaks

General overview for 2014

Incidence (Table 11-1): In 2014, a total of 135 confirmed cases associated with 19 *Clostridium difficile* infection (CDI) hospital outbreaks were reported in Ontario. The number of outbreaks in hospitals fell to the lowest level since 2010, while the average number of cases per outbreak remained comparable to 2013.

Age and sex (Figure 11-1): The majority of CDI cases were observed in the 60 years and older age groups. Overall, males comprised a higher proportion of all CDI cases with complete data on sex at 54.0% versus 46.0% for females. Demographic data have been aggregated across all hospital outbreaks and likely reflect the age and sex profiles of settings that have a higher risk of CDI outbreaks.

Risk factors (Table 11-2): Risk factors were documented for 104 (77.0%) CDI cases associated with a CDI outbreak in a hospital. Although likely underreported, antibiotic use continues to be the most common risk factor and was reported by 86.5% of cases.

Seasonal trends (Figure 11-2): The seasonal pattern linked to CDI outbreaks is likely related to a number of factors including the seasonality of respiratory illnesses such as influenza and the concurrent increase in antibiotic use.[14]

Geographic distribution (Map 11-1): In 2014, the highest proportion of CDI outbreaks in hospitals (31.6%, 6/19) was reported by Middlesex-London Health Unit. Public health units with academic teaching hospitals that serve a high proportion of at-risk patients are likely to have higher rates of CDI and may experience more outbreaks as a result.

Additional methodological issues

On September 1, 2008, Ontario amended regulations to make *Clostridium difficile*-associated disease (now more commonly referred to as CDI) outbreaks in public hospitals reportable to public health units under the Health Protection and Promotion Act.[15,16] Although, CDI outbreaks in long-term care homes are also reportable to the local Medical Officer of Health as institutional outbreaks of gastroenteritis, these outbreaks have been excluded from this report due to a lack of consistency in public health unit reporting practices. Based on information provided by hospitals, the data presented on CDI outbreaks and cases in this report were obtained from iPHIS and analyzed as follows:

- Outbreaks were allocated to an episode year based on the onset date of the index case. Where onset date of the index case was missing, the date the outbreak was created in iPHIS was used.
- For outbreak-level analysis, where discrepancies were observed between reported CDI aggregate case counts and line listed cases for the outbreak, the counts of cases and deaths were determined based on the higher number.
- For case-level analysis, only individual confirmed case records associated with confirmed CDI outbreaks in hospitals were included for demographic analysis. Cases with a non-reportable classification (e.g., probable cases) were excluded.

In previously published reports, data were summarized from *Clostridium difficile* infection (CDI) outbreaks reported by hospitals and long-term care facilities. Due to a lack of consistency in public health unit reporting practices, CDI outbreaks in long-term care facilities have now been excluded. The data presented in this summary chapter are from CDI outbreaks in hospitals.

Additional sources of information

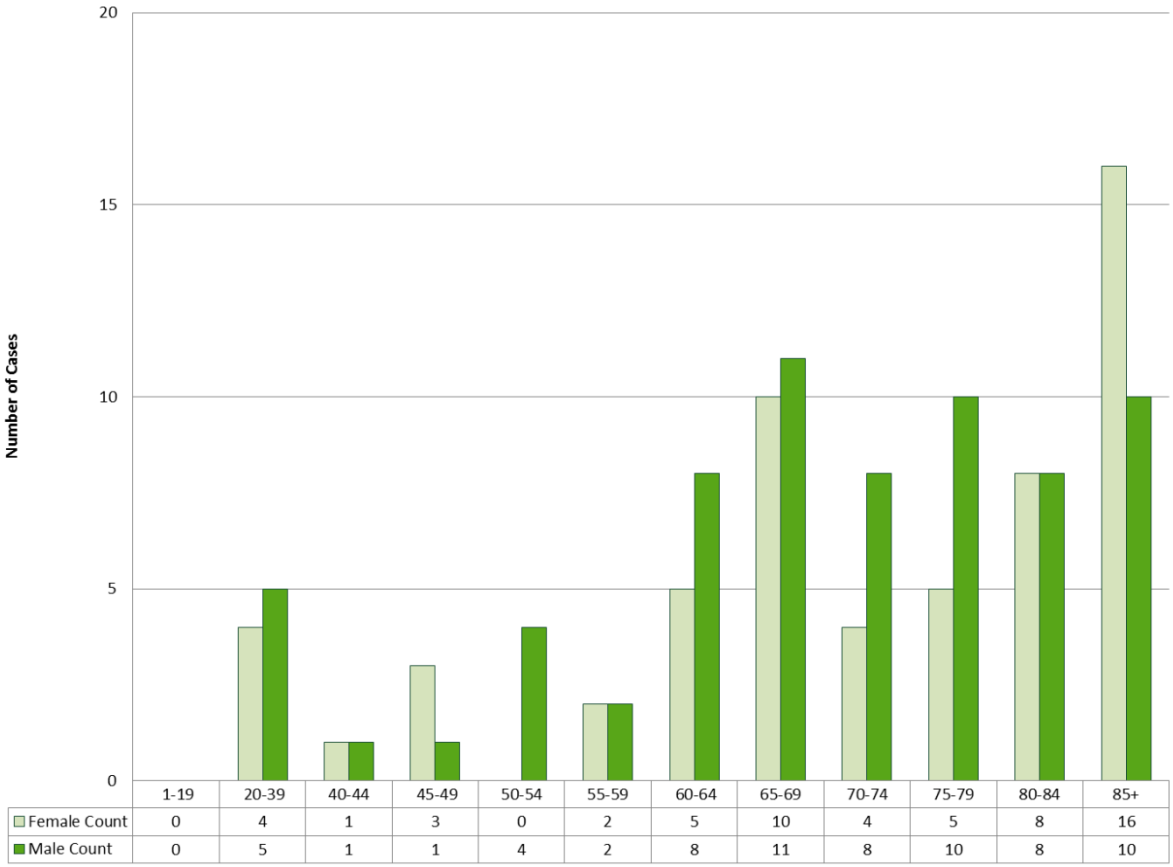
- PHO's Monthly Infectious Diseases Surveillance Report, August 2015 edition

Table 11-1. Number of cases linked to CDI outbreaks in hospitals and all-cause mortality: Ontario, 2009-14

Year of CDI Outbreak	Number of Outbreaks	Number of Cases linked to a CDI Outbreak	Average Number of Cases per Outbreak	All-Cause Mortality (#)	All-Cause Mortality (%)
2009	15	275	18	74	26.9
2010	26	561	22	147	26.2
2011	35	422	12	104	24.6
2012	31	330	11	72	21.8
2013	25	147	6	21	14.3
2014	19	135	7	23	17.0
2009-2014	151	1870	12	441	23.6

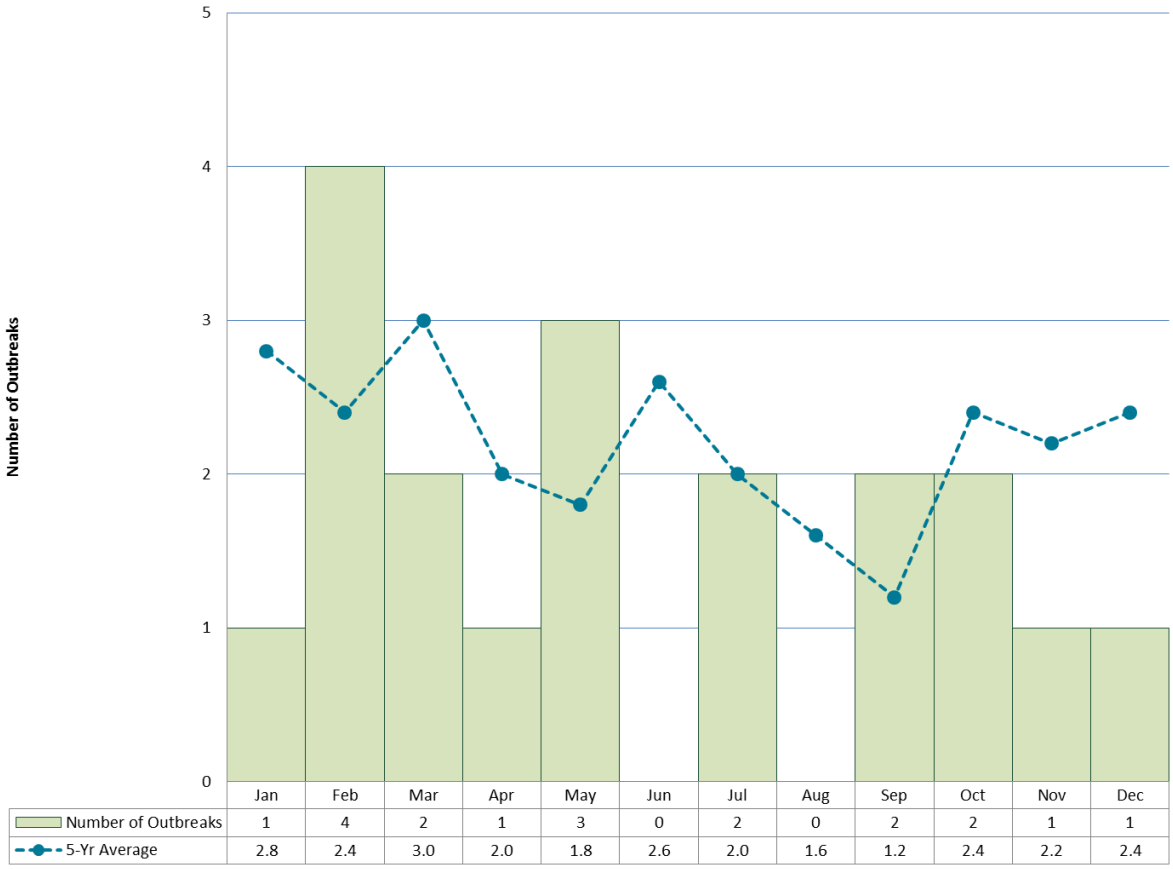
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/11/18].

Figure 11-1. Number of CDI cases associated with a hospital outbreak by sex and age group: Ontario, 2014



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/11/18].
Note: Excludes 9 cases of unknown age and/or sex.

Figure 11-2. Number of confirmed CDI hospital outbreaks in 2014 and average number of outbreaks from 2009 to 2013 by month: Ontario



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Number of Outbreaks	1	4	2	1	3	0	2	0	2	2	1	1
5-Yr Average	2.8	2.4	3.0	2.0	1.8	2.6	2.0	1.6	1.2	2.4	2.2	2.4

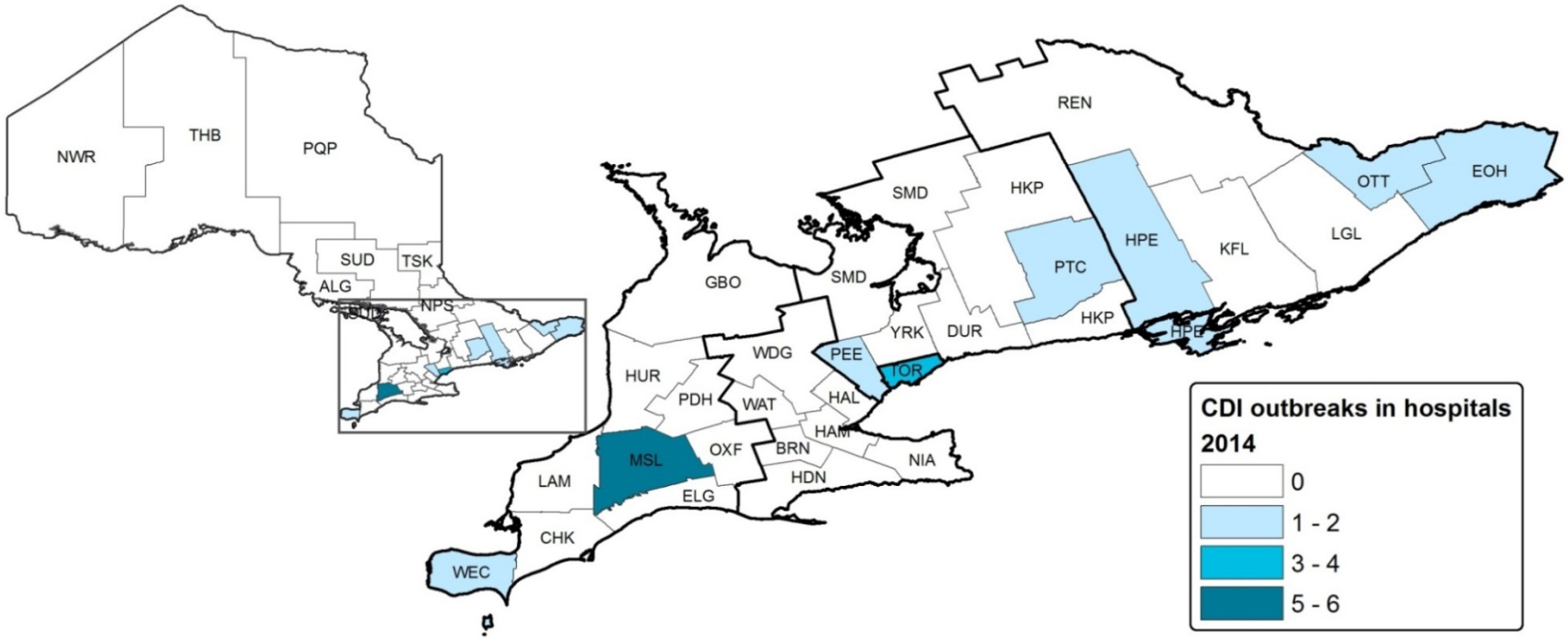
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/11/18].
5-Yr Average: Represents the five-year (2009-2013) average of the number of outbreaks reported in the corresponding month.

Table 11-2. Risk factors for confirmed CDI cases associated with a hospital outbreak: Ontario, 2014 (N=104[1])

Risk factor description	Number of Cases	%
Antibiotic use[2]	90	86.5
Antacid/Antiulcer medication or proton pump inhibitors	44	42.3
Chronic illness/underlying medical condition	40	38.5
Prolonged hospitalization	38	36.5
Immunocompromised status[3]	31	29.8
Previous/recent hospitalization	17	16.3
Abdominal/gastrointestinal surgery	15	14.4
Close contact with a case	15	14.4
Other gastrointestinal conditions	9	8.7
Previous *C. difficile* infection	5	4.8
Feeding tube	3	2.9
Other	12	11.5
Unknown	15	14.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/11/18].
Note: 1. Only cases reporting at least one risk factor were included in the denominator. 2. Includes cases where antimicrobial therapy was selected as a risk factor. Antimicrobial therapy was inactivated as a risk factor in January 2012. 3. Includes cases where chemotherapy was selected as a risk factor. Chemotherapy was inactivated as a risk factor in January 2011.

Map 11-1. Number of CDI outbreaks in hospitals by public health unit: Ontario, 2014



PHU	Outbreaks	Cases (n)
ALG	0	0
BRN	0	0
CHK	0	0
DUR	0	0
ELG	0	0
EOH	1	4
GBO	0	0
HAL	0	0
HAM	0	0
HDN	0	0
HKP	0	0
HPE	2	13
HUR	0	0

PHU	Outbreaks	Cases (n)
KFL	0	0
LAM	0	0
LGL	0	0
MSL	6	30
NIA	0	0
NPS	0	0
NWR	0	0
OTT	2	15
OXF	0	0
PDH	0	0
PEE	2	6
PQP	0	0
PTC	1	45

PHU	Outbreaks	Cases (n)
REN	0	0
SMD	0	0
SUD	0	0
THB	0	0
TOR	4	17
TSK	0	0
WAT	0	0
WDG	0	0
WEC	1	5
YRK	0	0
Ontario	**19**	**135**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/11/18].

Chapter 12.

Creutzfeldt-Jakob disease

General overview for 2014

Gerstmann-Sträussler-Scheinker Syndrome (GSS), Fatal Familial Insomnia (FFI) and Kuru were removed from Ontario's Reportable Disease List on December 4, 2013, leaving Creutzfeldt-Jakob Disease (CJD) as the only prion disease reportable in Ontario. CJD is classified as sporadic, familial, iatrogenic or variant.

Incidence and comparison to Canada: Although CJD is reportable in Ontario, clinicians typically report cases to the Canadian CJD Surveillance System (CJDSS), which is maintained by the Public Health Agency of Canada. As a result, CJD cases are not consistently reported to the local public health units and entered in iPHIS.

Deaths reported through the CJDSS were assessed as "definite" or "probable" cases of CJD based on national case definitions. From 2010 to 2014, the CJDSS was notified of 78 CJD deaths in Ontario: 74 were classified as sporadic CJD, three as familial CJD, and one as variant CJD.[17] The number of CJD deaths reported to the CJDSS between 2010 and 2014 was 69.6% higher than the 46 confirmed or probable CJD cases with a fatal outcome reported in iPHIS for the same period.

The CJDSS recorded 80 CJD deaths from 2005 to 2009, higher than the number of deaths from 2010 to 2014 and 77.8% higher than the 45 confirmed or probable CJD cases with a fatal outcome reported in iPHIS for the same period.

Additional methodological issues

Deaths due to CJD may be under investigation for long periods of time, as the length of the investigation often depends on the information received from physicians, health care institutions and family members. To compare case counts from the CJDSS and iPHIS, cases classified as "definite" or "probable" according to the national case definition were considered to be equivalent to cases classified as "confirmed" and "probable" according to the provincial case definition.

Chapter 13.

Cryptosporidiosis

General overview for 2014

Incidence and comparison to Canada (Figure 14-1): In 2014 there were 361 confirmed cases of cryptosporidiosis reported in Ontario, representing an incidence rate of 2.7 cases per 100,000 population. Incidence rates in Ontario were higher than the national rates from 2005-12. In 2013, the incidence rate of cryptosporidiosis in Ontario was similar to the national rate.

Age and sex (Figure 13-2): Incidence rates were highest for those younger than 30 years. The lowest incidence rates were observed among adults 50 years and over. Incidence rates by sex differed across various age groups, with no particular pattern. Males in the 0-4 year age group had the highest incidence rate at 7.9 cases per 100,000 population. For females, the highest incidence rate was observed among females in the 20-29 year age group at 8.0 cases per 100,000 population.

Seasonal trends (Figure 13-3): Cryptosporidiosis consistently shows a seasonal trend with case counts increasing in the summer months, peaking in August. In 2014, 51.5% of cases (186/361) were reported between July and September.

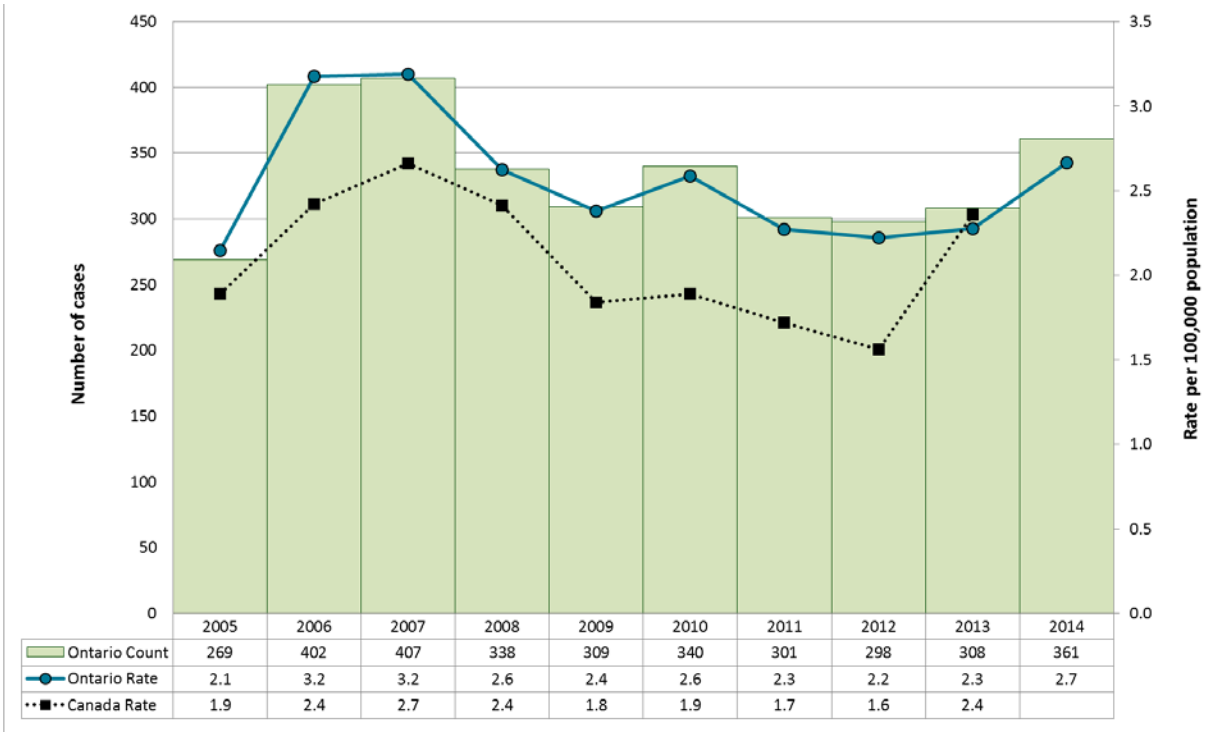
Geographic distribution (Map 13-1): The highest incidence rates of cryptosporidiosis were reported in Northwestern (19.7 cases per 100,000 population), Perth District (18.0 cases per 100,000 population), and Timiskaming (14.5 cases per 100,000 population). The highest number of cases were reported in Toronto (72 cases), City of Ottawa (21 cases), and Wellington-Dufferin-Guelph (18 cases).

Hospitalizations and deaths: Hospitalization was reported for 5.0% (18/361) of cases and no deaths were reported.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, July 2015 edition (Volume 4, Issue 7)

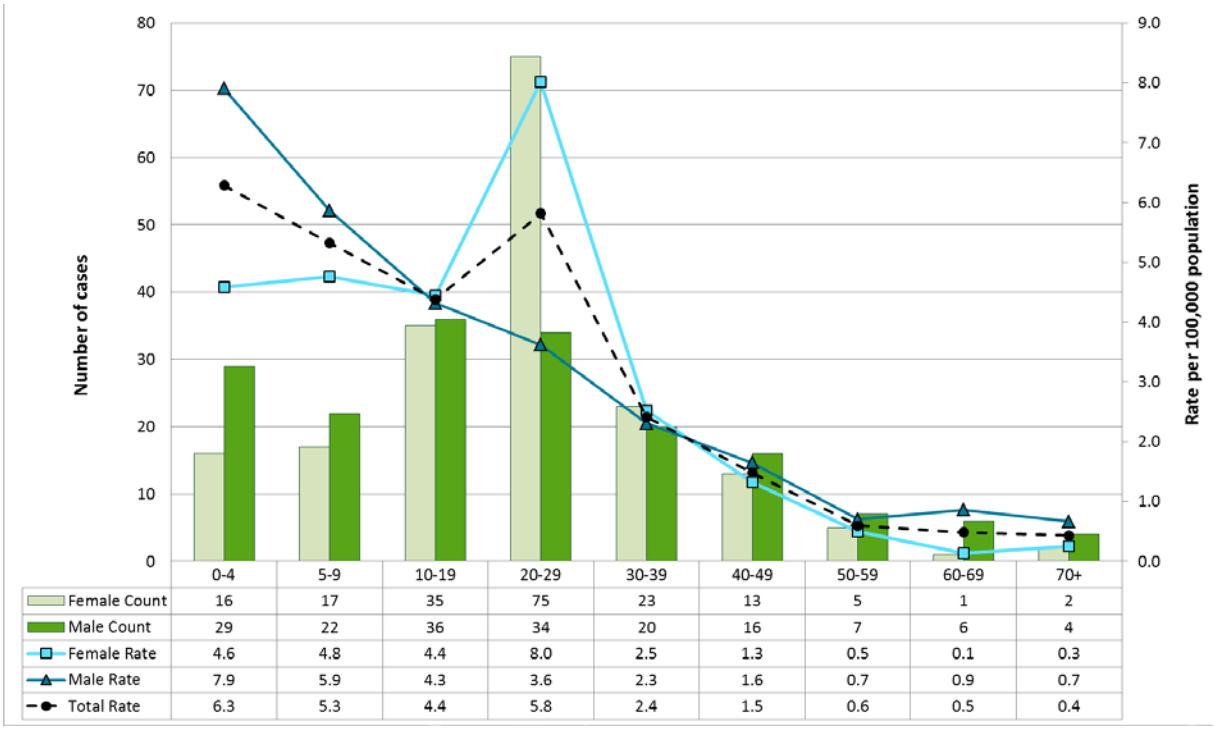
Figure 13-1. Incidence of cryptosporidiosis: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	269	402	407	338	309	340	301	298	308	361
Ontario Rate	2.1	3.2	3.2	2.6	2.4	2.6	2.3	2.2	2.3	2.7
Canada Rate	1.9	2.4	2.7	2.4	1.8	1.9	1.7	1.6	2.4	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

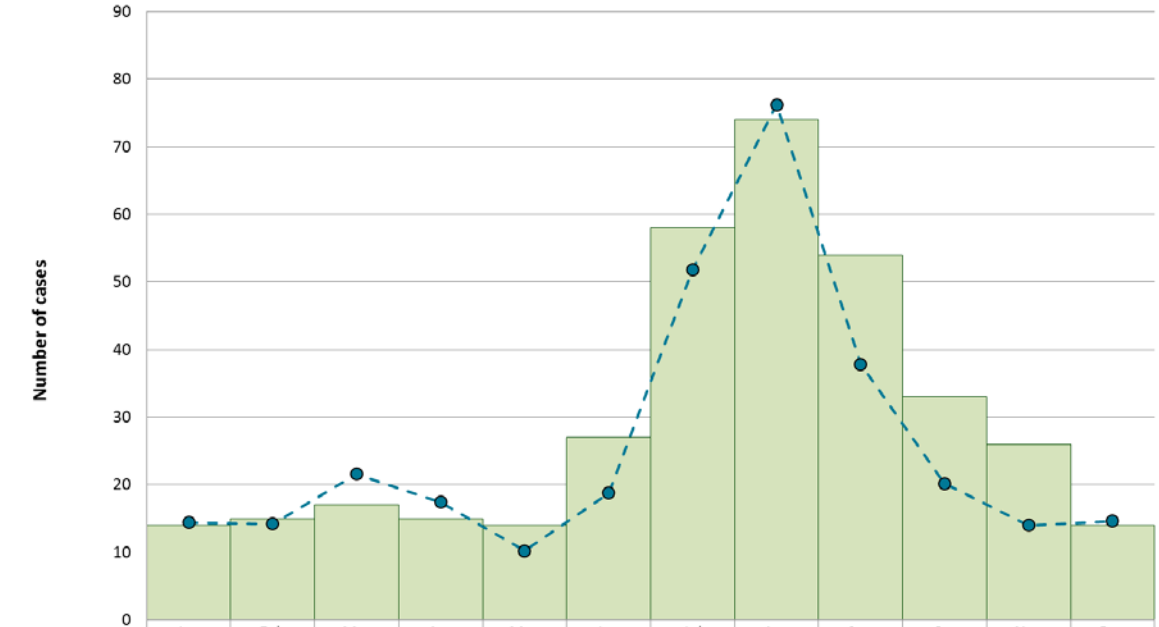
Figure 13-2. Incidence of cryptosporidiosis by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	16	17	35	75	23	13	5	1	2
Male Count	29	22	36	34	20	16	7	6	4
Female Rate	4.6	4.8	4.4	8.0	2.5	1.3	0.5	0.1	0.3
Male Rate	7.9	5.9	4.3	3.6	2.3	1.6	0.7	0.9	0.7
Total Rate	6.3	5.3	4.4	5.8	2.4	1.5	0.6	0.5	0.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

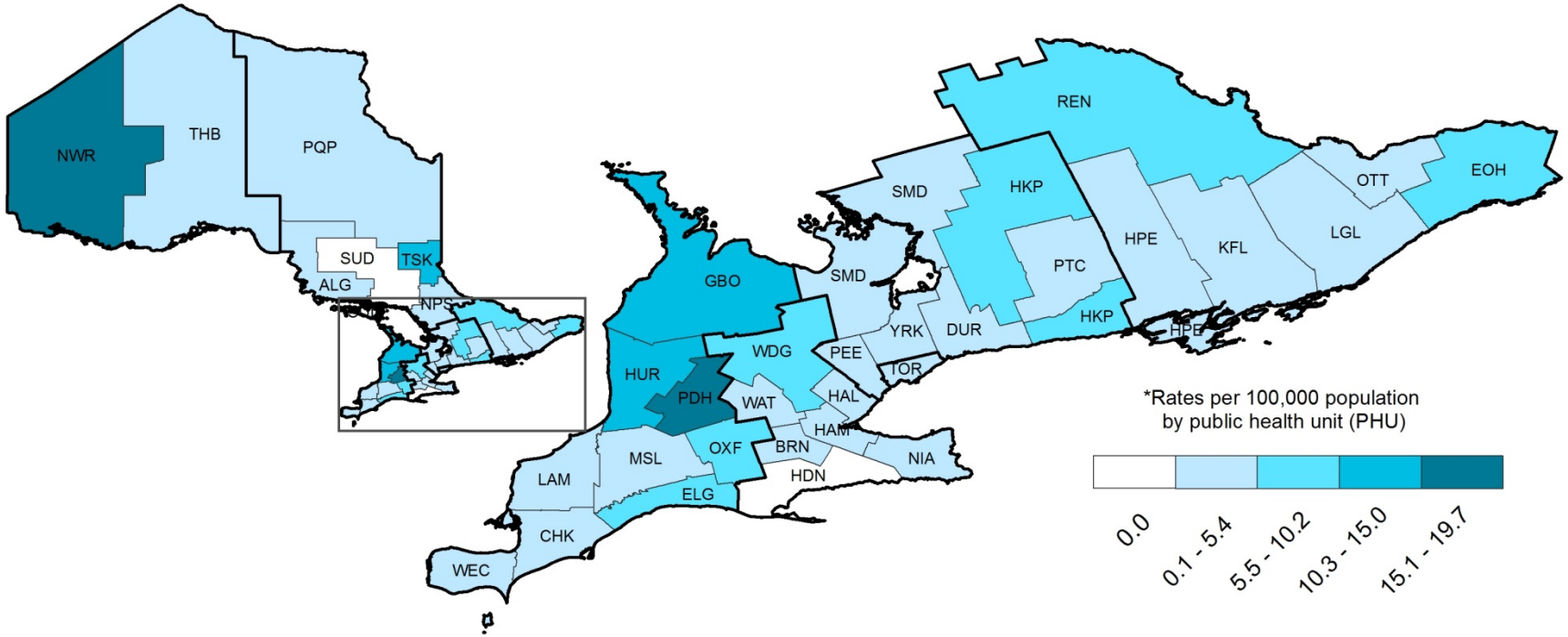
Figure 13-3. Number of cryptosporidiosis cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	14	15	17	15	14	27	58	74	54	33	26	14
5-Yr Average	14.4	14.2	21.6	17.4	10.2	18.8	51.8	76.2	37.8	20.2	14.0	14.6

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 13-1. Incidence of cryptosporidiosis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	1	0.9
BRN	2	1.4
CHK	2	1.9
DUR	10	1.6
ELG	5	5.5
EOH	15	7.3
GBO	17	10.4
HAL	10	1.9
HAM	5	0.9
HDN	0	0.0
HKP	13	7.3
HPE	8	4.9
HUR	8	13.7

PHU	Cases (n)	*Rates
KFL	6	3.0
LAM	6	4.6
LGL	9	5.3
MSL	4	0.9
NIA	11	2.5
NPS	2	1.6
NWR	16	19.7
OTT	21	2.2
OXF	8	7.2
PDH	14	18.0
PEE	14	1.0
PQP	3	3.5
PTC	5	3.6

PHU	Cases (n)	*Rates
REN	6	5.7
SMD	13	2.4
SUD	0	0.0
THB	6	3.9
TOR	72	2.6
TSK	5	14.5
WAT	11	2.1
WDG	18	6.5
WEC	4	1.0
YRK	11	1.0
Ontario	**361**	**2.7**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 14.

Cyclosporiasis

General overview for 2014

Incidence and comparison to Canada (Figure 14-1): In 2014, there were 140 confirmed cases of cyclosporiasis in Ontario, representing an incidence rate of 1.0 case per 100,000 population. From 2005-13, rates in Ontario were higher than the corresponding national rates. The higher rates in Ontario may be due to differences in laboratory testing and reporting requirements for cyclosporiasis compared to other jurisdictions in Canada.

Age and sex (Figure 14-2): The highest incidence rates were observed among adults, particularly in the 30-39 (1.5 cases per 100,000 population) and 50-59 year age groups (1.9 cases per 100,000 population). There were no clear trends in incidence rates by sex.

Seasonal trends (Figure 14-3): Cyclosporiasis tends to follow a seasonal pattern, with an increase during the warmer months. In 2014, 59.3% of cases (83/140) were reported between June and July (see "Outbreak activity" below).

Geographic distribution (Map 14-1): The highest incidence rates were reported by Haliburton, Kawartha, Pine Ridge (2.8 cases per 100,000 population), Halton Region (2.2 cases per 100,000), and Windsor-Essex County (2.0 cases per 100,000). The highest number of cases were reported in Toronto (35 cases), York Region (13 cases), Halton Region (12 cases), and Peel Region (11 cases).

Hospitalizations and deaths: Hospitalization was reported for 0.7% (1/140) of cases and no deaths were reported.

Highlights

Cyclospora is not endemic to Ontario and is unlikely to be transmitted from person to person. As a result, it is expected that all reported cases in the province are either travel-related or associated with an imported food source that is contaminated.[18,19]

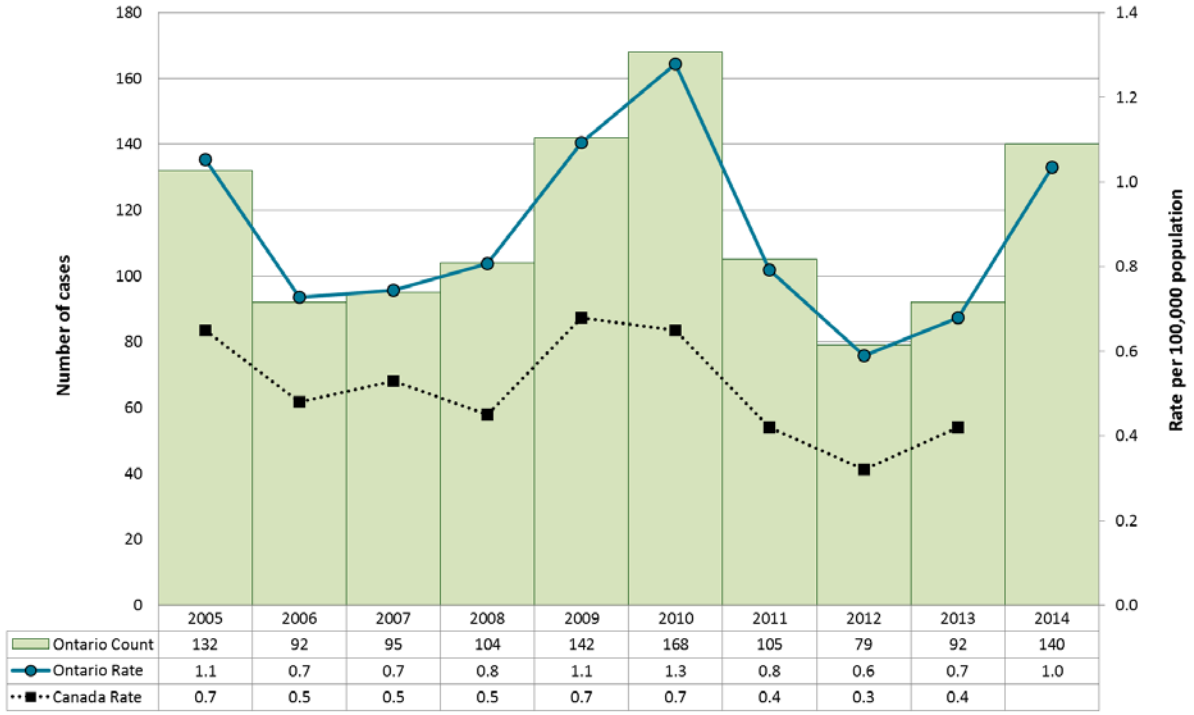
Outbreak activity

In 2014, there was a national outbreak investigation involving an increase in non-travel related cases of cyclosporiasis. The increase in non-travel related cyclosporiasis cases in Ontario began in May, with the majority of cases occurring in June and July. A total of 85 outbreak-confirmed cases were reported nationally, 52 of which were reported in Ontario. A definitive source for the outbreak was not identified; however, evidence collected during food safety investigations and a cohort analysis suggested blackberries imported from Mexico were a possible source of the outbreak.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, June 2014 edition (Volume 3, Issues 6)

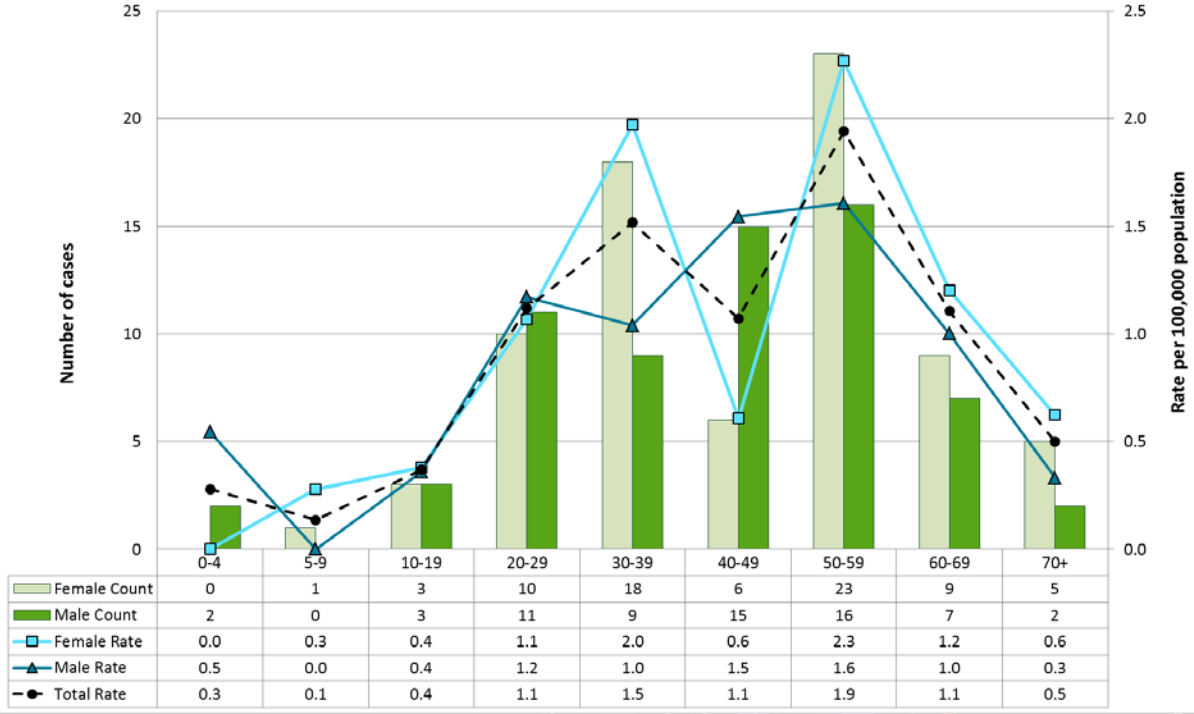
Figure 14-1. Incidence of cyclosporiasis: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	132	92	95	104	142	168	105	79	92	140
Ontario Rate	1.1	0.7	0.7	0.8	1.1	1.3	0.8	0.6	0.7	1.0
Canada Rate	0.7	0.5	0.5	0.5	0.7	0.7	0.4	0.3	0.4	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

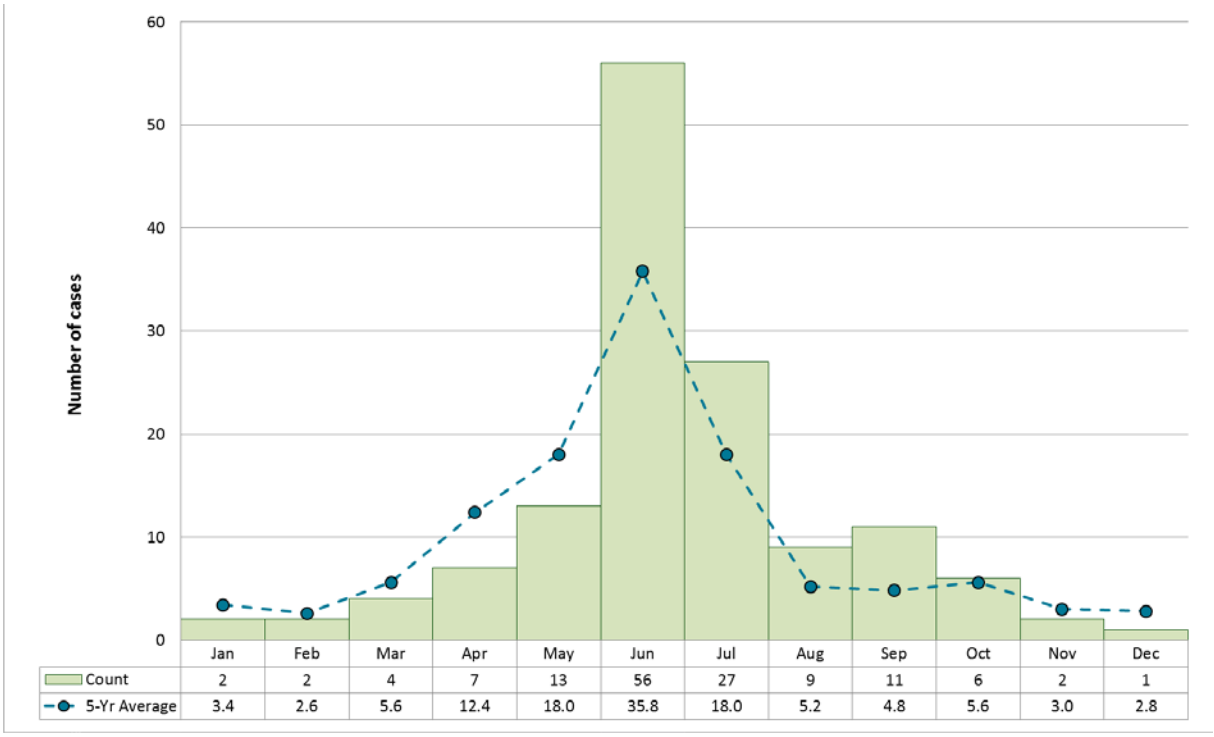
Figure 14-2. Incidence of cyclosporiasis by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	0	1	3	10	18	6	23	9	5
Male Count	2	0	3	11	9	15	16	7	2
Female Rate	0.0	0.3	0.4	1.1	2.0	0.6	2.3	1.2	0.6
Male Rate	0.5	0.0	0.4	1.2	1.0	1.5	1.6	1.0	0.3
Total Rate	0.3	0.1	0.4	1.1	1.5	1.1	1.9	1.1	0.5

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

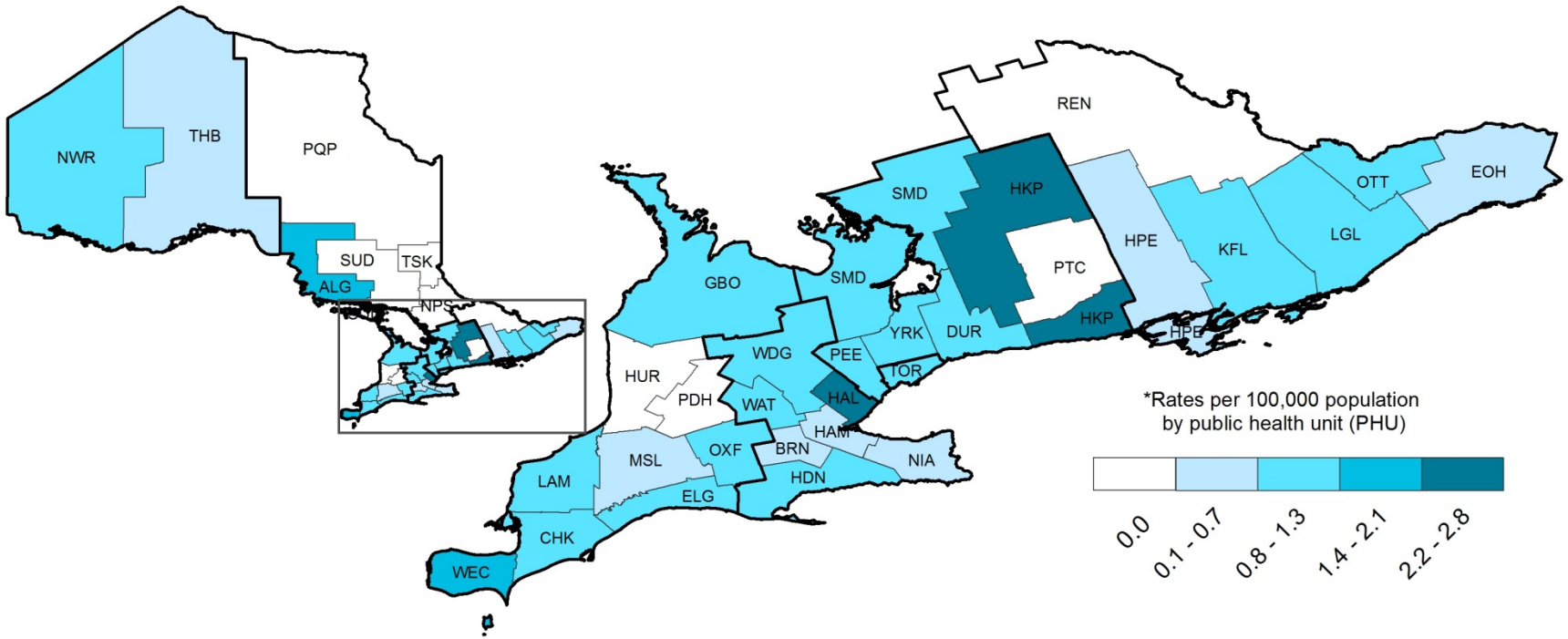
Figure 14-3. Number of cyclosporiasis cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	2	2	4	7	13	56	27	9	11	6	2	1
5-Yr Average	3.4	2.6	5.6	12.4	18.0	35.8	18.0	5.2	4.8	5.6	3.0	2.8

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 14-1. Incidence of cyclosporiasis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	2	1.7
BRN	1	0.7
CHK	1	0.9
DUR	6	0.9
ELG	1	1.1
EOH	1	0.5
GBO	2	1.2
HAL	12	2.2
HAM	3	0.5
HDN	1	0.9
HKP	5	2.8
HPE	1	0.6
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	2	1.0
LAM	1	0.8
LGL	2	1.2
MSL	2	0.4
NIA	3	0.7
NPS	0	0.0
NWR	1	1.2
OTT	8	0.9
OXF	1	0.9
PDH	0	0.0
PEE	11	0.8
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	6	1.1
SUD	0	0.0
THB	1	0.6
TOR	35	1.3
TSK	0	0.0
WAT	7	1.3
WDG	3	1.1
WEC	8	2.0
YRK	13	1.2
Ontario	**140**	**1.0**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 15.

Diphtheria

General overview for 2014

Under Ontario's publicly funded immunization program, diphtheria toxoid-containing vaccine is routinely administered in combination with vaccines against tetanus, pertussis, polio and *Haemophilus influenzae* type b to children at two, four, six and 18 months of age.[20] Subsequent, booster doses are administered at 4-6 and 14-16 years of age, with additional booster doses recommended every 10 years throughout life for continued protection.[20,21]

Incidence and comparison to Canada: There were no cases of diphtheria reported in Ontario in 2014. No cases have been reported in the province since 1995. Annual Canadian incidence rates ranged between 0.0 and 0.1 cases per 1,000,000 population between 2005 and 2013.

Chapter 16.

Giardiasis

General overview for 2014

Incidence and comparison to Canada (Figure 16-1): In 2014, there were 1,282 confirmed cases of giardiasis in Ontario, representing an incidence rate of 9.5 cases per 100,000 population. The provincial incidence rate has decreased over time and from 2010 to 2013 the provincial rate was lower than the national rate.

Age and sex (Figure 16-2): The highest incidence rates were observed among young children aged 0 to9 years and young to middle-aged adults aged 20 to 49 years. Incidence rates were higher among males compared to females across all age groups.

Seasonal trends (Figure 16-3): A seasonal pattern was observed for giardiasis with case counts peaking in the summer months. According to an Ontario study, cases reported during the winter months are largely attributed to international travel.[22]

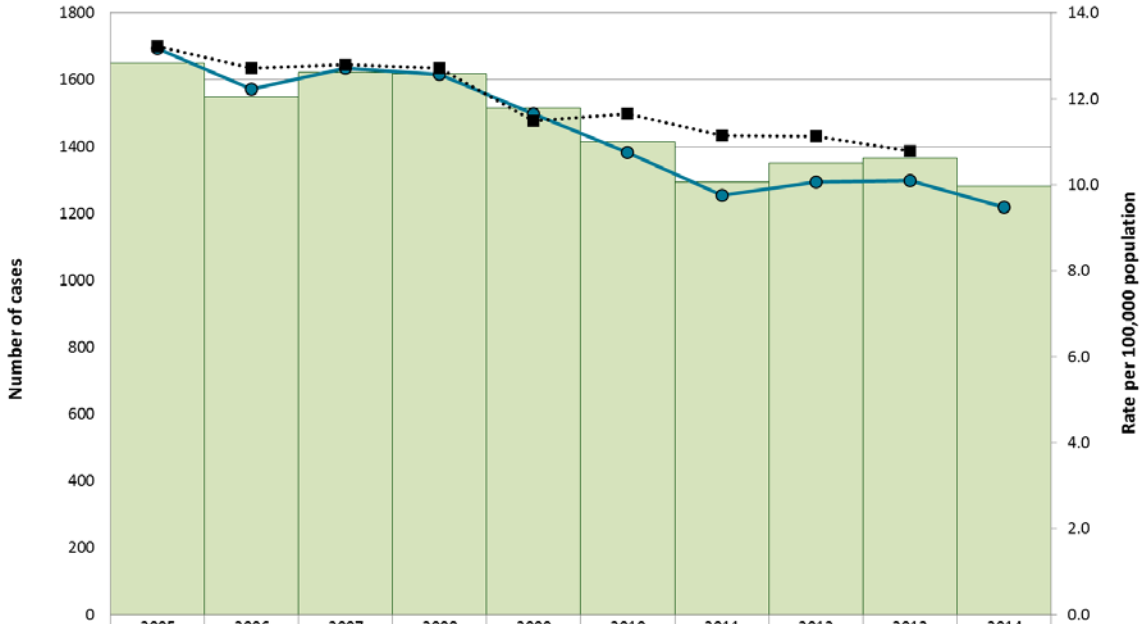
Geographic distribution (Map 16-1): The highest incidence rates were reported by Haliburton, Kawartha, Pine Ridge (19.5 cases per 100,000 population), Toronto (15.0 cases per 100,000 population), and Thunder Bay District (14.8 cases per 100,000 population). The highest number of cases were reported by Toronto (416 cases), Peel Region (106 cases), and City of Ottawa (83 cases).

Hospitalizations and deaths: Hospitalization was reported for 1.4% (18/1,282) of cases and death was reported for one case.

Additional sources of information

- Vrbova L, Johnson K, Whitfield Y, Middleton D. A descriptive study of reportable gastrointestinal illnesses in Ontario, Canada, from 2007 to 2009. BMC public health [Internet]. 2012;12(970)
- PHO's Monthly Infectious Diseases Surveillance Report, April 2012 edition (Volume 1, Issue 5)

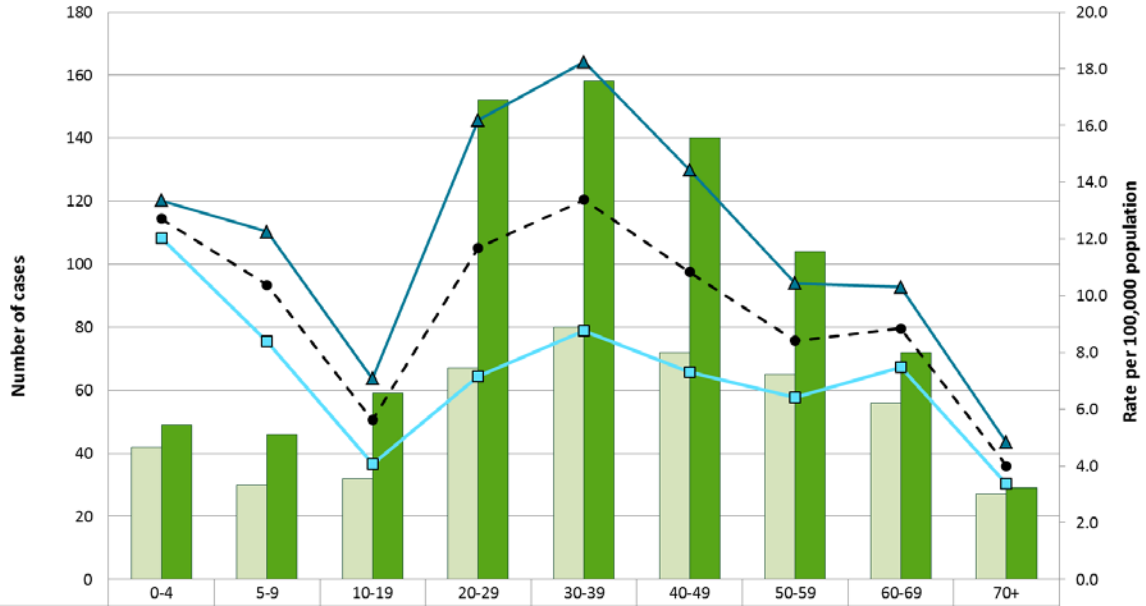
Figure 16-1. Incidence of giardiasis: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	1650	1548	1622	1618	1514	1413	1294	1351	1366	1282
Ontario Rate	13.2	12.2	12.7	12.6	11.6	10.8	9.8	10.1	10.1	9.5
Canada Rate	13.2	12.7	12.8	12.7	11.5	11.7	11.1	11.1	10.8	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

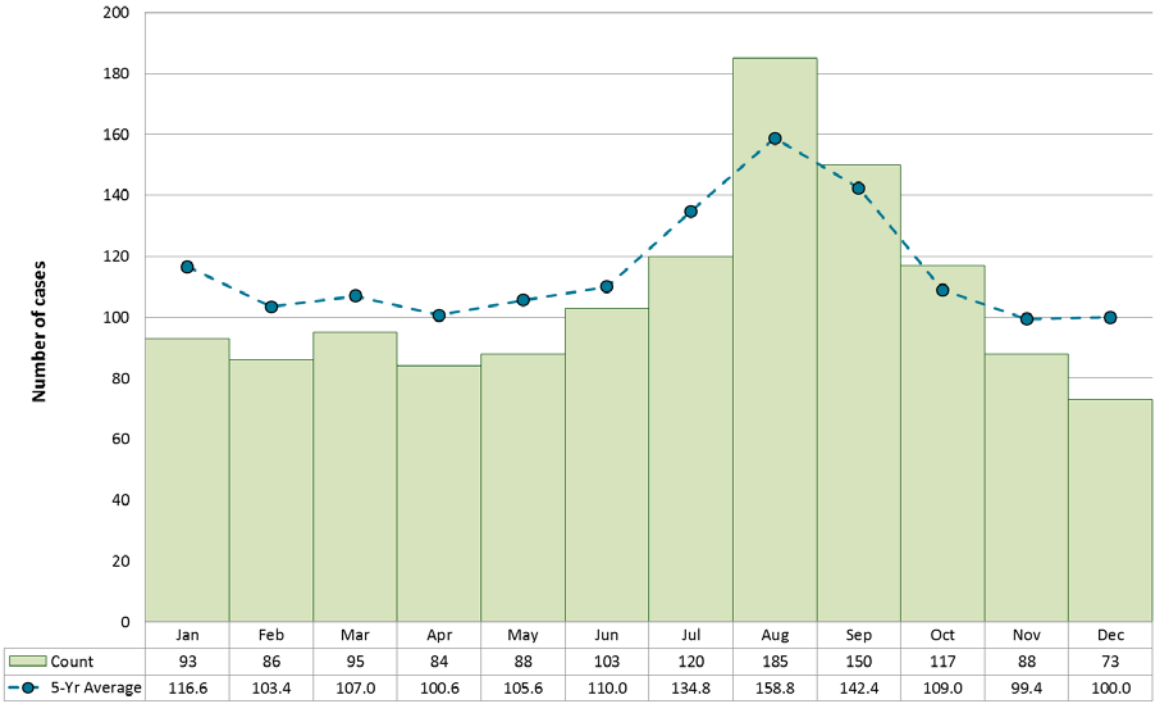
Figure 16-2. Incidence of giardiasis by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	42	30	32	67	80	72	65	56	27
Male Count	49	46	59	152	158	140	104	72	29
Female Rate	12.0	8.4	4.1	7.2	8.8	7.3	6.4	7.5	3.4
Male Rate	13.4	12.3	7.1	16.2	18.2	14.4	10.4	10.3	4.8
Total Rate	12.7	10.4	5.6	11.7	13.4	10.8	8.4	8.8	4.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes one case of unknown age and one case of unknown sex.

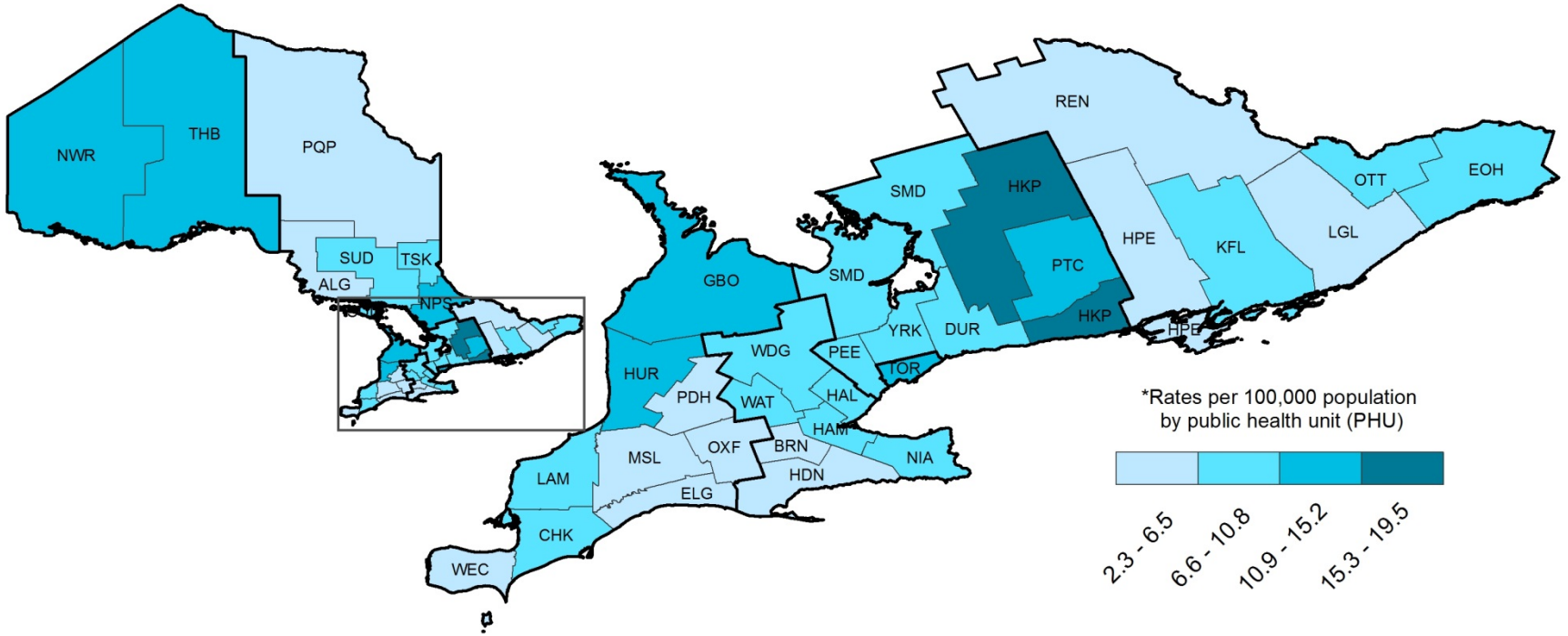
Figure 16-3. Number of giardiasis cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	93	86	95	84	88	103	120	185	150	117	88	73
5-Yr Average	116.6	103.4	107.0	100.6	105.6	110.0	134.8	158.8	142.4	109.0	99.4	100.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 16-1. Incidence of giardiasis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	6	5.1
BRN	7	4.9
CHK	9	8.5
DUR	55	8.5
ELG	4	4.4
EOH	16	7.8
GBO	21	12.9
HAL	46	8.5
HAM	44	8.1
HDN	7	6.4
HKP	35	19.5
HPE	10	6.1
HUR	7	12.0

PHU	Cases (n)	*Rates
KFL	17	8.5
LAM	9	6.9
LGL	11	6.5
MSL	20	4.3
NIA	36	8.1
NPS	15	11.7
NWR	9	11.1
OTT	83	8.9
OXF	6	5.4
PDH	3	3.9
PEE	106	7.6
PQP	2	2.3
PTC	20	14.4

PHU	Cases (n)	*Rates
REN	6	5.7
SMD	40	7.5
SUD	17	8.5
THB	23	14.8
TOR	416	15.0
TSK	3	8.7
WAT	48	9.0
WDG	24	8.6
WEC	23	5.7
YRK	78	7.1
Ontario	**1282**	**9.5**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 17.

Gonorrhea

General overview for 2014

Incidence and comparison to Canada (Figure 17-1): Gonorrhea is the second most frequently reported sexually transmitted infection in Ontario, after chlamydia. Of the 5,838 cases of gonorrhea reported in 2014, 22.6% (1,321/5,838) were co-infected with chlamydia. From 2005 to 2013, the incidence rate of gonorrhea in Ontario gradually increased from 26.5 cases per 100,000 population to 33.6 cases per 100,000 population, followed by a nearly 30% increase in 2014 to 43.1 cases per 100,000 population. Since 2005, incidence rates of gonorrhea reported in Ontario have been lower than the Canadian rates.

Age and sex (Figure 17-2): The incidence of gonorrhea in 2014 was greater among males, with an incidence rate of 57.3 cases per 100,000 population, compared to 29.3 cases per 100,000 population among females. Over 65% (3,807/5,838) of cases in 2014 were reported among males (data not shown). The higher incidence of gonorrhea among males may be partly attributed to transmission among men who have sex with men (MSM).[23] Among male cases in 2014 reporting a risk factor, 40.8% reported MSM (data not shown). In 2014, the highest incidence of gonorrhea reported among females occurred in the 15 to 24 year age group. Among males in 2014, the highest incidence was reported in the 20 to 29 year age group. For both sexes, incidence rates subsequently decreased with increasing age.

Laboratory data (Figure 17-3): The number of laboratory tests performed for gonorrhea has an impact on the number of cases detected and reported, as many gonorrhea cases are asymptomatic, particularly among females. Based on testing performed at the Public Health Ontario Laboratory (PHOL), the percentage of nucleic acid amplification tests (from cervical, urethral and urine specimens) that were positive for gonorrhea each month in 2014 ranged from 0.7% to 1.2%. with an overall percent positivity of 0.9% for the year. The percent positivity in 2014 was higher than in 2012 (0.7%) and 2013 (0.8%). These data do not include testing performed at private laboratories throughout the province, which conducts the majority of testing for gonorrhea in Ontario.

Geographic distribution (Map 17-1): The highest reported incidence rates of gonorrhea in 2014 occurred in Toronto, with an incidence rate of 97.4 cases per 100,000 population, followed by Peel Region and Waterloo Region with incidence rates of 49.0 and 48.6 cases per 100,000 population, respectively.

Highlights

The increase in the incidence of gonorrhea is not yet fully understood; there are likely to be many contributing factors. Increases in the incidence of chlamydia and infectious syphilis cases reported in Ontario in 2014 are also not fully understood. Factors that may influence the reported incidence of gonorrhea include a true increase in incidence, changes in screening and testing practices among clinicians, follow-up by public health units, increasing resistance to antibiotics available to treat gonorrhea infections, as well as changes in knowledge, attitudes and behaviours related to STI prevention.[23]

Evolving antibiotic resistance presents challenges to successful gonorrhea treatment, which in turn impacts disease transmission. While a laboratory definition for what constitutes resistance to cefixime and ceftriaxone has not yet been agreed upon in North America, clinical failures associated with cefixime treatment have been reported in Ontario.[24] In response, Public Health Ontario released new provincial guidelines for testing and treatment of gonorrhea in April 2013.[25] While many cases in 2014 were treated according to these guidelines, opportunities exist to optimize the use of first line treatment recommendations.[23] The extent of

gonorrhea antimicrobial drug resistance in the province is likely underestimated, since it can only be detected using culture-based testing methods, rather than the nucleic acid amplification test that is most often used to diagnose gonorrhea in Ontario.

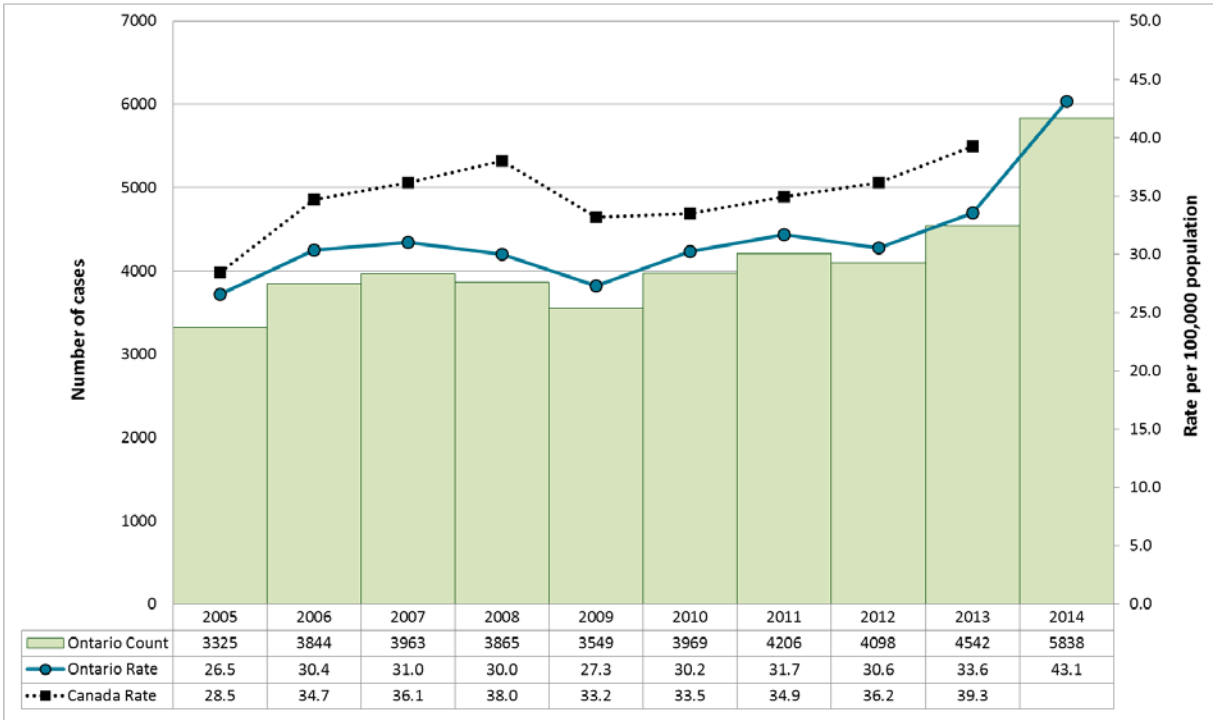
Additional methodological issues

Cases of gonorrhea are often undetected and, as a result, under-reported to public health units due to the occurrence of asymptomatic infections, particularly among women.[26]

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, November 2012 edition

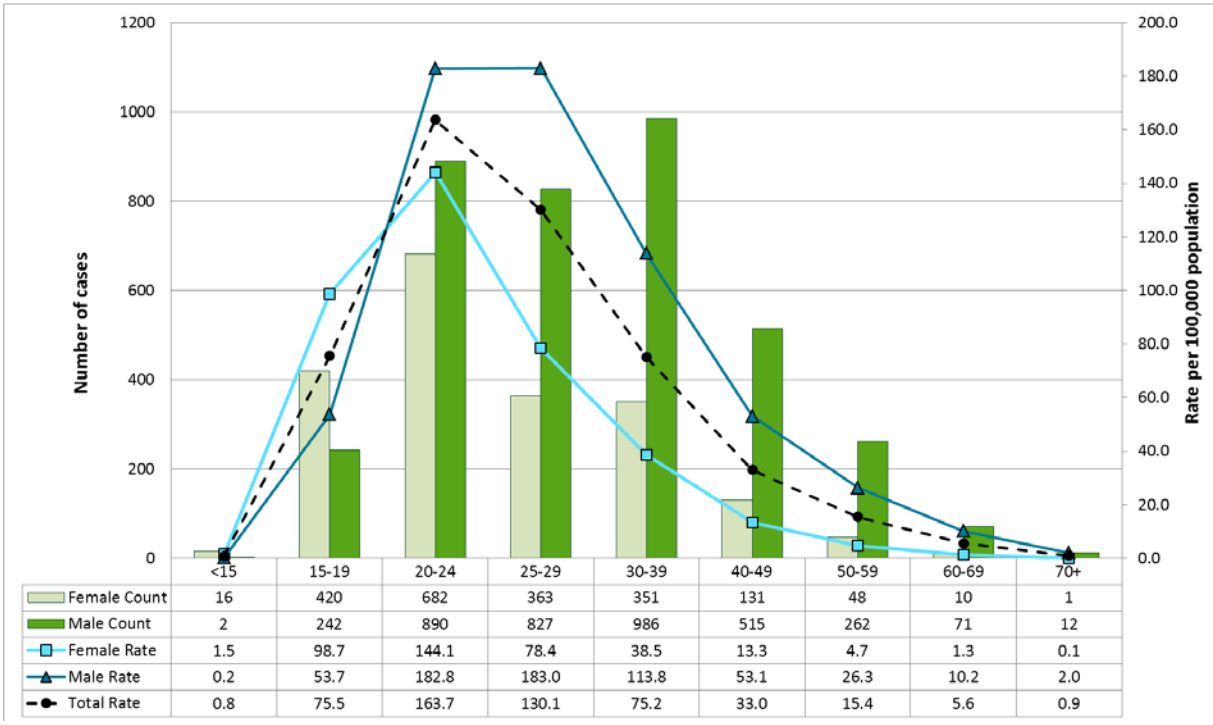
Figure 17-1. Incidence of gonorrhea: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	3325	3844	3963	3865	3549	3969	4206	4098	4542	5838
Ontario Rate	26.5	30.4	31.0	30.0	27.3	30.2	31.7	30.6	33.6	43.1
Canada Rate	28.5	34.7	36.1	38.0	33.2	33.5	34.9	36.2	39.3	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

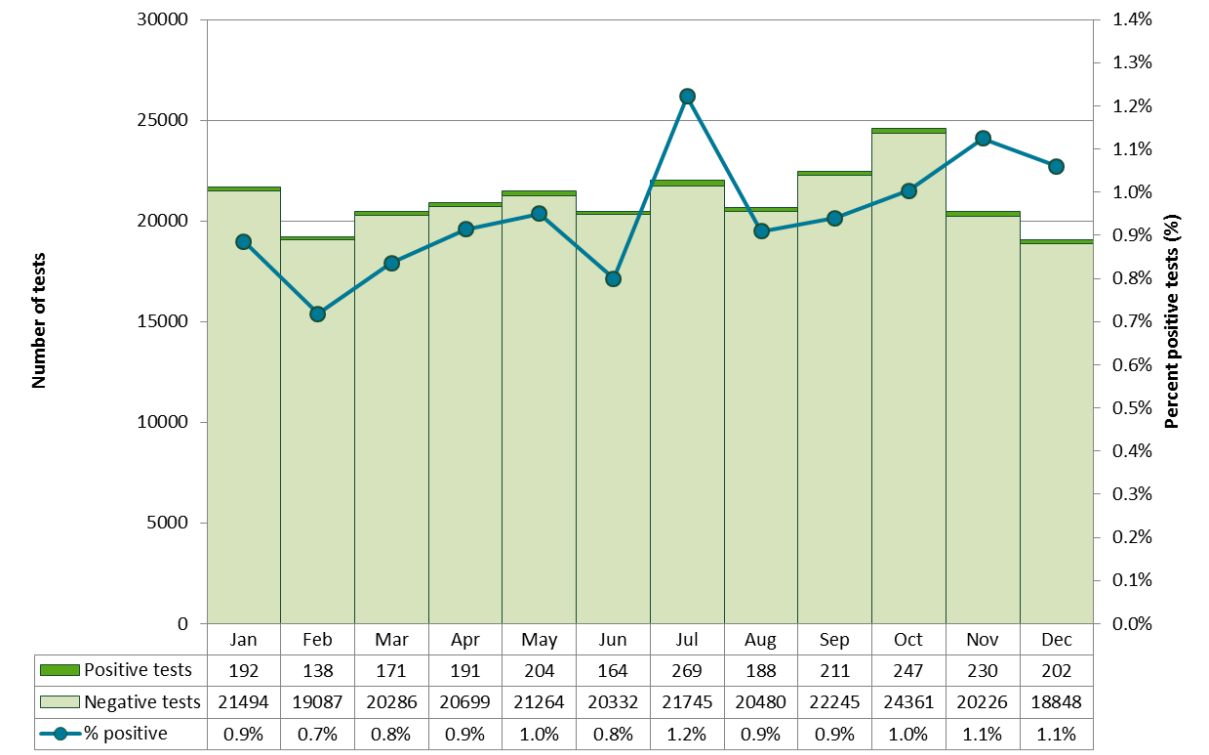
Figure 17-2. Incidence of gonorrhea by age and sex: Ontario, 2014



	<15	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	16	420	682	363	351	131	48	10	1
Male Count	2	242	890	827	986	515	262	71	12
Female Rate	1.5	98.7	144.1	78.4	38.5	13.3	4.7	1.3	0.1
Male Rate	0.2	53.7	182.8	183.0	113.8	53.1	26.3	10.2	2.0
Total Rate	0.8	75.5	163.7	130.1	75.2	33.0	15.4	5.6	0.9

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes nine cases of unknown age and/or sex.

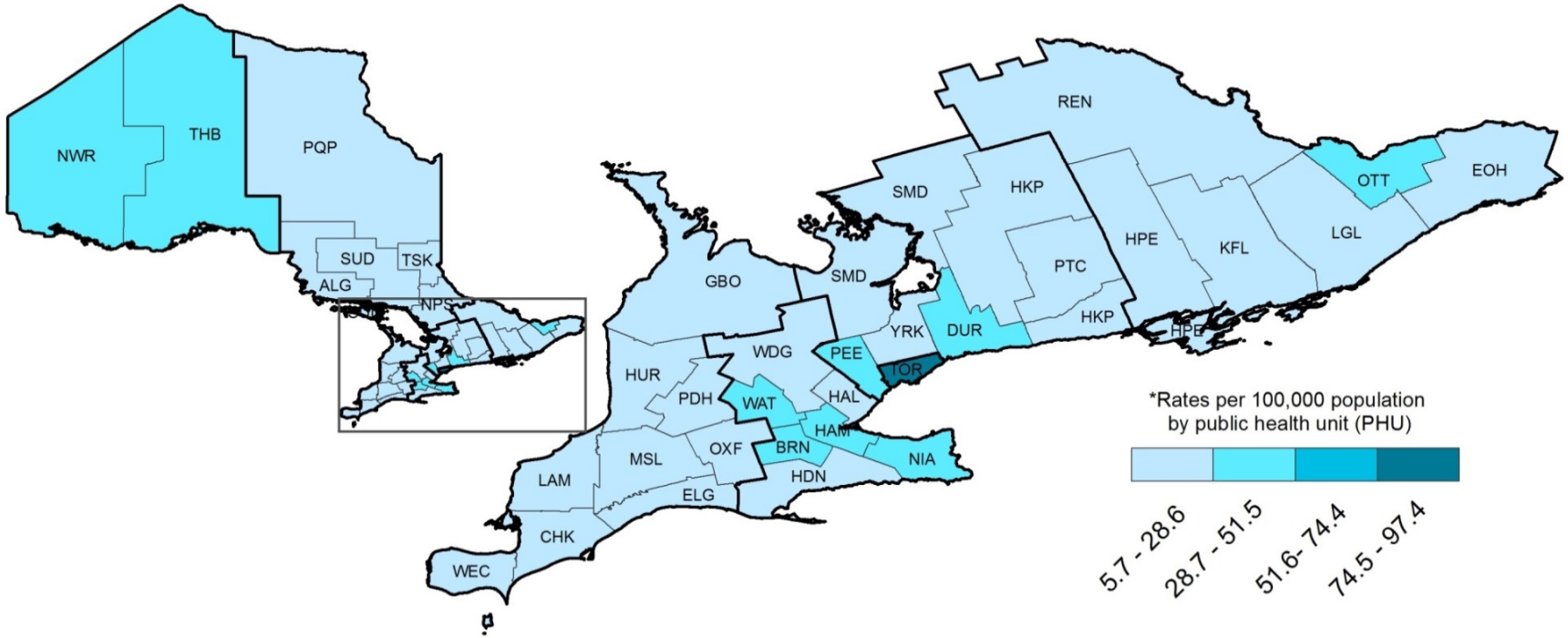
Figure 17-3. Number and percent of positive gonorrhea tests by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Positive tests	192	138	171	191	204	164	269	188	211	247	230	202
Negative tests	21494	19087	20286	20699	21264	20332	21745	20480	22245	24361	20226	18848
% positive	0.9%	0.7%	0.8%	0.9%	1.0%	0.8%	1.2%	0.9%	0.9%	1.0%	1.1%	1.1%

Source: Public Health Ontario Laboratory (PHOL), STI Online, extracted [2015/05/13].
Note: Data only include tests performed at PHOL.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Map 17-1. Incidence of gonorrhea by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	30	25.7
BRN	59	41.3
CHK	6	5.7
DUR	212	32.9
ELG	8	8.9
EOH	40	19.5
GBO	25	15.4
HAL	129	23.9
HAM	194	35.6
HDN	25	22.8
HKP	23	12.8
HPE	26	15.9
HUR	9	15.4

PHU	Cases (n)	*Rates
KFL	51	25.5
LAM	18	13.8
LGL	10	5.9
MSL	109	23.6
NIA	144	32.3
NPS	13	10.2
NWR	30	37.0
OTT	328	35.1
OXF	10	9.0
PDH	14	18.0
PEE	680	49.0
PQP	7	8.1
PTC	22	15.8

PHU	Cases (n)	*Rates
REN	9	8.5
SMD	118	22.1
SUD	53	26.5
THB	54	34.8
TOR	2699	97.4
TSK	5	14.5
WAT	260	48.6
WDG	65	23.3
WEC	56	13.9
YRK	297	26.9
Ontario	**5838**	**43.1**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03]

Chapter 18.

Group A streptococcal disease, invasive

General overview for 2014

Incidence and comparison to Canada (Figure 18-1): In 2014, 730 cases of invasive group A streptococcal (iGAS) disease were reported in Ontario, corresponding to an incidence rate of 5.4 cases per 100,000 population. From 2005 to 2014, there was a general increase in the incidence rate of iGAS disease, from a low of 3.1 cases per 100,000 population in 2005 to the current 2014 high of 5.4 cases per 100,000 population. Overall, incidence rates of iGAS in Ontario have been similar to the Canadian incidence rates over this time period.

Age and sex (Figure 18-2): In 2014, the overall incidence rate of iGAS was higher in males (5.7 cases per 100,000 population) than females (5.1 cases per 100,000 population). The incidence of iGAS was relatively high among infants less than one year of age with an incidence rate of 10.6 cases per 100,000 population; was lowest among those between 10 and 19 years of age; and increased steadily with age among those aged 20 years and older. The majority of iGAS cases (79.2%, 578/730) in 2014 were reported among those 30 years of age and older.

Seasonal trends (Figure 18-3): The incidence of iGAS disease tends to follow a seasonal pattern, with higher case counts in the winter and early spring months. This seasonal trend was observed in 2014, where monthly case counts from January to May ranged from 72 cases (in May) to 87 cases (in March). Case counts reached a low in September with 29 cases. Monthly case counts in 2014 exceeded the corresponding five-year (2009-13) monthly averages except for September and October.

Laboratory data (Table 18-1): Laboratory testing for iGAS cases may include further differentiation by *emm* type, which assists in determining potential linkages among cases. iGAS emm types also assist in identifying circulating strains associated with invasive disease and identifying new strains that may be associated with more severe illness.[27] In 2014, an *emm* type was entered in iPHIS for 44.1% (322/730) of confirmed iGAS cases. Among iGAS cases for which an *emm* type was specified, *emm* 1 (28.9%, 93/322), *emm* 89 (9.9%, 32/322), and *emm* 68 (6.5%, 21/322) were the three most commonly reported *emm* types. From 2008 to 2013 the two most common *emm* types have consistently been *emm* 1 and *emm* 89 (data not shown). There was geographic variation in the distribution of *emm* types across the province in 2014. For example, *emm* 1 was the most common *emm* type in Toronto (31.7%, 19/60) and Ottawa (46.3%, 19/41), whereas *emm* 68 was unique to Northwestern and Thunder Bay District. Among 25 health units with *emm* type data reported, the median number of *emm* types identified was four (range: 1 to 17).

Geographic distribution (Map 18-1): In 2014, incidence rates of iGAS in Ontario were highest in Northwestern (48.1 cases per 100,000 population), followed by Thunder Bay District (20.0 cases per 100,000 population), and Timiskaming (17.3 cases per 100,000 population). However, the public health unit with the most iGAS cases (21.2%, 155/730) in 2014 was Toronto.

Hospitalizations and deaths: In 2014, 78.1% (570/730) of invasive iGAS cases were hospitalized; 14.8% (108/730) of cases were fatal.

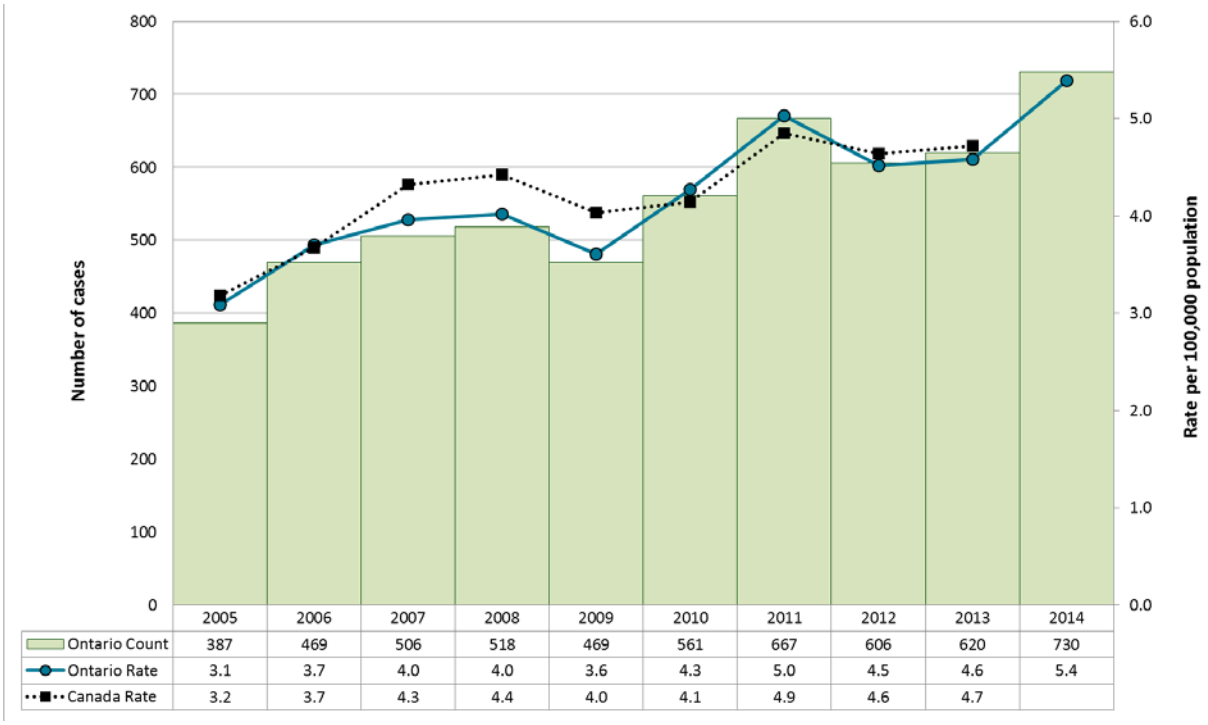
Additional methodological issues

The *emm*-type data can be captured in iPHIS; however, data on *emm*-type are missing for many iGAS cases making it difficult to accurately assess spatial and temporal distributions. Emm-type data may be unavailable for assessment for several reasons: *emm* type testing was not performed, *emm* type results were not reported to Public Health Ontario or the local public health unit, or *emm* type data were not entered into iPHIS.

Additional sources of information

- PHO's Provincial Epidemiological Summary: Group A Streptococcal Disease, Invasive, January 2014
- PHO's Provincial Epidemiological Summary: Group A Streptococcal Disease, Invasive, October 2014

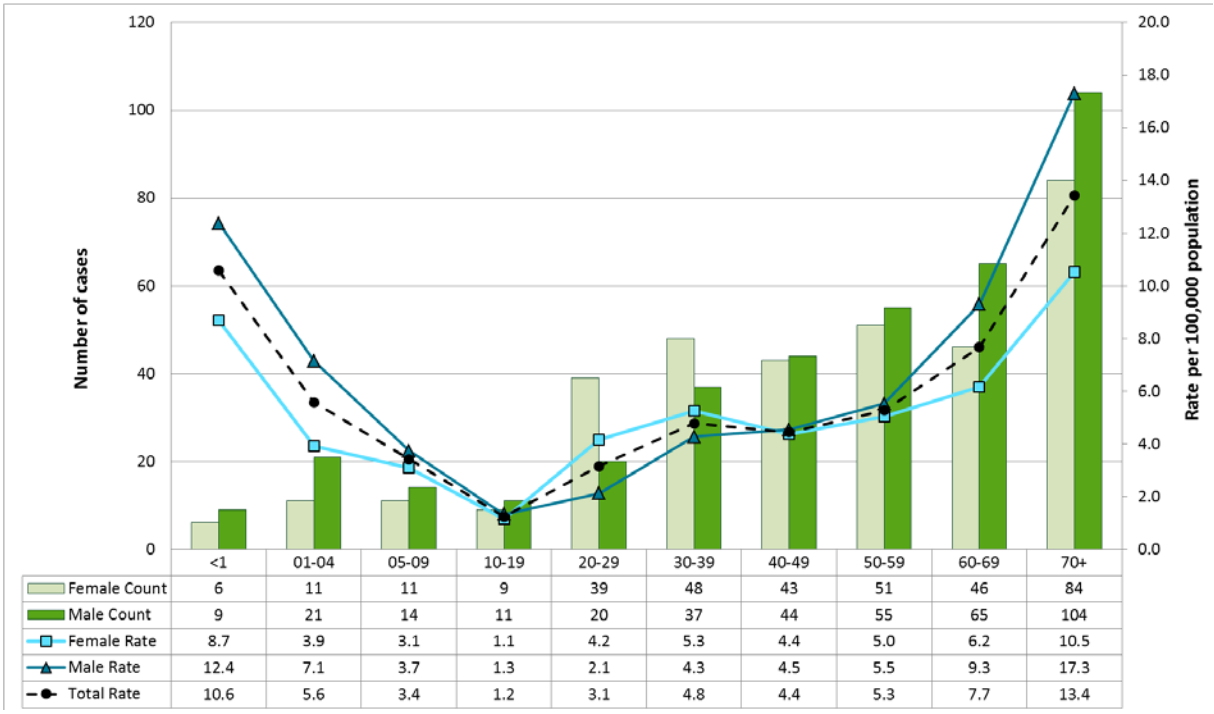
Figure 18-1. Incidence of group A streptococcal disease, invasive (iGAS): Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	387	469	506	518	469	561	667	606	620	730
Ontario Rate	3.1	3.7	4.0	4.0	3.6	4.3	5.0	4.5	4.6	5.4
Canada Rate	3.2	3.7	4.3	4.4	4.0	4.1	4.9	4.6	4.7	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

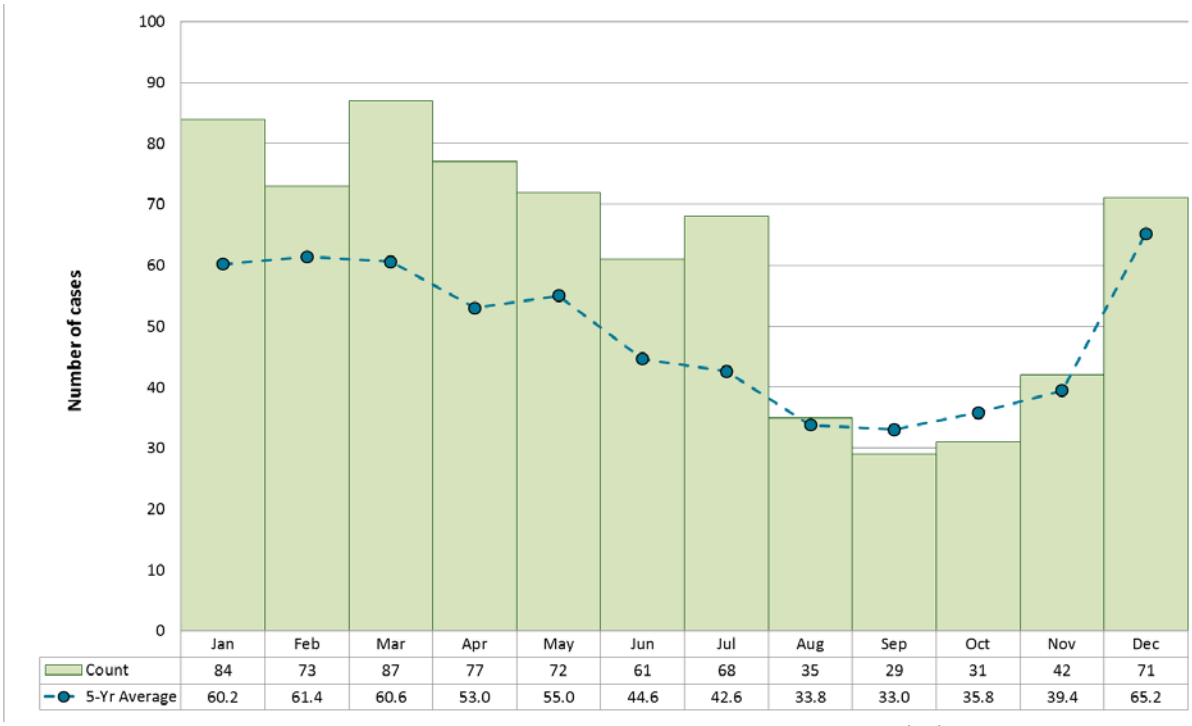
Figure 18-2. Incidence of group A streptococcal disease, invasive (iGAS) by age and sex: Ontario, 2014



	<1	01-04	05-09	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	6	11	11	9	39	48	43	51	46	84
Male Count	9	21	14	11	20	37	44	55	65	104
Female Rate	8.7	3.9	3.1	1.1	4.2	5.3	4.4	5.0	6.2	10.5
Male Rate	12.4	7.1	3.7	1.3	2.1	4.3	4.5	5.5	9.3	17.3
Total Rate	10.6	5.6	3.4	1.2	3.1	4.8	4.4	5.3	7.7	13.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes two cases where the client did not indicate male or female.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Figure 18-3. Number of group A streptococcal disease, invasive (iGAS) cases by month: Ontario, 2014



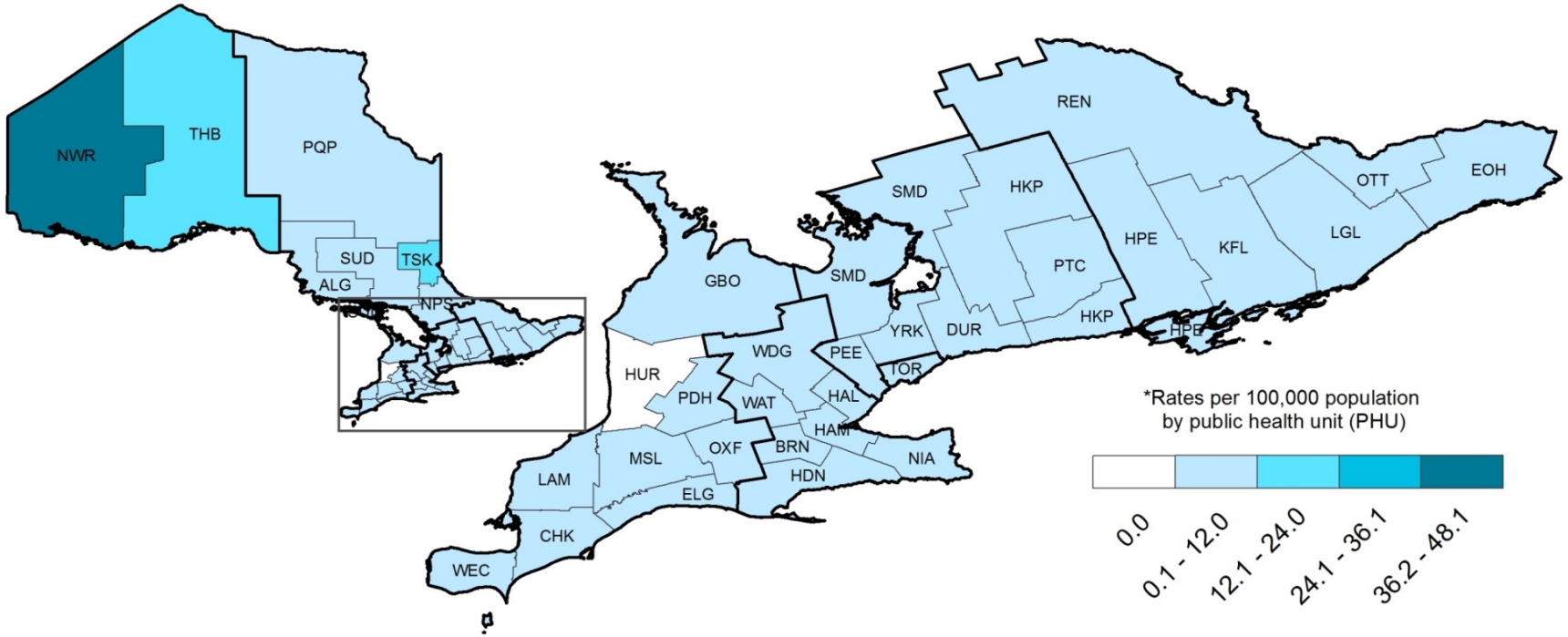
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Table 18-1. Cases of group A streptococcal disease, invasive (iGAS) by *emm* type: Ontario, 2014

	Cases	
***emm* Type**	**n**	**%**
emm1	93	12.7%
emm89	32	4.4%
emm68	21	2.9%
emm12	20	2.7%
emm11	19	2.6%
emm28	18	2.5%
emm4	17	2.3%
All other (specified)	102	14.0%
Unspecified	408	55.9%
Total	730	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/09/22].
Note: "Other" is the sum of *emm* types with a frequency below 2%. Unspecified refers to the sum of cases for which *emm* type was reported as "unspecified" or left blank.

Map 18-1. Incidence of group A streptococcal disease, invasive (iGAS) by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	9	7.7
BRN	15	10.5
CHK	8	7.6
DUR	25	3.9
ELG	6	6.6
EOH	5	2.4
GBO	13	8.0
HAL	22	4.1
HAM	24	4.4
HDN	4	3.6
HKP	11	6.1
HPE	11	6.7
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	13	6.5
LAM	10	7.7
LGL	7	4.1
MSL	20	4.3
NIA	22	4.9
NPS	12	9.4
NWR	39	48.1
OTT	56	6.0
OXF	5	4.5
PDH	3	3.9
PEE	46	3.3
PQP	10	11.5
PTC	6	4.3

PHU	Cases (n)	*Rates
REN	7	6.6
SMD	37	6.9
SUD	15	7.5
THB	31	20.0
TOR	155	5.6
TSK	6	17.3
WAT	25	4.7
WDG	8	2.9
WEC	17	4.2
YRK	27	2.4
Ontario	**730**	**5.4**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 19.

Group B streptococcal disease, neonatal

General overview for 2014

Incidence and comparison to Canada (Figure 19-1): In 2014, there were 54 cases of neonatal group B streptococcal (GBS) disease in Ontario, corresponding to an incidence rate of 38.6 cases per 100,000 live births.

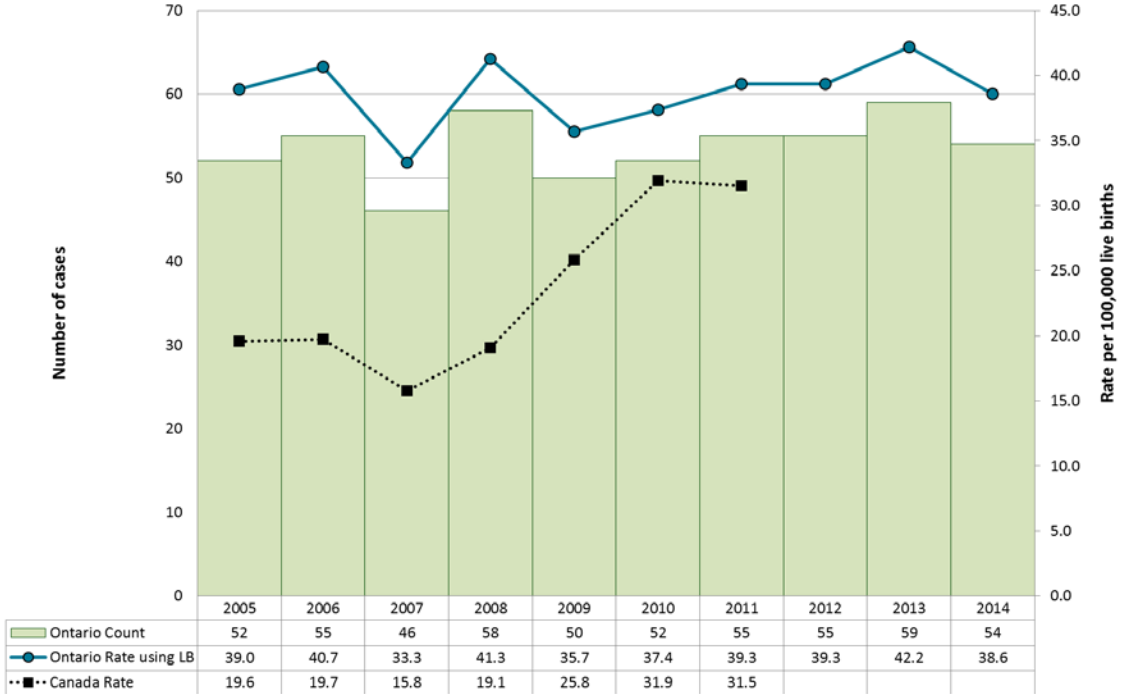
Between 2005 and 2014, the incidence of neonatal GBS disease in Ontario ranged from 33.3 to 42.2 cases per 100,000 live births. Rates of neonatal GBS disease in Ontario were higher compared to the Canadian rates reported from 2005 to 2011; however, this difference has lessened since 2009 as a result of an increase in the national rates.

Sex: The incidence rate of neonatal GBS was 51.3 cases per 100,000 female live births, compared to 26.5 cases per 100,000 male live births. Of the 54 neonatal GBS cases reported in 2014, 35 (64.8%) were female and 19 (35.2%) were male (data not shown).

Geographic distribution (Map 19-1): Cases of neonatal GBS disease were reported in 16 public health units in 2014. The Toronto public health unit accounted for over one-third (35.2%; 19/54) of neonatal GBS disease cases reported in 2014. The highest incidence rates, however, were reported from Huron County with 163.7 cases per 100,000 live births, followed by Northwestern and Wellington-Dufferin-Guelph, with 114.0 and 98.8 cases per 100,000 live births, respectively.

Deaths: There were two reported deaths among neonates related to this infection in 2014.

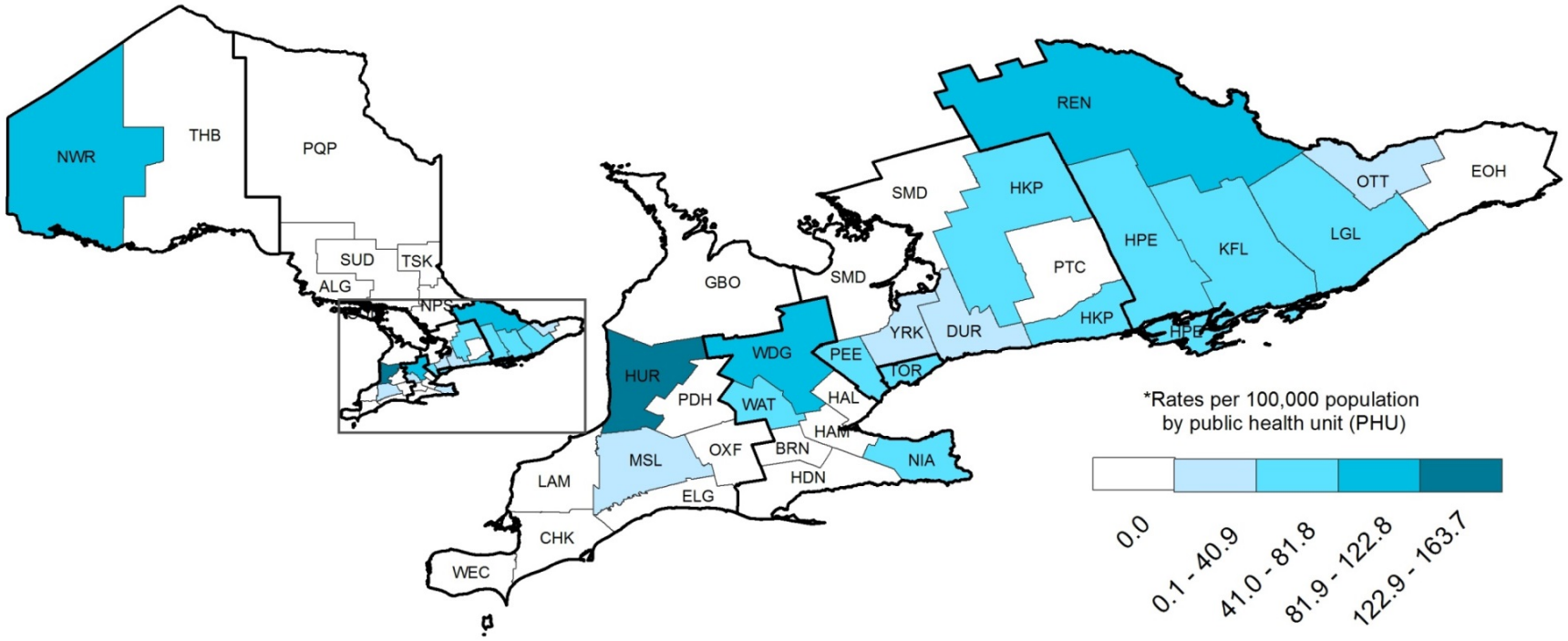
Figure 19-1. Incidence of group B streptococcal disease, neonatal: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	52	55	46	58	50	52	55	55	59	54
Ontario Rate using LB	39.0	40.7	33.3	41.3	35.7	37.4	39.3	39.3	42.2	38.6
Canada Rate	19.6	19.7	15.8	19.1	25.8	31.9	31.5			

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Live Births [2004 to 2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2014/07/15]; national data available up to 2011.
Note: Ontario rates - Live births data for 2012-14 were unavailable at the time of data extraction; therefore, 2011 live births data were used to calculate rates for these years.
Note: Canadian rates - The denominators for rate calculations are live births from 2005 to 2011. Quebec did not report neonatal GBS cases from 2009 to 2011; Alberta did not report from 2009–2011. Denominators (live births) have been adjusted in these years for the rate calculations.

Map 19-1. Incidence of group B streptococcal disease, neonatal by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	0	0.0
CHK	0	0.0
DUR	1	15.2
ELG	0	0.0
EOH	0	0.0
GBO	0	0.0
HAL	0	0.0
HAM	0	0.0
HDN	0	0.0
HKP	1	75.2
HPE	1	69.3
HUR	1	163.7

PHU	Cases (n)	*Rates
KFL	1	55.2
LAM	0	0.0
LGL	1	74.0
MSL	1	21.3
NIA	2	50.6
NPS	0	0.0
NWR	1	114.0
OTT	4	40.6
OXF	0	0.0
PDH	0	0.0
PEE	11	69.5
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	1	94.0
SMD	0	0.0
SUD	0	0.0
THB	0	0.0
TOR	19	62.2
TSK	0	0.0
WAT	3	49.7
WDG	3	98.8
WEC	0	0.0
YRK	3	26.8
Ontario	**54**	**38.6**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Live Births [2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].

Chapter 20.

Hantavirus pulmonary syndrome

General overview for 2014

There were no cases of Hantavirus Pulmonary Syndrome reported in Ontario in 2014. A case of Hantavirus Pulmonary Syndrome has yet to be identified in Ontario since it became reportable in 2001.

Chapter 21.

Hemorrhagic fevers

General overview for 2014

Incidence and comparison to Canada: Viral hemorrhagic fevers (VHFs) such as Ebola virus disease, Marburg virus disease and Lassa fever are not endemic to Ontario or Canada. Although Lassa fever is a VHF, it is listed as a separate reportable disease under *Ontario Regulation 559/91: Specification of Reportable Diseases*, while Ebola virus disease and Marburg virus disease are both classified as VHFs under this regulation.[16]

However, under national case definitions, Lassa fever is included under the general category of viral hemorrhagic fever.

No cases of any VHFs have been reported in Canada since 2002 when the disease group was re-listed as a nationally notifiable disease.

Chapter 22.

Hepatitis A

General overview for 2014

Incidence and comparison to Canada (Figure 22-1): In 2014, there were 87 confirmed cases of hepatitis A in Ontario, representing an incidence rate of 0.6 cases per 100,000 population. From 2005 to 13, rates in Ontario were comparable to the Canadian rates.

Age and sex (Figure 22-2): The highest incidence rates were observed in the 5-9 year age group (1.9 cases per 100,000 population) and the 20-29 year age group (1.5 cases per 100,000 population). Incidence rates by sex differed across the age groups, with no particular pattern.

Seasonal trends (Figure 22-3): No seasonal trend was observed in 2014.

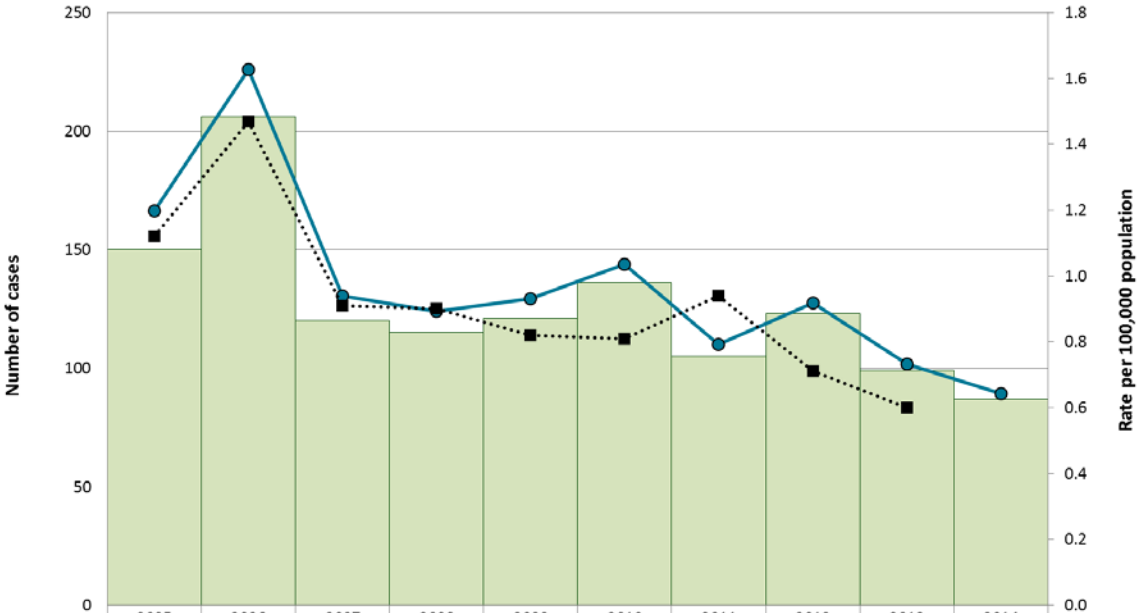
Geographic distribution (Map 22-1): The highest incidence rates were observed in Waterloo Region (1.7 cases per 100,000 population), Toronto (1.2 cases per 100,000 population), Wellington-Dufferin Guelph (1.1 cases per 100,000 population), and Halton Region (1.1 cases per 100,000 population).

Hospitalizations and deaths: Hospitalization was reported for 41.4% (36/87) of cases; no deaths were reported.

Additional sources of information

- Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. *Hepatitis A Post-exposure Prophylaxis*. Toronto, ON: Queen's Printer for Ontario; October 2013.
- PHO's Monthly Infectious Diseases Surveillance Report, November 2014 edition (Volume 3, Issue 11)
- Vrbova L, Johnson K, Whitfield Y, Middleton D. A descriptive study of reportable gastrointestinal illnesses in Ontario, Canada, from 2007 to 2009. BMC public health [Internet]. 2012;12(970)

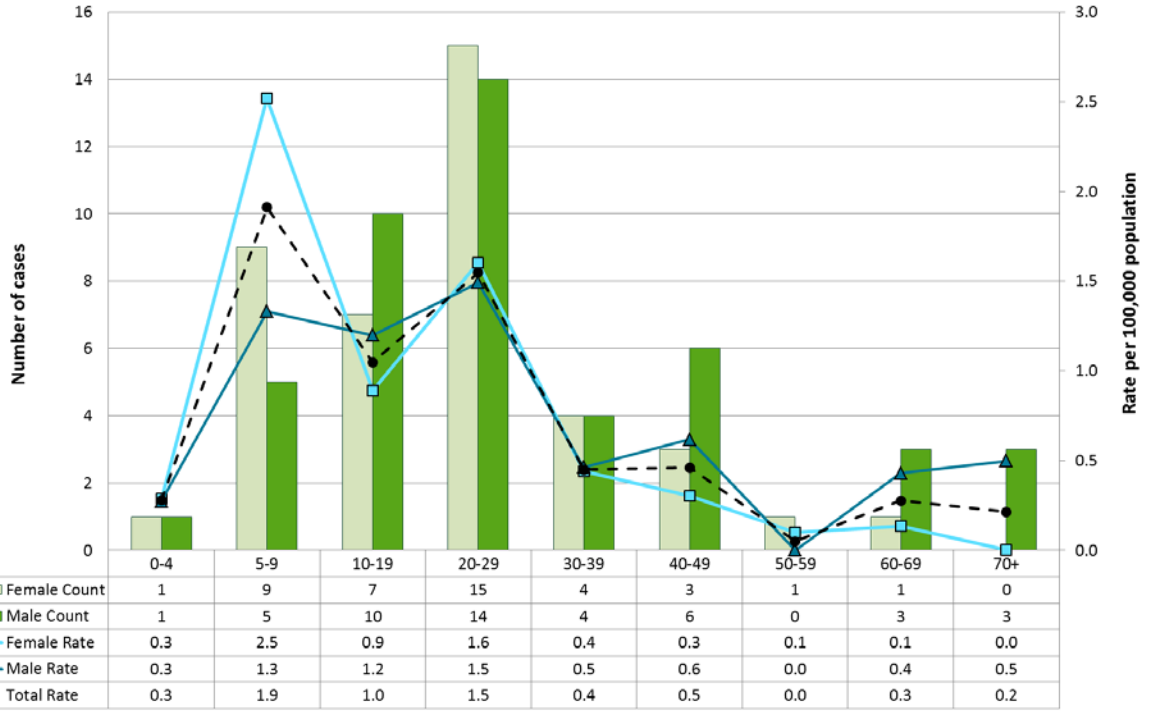
Figure 22-1. Incidence of hepatitis A: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	150	206	120	115	121	136	105	123	99	87
Ontario Rate	1.2	1.6	0.9	0.9	0.9	1.0	0.8	0.9	0.7	0.6
Canada Rate	1.1	1.5	0.9	0.9	0.8	0.8	0.9	0.7	0.6	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

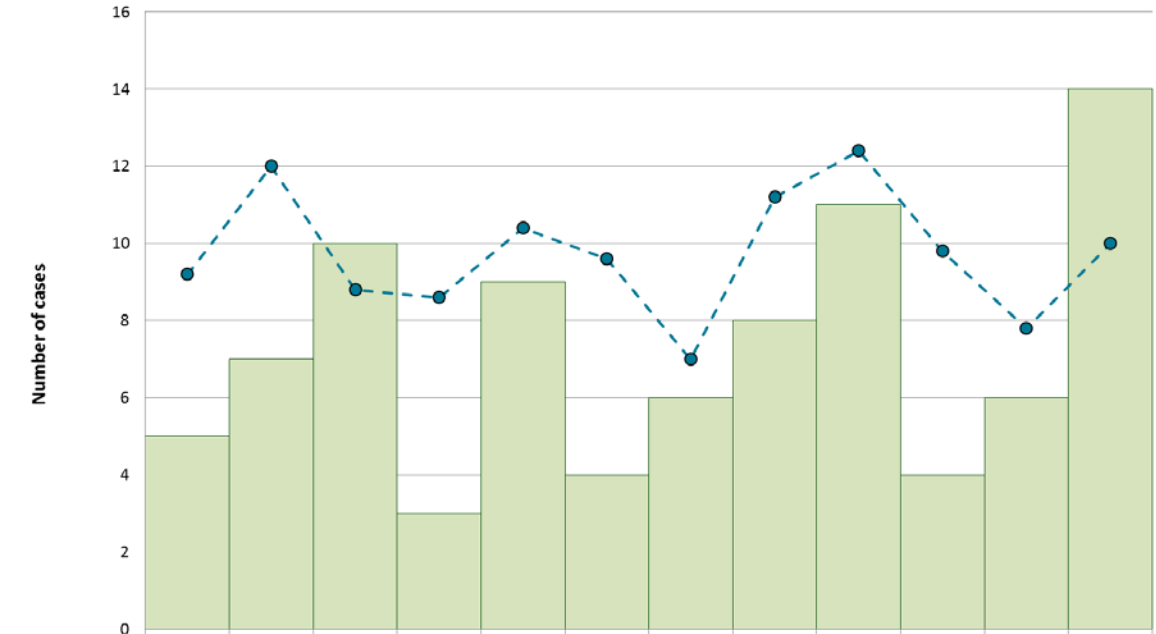
Figure 22-2. Incidence of hepatitis A by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	1	9	7	15	4	3	1	1	0
Male Count	1	5	10	14	4	6	0	3	3
Female Rate	0.3	2.5	0.9	1.6	0.4	0.3	0.1	0.1	0.0
Male Rate	0.3	1.3	1.2	1.5	0.5	0.6	0.0	0.4	0.5
Total Rate	0.3	1.9	1.0	1.5	0.4	0.5	0.0	0.3	0.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

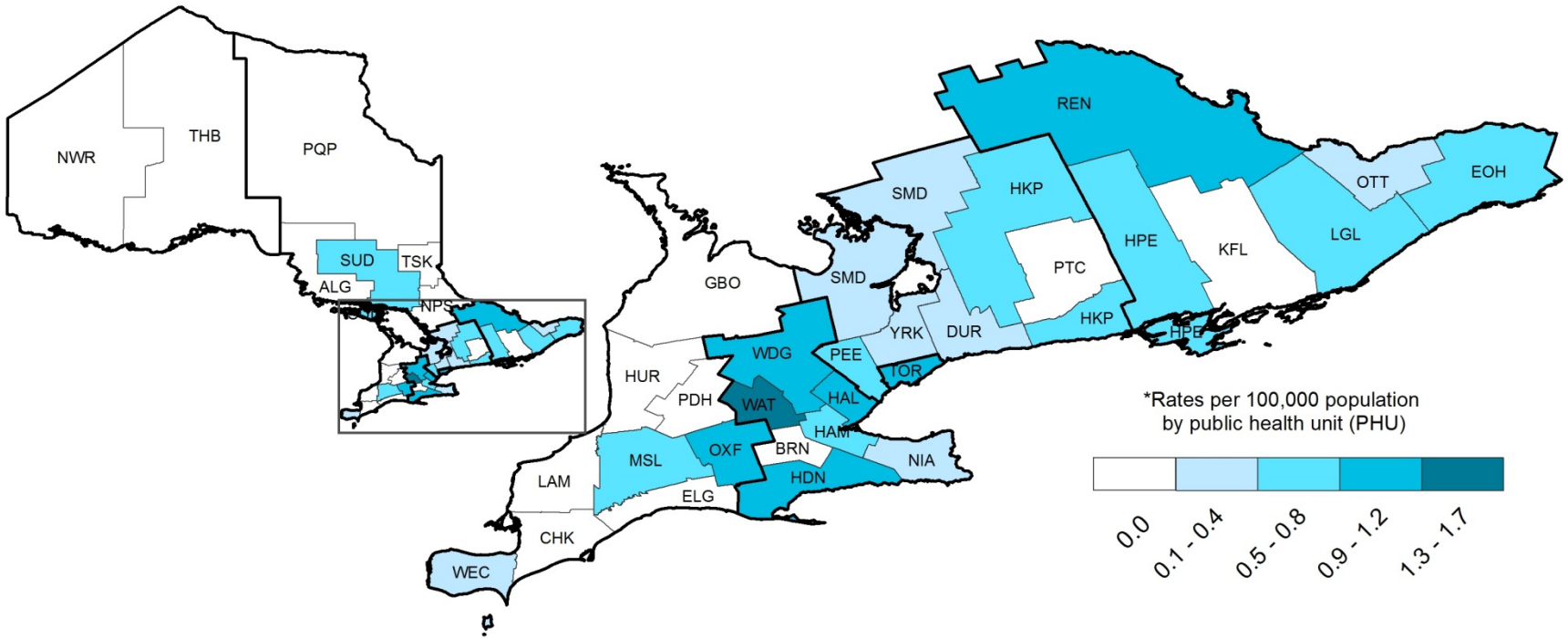
Figure 22-3. Number of hepatitis A cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	5	7	10	3	9	4	6	8	11	4	6	14
5-Yr Average	9.2	12.0	8.8	8.6	10.4	9.6	7.0	11.2	12.4	9.8	7.8	10.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 22-1. Incidence of hepatitis A by public health unit of residence: Ontario, 2014



PHU	Cases (n)	Rates
ALG	0	0.0
BRN	0	0.0
CHK	0	0.0
DUR	2	0.3
ELG	0	0.0
EOH	1	0.5
GBO	0	0.0
HAL	6	1.1
HAM	4	0.7
HDN	1	0.9
HKP	1	0.6
HPE	1	0.6
HUR	0	0.0

PHU	Cases (n)	Rates
KFL	0	0.0
LAM	0	0.0
LGL	1	0.6
MSL	3	0.6
NIA	1	0.2
NPS	0	0.0
NWR	0	0.0
OTT	4	0.4
OXF	1	0.9
PDH	0	0.0
PEE	9	0.6
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	Rates
REN	1	0.9
SMD	1	0.2
SUD	1	0.5
THB	0	0.0
TOR	32	1.2
TSK	0	0.0
WAT	9	1.7
WDG	3	1.1
WEC	1	0.2
YRK	4	0.4
Ontario	**87**	**0.6**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 23.

Hepatitis B

General overview for 2014: Hepatitis B (Acute)

Incidence (Figure 23-1): In 2014, 104 cases of acute hepatitis B infections were reported in Ontario, representing an incidence rate of 0.8 cases per 100,000 population. From 2005 to 2014, a general decrease in the annual incidence rates of reported cases was observed, from a high of 1.3 cases per 100,000 population in 2006 to a low of 0.7 cases per 100,000 population in 2012. National incidence rates of hepatitis B do not distinguish between acute, chronic, and unspecified cases and are therefore not comparable to rates of acute hepatitis B in Ontario.

Age and sex (Figure 23-2): The 2014 incidence rate of reported acute hepatitis B cases was higher among males than females. Males accounted for 57.7% (60/104) of all reported acute hepatitis B cases, corresponding to a reported incidence rate of 0.9 cases per 100,000 population, while females had a reported incidence rate of 0.6 cases per 100,000 population (data not shown). Overall, the incidence of reported acute hepatitis B was highest in those between 30 and 69 years of age. In females, the incidence rate was highest among those 25 to 39 years of age (1.1 cases per 100,000 population) whereas in males, the incidence of reported hepatitis B was highest among those 50 to 69 years of age at 1.6 cases per 100,000, population. Rates were higher among females compared to males in the age groups from 15 to 39 years of age, whereas among the age groups from 40 years and older, rates were higher in males compared to females.

Geographic distribution (Map 23-1): In 2014, acute hepatitis B was reported in over three-quarters (80.6%, 29/36) of public health units in Ontario. The highest incidence rates were observed in Lambton, Grey Bruce, and Kingston, Frontenac and Lennox & Addington, with rates of 3.8, 3.7, and 3.0 cases per 100,000 populations, respectively.

Hospitalizations and deaths: In 2014, 6.7% (7/104 cases) of acute hepatitis B cases were reported as hospitalized and two cases were reported as fatal.

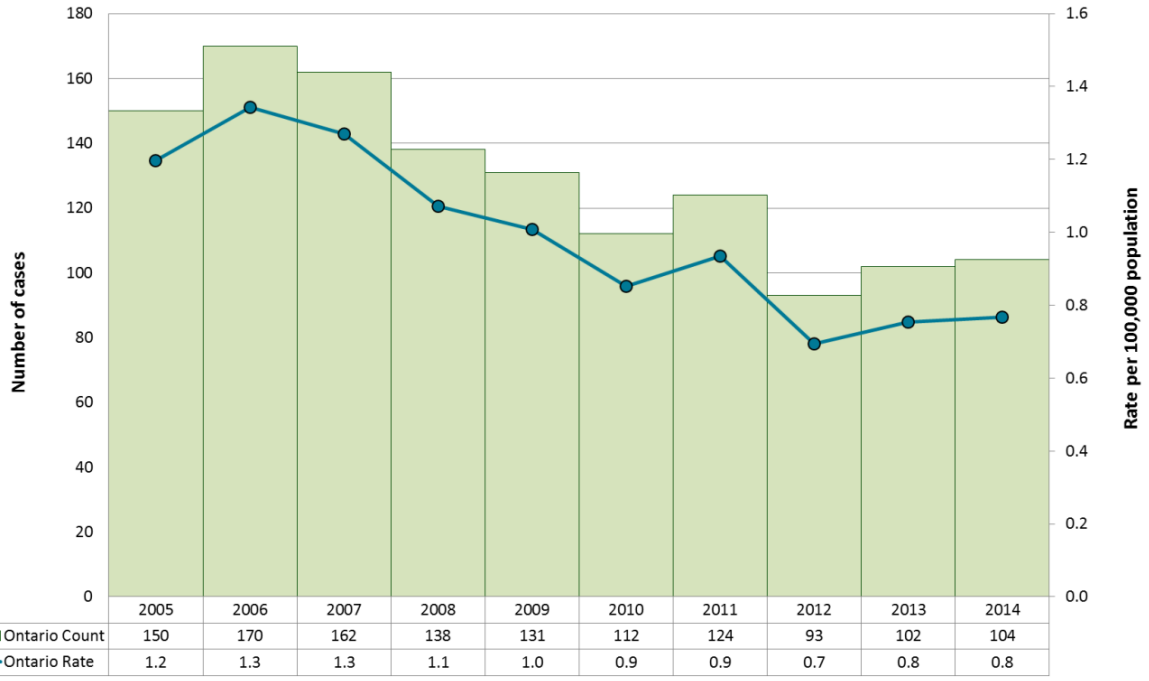
Additional methodological issues

Hepatitis B classification is based on various laboratory tests that measure serological responses and the presence of viral antigens in the blood over time; however, interpretation of available test results may lead to temporal changes in case classification. Acute hepatitis B is often asymptomatic and while some infections may resolve, others may progress to chronic infection; therefore the status of an individual as an acute case or chronic carrier may change over time.[28] This may result in a single person having two hepatitis B records in iPHIS at different times: one as an acute case and the other as a chronic case. Consequently, counts of acute and chronic hepatitis B are not mutually exclusive in iPHIS and cannot be combined to provide an overall estimate of incidence rates for this infection

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, October 2013 edition

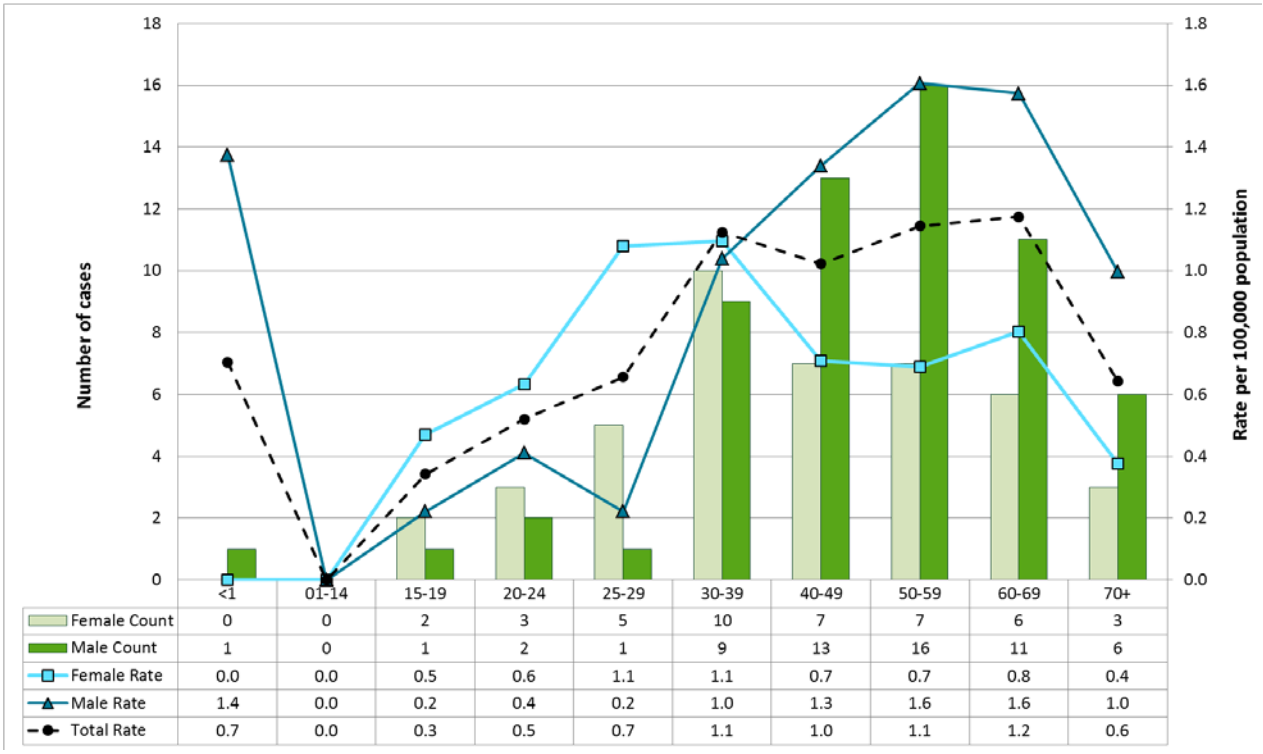
Figure 23-1. Incidence of hepatitis B (acute): Ontario, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	150	170	162	138	131	112	124	93	102	104
Ontario Rate	1.2	1.3	1.3	1.1	1.0	0.9	0.9	0.7	0.8	0.8

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Canadian rates are not shown as they include acute, chronic and unspecified hepatitis B cases and are therefore not directly comparable to Ontario's acute case counts and rates.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

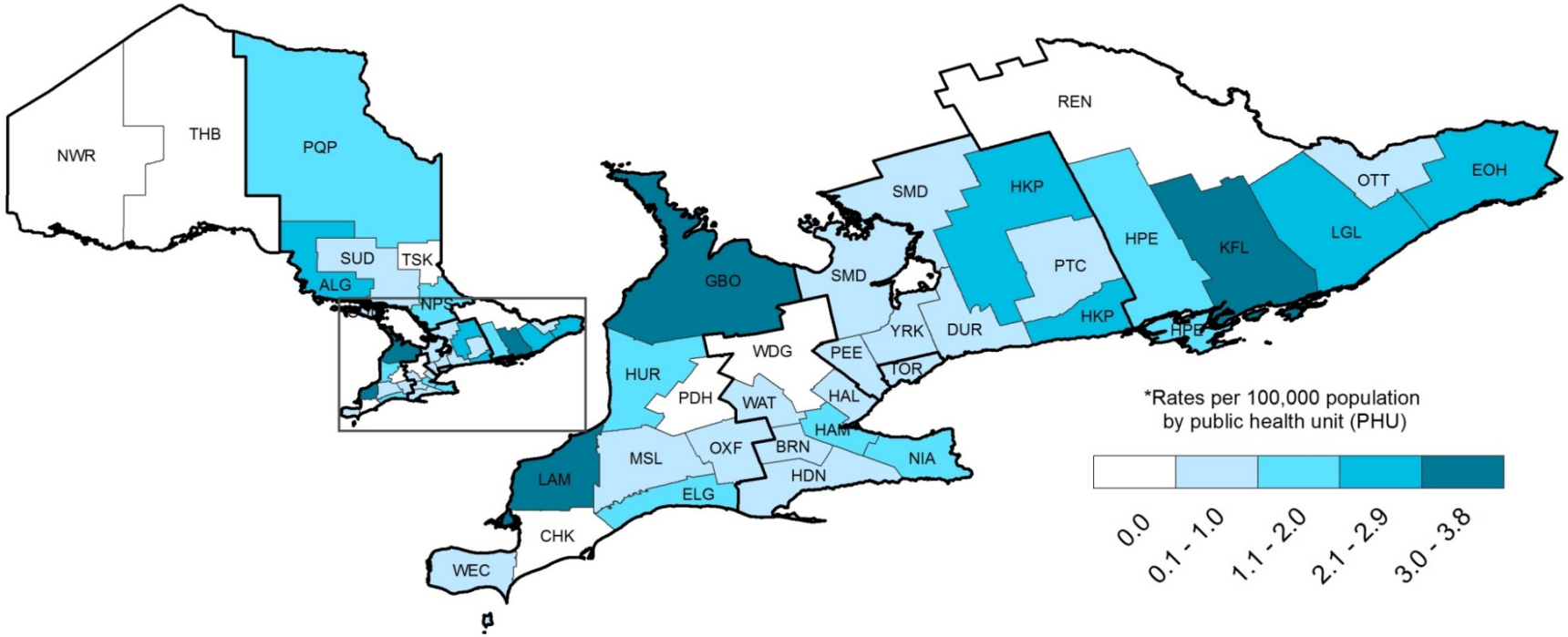
Figure 23-2. Incidence of hepatitis B (acute) by age and sex: Ontario, 2014



	<1	01-14	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	0	0	2	3	5	10	7	7	6	3
Male Count	1	0	1	2	1	9	13	16	11	6
Female Rate	0.0	0.0	0.5	0.6	1.1	1.1	0.7	0.7	0.8	0.4
Male Rate	1.4	0.0	0.2	0.4	0.2	1.0	1.3	1.6	1.6	1.0
Total Rate	0.7	0.0	0.3	0.5	0.7	1.1	1.0	1.1	1.2	0.6

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes one case of unknown sex.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Map 23-1. Incidence of hepatitis B (acute) by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	3	2.6
BRN	1	0.7
CHK	0	0.0
DUR	6	0.9
ELG	1	1.1
EOH	6	2.9
GBO	6	3.7
HAL	3	0.6
HAM	6	1.1
HDN	1	0.9
HKP	5	2.8
HPE	2	1.2
HUR	1	1.7

PHU	Cases (n)	*Rates
KFL	6	3.0
LAM	5	3.8
LGL	4	2.4
MSL	2	0.4
NIA	5	1.1
NPS	2	1.6
NWR	0	0.0
OTT	3	0.3
OXF	1	0.9
PDH	0	0.0
PEE	5	0.4
PQP	1	1.2
PTC	1	0.7

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	1	0.2
SUD	2	1.0
THB	0	0.0
TOR	12	0.4
TSK	0	0.0
WAT	1	0.2
WDG	0	0.0
WEC	2	0.5
YRK	10	0.9
Ontario	**104**	**0.8**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

General overview for 2014: Hepatitis B (chronic)

Incidence: In 2014, 1,982 cases of chronic hepatitis B were reported in Ontario, representing a rate of newly reported chronic carriers of 14.6 cases per 100,000 population. This is lower than 2013, when 2,299 cases were reported for a rate of 17.0 cases per 100,000 population. As with acute hepatitis B, provincial rates of chronic hepatitis B are not directly comparable to national rates as national rates are calculated differently.

Age and sex (Figure 23-3): The number and rate of reported cases of chronic hepatitis B in 2014 was higher among males than females, with sex-specific rates of 15.7 and 13.5 cases per 100,000 population, respectively (data not shown). Overall, the age-specific rates for reported chronic hepatitis B were highest among those between 25 and 39 years of age, with over one-third (37.7%, 748/1,982) of all the cases being reported in this age range. Among females, the rate for reported chronic carriers was highest in the 25 to 29 year age group, with 28.5 cases per 100,000 population; among males, the rate was highest in the 30 to 39 year age group, with 29.4 cases per 100,000 population.

Geographic distribution (Map 23-2): In 2014, 75.0% (27/36) of public health units reported at least one case of chronic hepatitis B. The highest rates of reported chronic hepatitis B were in York Region and Toronto, with rates of 37.2 and 31.5 cases per 100,000 population, respectively. Nearly two-thirds (64.8%, 1,285/1,982) of chronic hepatitis B cases in 2014 were reported by these two public health units.

Hospitalizations and deaths: In 2014, six cases of chronic hepatitis B cases were reported as being hospitalized and two cases were reported as fatal. Hospitalizations and deaths for chronic hepatitis B cases may occur long after cases are initially reported to and followed up by public health units and, as a result, are likely to be underreported in iPHIS.

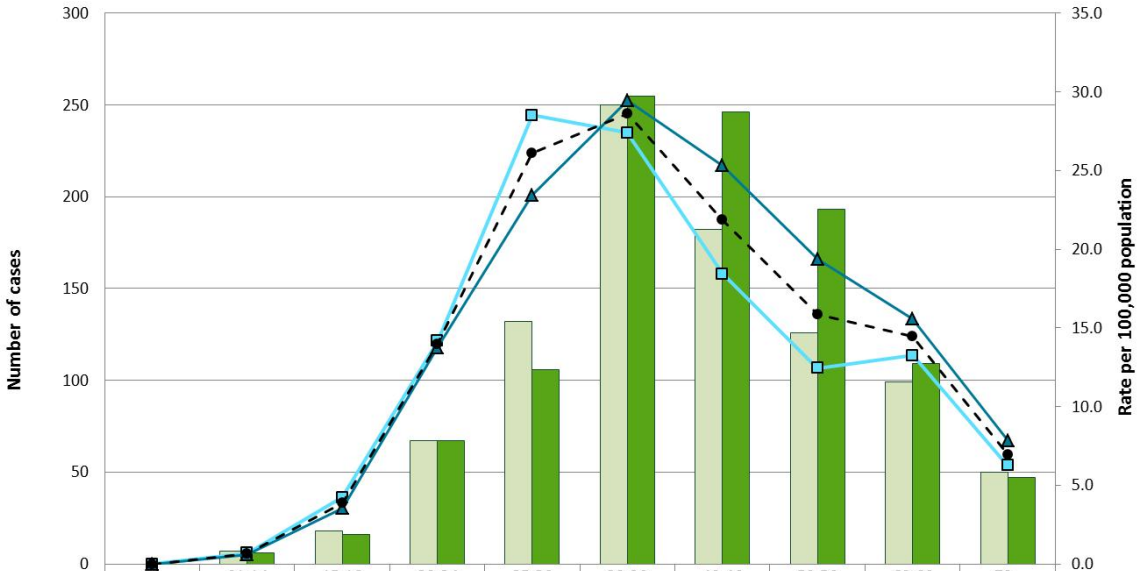
Additional methodological issues

A chronic carrier of hepatitis B is identified as an individual who has evidence of hepatitis B surface antigen lasting at least six months. While chronic carriers are most likely to have acquired their infection at birth or in early childhood,[29,30] the acute phase of infection may not have been previously diagnosed or reported. The annual incidence of chronic hepatitis B consists of cases reported to public health units in Ontario during a given calendar year. The year in which cases are diagnosed with chronic infection usually does not reflect when the acute infection was acquired or when the individual became a chronic carrier, both of which could have occurred considerably earlier.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, October 2013 edition

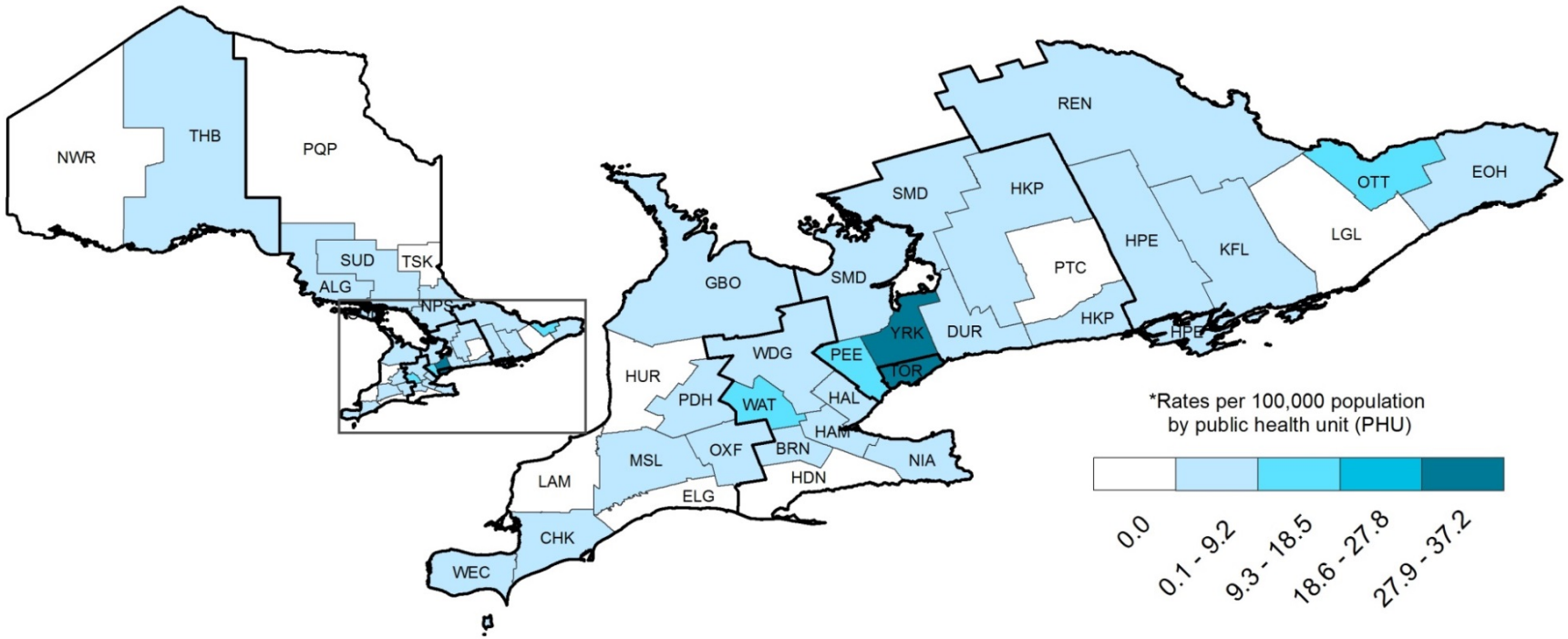
Figure 23-3. Reported cases and rates of hepatitis B (chronic) by age and sex: Ontario, 2014



	<1	01-14	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	0	7	18	67	132	250	182	126	99	50
Male Count	0	6	16	67	106	255	246	193	109	47
Female Rate	0.0	0.7	4.2	14.2	28.5	27.4	18.4	12.4	13.2	6.3
Male Rate	0.0	0.6	3.5	13.8	23.5	29.4	25.3	19.4	15.6	7.8
Total Rate	0.0	0.6	3.9	14.0	26.1	28.6	21.9	15.9	14.4	6.9

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/09/23].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes six cases of unknown sex.

Map 23-2. Reported rates of hepatitis B (chronic) by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	1	0.9
BRN	2	1.4
CHK	3	2.8
DUR	35	5.4
ELG	0	0.0
EOH	2	1.0
GBO	1	0.6
HAL	36	6.7
HAM	47	8.6
HDN	0	0.0
HKP	3	1.7
HPE	1	0.6
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	6	3.0
LAM	0	0.0
LGL	0	0.0
MSL	35	7.6
NIA	15	3.4
NPS	2	1.6
NWR	0	0.0
OTT	151	16.2
OXF	4	3.6
PDH	3	3.9
PEE	211	15.2
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	1	0.9
SMD	15	2.8
SUD	7	3.5
THB	6	3.9
TOR	874	31.5
TSK	0	0.0
WAT	80	15.0
WDG	21	7.5
WEC	9	2.2
YRK	411	37.2
Ontario	**1982**	**14.6**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/09/23].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 24.

Hepatitis C

General overview for 2014

According to the Ontario Burden of Infectious Disease Study (ONBOIDS), hepatitis C is the most burdensome infectious disease in Ontario based on measures of morbidity and mortality.[31]

Incidence and comparison to Canada (Figure 24-1): In 2014, 4,214 confirmed hepatitis C cases were reported in Ontario, representing a reported rate of 31.1 cases per 100,000 population. The reported rate of hepatitis C declined from 2008 to 2011 but has remained stable up to 2014. The highest reported rate was observed in 2008 and the lowest in 2013 at 36.7 and 30.9 cases per 100,000 population, respectively. There has been a similar decreasing trend in reported incidence rates of hepatitis C in Canada. Annual reported rates in Ontario have been higher than the Canadian rates since 2008.

Age and sex (Figure 24-2): Hepatitis C is more commonly reported among males. In 2014, males accounted for 62.2% (2,623/4,214) of hepatitis C cases reported in Ontario, with an overall rate of 39.5 cases per 100,000 population, compared to a rate of 22.9 cases per 100,000 population among females. Among both males and females, the rate was highest in the 25-29 year age group at 68.6 and 47.8 cases per 100,000 population, respectively. There were 20 cases under the age of one reported, likely reflecting mother-to-child transmission.

Geographic distribution (Map 24-1): The highest reported incidence rates in Ontario were from Northwestern, Thunder Bay District and Sudbury and District, with 123.3, 103.1 and 75.6 cases per 100,000 population, respectively.

Hospitalizations and deaths: In 2014, 0.8% (32/4,214 cases) of reported hepatitis C cases were hospitalized and 23 (0.5%) were fatal.

Additional Methodological Issues

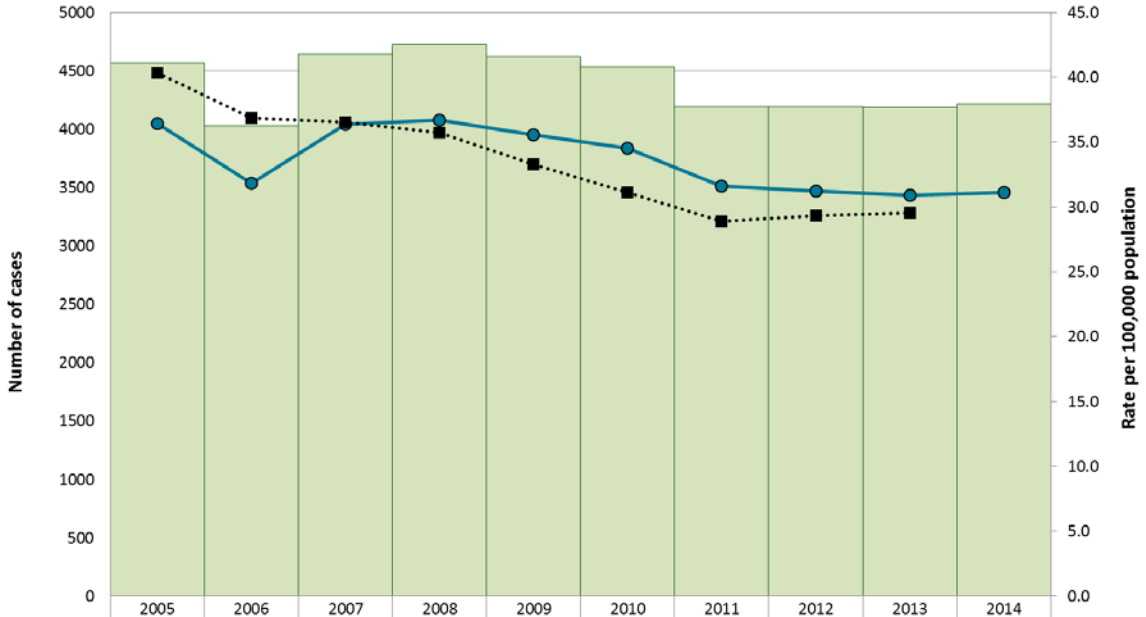
Hepatitis C cases reported to public health units may include newly acquired, chronic, and resolved infections. The presence of antibodies to the hepatitis C virus is required to meet the case definition for hepatitis C;[32] however, testing for antibodies does not distinguish between newly acquired, chronic, and resolved infections. Reported hepatitis C rates mostly reflect cases who were infected in the past but are newly diagnosed, rather than newly acquired cases. Ribonucleic acid (RNA) testing is required to distinguish between cases with resolved infections (either spontaneously or due to treatment) who are RNA negative, from those with ongoing infection who are RNA positive. This distinction is important since only those with ongoing infection remain infectious to others and at risk for developing chronic sequelae such as liver cirrhosis and liver cancer. However, RNA testing may not be routinely ordered after a positive antibody test and the results may not be reported to public health when testing is done. Therefore, not all reported hepatitis C cases based on antibody testing are infectious. It should also be noted that, the number of reported hepatitis C cases is likely an underestimate of the true burden of hepatitis C, as more than 90% of initial infections are asymptomatic and therefore can remain undiagnosed for a long time.[33]

Chronic sequalae, such as cirrhosis and liver cancer, are not likely to be accurately captured in iPHIS as they can take many years to develop and so may not be present and/or recognized at the time of hepatitis C reporting. The same is true for hospitalizations and death due to hepatitis C if these outcomes occur after public health units have completed follow-up and reporting a case.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, December 2014 edition

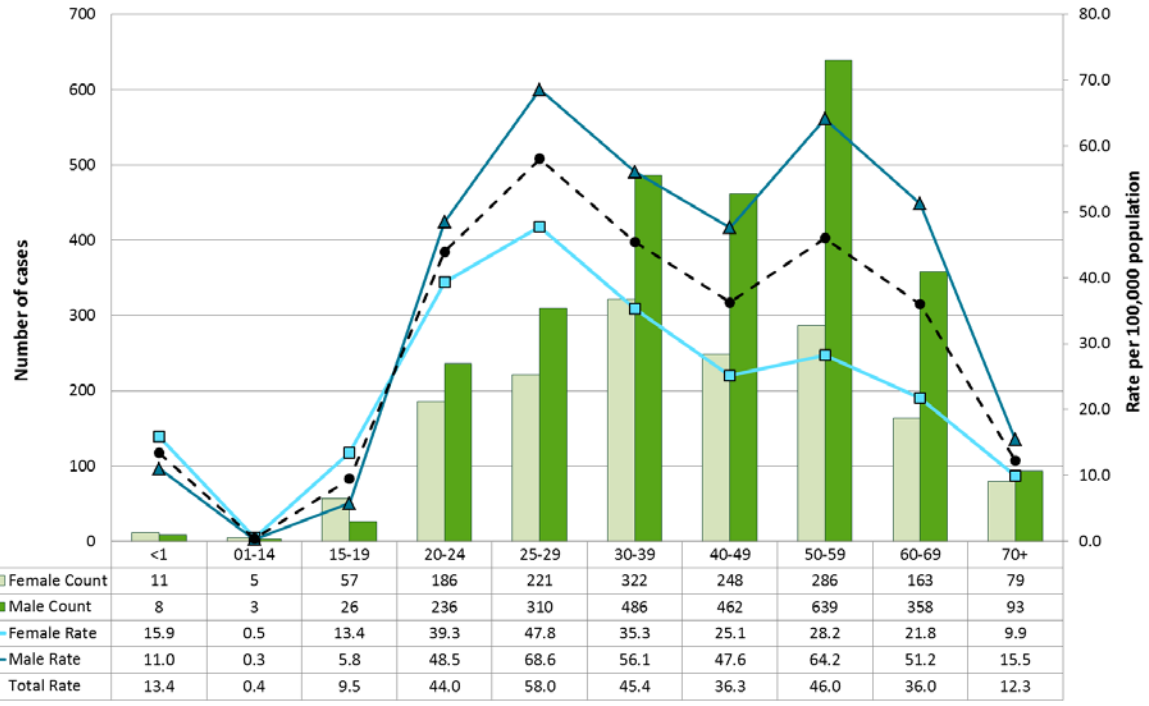
Figure 24-1. Reported cases and rates of hepatitis C: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	4566	4030	4643	4724	4619	4532	4189	4191	4185	4214
Ontario Rate	36.4	31.8	36.4	36.7	35.5	34.5	31.6	31.2	30.9	31.1
Canada Rate	40.31	36.84	36.54	35.73	33.30	31.09	28.91	29.31	29.55	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

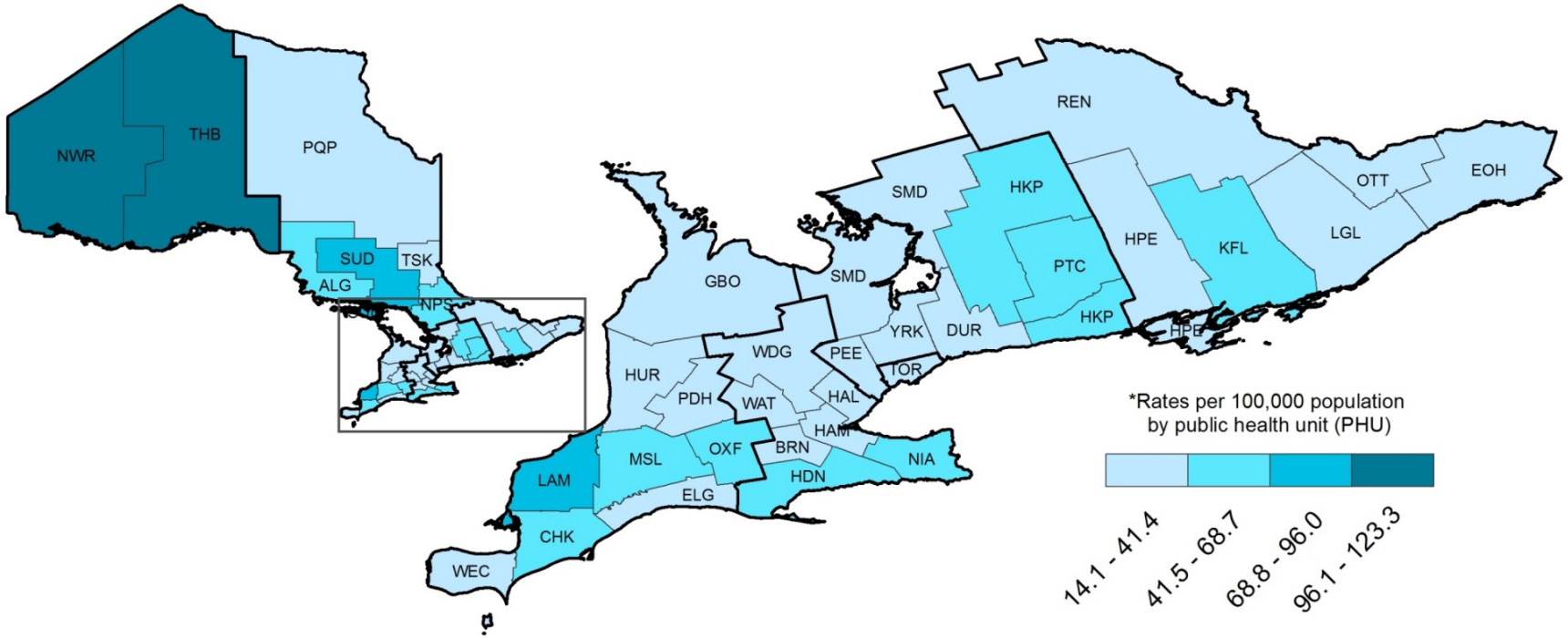
Figure 24-2. Reported rates of hepatitis C by age and sex: Ontario, 2014



	<1	01-14	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	11	5	57	186	221	322	248	286	163	79
Male Count	8	3	26	236	310	486	462	639	358	93
Female Rate	15.9	0.5	13.4	39.3	47.8	35.3	25.1	28.2	21.8	9.9
Male Rate	11.0	0.3	5.8	48.5	68.6	56.1	47.6	64.2	51.2	15.5
Total Rate	13.4	0.4	9.5	44.0	58.0	45.4	36.3	46.0	36.0	12.3

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes 15 cases of unknown age and/or sex.

Map 24-1. Reported rates of hepatitis C by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	73	62.6
BRN	51	35.7
CHK	51	48.2
DUR	167	25.9
ELG	15	16.6
EOH	50	24.4
GBO	34	20.9
HAL	98	18.2
HAM	208	38.1
HDN	61	55.5
HKP	76	42.4
HPE	52	31.8
HUR	17	29.1

PHU	Cases (n)	*Rates
KFL	128	64.1
LAM	91	69.8
LGL	63	37.2
MSL	216	46.8
NIA	250	56.1
NPS	61	47.6
NWR	100	123.3
OTT	235	25.2
OXF	47	42.4
PDH	11	14.1
PEE	304	21.9
PQP	29	33.4
PTC	61	43.9

PHU	Cases (n)	*Rates
REN	18	17.1
SMD	196	36.7
SUD	151	75.6
THB	160	103.1
TOR	649	23.4
TSK	9	26.0
WAT	122	22.8
WDG	52	18.7
WEC	146	36.3
YRK	162	14.6
Ontario	**4214**	**31.1**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 25.

Influenza

General overview for the 2013-14 influenza season

The incidence of influenza fluctuates from season to season due to a variety of factors, including characteristics of the circulating strains and susceptibility of the population. In the 2013-14 influenza season (defined as September 1, 2013 to August 31, 2014), the predominant strain was influenza A (H1N1) pdm09; this was the first season since the 2009 pandemic that this strain circulated widely. The season was also notable for a large wave of influenza B activity later in the influenza season.

Incidence (Figure 25-1): During the 2013-14 influenza reporting season, 9,958 cases of laboratory-confirmed cases of influenza were reported in Ontario, which corresponds to an incidence rate of 73.6 cases per 100,000 population. It should be noted that reported cases represent just a fraction of those infected with influenza as the majority of influenza cases are not laboratory confirmed.

Over the past 10 influenza seasons, the highest reported incidence rate was observed for the 2013-14 season, followed closely by the 2012-13 season (72.3 per 100,000 population). Other seasons with high incidence rates included the 2008-09 and 2009-10 seasons (62.9 and 57.9 per 100,000 population respectively), which can primarily be attributed to the influenza A (H1N1) pdm09 pandemic which emerged in the spring of 2009 and circulated again in the fall of 2009.

Age and sex (Figure 25-2): Overall incidence rates of laboratory-confirmed influenza cases were higher for females than males, at 76.3 and 70.5 cases per 100,000 population, respectively (data not shown). However, differences in rates were noted between males and females by age group. For example, the incidence rate in age groups below 20 years of age was higher in males than females, while females had higher rates than males for most other age groups. The highest age-specific incidence rates of laboratory-confirmed influenza were observed among children under the age of five, as well as in adults 65 years of age and older. Higher rates of reported disease in these age groups may be reflective of healthcare-seeking behaviours and/or testing practices in general; for those 65 years of age and over, testing may be done as part of institutional outbreak management. Also, these age groups may present with more severe disease requiring hospitalization and/or intensive care, resulting in a higher likelihood of being tested or use of more sensitive test methods leading to a greater likelihood of being confirmed as a case of influenza.

Geographic distribution (Map 25-1): Among public health units, the incidence of laboratory-confirmed influenza for the 2013-14 reporting season was highest in North Bay Parry Sound District, Grey Bruce, City of Hamilton and Perth District, with rates of 242.9, 115.5, 107.4, and 106.5 cases per 100,000 population, respectively. Although these rates may reflect true geographical differences in influenza activity, they may also result from differences in testing practices among clinicians or differences in healthcare-seeking behaviours among cases.

Seasonal trends (Figure 25-3): While influenza cases are reported throughout the year in Ontario, influenza activity is seasonal and peaks during the colder months. The incidence of influenza based on reported cases was highest in December and January of the 2013-14 season; nearly half (48.1%, 4,785/9,958) of all cases were reported in these months and these cases were mainly influenza A, specifically A (H1N1) pdm09. A second peak was observed in March and early April 2014 as a result of increased influenza B activity. Influenza B typically peaks around March. In 2013-14, a larger number of influenza B cases were reported than in the 10 previous years (data not shown).

Laboratory data (Figure 25-4): Based on data reported through iPHIS, influenza A was the dominant circulating influenza type during the 2013-14 season, accounting for 58.9% (5,864/9,958) of laboratory-confirmed influenza cases in Ontario. Subtype information was available for 2,540 cases of laboratory-confirmed influenza A. The dominant subtype of influenza A was H1N1pdm09, representing 85.7% (2,178/2,540) of cases for whom a subtype was reported (data not shown).[34] The percentage of specimens submitted to the Public Health Ontario Laboratory (PHOL) that were positive for influenza A (i.e., percent positivity) peaked in week one, 2014 at 32.0%, while influenza B percent positivity peaked in week 15 at 26.5%**.**

Hospitalizations and deaths: During the 2013-14 season, 37.5% (3,739/9,958 cases) of laboratory-confirmed influenza cases were hospitalized and deaths were reported in 2.3% (228/9,958) of cases.

The percentage of reported laboratory-confirmed cases who were hospitalized in 2013-14 (37.5%; 3,739/9,958) was similar to the 2012-13 (37.8%; 3,698/9,778) and 2010-11 (38.7%; 2,342/6,049) seasons, both of which were H3N2 dominant seasons.[35,36] A lower proportion of reported cases were hospitalized in 2011-12 (31.0%; 1,223/3,940),[37] a season in which influenza B dominated.

Respiratory infection outbreaks in institutions, including influenza: In the 2013-14 season, 976 respiratory infection outbreaks in institutions (i.e. hospitals, long-term care homes (LTCHs) and retirement homes) were reported and influenza was identified in 323 (33.1%) of them.[34] During the 2012-13, 2011-12 and 2010-11 seasons, influenza was identified in 45.0% (646/1,437), 19.1% (140/734) and 42.0% (437/1,040) of reported institutional respiratory infection outbreaks, respectively.[35-37] Of all the institutional influenza outbreaks reported in 2013-14, 62.8% (203/323) were in LTCHs, 19.8% (64/323) were in retirement homes, and 11.5% (37/323) occurred in hospitals.

Vaccine effectiveness: Based on results from the Canadian Sentinel Physician Surveillance Network for the 2013-14 influenza season, the influenza vaccine effectiveness for the A (H1N1) pdm09 subtype was 71%. The vaccine effectiveness for the influenza B Yamagata lineage, the B lineage that was in the influenza vaccine, was 73%. Numbers of H3N2 cases were too low to calculate vaccine effectiveness.[38]

Additional methodological issues

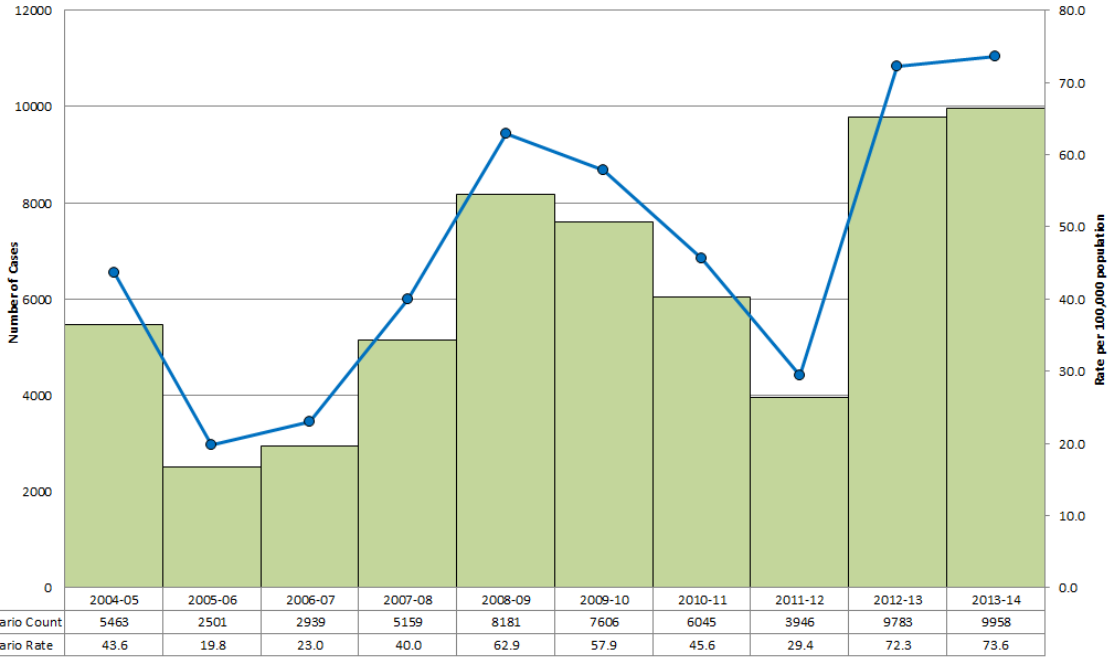
Reporting of laboratory-confirmed influenza cases significantly underestimates the burden of influenza in Ontario, since many individuals with influenza-like illness never seek care nor have confirmatory laboratory testing performed. Cases who are hospitalized are more likely to be tested for influenza and are more likely to be tested using molecular-based tests which are more sensitive than the culture-based tests used for community dwelling cases by some laboratories.

Due to the large volume of laboratory-confirmed cases of influenza that are reported to PHUs each season, as well as challenges with case follow-up, it can be difficult to obtain information on hospitalizations and deaths for some laboratory-confirmed cases. In addition, hospitalizations and deaths may occur after the PHUs follows up with the case and the PHU may not be aware that the event has occurred. These factors result in under-reporting of hospitalization and deaths in iPHIS and hence underestimation of the severity of influenza infection.

Additional sources of information

- Ontario Respiratory Virus Bulletin, Surveillance Season (September 1, 2013 - August 31, 2014)
- Ontario Respiratory Pathogen Bulletin
- Ontario influenza surveillance weeks and corresponding date ranges for the 2013-14 influenza reporting season

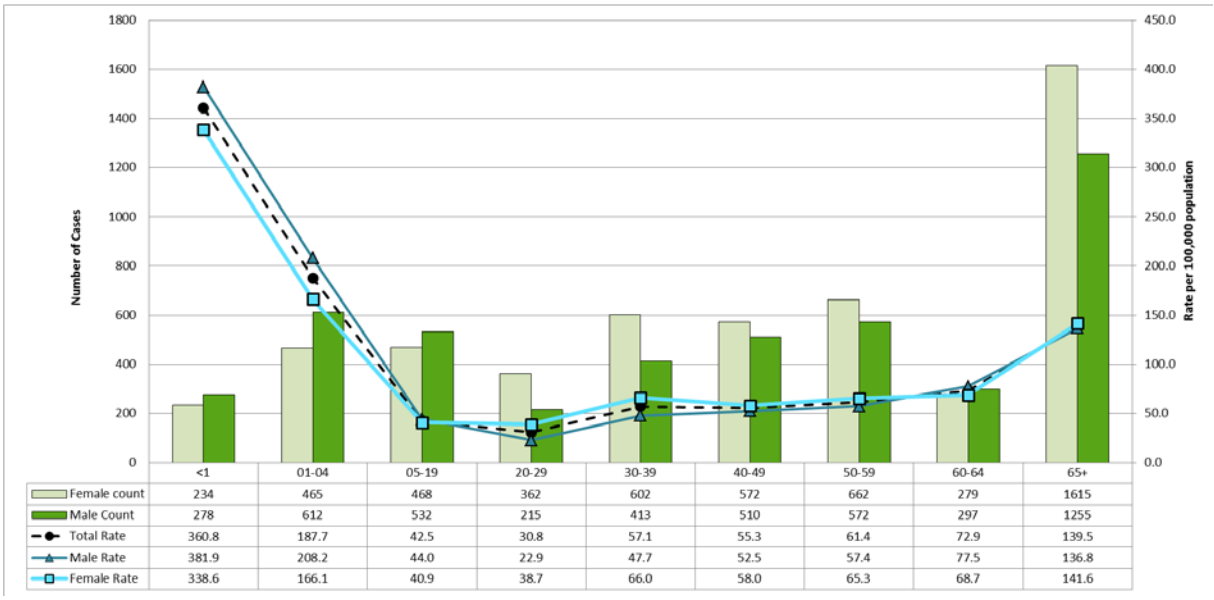
Figure 25-1. Incidence of laboratory-confirmed influenza: Ontario, 2004-05 to 2013-14



	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Ontario Count	5463	2501	2939	5159	8181	7606	6045	3946	9783	9958
Ontario Rate	43.6	19.8	23.0	40.0	62.9	57.9	45.6	29.4	72.3	73.6

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13]; seasons 2008/09 and 2009/10 extracted [2013/11/13].
Ontario Population: Population Estimates [2004-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: National rates for influenza are not available at this time.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

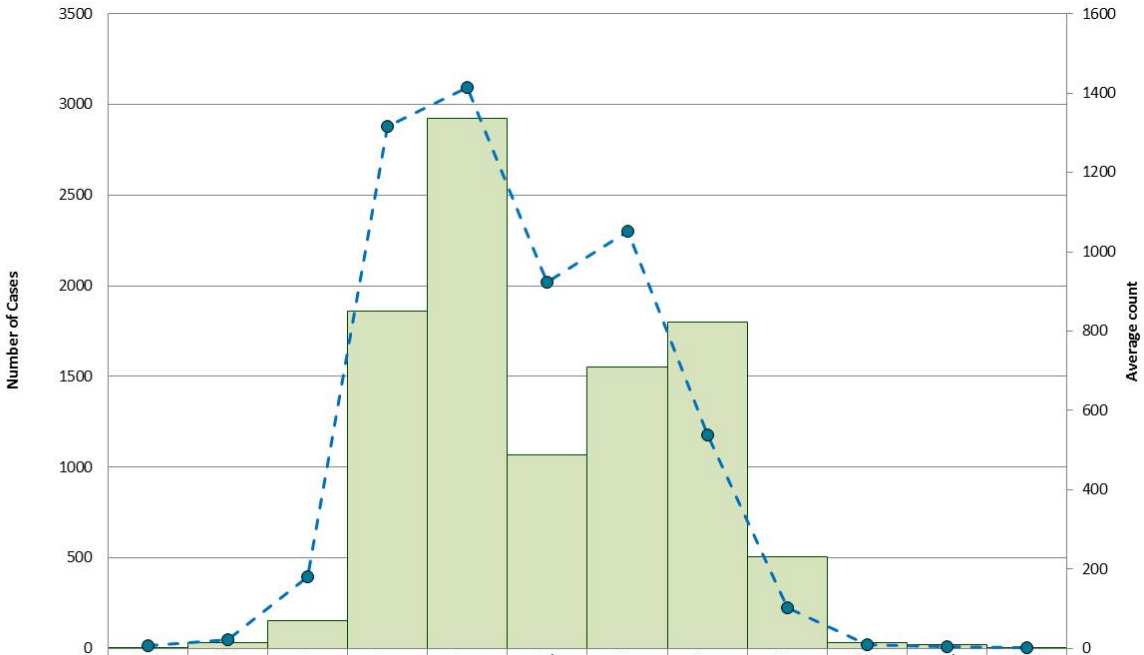
Figure 25-2. Incidence of laboratory-confirmed influenza by age and sex: Ontario, 2013-14



	<1	01-04	05-19	20-29	30-39	40-49	50-59	60-64	65+
Female count	234	465	468	362	602	572	662	279	1615
Male Count	278	612	532	215	413	510	572	297	1255
Total Rate	360.8	187.7	42.5	30.8	57.1	55.3	61.4	72.9	139.5
Male Rate	381.9	208.2	44.0	22.9	47.7	52.5	57.4	77.5	136.8
Female Rate	338.6	166.1	40.9	38.7	66.0	58.0	65.3	68.7	141.6

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes 15 cases of unknown age and/or sex.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Figure 25-3. Number of laboratory-confirmed influenza cases by month: Ontario, 2013-14



	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Count	6	35	151	1860	2925	1069	1551	1800	506	33	19	3
5 season ave	7	23	181	1315	1413	924	1051	539	103	9	6	3

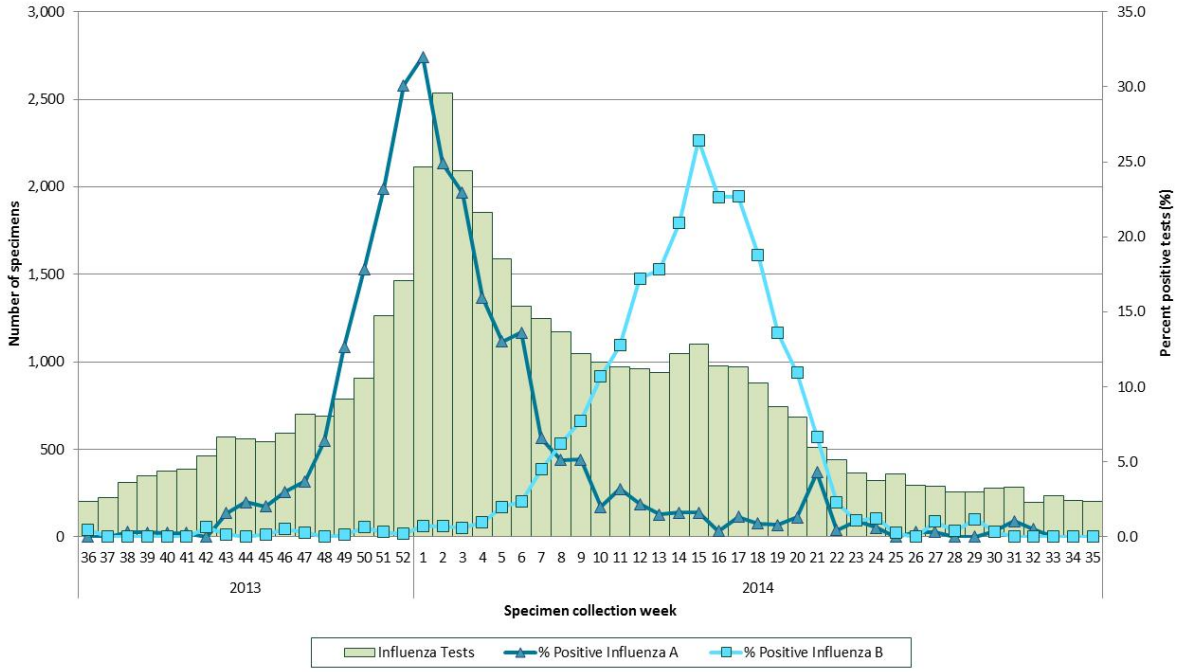
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Note: Monthly five year averages were calculated using the most recent five non-pandemic influenza seasons (2006–07 to 2012–13, with the 2008–09 and 2009–10 seasons excluded).

Table 25-1. Laboratory-confirmed influenza cases by type: Ontario, 2013-14

Influenza Type	Cases	
	n	%
Influenza A	5,864	58.9
Influenza B	4,089	41.1
Influenza A and B	5	0.1
Total	**9,958**	**100.0**

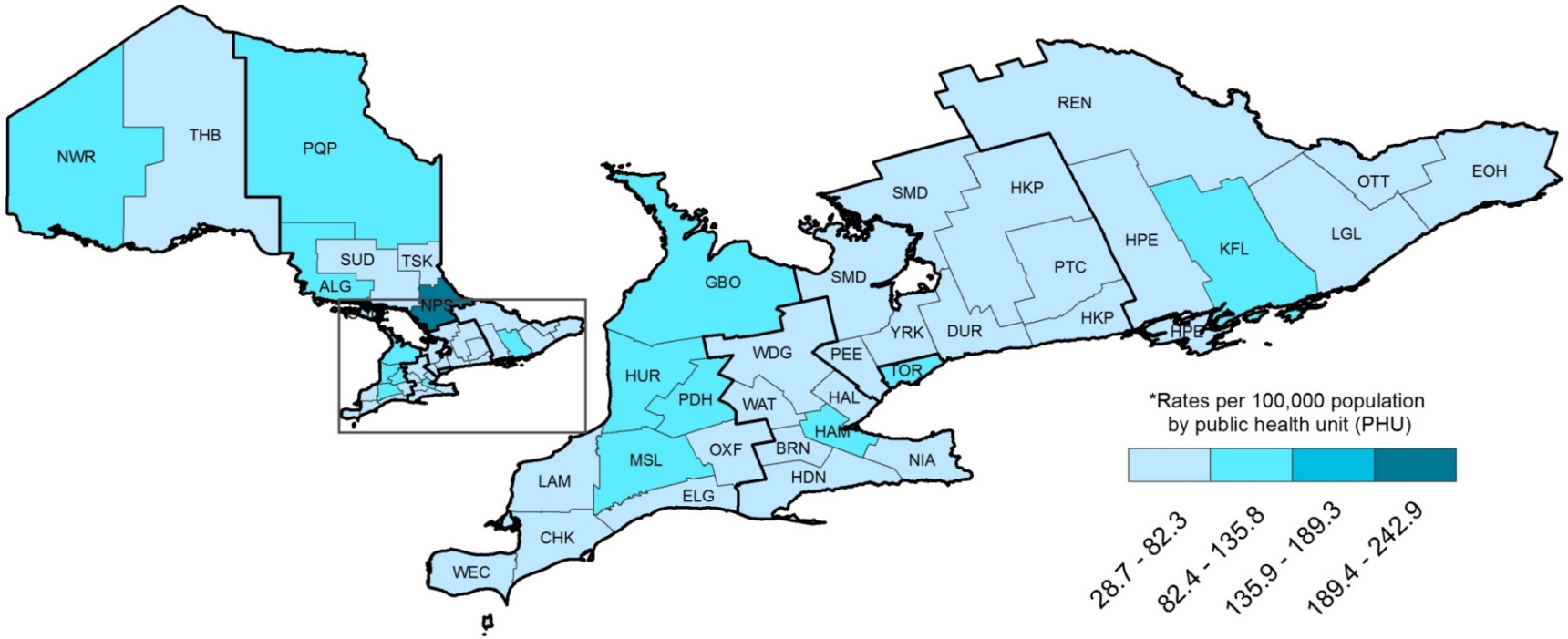
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].

Figure 25-4. Number of influenza tests and percent of positive specimens by week of specimen collection: Ontario, 2013-14 season



Source: Public Health Ontario Laboratory (PHOL), Laboratory Information Management System, extracted [2015/03/26].
Note: Includes specimens tested for influenza at PHOL by all testing methods. The PHOL performs the majority of testing for influenza and other respiratory viruses; however, other microbiology laboratories also perform these tests.
Note: Weeks are assigned based on the week of specimen collection or the date the specimen was received at the laboratory if specimen collection date was unavailable. See the section on Additional Sources of Information for the details of the influenza surveillance weeks and corresponding date ranges.

Map 25-1. Incidence of laboratory-confirmed influenza by public health unit of residence: Ontario, 2013-14



PHU	Cases (n)	*Rates
ALG	108	92.7
BRN	104	72.9
CHK	78	73.8
DUR	317	49.1
ELG	65	71.9
EOH	84	41.0
GBO	188	115.5
HAL	378	70.1
HAM	586	107.4
HDN	75	68.3
HKP	141	78.7
HPE	47	28.8
HUR	58	99.2

PHU	Cases (n)	*Rates
KFL	166	83.1
LAM	50	38.4
LGL	89	52.6
MSL	395	85.5
NIA	287	64.4
NPS	311	242.9
NWR	78	96.1
OTT	402	43.0
OXF	52	47.0
PDH	83	106.5
PEE	1084	78.1
PQP	75	86.4
PTC	84	60.4

PHU	Cases (n)	*Rates
REN	61	57.9
SMD	392	73.4
SUD	160	80.1
THB	122	78.6
TOR	2524	91.1
TSK	25	72.3
WAT	314	58.7
WDG	200	71.8
WEC	191	47.5
YRK	584	52.8
Ontario	**9958**	**73.6**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 26.

Invasive *haemophilus influenzae*, type b

General overview for 2014

Haemophilus influenzae is a bacterium that can be differentiated into six serotypes (a to f) or non-typeable strains, all of which can cause invasive disease. While all invasive *H. influenzae* diseases are reportable at the national level, only confirmed and probable cases of invasive *H. influenzae* type b (Hib) are reportable in Ontario.[39]

A polysaccharide Hib vaccine was introduced in Ontario in 1987, followed by a more effective conjugate vaccine in 1988. Hib conjugate vaccine is routinely administered in combination with vaccines against diphtheria, tetanus, pertussis, and polio as a primary series at two, four and six months of age, with a booster dose given at 18 months of age.[20] Following the introduction of the infant Hib vaccination programs, there has been a decline in disease incidence in all age groups, including those not targeted by vaccination, both in Ontario and the rest of Canada.[40,41]

Incidence and comparison to Canada (Figure 26-1): In 2014, four confirmed cases of invasive Hib disease were reported in Ontario, representing an incidence rate of 0.3 cases per 1,000,000 population. The annual incidence rate of invasive Hib disease in Ontario ranged between 0.1 and 0.8 cases per 1,000,000 population between 2005 and 2014, and was lower than the Canadian rate in all years up to 2013.

Age and sex: The cases occurring in 2014 ranged in age between 13 and 76 years, with a median age of 47 years. Of the four cases, two were male.

Immunization: Of the four cases reported in 2014, only one case was eligible to receive the publicly-funded Hib vaccine series. This case was a child in the 10-19 year age group who completed the three-dose primary series but did not receive the 18-month booster dose. A booster dose on or after one year of age is essential for sustained protection.[42] The remaining three adult cases were reported as having unknown immunization status; however all were born before the implementation of publicly-funded Hib vaccine program. Hib-containing vaccine is not routinely indicated for those five years of age and older unless they have certain conditions which pose a higher risk of invasive Hib disease.

Geographic distribution: Four cases of Hib in 2014 were reported from four public health units. The public health unit-specific incidence rates ranged from 0.0 to 5.0 cases per 1,000,000 population.

Hospitalizations and deaths: Three of the four cases were reported as hospitalized in 2014 and no deaths were reported.

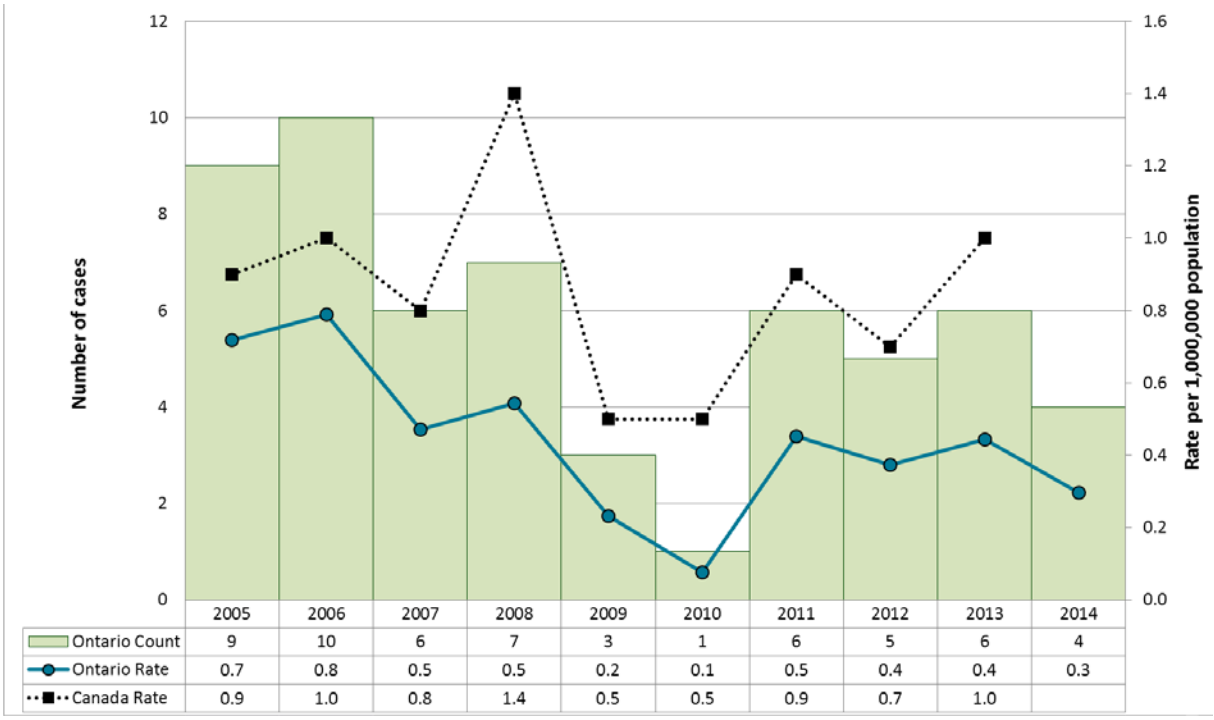
Additional methodological issues

Data for this analysis were obtained by linking and validating cases that were reported in iPHIS with laboratory data received from the Public Health Ontario Laboratory (PHOL). Both iPHIS and PHOL data for 2014 cases were extracted in 2015. Cases for 2005-2013 were obtained from a previously linked dataset. The purpose of the data linkage was to identify additional confirmed cases that were not reported in iPHIS and to help exclude cases that were incorrectly classified as Hib.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, November 2013 edition

Figure 26-1. Incidence of *Haemophilus influenzae,* type b: Ontario and Canada, 2005–14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	9	10	6	7	3	1	6	5	6	4
Ontario Rate	0.7	0.8	0.5	0.5	0.2	0.1	0.5	0.4	0.4	0.3
Canada Rate	0.9	1.0	0.8	1.4	0.5	0.5	0.9	0.7	1.0	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Specimens: Public Health Ontario Laboratory (PHOL), extracted from the Laboratory Information Management System [2015/02/19].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.
Note: Nunavut and New Brunswick did not report on Hib cases for 2012-13. Their populations have been removed for Canada rate calculation.

Chapter 27.

Legionellosis

General overview for 2014

Incidence and comparison to Canada (Figure 27-1): In 2014, 127 cases of legionellosis were reported in Ontario for an incidence rate of 0.9 cases per 100,000 population. This was a substantial decline from 2013 when 264 cases were reported for an incidence rate of 2.0 per 100,000 population. From 2005 to 2009, the incidence rate of legionellosis remained relatively stable ranging from 0.5 to 0.6 cases per 100,000 population. Annual incidence rates increased between 2010 and 2013 then declined in 2014, with annual rates over this period ranging from 0.9 to 2.0 cases per 100,000 population. The annual incidence rates of legionellosis in Ontario from 2005 to 2013 were higher than the Canadian rates, with the exception of 2012 where the provincial and national rates were essentially the same.

Age and sex (Figure 27-2): In 2014, males accounted for 74.8% (95/127) of cases reported in Ontario. The incidence rate among males was 1.4 cases per 100,000 population, almost three times the corresponding rate of 0.5 cases per 100,000 population among females. The incidence of legionellosis increased with increasing age for both sexes. Of legionellosis cases reported in 2014, one case was reported in the less than 20 age group, while 85.8% (109/127) were reported among individuals 50 years of age and older. The highest incidence rate was reported among men 70 years of age and older with 4.8 cases per 100,000 population.

Seasonal trends (Figure 27-3): The incidence of legionellosis follows a seasonal pattern, with the majority of cases occurring in summer and fall. Most cases in 2014 were reported from June to October (78.0% of cases, 99/127), with the highest number of cases observed in July and August (28 and 29 cases, respectively). The number of cases reported each month in 2014 was below the corresponding monthly five-year (2009-13) average case count for every month except January and July.

Laboratory data (Figure 27-4): The number of patient specimen received and tested for *Legionella* at the Public Health Ontario Laboratory (PHOL) fluctuated by month, with the percent positivity (i.e., percentage of patients that were positive for at least one *Legionella* test) increasing from May to August 2014. The highest percent positivity occurred in August at 6.7%, compared to 2013 when the highest percent positivity of 7.4% occurred in July (data not shown). Overall, percent positivity for *Legionella* was lower in 2014 at 1.7% (8,285 total patients with at least one test) compared to a percent positivity of 3.1%. in 2013 (8,530 total patients with at least one test). Therefore the decline in the number of cases observed in 2014 appears to be unrelated to a decline in the number of patients tested.

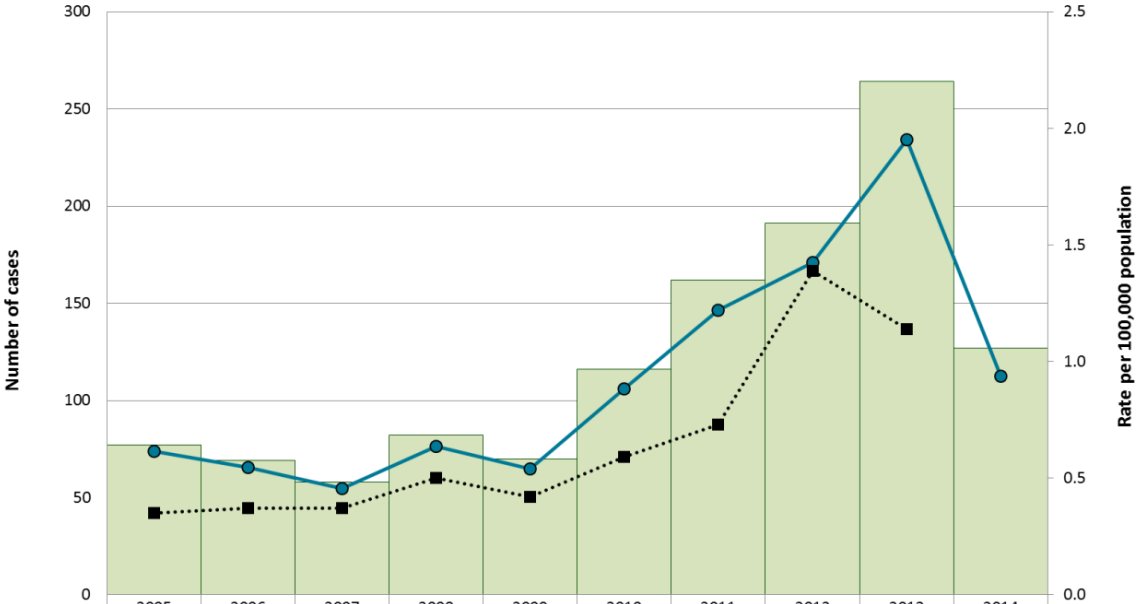
Geographic distribution (Map 27-1): The incidence rate of legionellosis was highest in the City of Hamilton with a rate of 3.1 cases per 100,000, followed by Waterloo Region, Niagara Region, and Oxford County with rates of 1.9, 1.8 and 1.8 cases per 100,000 population, respectively. In 2014, over half of the cases (52.8%; 67/127) in Ontario were reported from four public health units: Toronto, Peel Region, City of Hamilton, and Waterloo Region. Thirteen public health units did not report any cases of legionellosis in 2014.

Hospitalizations and deaths: In 2014, 74.8% (95/127) of legionellosis cases were hospitalized, with deaths reported in 9.4% (12/127) of cases.

Additional sources of information

- PHO's Epidemiology of Legionellosis in Ontario, 2013
- PHO's Monthly Infectious Diseases Surveillance Report, December 2011 edition
- PHO's Monthly Infectious Diseases Surveillance Report, May 2014 edition
- PHO's Monthly Infectious Diseases Surveillance Report, November 2015 edition

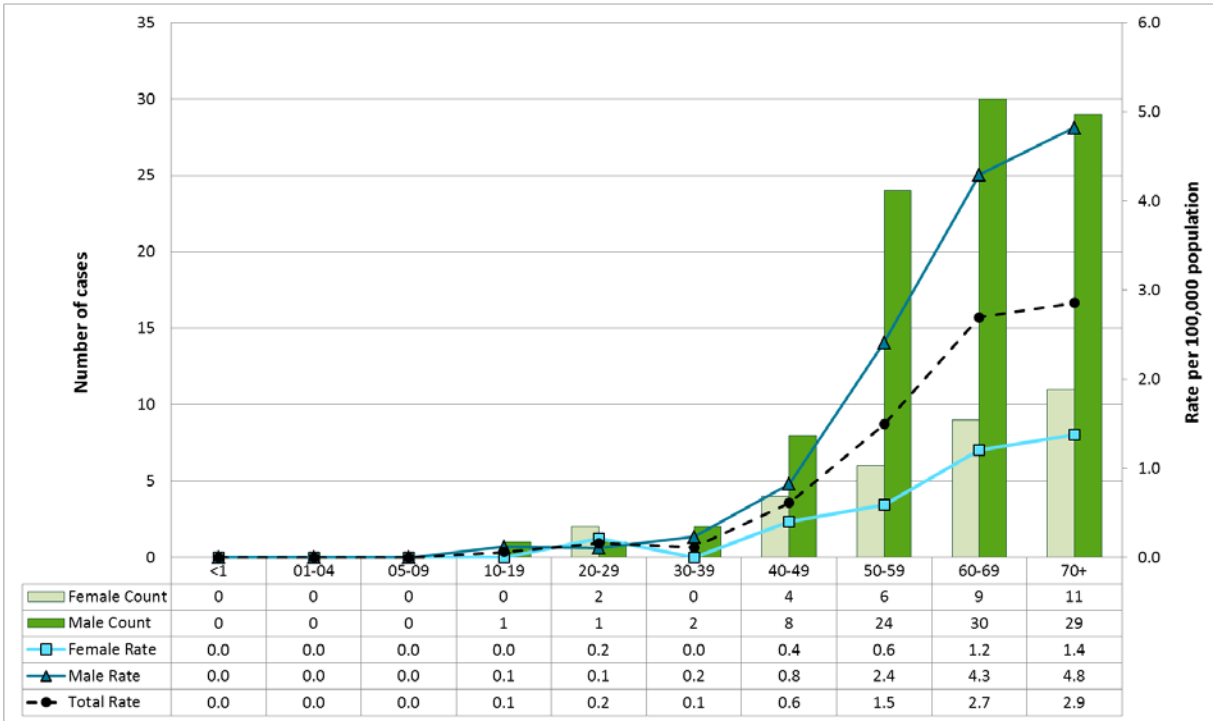
Figure 27-1. Incidence of legionellosis: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	77	69	58	82	70	116	162	191	264	127
Ontario Rate	0.6	0.5	0.5	0.6	0.5	0.9	1.2	1.4	2.0	0.9
Canada Rate	0.4	0.4	0.4	0.5	0.4	0.6	0.7	1.4	1.1	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

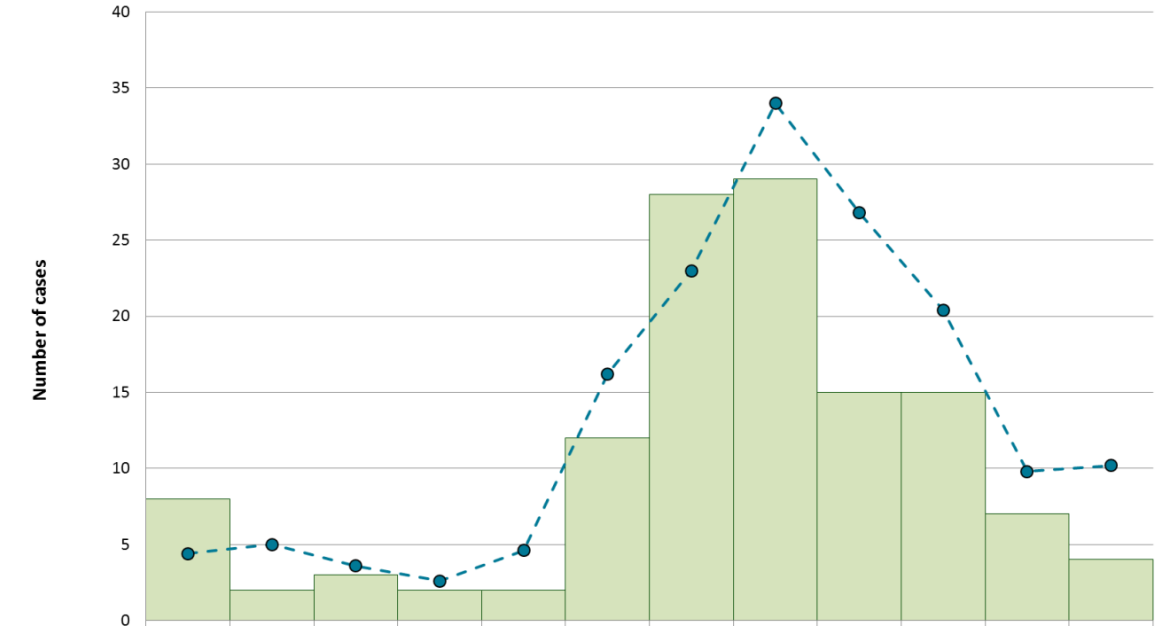
Figure 27-2. Incidence of legionellosis by age and sex: Ontario, 2014



	<1	01-04	05-09	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	0	0	0	0	2	0	4	6	9	11
Male Count	0	0	0	1	1	2	8	24	30	29
Female Rate	0.0	0.0	0.0	0.0	0.2	0.0	0.4	0.6	1.2	1.4
Male Rate	0.0	0.0	0.0	0.1	0.1	0.2	0.8	2.4	4.3	4.8
Total Rate	0.0	0.0	0.0	0.1	0.2	0.1	0.6	1.5	2.7	2.9

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

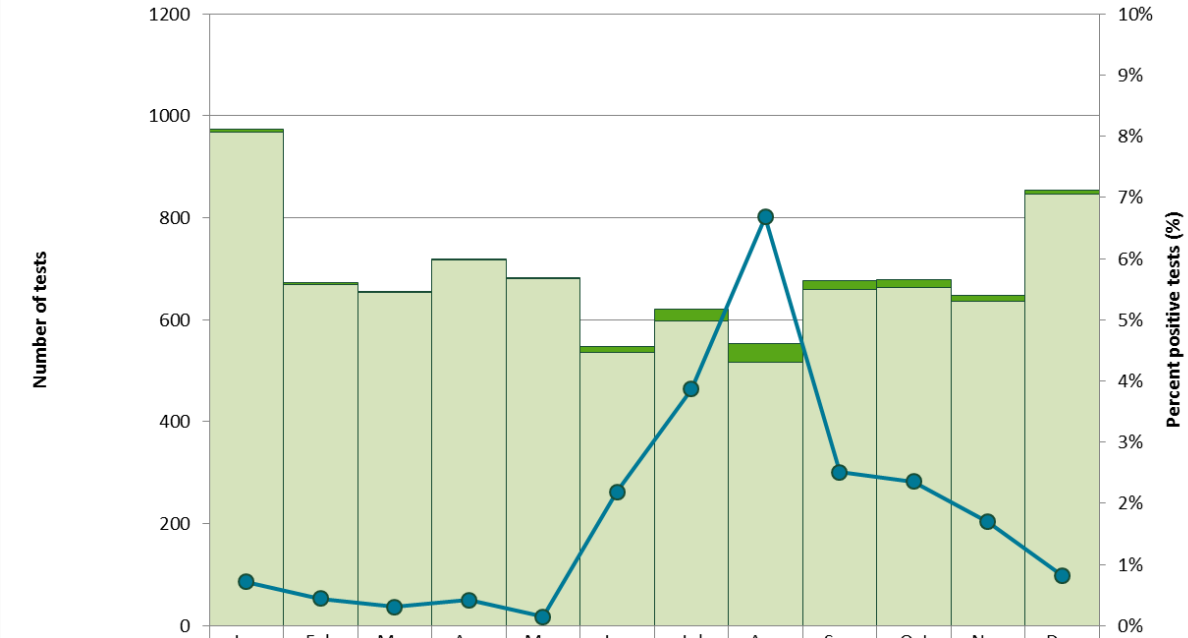
Figure 27-3. Number of legionellosis cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	8	2	3	2	2	12	28	29	15	15	7	4
5-Yr Average	4.4	5.0	3.6	2.6	4.6	16.2	23.0	34.0	26.8	20.4	9.8	10.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2014/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

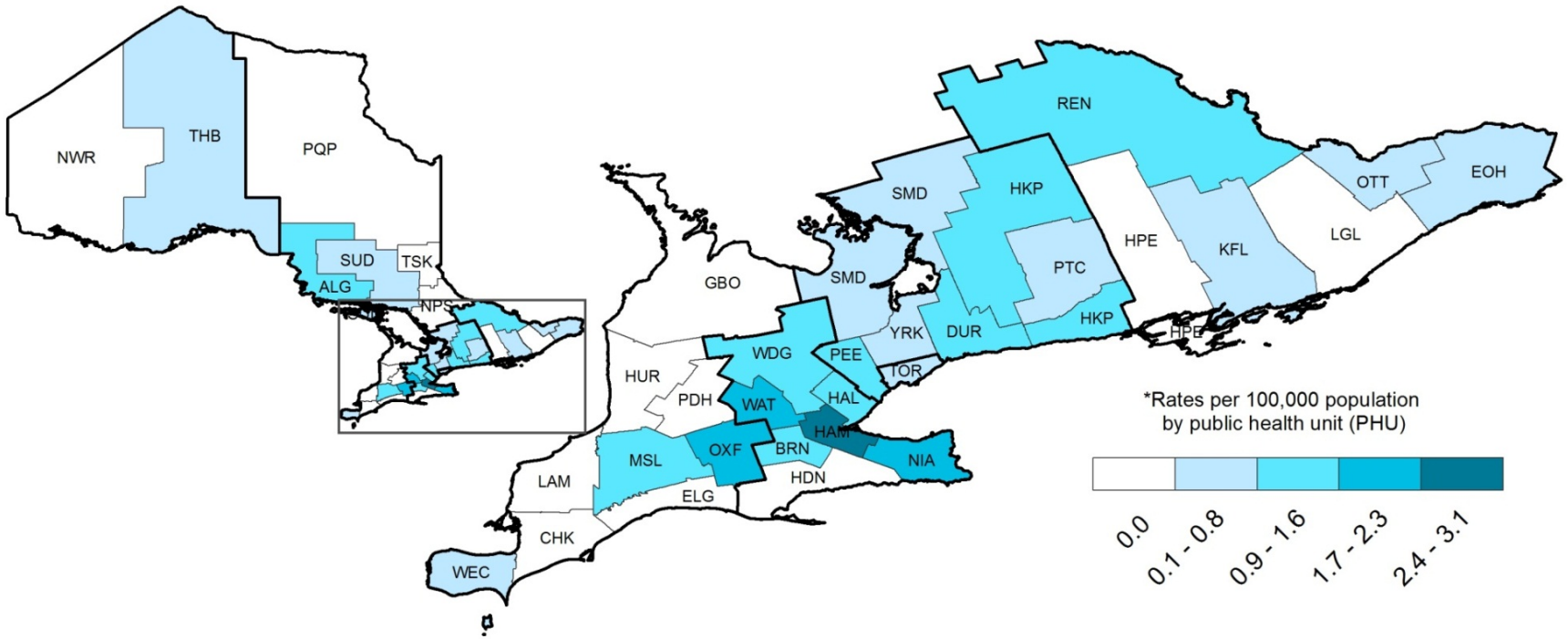
Figure 27-4. Number of patients tested and percent positivity for *Legionella* by test month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Positive tests	7	3	2	3	1	12	24	37	17	16	11	7
Negative tests	967	669	654	717	681	536	597	517	660	663	637	847
% positive	0.7%	0.4%	0.3%	0.4%	0.1%	2.2%	3.9%	6.7%	2.5%	2.4%	1.7%	0.8%

Source: Public Health Ontario Laboratory (PHOL), Laboratory Information Management System, extracted [2015/09/10].
Note: Includes all patients tested for *Legionella* by all methods (i.e., urine antigen, culture, polymerase chain reaction, and direct fluorescent antibody); each patient is only counted once regardless of number of specimens tested. Percent positivity is the percentage of patients tested with at least one positive result. Test month is based on the month the specimen was received at the lab. Out of province patients were excluded from the analysis.

Map 27-1. Incidence of legionellosis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	1	0.9
BRN	2	1.4
CHK	0	0.0
DUR	8	1.2
ELG	0	0.0
EOH	1	0.5
GBO	0	0.0
HAL	7	1.3
HAM	17	3.1
HDN	0	0.0
HKP	2	1.1
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	1	0.5
LAM	0	0.0
LGL	0	0.0
MSL	4	0.9
NIA	8	1.8
NPS	0	0.0
NWR	0	0.0
OTT	2	0.2
OXF	2	1.8
PDH	0	0.0
PEE	17	1.2
PQP	0	0.0
PTC	1	0.7

PHU	Cases (n)	*Rates
REN	1	0.9
SMD	4	0.7
SUD	1	0.5
THB	1	0.6
TOR	23	0.8
TSK	0	0.0
WAT	10	1.9
WDG	4	1.4
WEC	3	0.7
YRK	7	0.6
Ontario	**127**	**0.9**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 28.

Leprosy

General overview for 2014

Incidence and comparison to Canada (Table 28-1): Leprosy is a rare disease in Ontario. In 2014, one confirmed case was reported in the province, which corresponds to an incidence rate of 0.1 cases per 1,000,000 population. From 2005 to 2014, a total of 30 confirmed cases of leprosy were reported in Ontario, for an average of 3.0 cases per year over this period. The largest number of cases during this period was reported in 2008, 2009 and 2011, with five confirmed cases in each year. Over this 10-year period, provincial incidence rates of leprosy have consistently been higher or similar to the Canadian rates. None of the cases reported from 2005 to 2014 acquired their infection in Ontario.

Age and sex: Among all confirmed cases reported from 2005 to 2014, 83.3% (25/30) were male and 63.3% (19/30) were over the age of 40.

Table 28-1. Incidence of leprosy: Ontario, 2005-14

Year	Ontario cases	Ontario rate (per 1,000,000 population)	Canadian rate (per 1,000,000 population)
2005	3	0.2	0.2
2006	2	0.2	0.1
2007	2	0.2	0.1
2008	5	0.4	0.1
2009	5	0.4	0.1
2010	2	0.2	0.1
2011	5	0.4	0.2
2012	3	0.2	0.2
2013	2	0.1	0.03
2014	1	0.1	-

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2004-2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/12]; national data available up to 2013.

Chapter 29.

Listeriosis

General overview for 2014

Incidence and comparison to Canada (Figure 29-1): In 2014, there were 52 confirmed cases of listeriosis in Ontario, representing an incidence rate of 0.4 cases per 100,000 population. The incidence rate for listeriosis remained stable from 2007-14, with the exception of 2008. In 2008, the incidence of listeriosis increased due to an outbreak attributed to ready-to-eat deli meats. From 2007-13, rates in Ontario have been comparable to the Canadian rates.

Age and sex (Figure 29-2): The highest incidence rates were observed in the 70 years and older age group (1.6 cases per 100,000 population), followed by the 60-69 year age group (0.8 cases per 100,000 population). There was little difference in the incidence rates by sex.

Seasonal trends (Figure 29-3): Listeriosis tends to follow a seasonal pattern, with increased incidence in the warmer months. In 2014, 42.3% (22/52) of cases were reported in July and August.

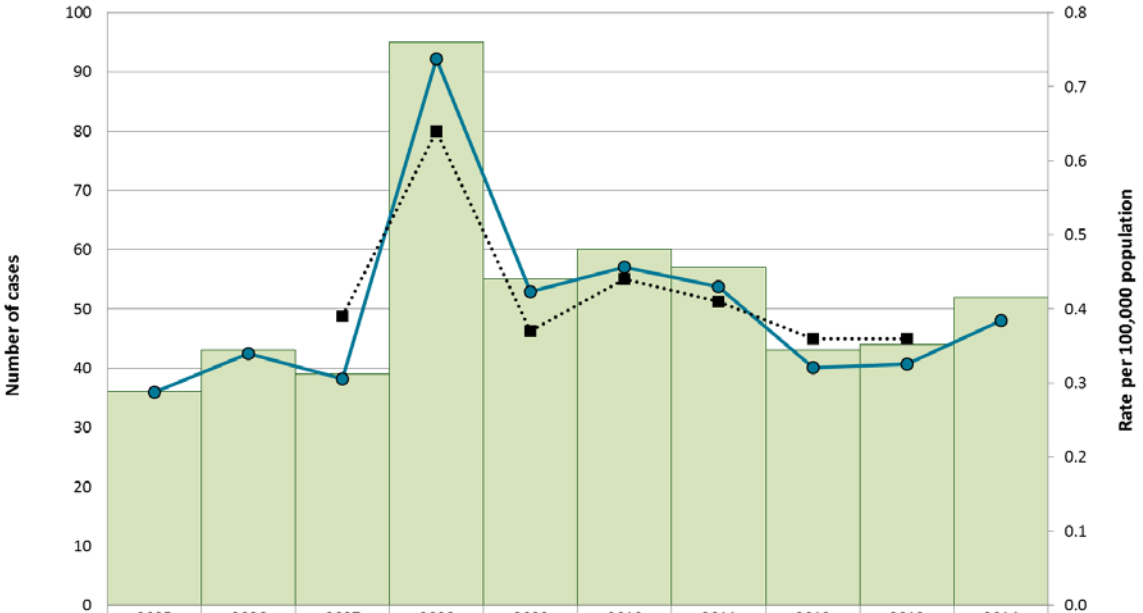
Geographic distribution (Map 29-1): The highest incidence rates were observed in Porcupine (2.3 cases per 100,000 population), North Bay Parry Sound District (1.6 cases per 100,000 population) and Oxford County (0.9 cases per 100,000 population). Owing to large population size, the highest number of cases was reported by Toronto (17 cases) and Peel Region (11 cases).

Hospitalizations and deaths: Hospitalization was reported for 65.4% (34/52) of cases and death was reported for 11.5% (6/52) of cases. The proportion of cases that died is expected to be an underestimate of the true number since death outcomes reported in iPHIS are captured only at the time of case investigation. A report from the Public Health Agency of Canada's National Enhanced Listeriosis Surveillance Program reported a fatal outcome of 17-20% for cases in Ontario from 2011 to 2012.[43] The difference between the case fatality rates reported in this report and those captured through the national surveillance program is likely due to more complete reporting in the enhanced surveillance program.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, February 2014 edition (Volume 3, Issue 2)

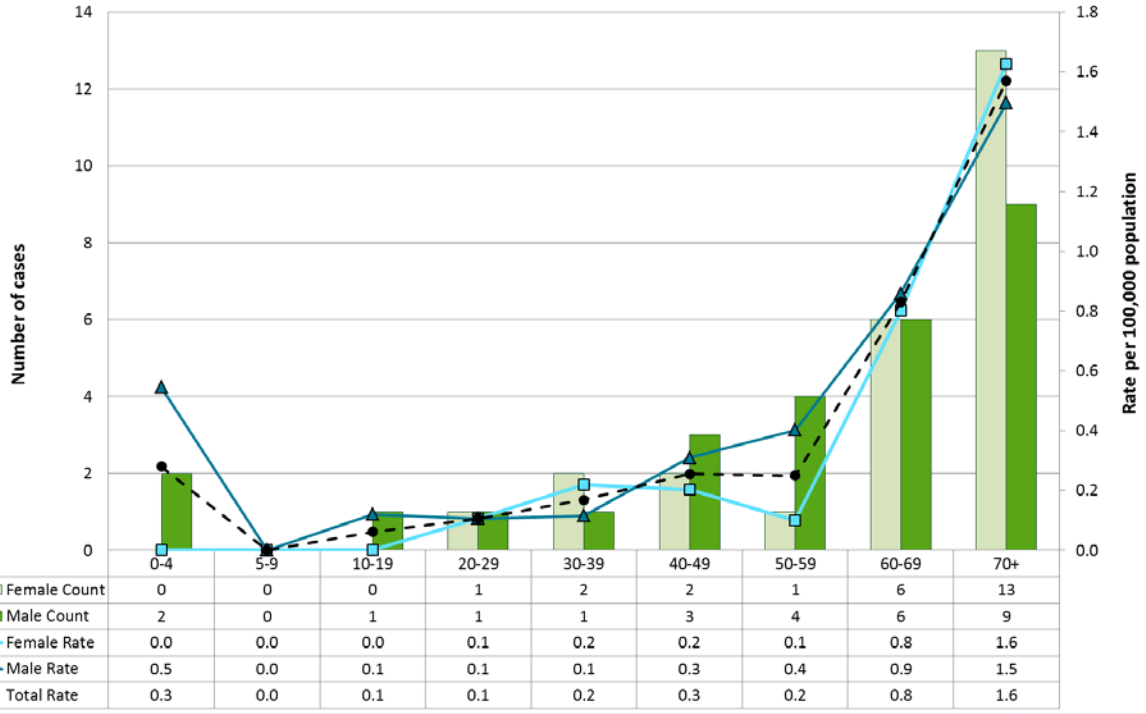
Figure 29-1. Incidence of listeriosis: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	36	43	39	95	55	60	57	43	44	52
Ontario Rate	0.3	0.3	0.3	0.7	0.4	0.5	0.4	0.3	0.3	0.4
Canada Rate			0.4	0.6	0.4	0.4	0.4	0.4	0.4	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available from 2007-13.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

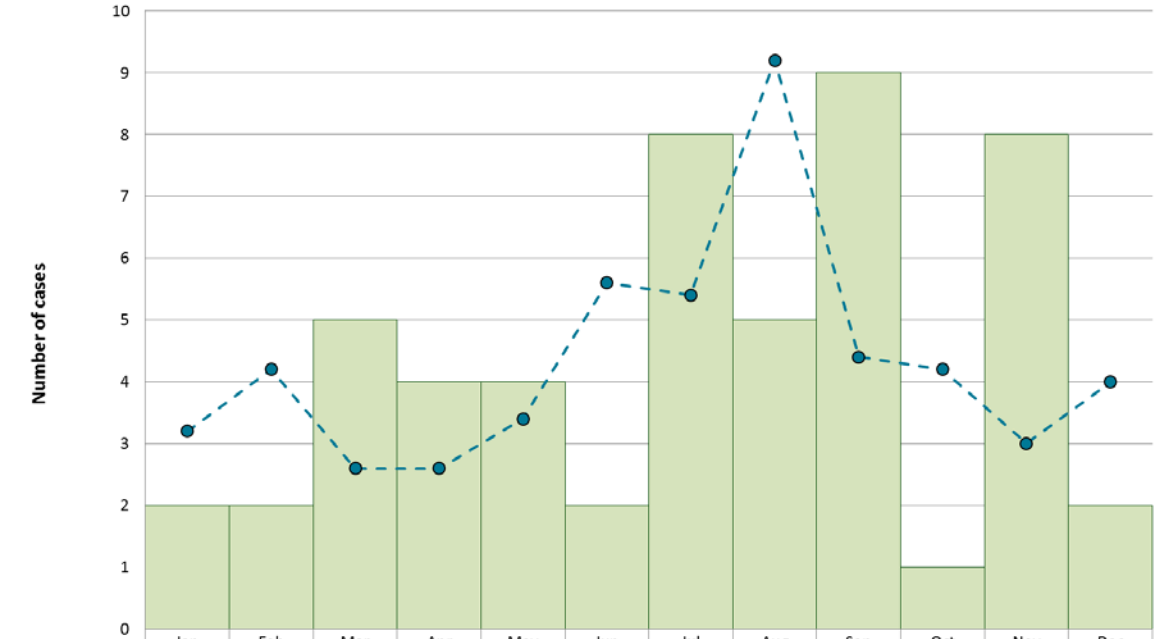
Figure 29-2. Incidence of listeriosis by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	0	0	0	1	2	2	1	6	13
Male Count	2	0	1	1	1	3	4	6	9
Female Rate	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.8	1.6
Male Rate	0.5	0.0	0.1	0.1	0.1	0.3	0.4	0.9	1.5
Total Rate	0.3	0.0	0.1	0.1	0.2	0.3	0.2	0.8	1.6

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

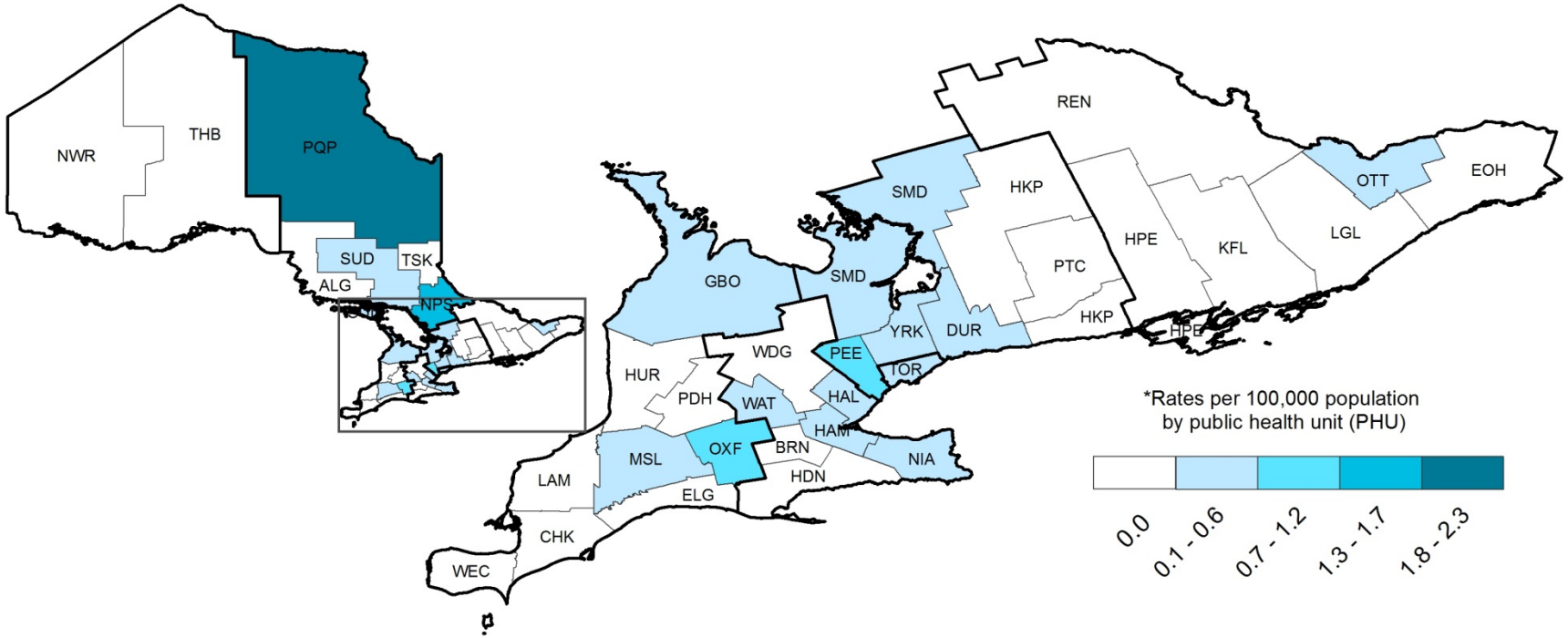
Figure 29-3. Number of listeriosis cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	2	2	5	4	4	2	8	5	9	1	8	2
5-Yr Average	3.2	4.2	2.6	2.6	3.4	5.6	5.4	9.2	4.4	4.2	3.0	4.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 29-1. Incidence of listeriosis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	0	0.0
CHK	0	0.0
DUR	1	0.2
ELG	0	0.0
EOH	0	0.0
GBO	1	0.6
HAL	3	0.6
HAM	1	0.2
HDN	0	0.0
HKP	0	0.0
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	0	0.0
LAM	0	0.0
LGL	0	0.0
MSL	1	0.2
NIA	2	0.4
NPS	2	1.6
NWR	0	0.0
OTT	2	0.2
OXF	1	0.9
PDH	0	0.0
PEE	11	0.8
PQP	2	2.3
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	1	0.2
SUD	1	0.5
THB	0	0.0
TOR	17	0.6
TSK	0	0.0
WAT	3	0.6
WDG	0	0.0
WEC	0	0.0
YRK	3	0.3
Ontario	**52**	**0.4**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 30.

Lyme disease

General overview for 2014

Incidence and comparison to Canada (Figure 30-1): In 2014, there were 146 confirmed and 82 probable cases of Lyme disease in Ontario, representing a combined incidence rate of 1.7 cases per 100,000 population. This rate was 32% lower than the 2013 rate of 2.5 cases per 100,000 population, and is the first notable decrease in annual incidence since 2002. Lyme disease has been nationally notifiable since 2009, and since then incidence rates in Ontario have been above the Canadian rates.

Age and sex (Figure 30-2): Although Lyme disease can be contracted at any age, the highest incidence rates were observed in older adults in the 50- 59 and 60-69 year age groups. Rates among males were the same or higher than females, with the exception of the 0- 4 and 70 years and older age groups.

Seasonal trends (Figure 30-3): Lyme disease tends to follow a seasonal pattern, with an increased number of cases reported in the summer months, which corresponds with the nymphal stage of the blacklegged tick's life cycle and increased outdoor activity.[44] In 2014, 67.1% of total cases (153/228) were reported between June and August.

Geographic distribution (Map 30-1): The highest incidence rates were reported in Leeds, Grenville and Lanark District (24.2 cases per 100,000 population), Kingston, Frontenac, Lenox, and Addington (19.0 cases per 100,000 population) and in Hastings-Prince Edward Counties (6.7 cases per 100,000 population).

Hospitalizations and deaths: Hospitalization was reported for 3.9% (9/228) of cases and no deaths were reported.

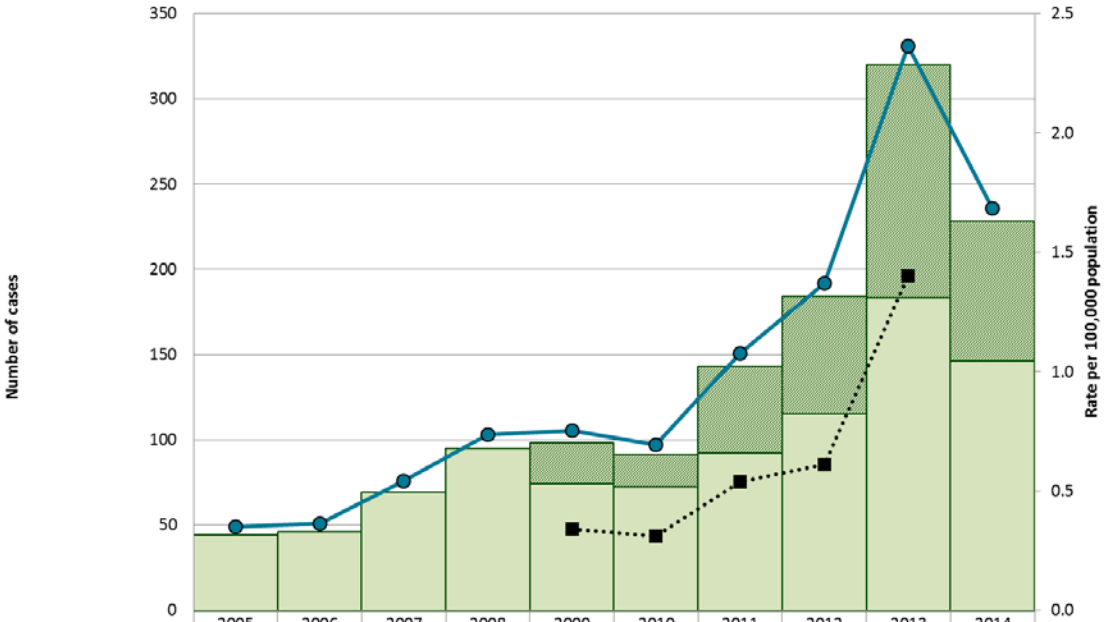
Additional methodological issues

Prior to 2009, probable cases of Lyme disease were not reportable. In early 2009, the provincial case definition for Lyme disease was revised to include both confirmed and probable cases such that certain cases that previously met the confirmed case definition were required to be reported as probable. The impact of this change was substantial with probable cases constituting a significant proportion of total case counts as of 2009. In order to ensure valid comparisons over time, probable case counts are included in total counts for 2009 and later years.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, September 2013 (Volume 2, Issue 9)
- PHO's Lyme Disease Testing Labstract
- PHO's Lyme Disease Risk Areas Map

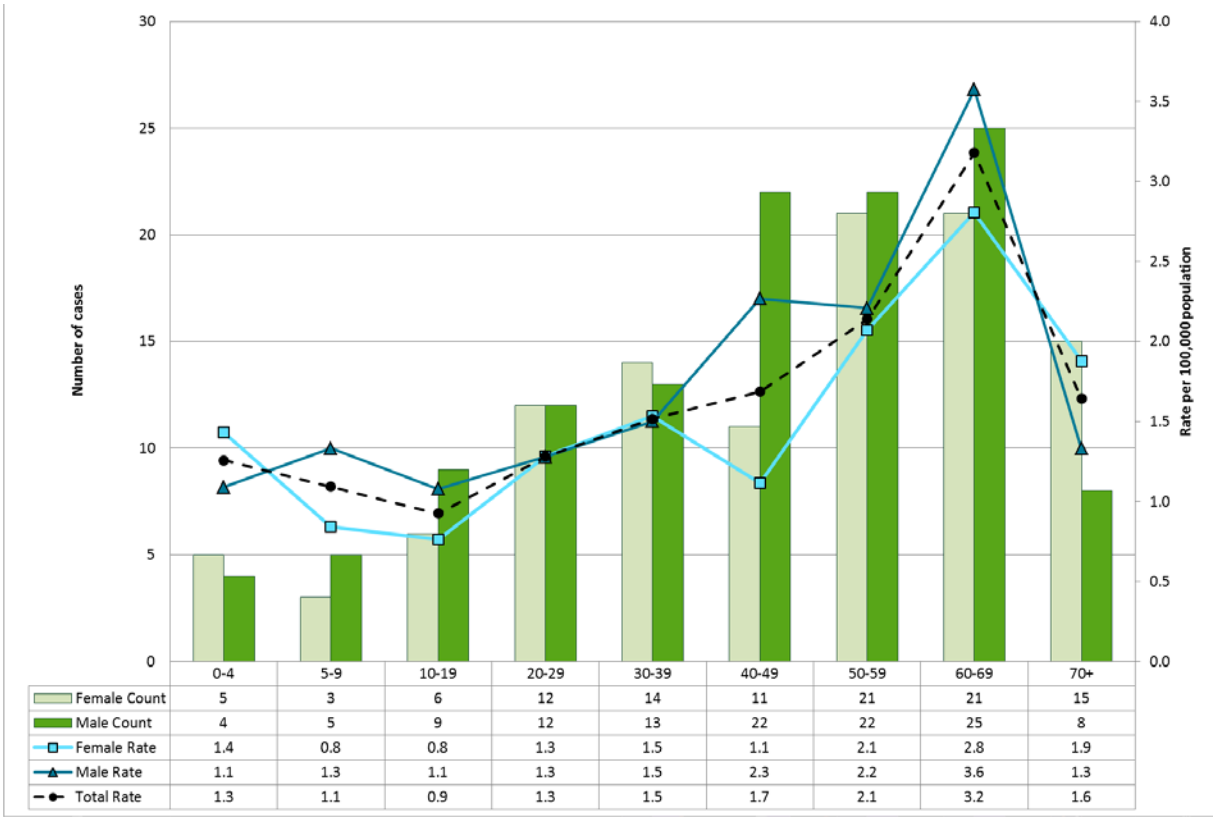
Figure 30-1. Incidence of confirmed and probable Lyme disease: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count (Probable)					24	19	51	69	137	82
Ontario Count (Confirmed)	44	46	69	95	74	72	92	115	183	146
Ontario Rate	0.4	0.4	0.5	0.7	0.8	0.7	1.1	1.4	2.4	1.7
Canada Rate					0.3	0.3	0.5	0.6	1.4	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03]. Incidence rates for Ontario from 2009 are based on confirmed and probable cases.
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2014/07/10]; national data available from 2009-13.

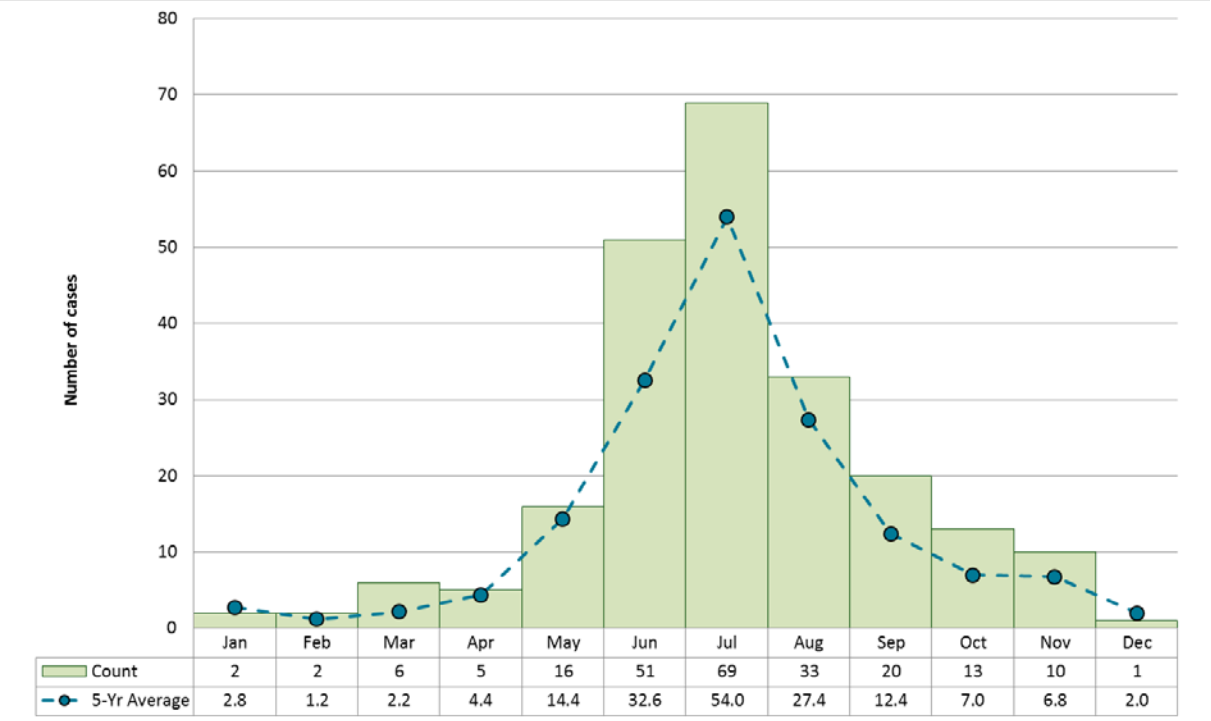
Figure 30-2. Incidence of Lyme disease by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	5	3	6	12	14	11	21	21	15
Male Count	4	5	9	12	13	22	22	25	8
Female Rate	1.4	0.8	0.8	1.3	1.5	1.1	2.1	2.8	1.9
Male Rate	1.1	1.3	1.1	1.3	1.5	2.3	2.2	3.6	1.3
Total Rate	1.3	1.1	0.9	1.3	1.5	1.7	2.1	3.2	1.6

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

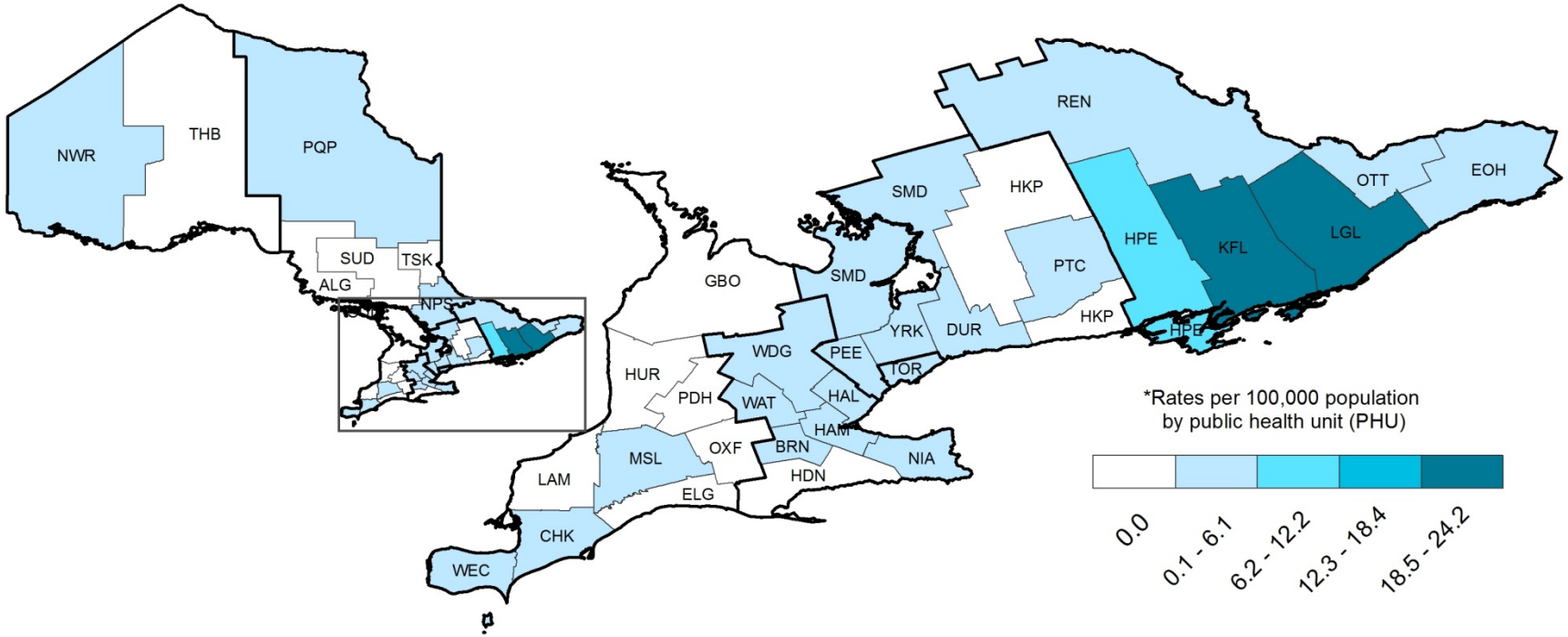
Figure 30-3. Number of Lyme disease cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	2	2	6	5	16	51	69	33	20	13	10	1
5-Yr Average	2.8	1.2	2.2	4.4	14.4	32.6	54.0	27.4	12.4	7.0	6.8	2.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 30-1. Incidence of Lyme disease by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	3	2.1
CHK	3	2.8
DUR	13	2.0
ELG	0	0.0
EOH	5	2.4
GBO	0	0.0
HAL	5	0.9
HAM	6	1.1
HDN	0	0.0
HKP	0	0.0
HPE	11	6.7
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	38	19.0
LAM	0	0.0
LGL	41	24.2
MSL	4	0.9
NIA	8	1.8
NPS	1	0.8
NWR	1	1.2
OTT	22	2.4
OXF	0	0.0
PDH	0	0.0
PEE	4	0.3
PQP	1	1.2
PTC	1	0.7

PHU	Cases (n)	*Rates
REN	3	2.8
SMD	5	0.9
SUD	0	0.0
THB	0	0.0
TOR	40	1.4
TSK	0	0.0
WAT	1	0.2
WDG	2	0.7
WEC	4	1.0
YRK	6	0.5
Ontario	**228**	**1.7**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 31.

Malaria

General overview for 2014

Incidence and comparison to Canada (Figure 31-1): In 2014, there were 191 confirmed cases of malaria in Ontario, representing an incidence rate of 1.4 cases per 100,000 population. The incidence rate increased in 2010, but has since declined. From 2005 to 2013, incidence rates in Ontario have been higher than the Canadian rates. As malaria is not endemic in Canada, its incidence reflects travel to, or recent immigration from, malaria endemic countries. Of the 191 confirmed cases reported in 2014, 175 provided information related to travel to or residence in an endemic country. Of these cases 98.9% (173/175) reported yes to traveling to or having lived in an endemic country.

Age and sex (Figure 31-2): Males accounted for 70% of malaria cases in 2014 for which sex was known (133/190). Overall, the highest incidence rates were observed in the 20 to 69 years age range and among males in all age groups within this age range. The preponderance of cases in the 20 to 69 year age range may be reflective of travel patterns to malaria endemic countries, with sex-specific disparities in the uptake of personal protective measures during travel contributing to the higher proportion of males in this age range.

Seasonal trends (Figure 31-3): In 2014, 56.0% of the cases (107/191) were reported from May to September.

Parasite species (Table 31-1): *P. falciparum* (64.4%, 123/191) and *P. vivax* (19.4%, 37/191) were the most frequently reported malarial species.

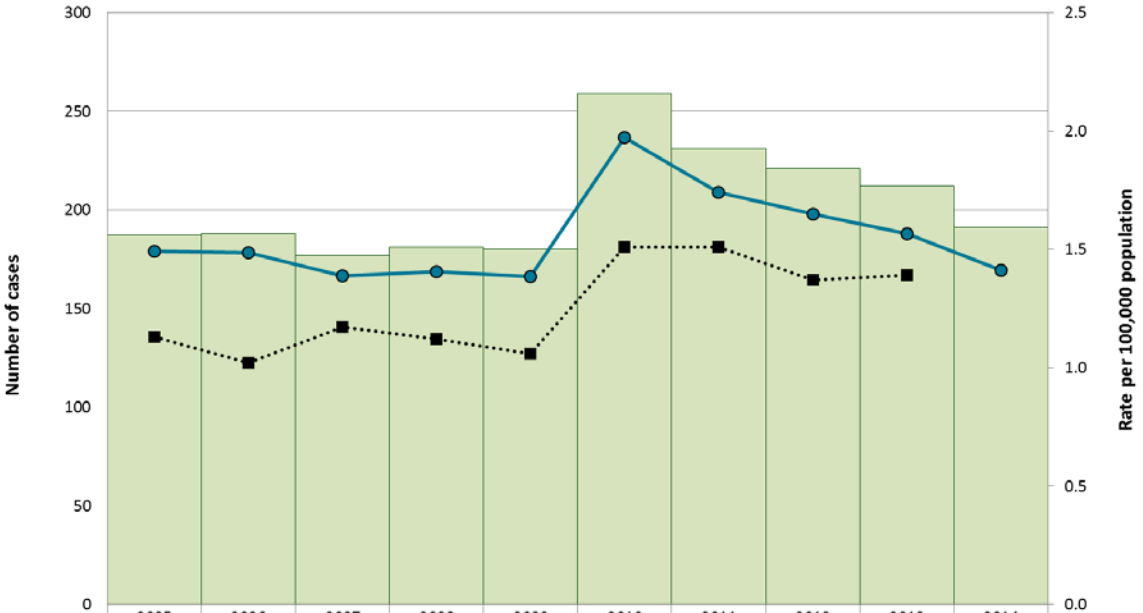
Geographic distribution (Map 31-1): The highest incidence rates were reported by Peel Region (2.9 cases per 100,000 population), Toronto (2.6 cases per 100,000 population), and City of Ottawa (2.1 cases per 100,000 population).

Hospitalizations and deaths: Hospitalization was reported for 36.1% (69/191) of cases and no deaths were reported.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, April 2014 edition (Volume 3, Issue 4)
- Nelder MP, Russell C, Williams D, Johnson K, Li L, Baker SL, et al. Spatiotemporal dynamics and demographic profiles of imported *Plasmodium falciparum* and *Plasmodium vivax* infections in Ontario, Canada (1990-2009). PLoS One. 2013;8(9):e76208

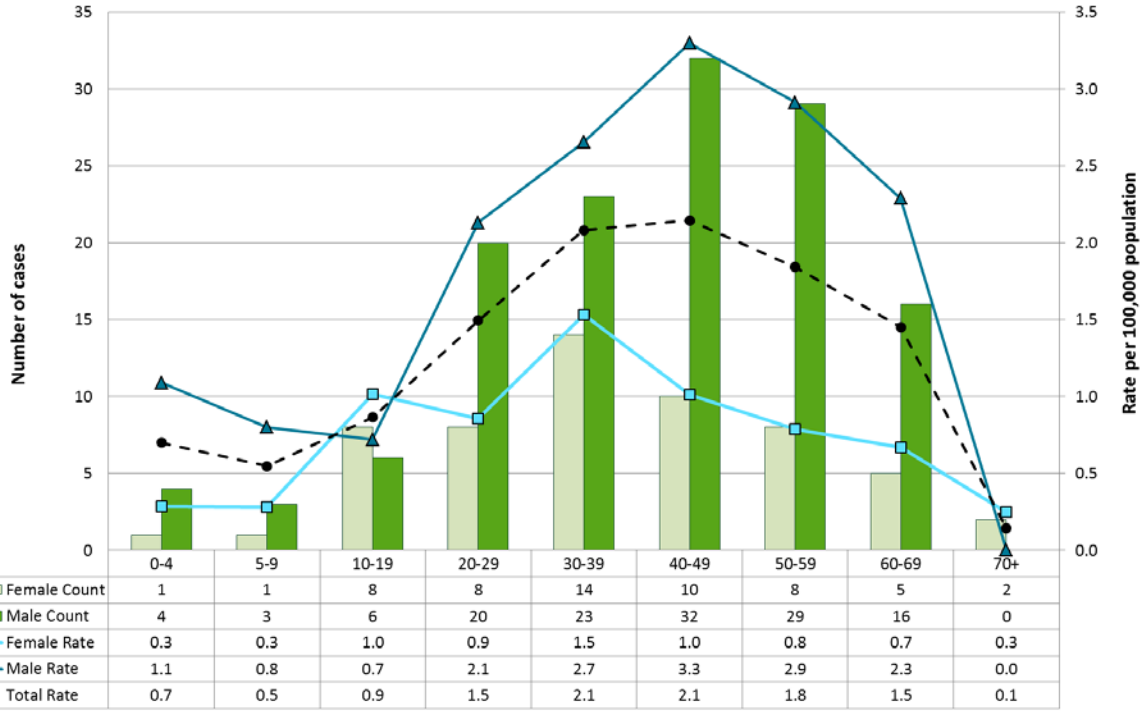
Figure 31-1. Incidence of malaria: Ontario and Canada, 2005 –14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	187	188	177	181	180	259	231	221	212	191
Ontario Rate	1.5	1.5	1.4	1.4	1.4	2.0	1.7	1.6	1.6	1.4
Canada Rate	1.1	1.0	1.2	1.1	1.1	1.5	1.5	1.4	1.4	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

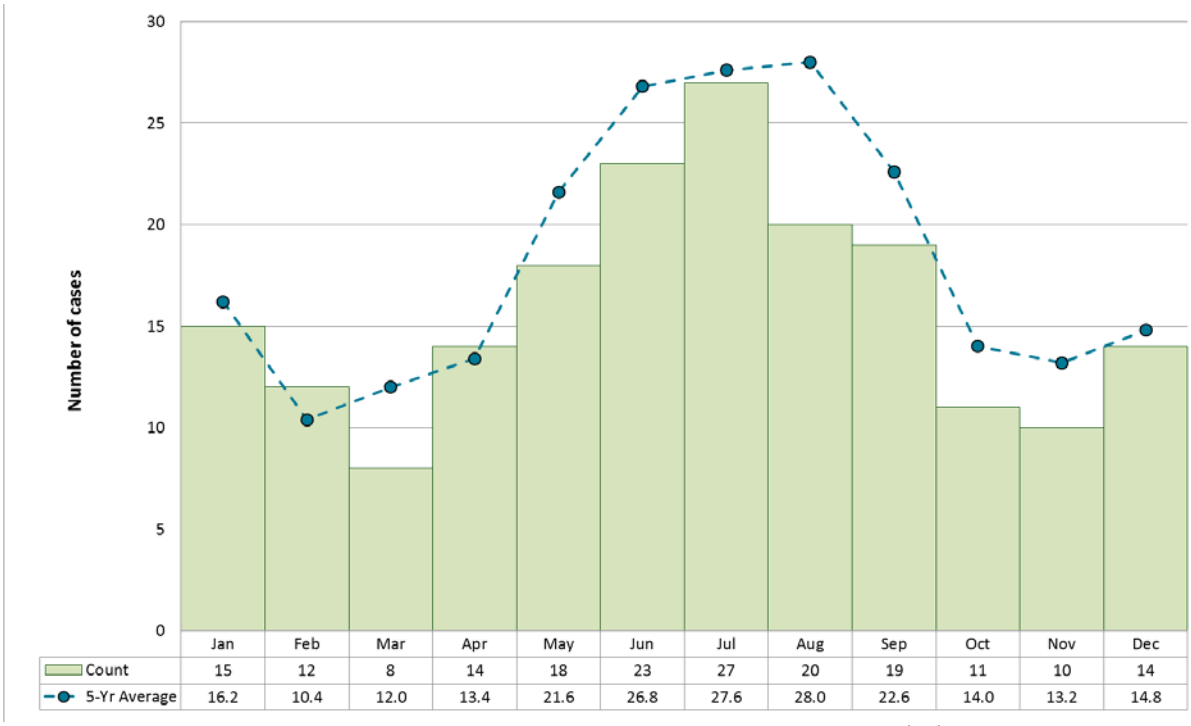
Figure 31-2. Incidence of malaria by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	1	1	8	8	14	10	8	5	2
Male Count	4	3	6	20	23	32	29	16	0
Female Rate	0.3	0.3	1.0	0.9	1.5	1.0	0.8	0.7	0.3
Male Rate	1.1	0.8	0.7	2.1	2.7	3.3	2.9	2.3	0.0
Total Rate	0.7	0.5	0.9	1.5	2.1	2.1	1.8	1.5	0.1

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes one case of unknown sex.

Figure 31-3. Number of malaria cases by month: Ontario, 2014



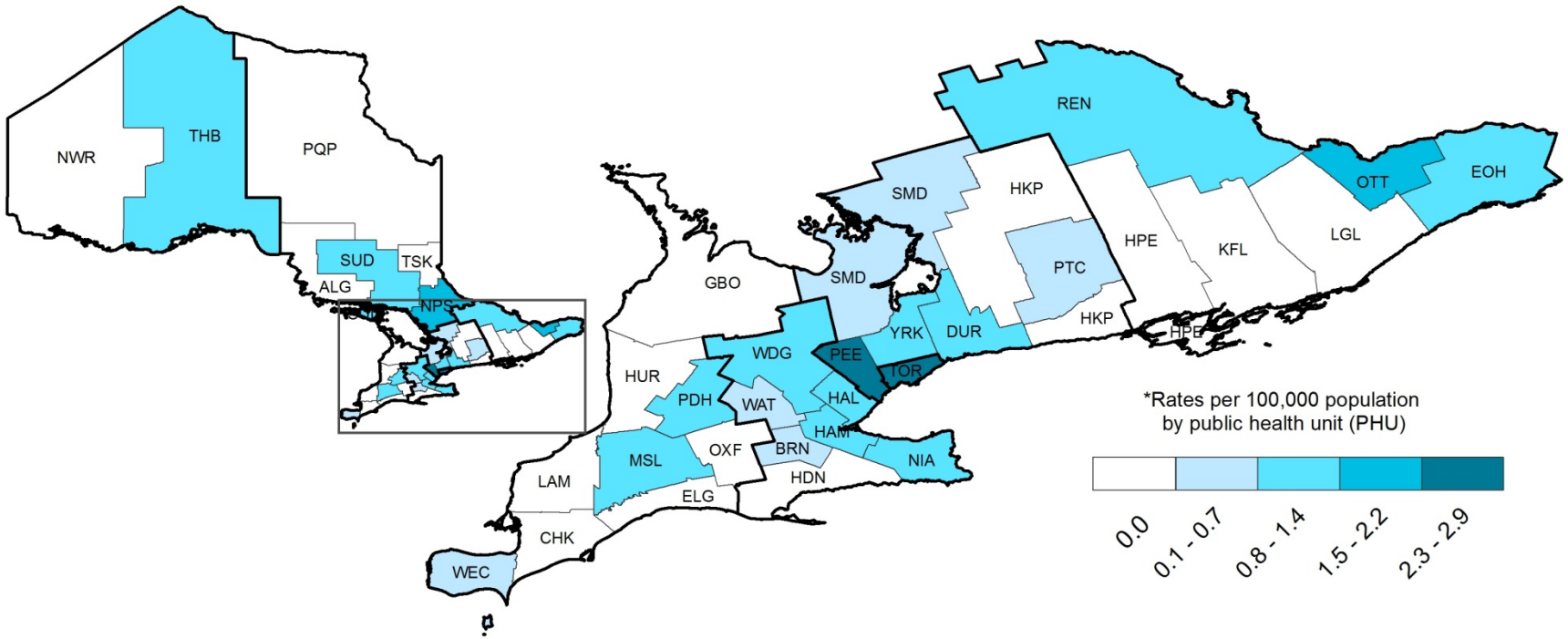
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Table 31-1. Malaria cases by *Plasmodium* species: Ontario, 2014

***Plasmodium* Species**	**Cases**	
	n	**%**
P. falciparum	123	64.4
P. vivax	37	19.4
P. ovale	16	8.4
P. malariae	3	1.6
Unspecified species	12	6.3
Total	**191**	**100.0**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].

Map 31-1. Incidence of malaria by public health unit of residence: Ontario, 2014



PHU	Cases (n)	Rates
ALG	0	0.0
BRN	1	0.7
CHK	0	0.0
DUR	8	1.2
ELG	0	0.0
EOH	2	1.0
GBO	0	0.0
HAL	7	1.3
HAM	5	0.9
HDN	0	0.0
HKP	0	0.0
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	Rates
KFL	0	0.0
LAM	0	0.0
LGL	0	0.0
MSL	4	0.9
NIA	4	0.9
NPS	2	1.6
NWR	0	0.0
OTT	20	2.1
OXF	0	0.0
PDH	1	1.3
PEE	40	2.9
PQP	0	0.0
PTC	1	0.7

PHU	Cases (n)	Rates
REN	1	0.9
SMD	1	0.2
SUD	2	1.0
THB	2	1.3
TOR	71	2.6
TSK	0	0.0
WAT	2	0.4
WDG	3	1.1
WEC	3	0.7
YRK	11	1.0
Ontario	**191**	**1.4**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 32.

Measles

General overview for 2014

Indigenous measles has been eliminated from Canada; the last endemic case of measles was reported in 1997.[45] Under the guidance of the Pan American Health Organization (PAHO), countries of the Americas are currently documenting the elimination of measles.[46] As the disease remains endemic in other parts of the world, importation of cases continues to occur. Immunization with two doses of a measles-containing vaccine is the most effective method of preventing the disease. In Canada, measles vaccine is only available in combination with mumps, rubella and varicella vaccines (MMR and MMRV vaccines). A two-dose measles immunization program was implemented in Ontario in 1996. Presently, the first MMR dose is administered at 12 months of age while the second dose is administered as a combined MMRV vaccine between four and six years of age.

Incidence and comparison to Canada (Figure 32-1): In 2014, 22 confirmed cases of measles were reported in Ontario, representing an incidence rate of 1.6 cases per 1,000,000 population. The annual incidence rate of measles ranged from 0.0 to 4.5 cases per 1,000,000 population between 2005 and 2014. In Canada, low incidence rates have been observed over the past decade except in 2007 and 2011, when distinct outbreaks were reported in Quebec.

Age and sex (Figure 32-2): In 2014, the highest incidence rate of measles was observed in infants under one year (21.1 cases per 1,000,000 population), however rates are unstable due to low case counts. Cases ranged in age from less than one year to 53 years, with a median age of 26 years; 63.6% of cases were in adults. Fourteen (63.6%) cases were female.

Importation status: Importation status was available for all 22 cases reported in 2014. All cases were imported or import-related. Half (11 cases) had traveled outside of Canada in the 7 to 21 days before rash onset (i.e., imported) and the other half were epidemiologically-linked to an imported case (i.e., import-related).

Genotype: Genotype information was available for 18 (81.8%) cases in 2014. Thirteen cases were identified as B3 and five were identified as D9.

Immunization: Of the 22 confirmed cases of measles in 2014, immunization status was available for 19 cases (86.4%). Of these, 14 cases (73.7%) were unimmunized, including three infants under one year of age. Two adult cases had received a single dose of measles-containing vaccine and three adult cases received two doses of measles-containing vaccine. In addition, three cases (two unimmunized and one of unknown immunization status) received vaccine after exposure.

Geographic distribution (Map 32-1): In 2014, cases of measles were reported by ten public health units. Among these public health units, Sudbury and District reported the highest incidence rate (5.0 cases per 1,000,000 population); however this rate is unstable as it is based on a single case. York Region reported the second highest incidence rate with 4.5 cases per 1,000,000 population, based on five cases.

Hospitalizations and deaths: Seven (31.8%) cases were reported as hospitalized in 2014 and none of the cases had a fatal outcome.

Highlights

Despite measles elimination, Canada experienced ongoing measles activity in 2014, with importations occurring in many provinces and territories. Globally there has been substantial measles activity reported in Europe, Africa and Asia.

All cases reported in 2014 were related to travel outside of Canada with seven of the imported cases having a history of travel to the Philippines, while the remaining four imported cases travelled to the United States,

Netherlands, Thailand and Pakistan. A cluster of import-related cases was epidemiologically-linked to a suspected case of measles who was a resident of China. Subsequent secondary measles transmission occurred from three imported cases and tertiary transmission occurred in one secondary case.

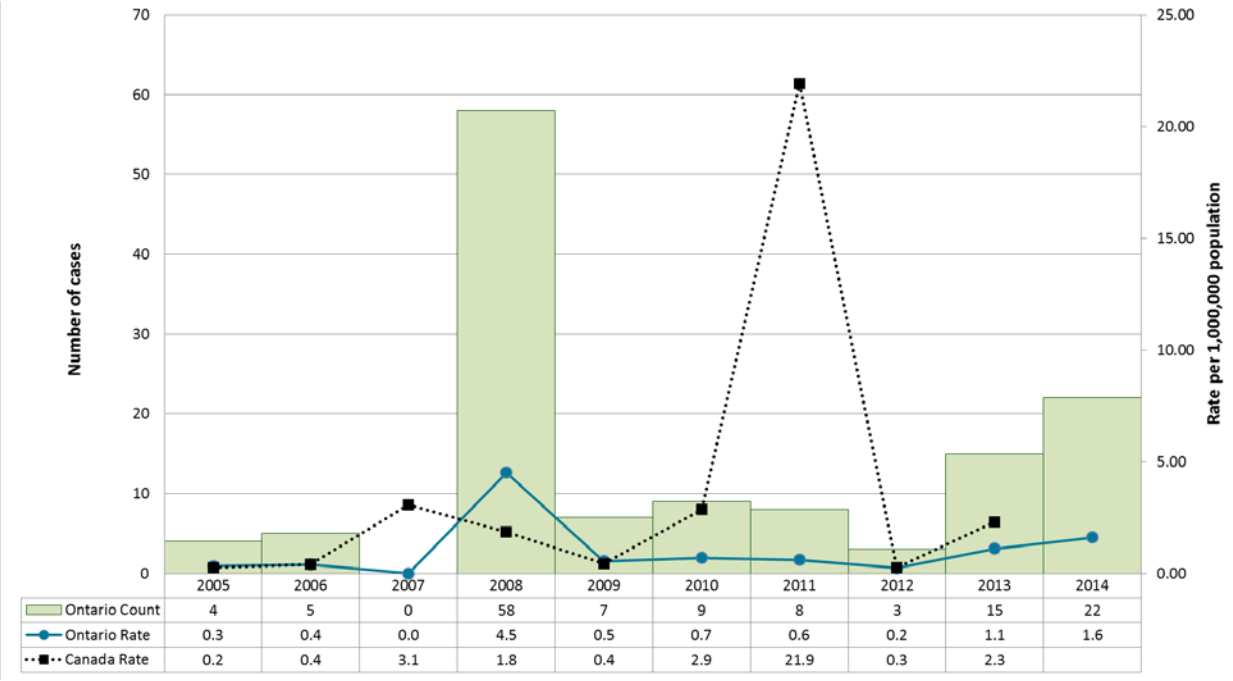
Additional methodological issues

In determining the importation status of the 22 confirmed cases of measles in 2014, consultation within the program area as well as review of iPHIS data fields (i.e., exposures, comments, case notes, and risk factor notes) were undertaken.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, August 2013 edition
- PHO's Ontario Measles Epidemiologic Summary
- Public Health Agency of Canada. Measles surveillance in Canada: Trends for 2013. CCDR. June 2014;40-12
- Public Health Ontario. Documenting the elimination of measles, rubella, and congenital rubella syndrome in Ontario: 2009-2012. Toronto, ON: Queen's Printer for Ontario; 2013.

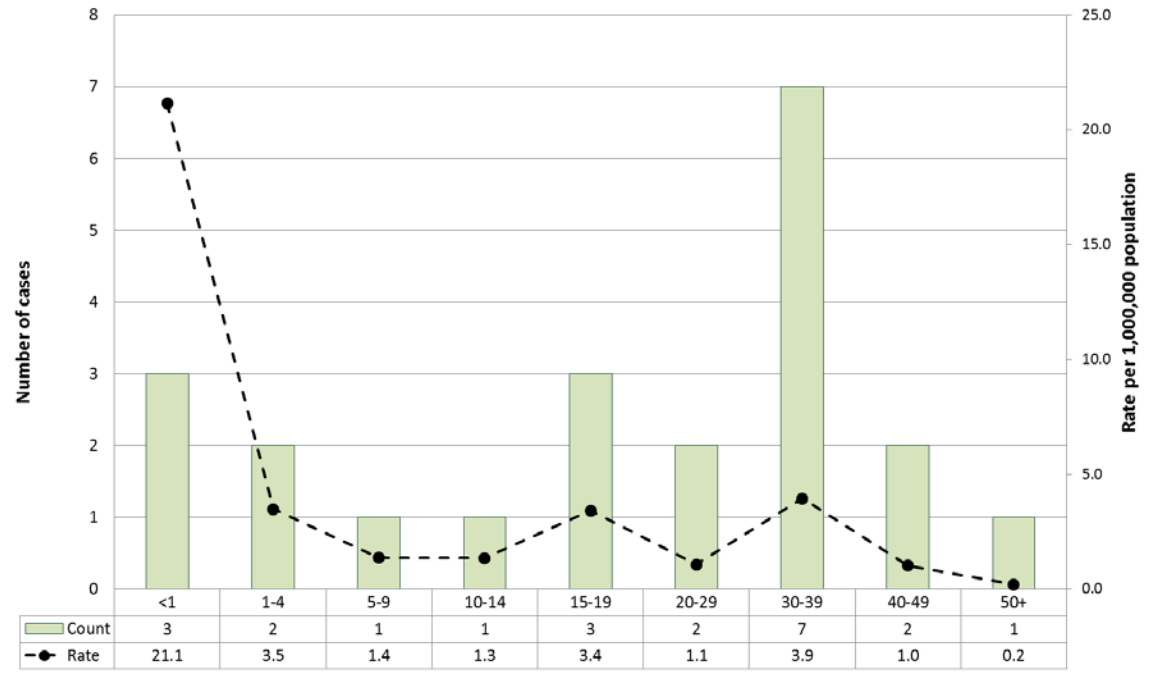
Figure 32-1. Incidence of measles: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	4	5	0	58	7	9	8	3	15	22
Ontario Rate	0.3	0.4	0.0	4.5	0.5	0.7	0.6	0.2	1.1	1.6
Canada Rate	0.2	0.4	3.1	1.8	0.4	2.9	21.9	0.3	2.3	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canada Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received [2015/07/10]; national data available up to 2013.
Note: Nunavut did not report on congenital measles cases for 2012-2013. Its population has been removed for Canada rate calculation

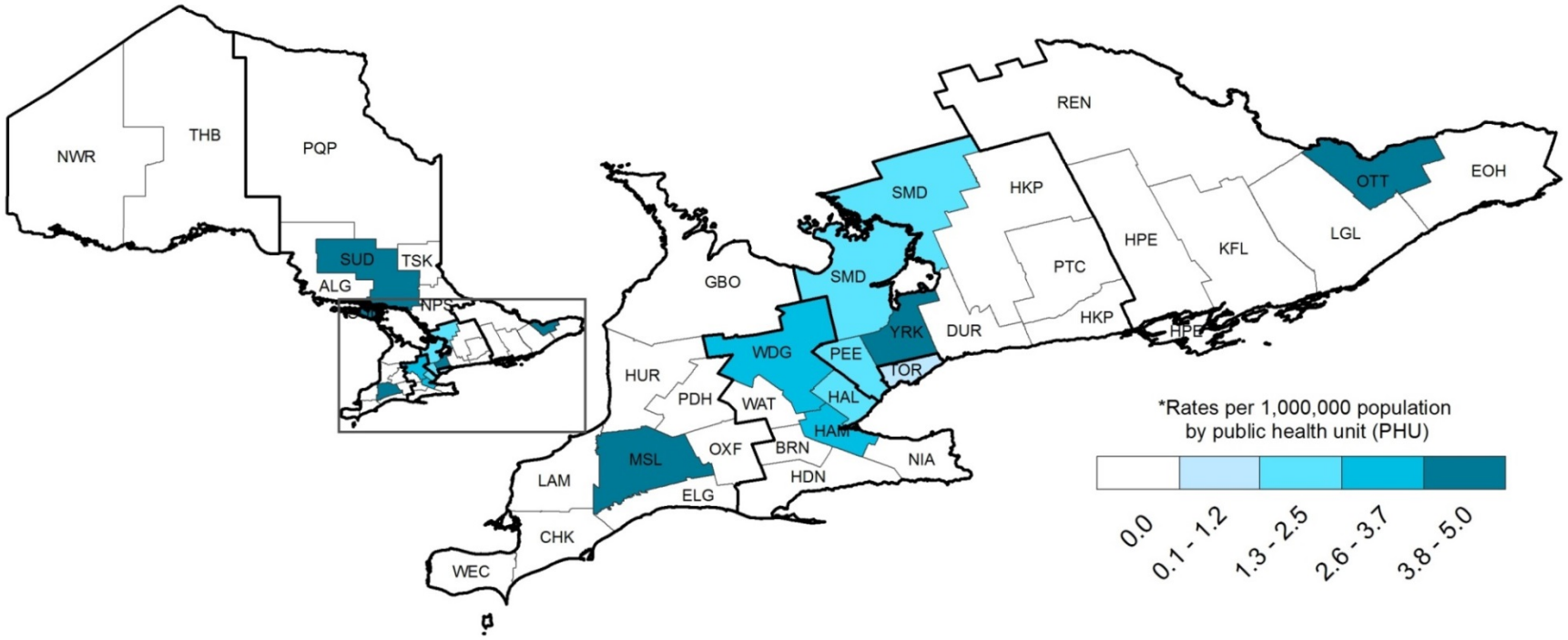
Figure 32-2. Incidence of measles by age: Ontario, 2014



	<1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50+
Count	3	2	1	1	3	2	7	2	1
Rate	21.1	3.5	1.4	1.3	3.4	1.1	3.9	1.0	0.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Map 32-1. Incidence of measles by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	0	0.0
CHK	0	0.0
DUR	0	0.0
ELG	0	0.0
EOH	0	0.0
GBO	0	0.0
HAL	1	1.9
HAM	2	3.7
HDN	0	0.0
HKP	0	0.0
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	0	0.0
LAM	0	0.0
LGL	0	0.0
MSL	2	4.3
NIA	0	0.0
NPS	0	0.0
NWR	0	0.0
OTT	4	4.3
OXF	0	0.0
PDH	0	0.0
PEE	2	1.4
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	1	1.9
SUD	1	5.0
THB	0	0.0
TOR	3	1.1
TSK	0	0.0
WAT	0	0.0
WDG	1	3.6
WEC	0	0.0
YRK	5	4.5
Ontario	**22**	**1.6**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 33.

Meningococcal disease, invasive

General overview for 2014

Invasive meningococcal disease (IMD) is an endemic but rare disease in Ontario. A single dose conjugated meningococcal vaccine against serogroup C (MCC) has been publicly funded in Ontario for one-year olds since September 2004. This was followed by a school-based single dose MCC vaccine program for grade seven students in January 2005, which was replaced with a quadrivalent meningococcal conjugated vaccine (MCV4) against serogroups A, C, Y and W in 2009.[20] As of December 2014, a meningococcal B vaccine (Bexsero®) has been added to the publicly funded immunization schedule in Ontario for individuals 2 months to 17 years of age with specific high risk conditions.[20] This group was already eligible for other meningococcal vaccines under the high risk program.

Incidence and comparison to Canada (Figure 33-1): Between 2000 and 2014, there were 841 IMD cases in Ontario, with 26 confirmed and probable cases occurring in 2014. Overall incidence rates ranged from a high of 9.4 cases per 1,000,000 in 2001 to a low of 1.7 and 1.9 cases per 1,000,000 population in 2013 and 2014, respectively. Similarly, national incidence showed a decrease in IMD incidence over time.

Serogroups (Figure 33-2): The epidemiology of IMD is serogroup-specific. The incidence of serogroup B disease fluctuated between 2000 and 2014, with the lowest incidence being 0.6 cases per 1,000,000 in 2014. Serogroup B tends to be the most common serogroup in the province, although the incidence has decreased since 2009. The incidence of serogroup C disease has decreased over time as well, suggesting vaccine program impact. Since 2007, serogroup Y has been the second most common form of IMD in the province, with rates fluctuating over time. The incidence of serogroup W disease has remained low (<0.3 cases per 1,000,000) since 2005. Only four cases of serogroup A were reported over the entire surveillance period.

Age and sex (Figure 33-3): Among the 26 cases occurring in 2014, the median age was 43 years, with a range of less than one year to 95 years; 34.6% of cases were in children under 18 years of age. The highest age-specific incidence rate was observed in infants less than one year (42.3 cases per 1,000,000 population), followed by adolescents aged 15-19 years (3.4 cases per 1,000,000 population). Overall, 14 (53.8%) of the cases were male.

Seasonality: In 2014, as in previous years, a seasonal pattern was observed where the occurrence of IMD peaked in winter months (46.1% of cases occurring in 2014). The average number of IMD cases is consistently higher in winter months compared to summer months from 2000 to 2014. Some evidence from the literature suggests that the increase in IMD in winter is associated with the influenza virus enhancing the risk of bacterial infection in colonized individuals.[47]

Immunization: Immunization status was assessed for 14 of the 26 (53.8%) IMD cases reported in 2014. Among them, 12 (85.7%) were reported as unimmunized and two (14.3%) were reported as having one dose of MCC or MCV4 vaccine. One of these cases had a serogroup not covered by the vaccine they received, whereas the other case had received MCV4 vaccine and had serogroup Y disease four years later. Efforts to improve documentation of immunization status are ongoing.

Geographic distribution (Map 33-1): In 2014, some geographic variation was observed, although only 12 of the 36 public health units reported cases of IMD. The highest incidence rates were reported by Thunder Bay District (12.9 cases per 1,000,000 population), Chatham-Kent (9.5 cases per 1,000,000 population) and Lambton (7.7 cases per 1,000,000 population). However, these rates should be interpreted with caution because they are based on small case counts which results in unstable rates.

Hospitalizations and deaths: Among the 26 IMD cases reported in 2014, hospitalization was reported for 21 cases (80.8%) and death was reported for two cases (7.7%).

Remarkable features in 2014

Documentation of immunization status is a critical data element for vaccine-preventable disease surveillance. As noted above, immunization status was not documented for 46.2% of invasive meningococcal disease (IMD) cases in 2014. Complete entry of immunization information remains an important component of provincial reporting in Ontario, and is essential for assessing the impact of vaccine programs.

Additional methodological issues

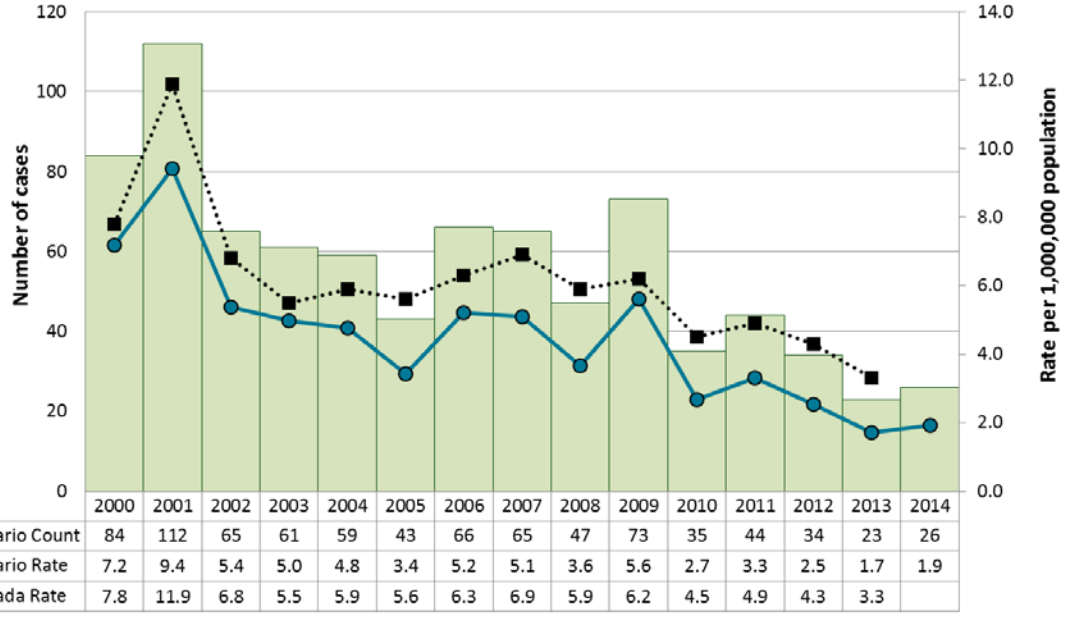
Unique IMD cases were identified using two data sources, the integrated Public Health Information System (iPHIS) and the Public Health Ontario Laboratory (PHOL). Confirmed and probable cases (starting in 2009) from iPHIS were linked to PHOL records using probabilistic record linkage from 2000 and 2010 and deterministic record linkage from 2011 to 2014. PHOL records not matched to iPHIS were also included in the presented case counts as distinct cases.

For the analysis conducted to assess seasonality, winter months were defined as January to March and summer months were from July to September.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, July 2014 edition

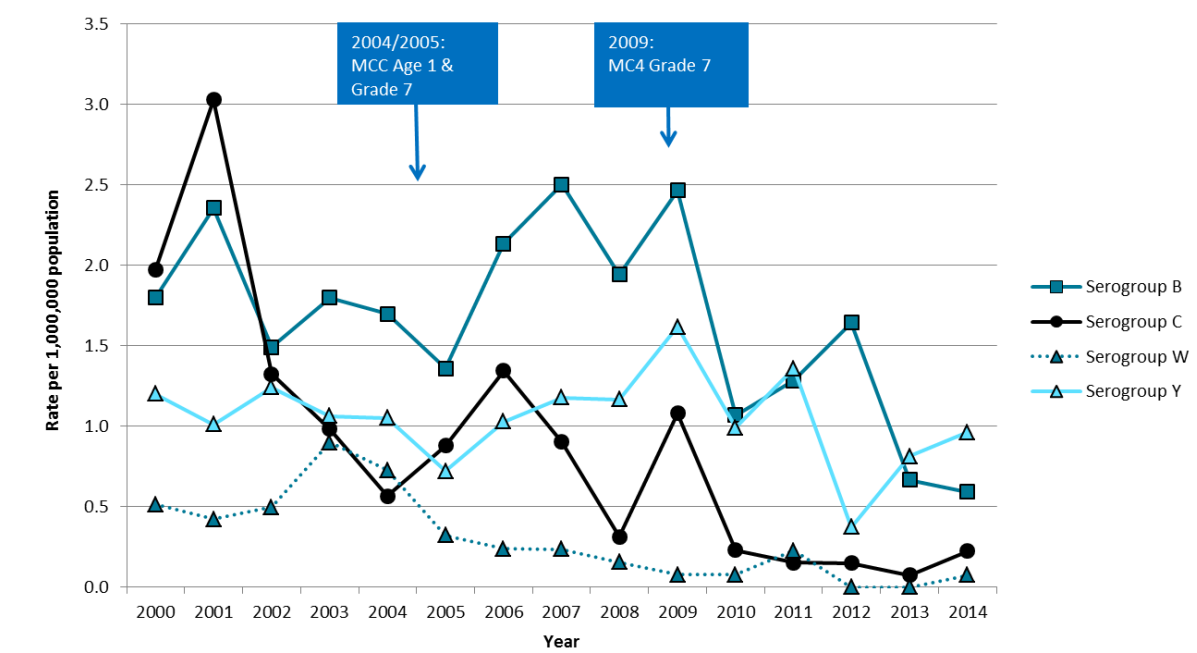
Figure 33-1. Number of cases and incidence of invasive meningococcal disease: Ontario and Canada, 2000-14



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	84	112	65	61	59	43	66	65	47	73	35	44	34	23	26
Ontario Rate	7.2	9.4	5.4	5.0	4.8	3.4	5.2	5.1	3.6	5.6	2.7	3.3	2.5	1.7	1.9
Canada Rate	7.8	11.9	6.8	5.5	5.9	5.6	6.3	6.9	5.9	6.2	4.5	4.9	4.3	3.3	

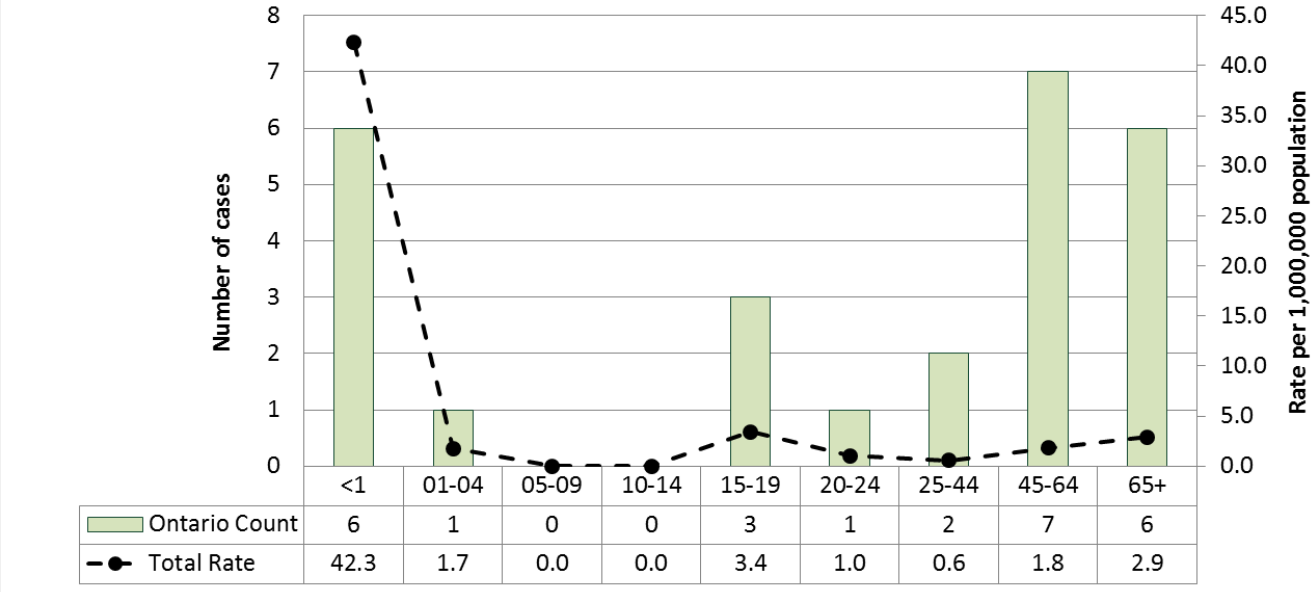
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13] and Public Health Ontario Laboratory (PHOL), extracted [2015/03/06].
Ontario Population: Population Estimates [2000-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/14]; national data available up to 2013.

Figure 33-2. Incidence of invasive meningococcal disease by serogroup*: Ontario, 2000-14



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13] and Public Health Ontario Laboratory (PHOL).
Ontario Population: Population Estimates [2000-2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
***Note:** Excludes cases with serogroup A (n=4), serogroup Z (n=1), and cases with unspecified serogroups (n=102).

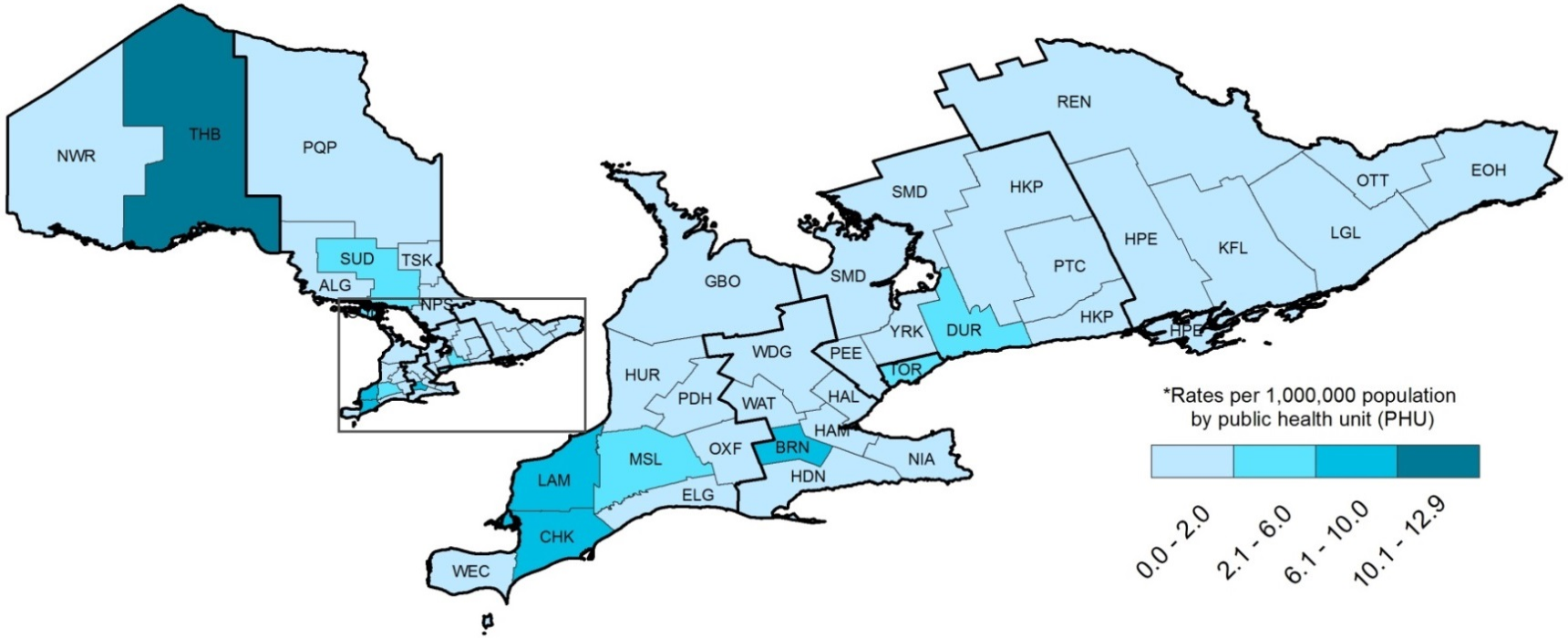
Figure 33-3. Number of cases and incidence of invasive meningococcal disease by age: Ontario, 2014



	<1	01-04	05-09	10-14	15-19	20-24	25-44	45-64	65+
Ontario Count	6	1	0	0	3	1	2	7	6
Total Rate	42.3	1.7	0.0	0.0	3.4	1.0	0.6	1.8	2.9

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13] and Public Health Ontario Laboratory (PHOL).
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Map 33-1. Incidence of invasive meningococcal disease by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	1	7.0
CHK	1	9.5
DUR	2	3.1
ELG	0	0.0
EOH	0	0.0
GBO	0	0.0
HAL	1	1.9
HAM	0	0.0
HDN	0	0.0
HKP	0	0.0
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	0	0.0
LAM	1	7.7
LGL	0	0.0
MSL	2	4.3
NIA	1	2.2
NPS	0	0.0
NWR	0	0.0
OTT	0	0.0
OXF	0	0.0
PDH	0	0.0
PEE	3	2.2
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	0	0.0
SUD	1	5.0
THB	2	12.9
TOR	10	3.6
TSK	0	0.0
WAT	0	0.0
WDG	0	0.0
WEC	1	2.5
YRK	0	0.0
Ontario	**26**	**1.9**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 34.

Mumps

General overview for 2014

The receipt of two doses of mumps-containing vaccine is required to be fully immunized against mumps. In Ontario, one dose of a combined measles, mumps, rubella (MMR) vaccine is currently given at 12 months of age, followed by a second dose at four to six years, in a combined measles, mumps, rubella, varicella (MMRV) vaccine.[48] There is no monovalent mumps vaccine used in Ontario. Given historical vaccine use through the publicly-funded schedule, a susceptible cohort of individuals born in approximately 1991 or earlier have been identified, who likely received only one dose of MMR vaccine and who would not have acquired natural immunity through infection.[49] Circulation of mumps continues to occur, with peaks in incidence mainly as a result of outbreaks.

Incidence and comparison to Canada (Figure 34-1): Between 2005 and 2014, there were 765 confirmed and probable cases of mumps in Ontario. Annual incidence rates fluctuated and ranged between a low of 0.8 cases per 1,000,000 population in 2006 to a high of 26.1 cases per 1,000,000 population in 2008. As seen in Figure 34-2, the incidence of sporadic mumps cases has remained relatively stable. Peaks in incidence seen between 2007 and 2011 were largely outbreak driven, with 82.2% of cases being linked to four separate outbreaks. In 2007, 29 cases were connected to outbreaks in Nova Scotia and New Brunswick and in 2008, 324 cases were associated with an under-immunized religious community linked to concurrent outbreaks in the Netherlands and British Columbia.[50,51] Between 2009 and 2010, 166 cases were linked to outbreaks in the United States and Quebec[52,53] and in 2011, 38 cases were linked to a Toronto cluster. In 2014 there were a total of 14 cases reported, one of which was linked to an outbreak associated with a professional sports organization.

Overall, national incidence has followed a similar trend to that of Ontario, with the exception of years where mumps outbreaks have occurred in other provinces, most notably in 2007 and 2010.[48]

Age and sex (Figures 34-3): In 2014, the highest age-specific incidence rate was observed in the 10-19 year age group. Half of all the cases occurred among males. Among adults aged 20-34 years, many of whom would have received only one dose of mumps-containing vaccine and are part of the susceptible cohort, the incidence of mumps was 1.1 cases per 1,000,000 population. No cases were reported among persons 50 years of age and older or among infants less than one year of age (infants are not yet eligible to receive the MMR vaccine).

Genotypes: Among the 14 cases reported in 2014, three were confirmed by polymerase chain reaction (PCR) and all were reported as genotype G.

Immunization: Immunization status was determined for eight (57.1%) of the cases reported in 2014. Among these cases, one was unimmunized, five had received one dose, while two had received two doses of mumps-containing vaccine. The unimmunized case was eligible to have received mumps-containing vaccine according to age. The two cases who were fully immunized reported receiving their last dose 10 and 13 years prior to disease onset.

Geographic distribution (Map 34-1): Only 13 of the 36 public health units reported one or more cases of mumps in 2014 and all except one reported a single case. The highest incidences were reported by Elgin-St. Thomas (22.1 cases per 1,000,000 population), Perth District (12.8 cases per 1,000,000 population), and Porcupine (11.5 cases per 1,000,000 population). However, these rates should be interpreted with caution given the small number of cases within each public health unit.

Hospitalizations and deaths: In 2014, 7.1% (1/14) of cases were hospitalized and no cases died.

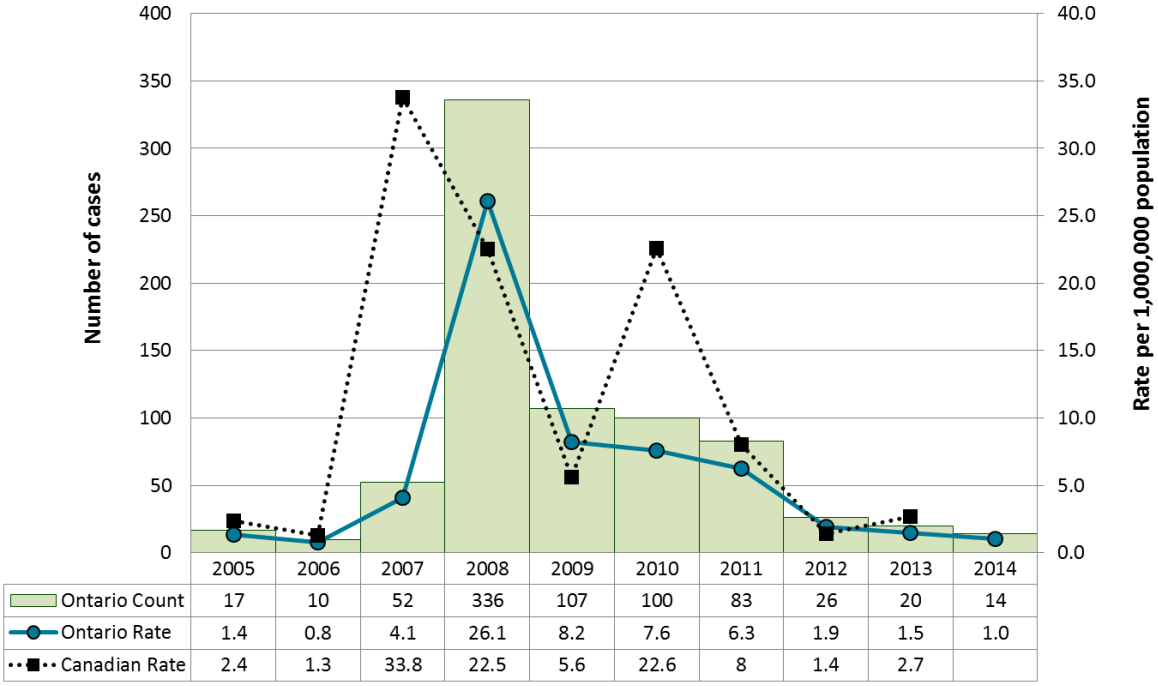
Remarkable features in 2014

Outbreaks have substantially influenced mumps epidemiology in Ontario in years where outbreaks occurred (2007-11). In 2014, the incidence of mumps was relatively low, consistent with the incidence in other non-outbreak years (2005-06 and 2012-13). However, in Ontario, many individuals remain susceptible to infection, including those with incomplete immunization and those travelling to endemic or outbreak areas. The receipt of two doses of MMR vaccine is important for preventing mumps infection.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, Sept 2014 edition

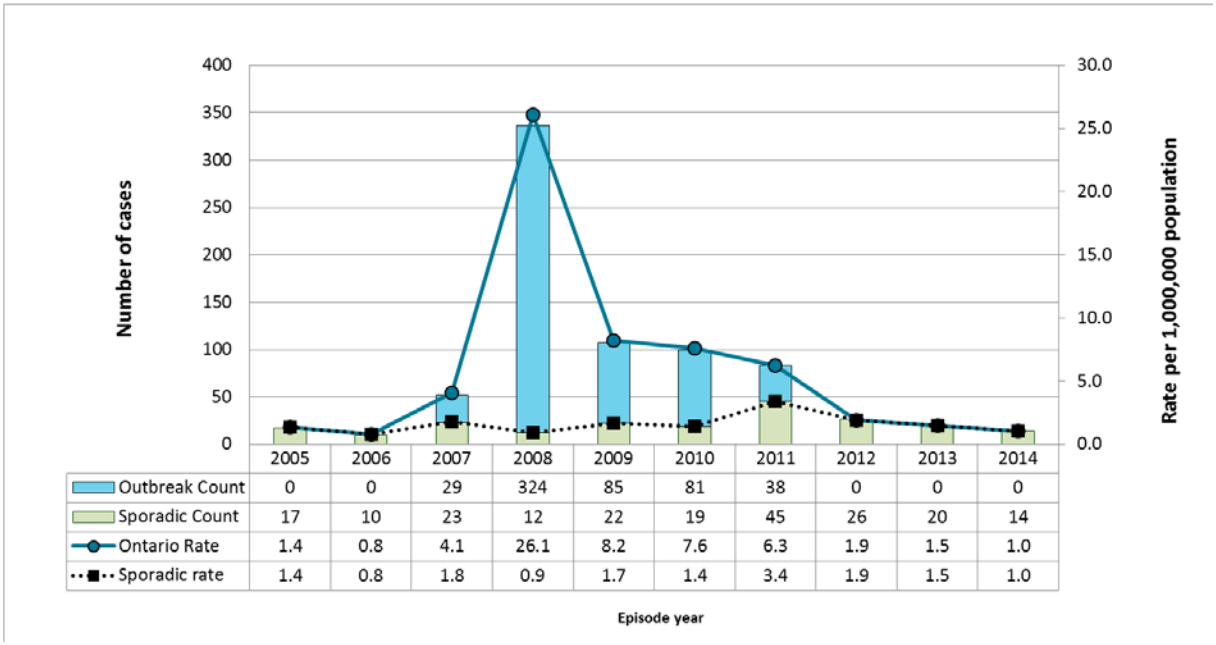
Figure 34-1. Incidence of mumps: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	17	10	52	336	107	100	83	26	20	14
Ontario Rate	1.4	0.8	4.1	26.1	8.2	7.6	6.3	1.9	1.5	1.0
Canadian Rate	2.4	1.3	33.8	22.5	5.6	22.6	8	1.4	2.7	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received [2015/07/14]; national data available up to 2013.

Figure 34-2. Incidence of mumps by outbreak status: Ontario, 2005-14

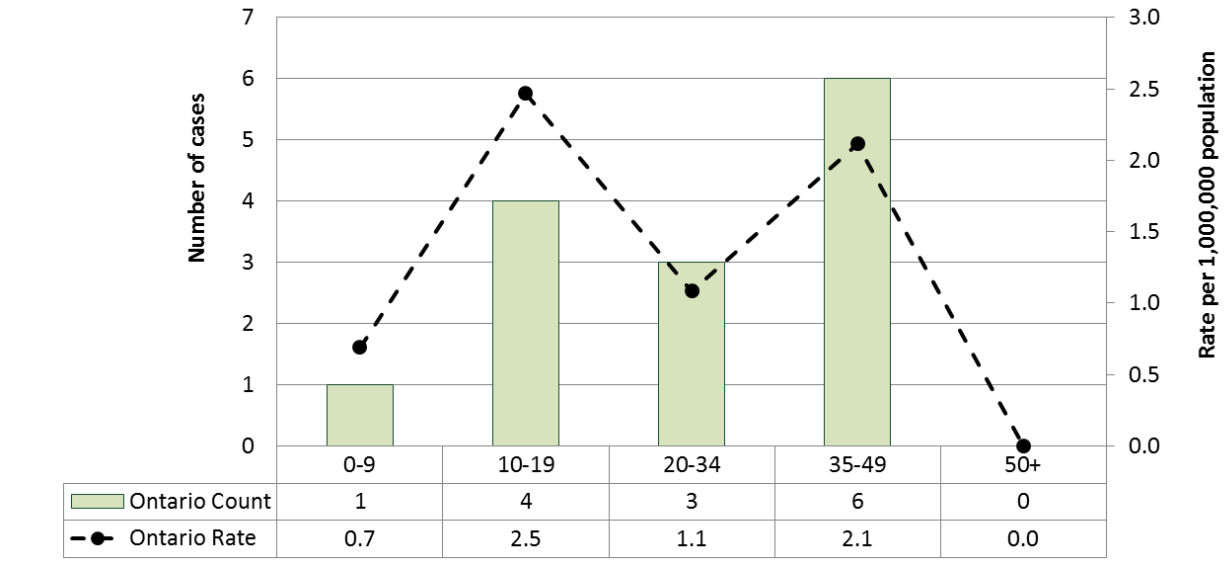


	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Outbreak Count	0	0	29	324	85	81	38	0	0	0
Sporadic Count	17	10	23	12	22	19	45	26	20	14
Ontario Rate	1.4	0.8	4.1	26.1	8.2	7.6	6.3	1.9	1.5	1.0
Sporadic rate	1.4	0.8	1.8	0.9	1.7	1.4	3.4	1.9	1.5	1.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].

Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Figure 34-3. Incidence of mumps by age: Ontario, 2014

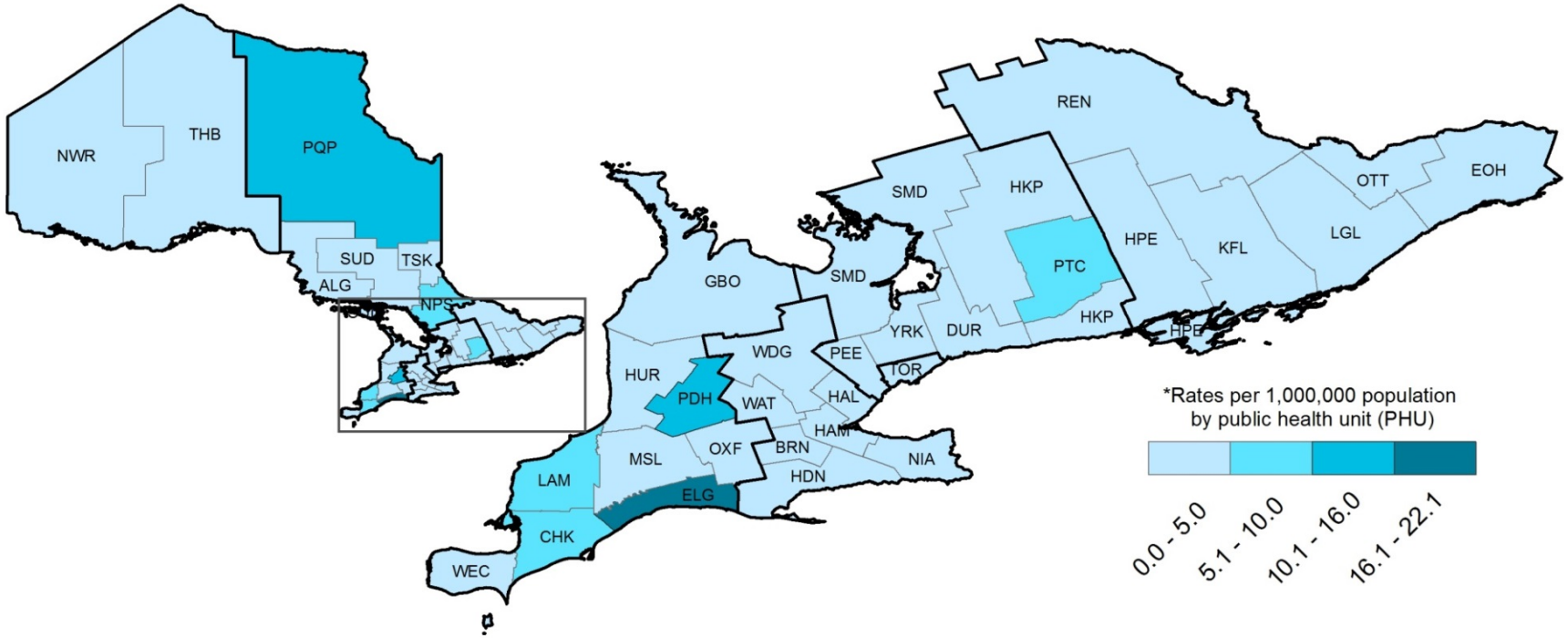


	0-9	10-19	20-34	35-49	50+
Ontario Count	1	4	3	6	0
Ontario Rate	0.7	2.5	1.1	2.1	0.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].

Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Map 34-1. Incidence of mumps by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	0	0.0
CHK	1	9.5
DUR	0	0.0
ELG	2	22.1
EOH	0	0.0
GBO	0	0.0
HAL	0	0.0
HAM	0	0.0
HDN	0	0.0
HKP	0	0.0
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	1	5.0
LAM	1	7.7
LGL	0	0.0
MSL	1	2.2
NIA	0	0.0
NPS	1	7.8
NWR	0	0.0
OTT	0	0.0
OXF	0	0.0
PDH	1	12.8
PEE	1	0.7
PQP	1	11.5
PTC	1	7.2

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	0	0.0
SUD	0	0.0
THB	0	0.0
TOR	1	0.4
TSK	0	0.0
WAT	1	1.9
WDG	0	0.0
WEC	1	2.5
YRK	0	0.0
Ontario	**14**	**1.0**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 35.

Ophthalmia neonatorum

General overview for 2014

Incidence (Table 35-1): In 2014, four cases of ophthalmia neonatorum were reported in Ontario, corresponding to an incidence rate of 2.9 cases per 100,000 live births. From 2005 to 2014, a total of 32 cases of ophthalmia neonatorum were reported for an average of 3.2 cases per year over this period. The highest numbers of cases during this period were reported in 2005 and 2010, with six and five cases reported, respectively. While none of the cases reported in 2005 had an etiologic agent identified in iPHIS, since 2006 all cases of ophthalmia neonatorum have been caused by *Chlamydia trachomatis,* with the exception of one case in 2014 caused by *Neisseria gonorrhoeae*.

No comparable national data are available as ophthalmia neonatorum is not nationally notifiable.

Table 35-1. Incidence of ophthalmia neonatorum: Ontario, 2005-14

Year	Ontario cases	Ontario rate per 100,000 live births
2005	6	4.5
2006	3	2.2
2007	3	2.2
2008	3	2.1
2009	1	0.7
2010	5	3.6
2011	1	0.7
2012	4	2.9
2013	2	1.4
2014	4	2.9

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Live Births [2004-11], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].
Note: Live births data from 2012-14 were unavailable at the time of data extraction; therefore, 2011 live births data were used to calculate rates for these years.
Note: Ophthalmia neonatorum is not a nationally notifiable disease.

Chapter 36.

Paralytic shellfish poisoning

General overview for 2014

No cases of paralytic shellfish poisoning have been diagnosed and reported in Ontario since the disease became reportable in December 2013.

Chapter 37.

Paratyphoid fever

General overview for 2014

Incidence and comparison to Canada (Figure 37-1): *Salmonella enterica* serotype Paratyphi is the causative agent of paratyphoid fever. In 2014, there were 25 confirmed cases in Ontario, representing an incidence rate of 0.2 cases per 100,000 population. The number of reported cases in 2014 decreased compared to previous years; in 2014, the decrease was 40% compared to 2013 (42 cases were reported in 2013). Travel outside of Canada to endemic countries such as India, Pakistan and Bangladesh accounts for the majority of paratyphoid fever cases reported in Ontario.

National data for paratyphoid fever are not available, as the disease has not been distinguished from other types of salmonellosis at the national level since the year 2000.

Age and sex (Figure 37-2): Males in the 10 to 39 age range accounted for the majority (56%) of paratyphoid fever cases reported in Ontario in 2014.

Seasonal trends (Figure 37-3): A seasonal trend was not observed in Ontario in 2014.

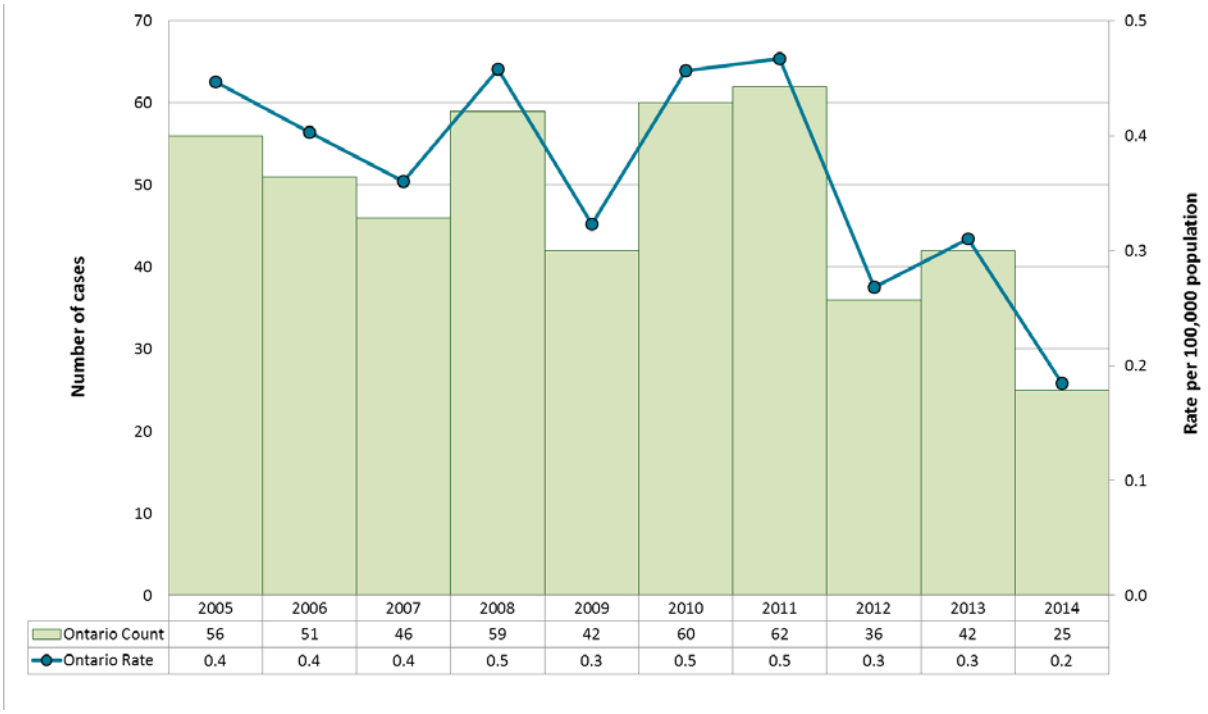
Geographic distribution (Map 37-1): The highest number of cases were observed in Peel Region (11 cases), Toronto (six cases), and Halton Region (three cases).

Hospitalizations and deaths: Hospitalization was reported for 40.0% (10/25) of cases and no deaths were reported.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, February 2013 edition (Volume 2, Issue 2)

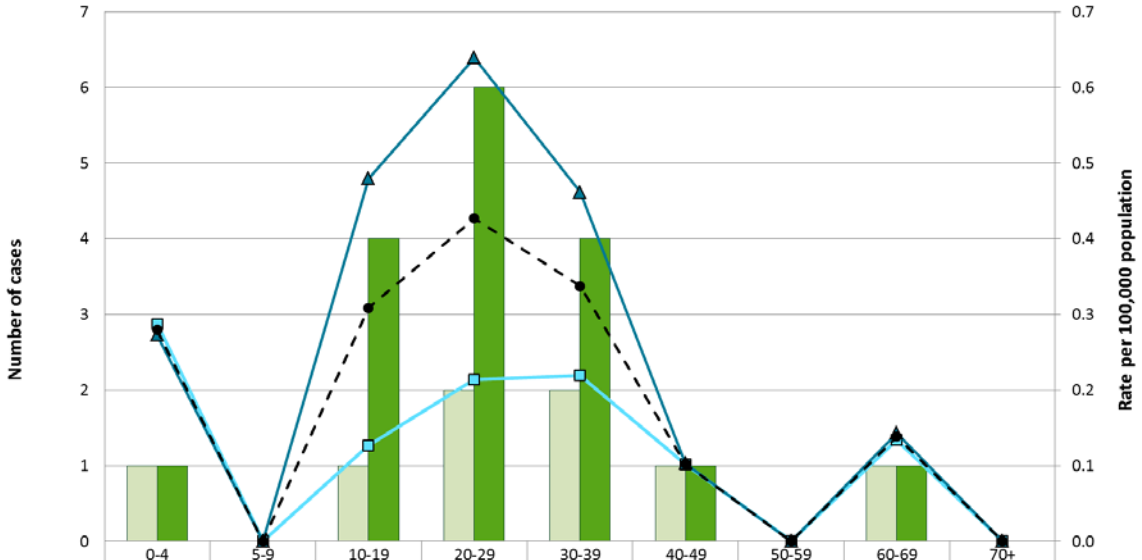
Figure 37-1. Incidence of paratyphoid fever: Ontario, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	56	51	46	59	42	60	62	36	42	25
Ontario Rate	0.4	0.4	0.4	0.5	0.3	0.5	0.5	0.3	0.3	0.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

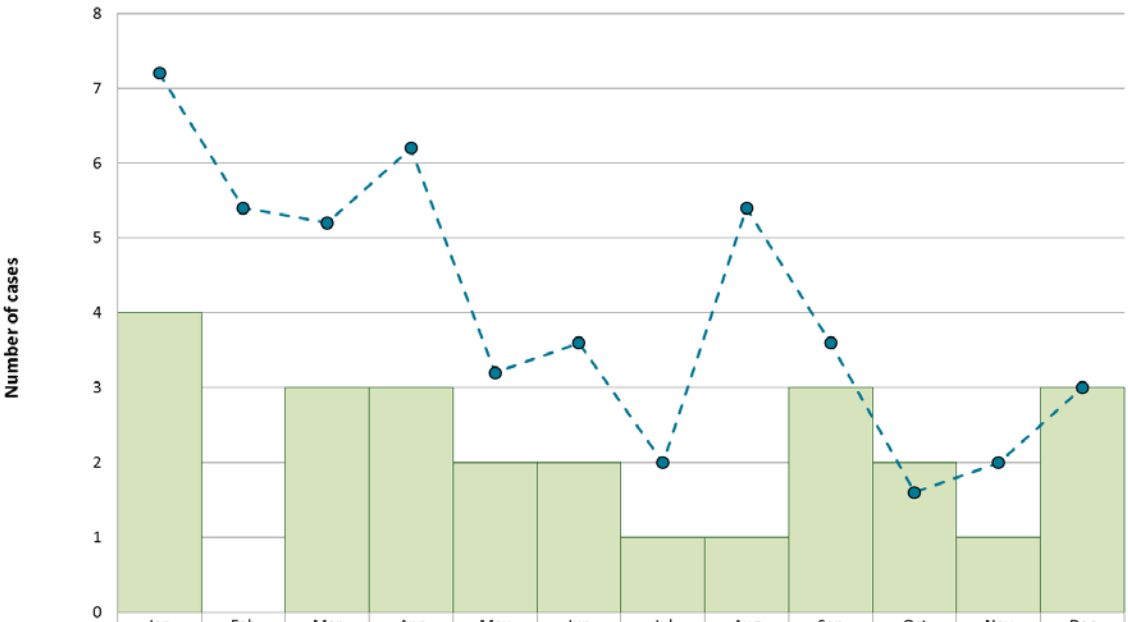
Figure 37-2. Incidence of paratyphoid fever by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	1	0	1	2	2	1	0	1	0
Male Count	1	0	4	6	4	1	0	1	0
Female Rate	0.3	0.0	0.1	0.2	0.2	0.1	0.0	0.1	0.0
Male Rate	0.3	0.0	0.5	0.6	0.5	0.1	0.0	0.1	0.0
Total Rate	0.3	0.0	0.3	0.4	0.3	0.1	0.0	0.1	0.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

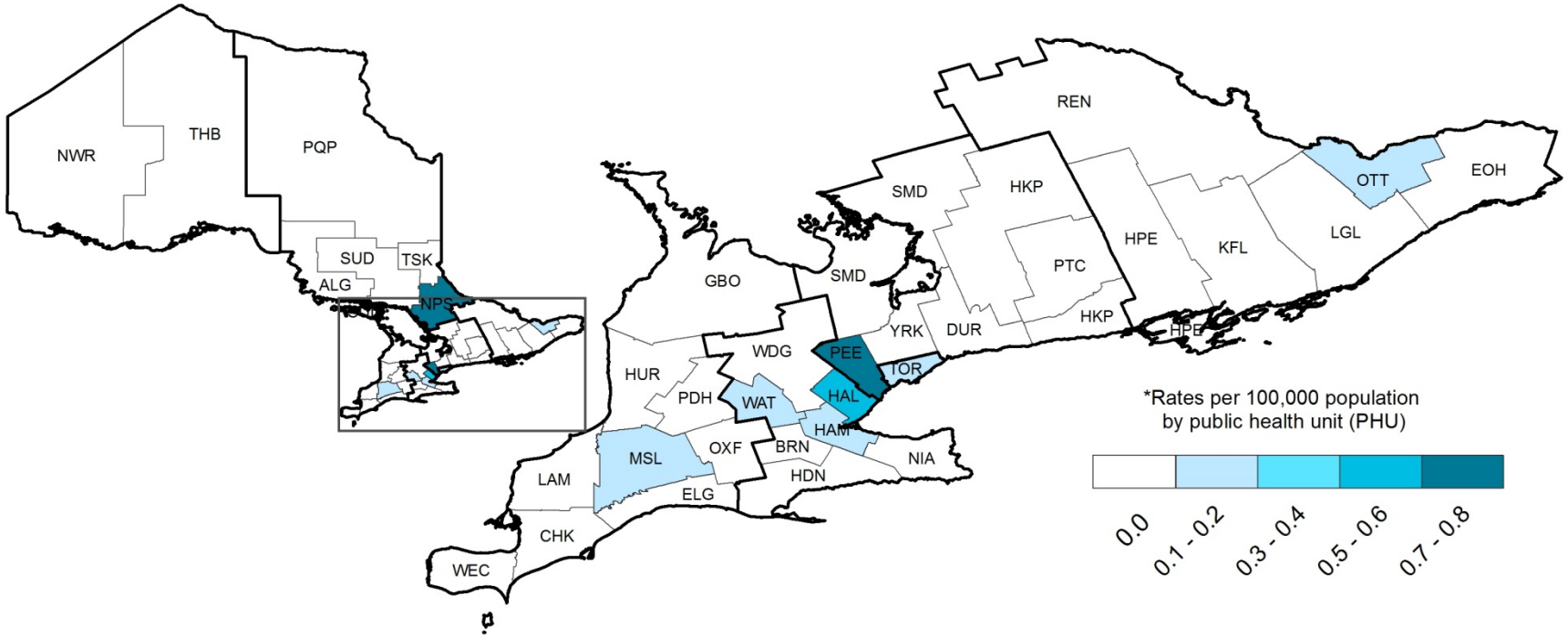
Figure 37-3. Number of paratyphoid fever cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	4	0	3	3	2	2	1	1	3	2	1	3
5-Yr Average	7.2	5.4	5.2	6.2	3.2	3.6	2.0	5.4	3.6	1.6	2.0	3.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 37-1. Incidence of paratyphoid fever by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	0	0.0
CHK	0	0.0
DUR	0	0.0
ELG	0	0.0
EOH	0	0.0
GBO	0	0.0
HAL	3	0.6
HAM	1	0.2
HDN	0	0.0
HKP	0	0.0
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	0	0.0
LAM	0	0.0
LGL	0	0.0
MSL	1	0.2
NIA	0	0.0
NPS	1	0.8
NWR	0	0.0
OTT	1	0.1
OXF	0	0.0
PDH	0	0.0
PEE	11	0.8
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	0	0.0
SUD	0	0.0
THB	0	0.0
TOR	6	0.2
TSK	0	0.0
WAT	1	0.2
WDG	0	0.0
WEC	0	0.0
YRK	0	0.0
Ontario	**25**	**0.2**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 38.

Pertussis

General overview for 2014

Under Ontario's publicly funded immunization program, an acellular pertussis vaccine is administered in combination with vaccines against diphtheria, tetanus, polio, and *Haemophilus influenzae* type b to children at two, four, and six months of age, with a booster dose given at 18 months. Subsequent booster doses of pertussis-containing vaccines are administered at 4-6 years and 14-16 years of age.[20] In 2011, a single booster dose of pertussis-containing vaccine was introduced for adults 19-65 years of age who did not previously receive a dose of the vaccine in adolescence. Effective December 2014, all adults over the age of 19 years are eligible to receive a single dose of the vaccine, irrespective of receiving a prior adolescent dose.[54]

Incidence and comparison to Canada (Figure 38-1): In 2014, there were 290 cases of pertussis (251 confirmed and 39 probable) reported in Ontario, representing an incidence rate of 2.1 cases per 100,000 population. Pertussis follows a cyclical trend with peaks occurring every two to five years.[55,56] In Ontario, peaks in incidence occurred in 2006 and again in 2012. Trends in incidence in Ontario were comparable to national rates between 2005 and 2013, except in 2012 when several pertussis outbreaks across Canada contributed to a higher national incidence rate.

Age and sex (Figure 38-2): In 2014, the highest incidence rate of pertussis was observed among infants under one year of age (28.9 cases per 100,000 population), followed by 10-14 year olds (8.1 cases per 100,000 population) and 1-4 year olds (7.3 cases per 100,000 population). Cases ranged in age from less than one year to 91 years, with a median age of 12 years. Of the cases with known sex, 45.6% were male. Incidence rates were higher for females than males in all age groups except for children 1-9 years of age, where the reverse was true.

Immunization: Immunization status was determined for 65.2% of pertussis cases reported in 2014; the remaining 34.8% had unknown immunization status. Among 189 cases with known immunization status, 46.0% were unimmunized and 54.0% had received at least one dose of pertussis-containing vaccine. Among infants under one year of age with known immunization status, 79.4% (27/34) were unimmunized; however, 16 cases were less than two months of age and thus, too young have been vaccinated. Young infants (less than four months of age) have the highest risk of mortality. Infants less than four months of age are too young to have completed the primary vaccine series and in some cases, too young to receive vaccine. Additionally, 31.0% of cases 1-19 years of age with known immunization status were unimmunized.

Seasonal trends (Figure 38-3): Pertussis has no distinct seasonal pattern, but incidence may increase in the summer and fall months.[57] In 2014, the number of cases was highest during October and November.

Geographic distribution (Map 38-1): The highest incidence rates were reported by Peterborough County-City (7.2 cases per 100,000 population) and Grey Bruce (6.8 cases per 100,000 population). Four public health units had no cases of pertussis in 2014.

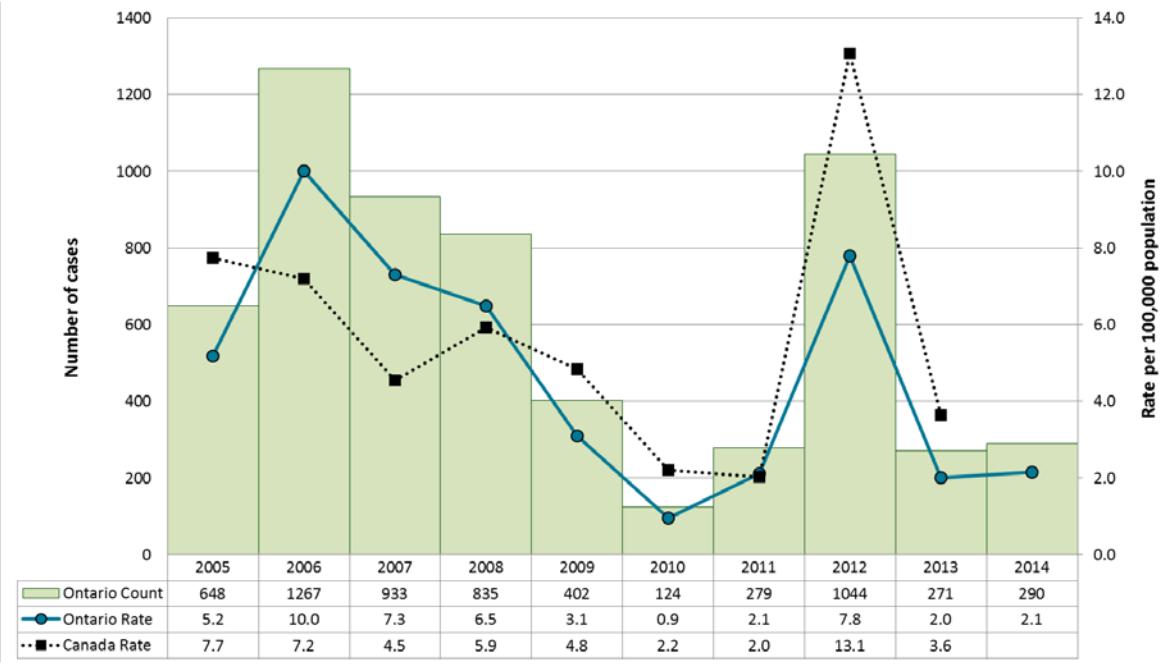
Hospitalizations and deaths: In 2014, 10.3% of cases were reported as hospitalized, of which 76.7% occurred in infants under one year of age. No deaths were reported in 2014.

Outbreak activity

Pertussis outbreaks tend to be cyclical in nature with increased disease activity approximately every two to five years.[58] A prolonged pertussis outbreak occurred between November 2011 and April 2013 that originated in an under-immunized religious community in southwestern Ontario.[59] The resurgence of pertussis in

this outbreak was hypothesized to be due to both low vaccine coverage and waning immunity among young adolescents. Vaccine coverage of at least 90% in infants with three doses of pertussis-containing vaccine remains a priority worldwide to reduce the risk of pertussis in infants.[60]

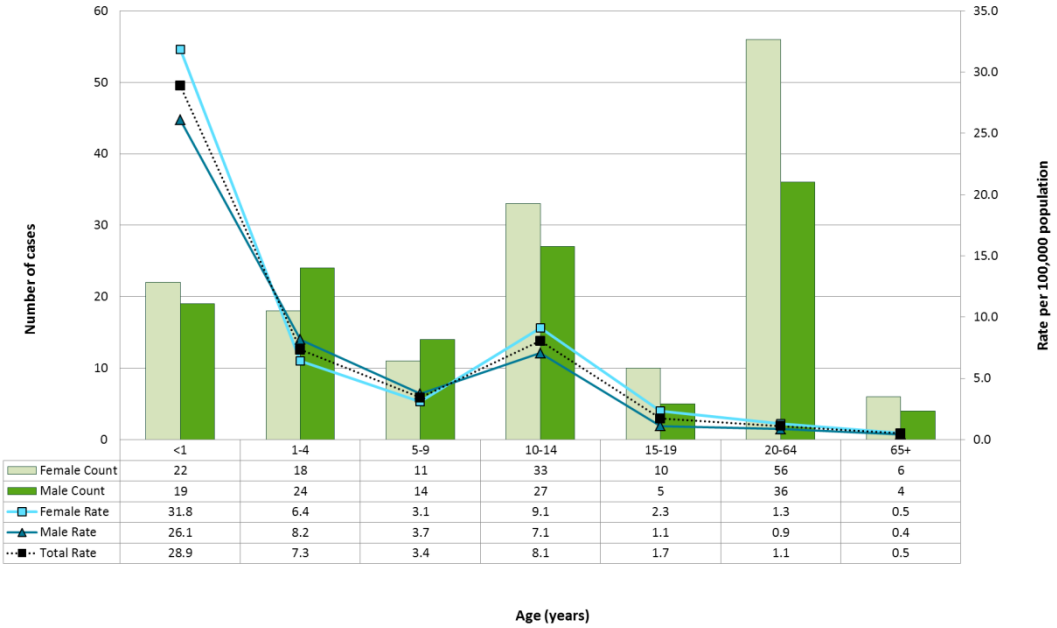
Figure 38-1. Incidence of pertussis: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	648	1267	933	835	402	124	279	1044	271	290
Ontario Rate	5.2	10.0	7.3	6.5	3.1	0.9	2.1	7.8	2.0	2.1
Canada Rate	7.7	7.2	4.5	5.9	4.8	2.2	2.0	13.1	3.6	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.
Note: Ontario counts include confirmed (2005-14), epi-linked confirmed (2005-14) and probable (2009-14) cases.
Note: Nunavut did not report on pertussis cases for 2012-2013. Its population has been removed for the Canadian rate calculation.

Figure 38-2. Incidence of pertussis by age and sex: Ontario, 2014

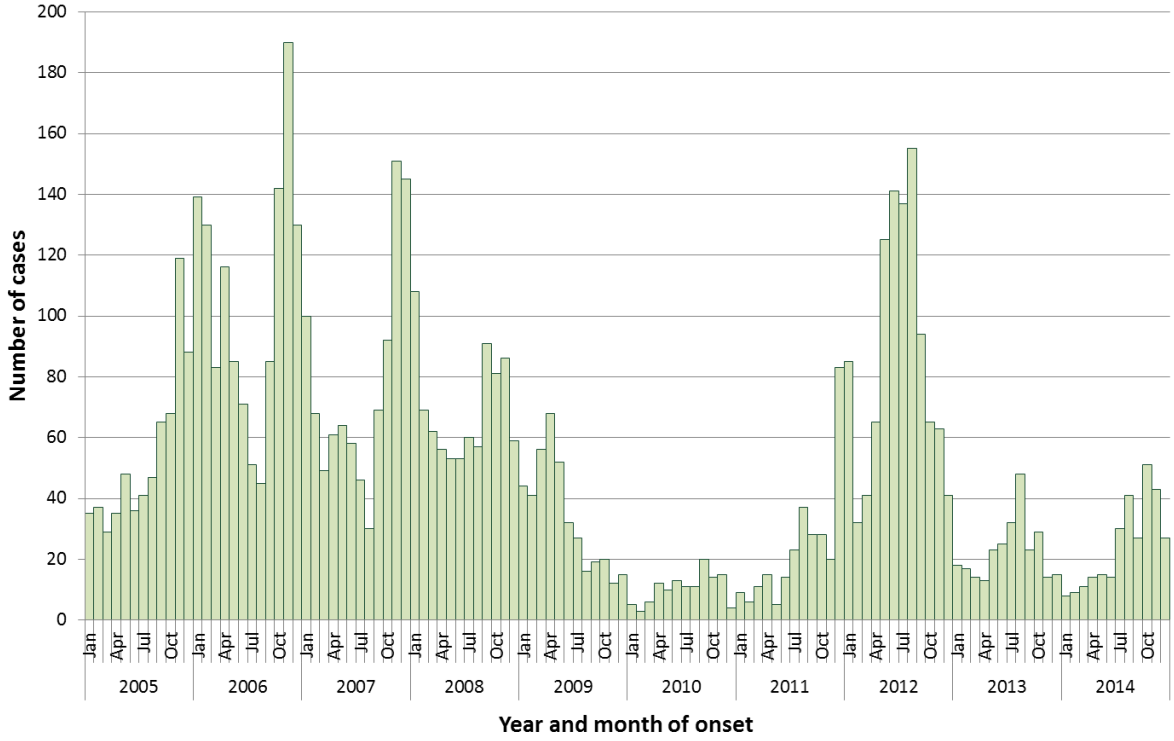


	<1	1-4	5-9	10-14	15-19	20-64	65+
Female Count	22	18	11	33	10	56	6
Male Count	19	24	14	27	5	36	4
Female Rate	31.8	6.4	3.1	9.1	2.3	1.3	0.5
Male Rate	26.1	8.2	3.7	7.1	1.1	0.9	0.4
Total Rate	28.9	7.3	3.4	8.1	1.7	1.1	0.5

Age (years)

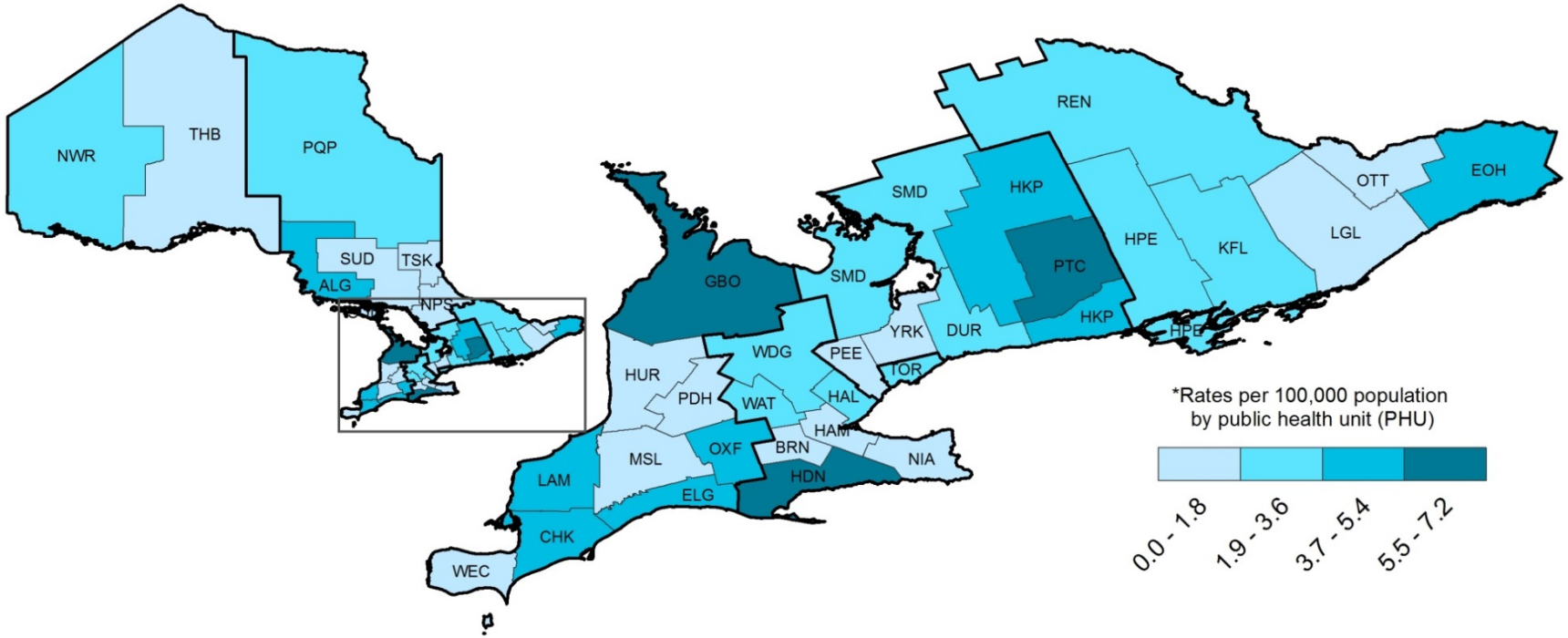
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes five cases of unknown age/sex.

Figure 38-3. Number of pertussis cases by month: Ontario, 2005-14



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].

Map 38-1. Incidence of pertussis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	5	4.3
BRN	1	0.7
CHK	5	4.7
DUR	13	2.0
ELG	4	4.4
EOH	8	3.9
GBO	11	6.8
HAL	14	2.6
HAM	2	0.4
HDN	6	5.5
HKP	8	4.5
HPE	4	2.4
HUR	1	1.7

PHU	Cases (n)	*Rates
KFL	6	3.0
LAM	5	3.8
LGL	3	1.8
MSL	3	0.6
NIA	3	0.7
NPS	1	0.8
NWR	2	2.5
OTT	14	1.5
OXF	5	4.5
PDH	0	0.0
PEE	14	1.0
PQP	2	2.3
PTC	10	7.2

PHU	Cases (n)	*Rates
REN	3	2.8
SMD	11	2.1
SUD	0	0.0
THB	0	0.0
TOR	87	3.1
TSK	0	0.0
WAT	10	1.9
WDG	6	2.2
WEC	4	1.0
YRK	19	1.7
Ontario	**290**	**2.1**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03]

Chapter 39.

Plague

General overview for 2014

There were no cases of plague reported in Ontario in 2014 or in the last ten years.

Chapter 40.

Poliomyelitis (polio)

General overview for 2014

Under Ontario's publicly funded immunization program, inactivated polio vaccine (IPV) is routinely administered in combination with vaccines against diphtheria, tetanus, pertussis, and *Haemophilus influenzae* type b to children at two, four, six and 18 months of age.[20] A booster dose of IPV-containing vaccine is administered at 4-6 years of age.[20,61]

Incidence and comparison to Canada: There were no cases of polio reported in Ontario in 2014. As a result of successful polio immunization programs, Canada was certified polio-free in 1994 by the World Health Organization.[61]

Highlights

Although polio remains endemic in only three countries (Afghanistan, Pakistan and Nigeria), cases of polio due to wild poliovirus were reported from nine countries in 2014.[62] In addition, cases of circulating vaccine-derived poliovirus were reported from four countries in 2014.[63] Despite Canada's polio-free status, there still remains a risk of importation of cases from countries where endemic transmission of polio still occurs.

Chapter 41.

Psittacosis/Ornithosis

General overview for 2014

There were no cases of psittacosis/ornithosis reported in Ontario in 2014. From 2005 to 2013, one confirmed case was reported in the province.

Chapter 42.

Q Fever

General overview for 2014

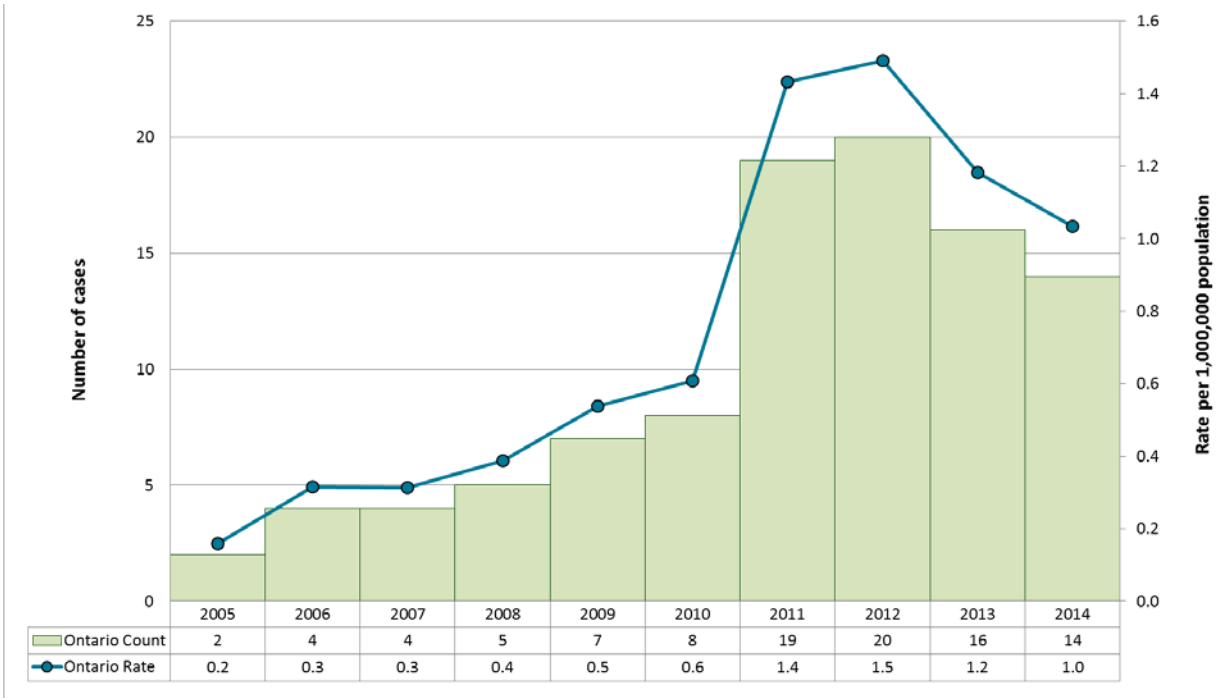
Incidence and comparison to Canada (Figure 42-1): In 2014, there were 14 confirmed cases of Q fever in Ontario, representing an incidence rate of 1.0 case per 1,000,000 population. The number of confirmed cases decreased for the second consecutive year following peaks in incidence in 2011 and 2012. The increase in incidence since 2011 may be attributed in part to sustained increases in the recognition, diagnosis and reporting of Q fever among a highly susceptible population of farmers taking part in the Ontario Q fever study, which started in 2010. No comparable national data are available because Q fever is not a nationally notifiable disease.

Hospitalizations and deaths: Hospitalization was reported for 50% (7/14) of cases reported in 2014 and one death was reported.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, June 2012 edition (Volume 1, Issue 7)

Figure 42-1. Incidence of Q fever: Ontario, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	2	4	4	5	7	8	19	20	16	14
Ontario Rate	0.2	0.3	0.3	0.4	0.5	0.6	1.4	1.5	1.2	1.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03]. Incidence rates for 2014 are based on 2013 population estimates.

Chapter 43.

Rabies

General overview for 2014

There were no cases of rabies reported in Ontario in 2014. Ontario's last domestic case of human rabies occurred in 1967; a more recent case associated with out-of-country travel was reported in 2012.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, September 2012 edition (Volume 1, Issue 10)
- Middleton D, Johnson KO, Rosatte RC, Hobbs JL, Moore SR, Rosella L, et al. Human Rabies Post-Exposure Prophylaxis and Animal Rabies in Ontario, Canada, 2001-2012. Zoonoses Public Health. 2014

Chapter 44.

Rubella and congenital rubella syndrome

General overview for 2014

Both indigenous rubella and congenital rubella syndrome (CRS) have been eliminated in Canada. In April 2015, the region of the Americas was declared the world's first to eliminate rubella and CRS by the Pan American Health Organization/World Health Organization (PAHO/WHO).[64] Despite this, rubella continues to occur elsewhere in the world, and therefore cases of rubella may still be reported in Ontario. Rubella vaccine is administered in combination with vaccines for mumps, measles, and varicella (MMR and MMRV vaccines) in Ontario as part of the publicly funded immunization program. A single dose of rubella-containing vaccine is required to be considered fully immunized against rubella. A single dose of MMR vaccine is recommended for susceptible non-pregnant women as rubella during pregnancy can result in CRS.[65]

Incidence and comparison to Canada (Figure 44-1): In 2014, one confirmed case of rubella was reported in Ontario, representing an incidence rate of 0.07 cases per 1,000,000 population. The annual incidence rate of rubella in Ontario ranged between 0.0 and 24.9 cases per 1,000,000 population since 2004. Between 2004 and 2014, the highest incidence rate was reported in 2005, which was due to a rubella outbreak in an under-immunized community in southwestern Ontario that was opposed to immunization.[65] Except for 2005, Ontario and Canadian incidence rates of rubella followed a similar trend with low incidence rates.

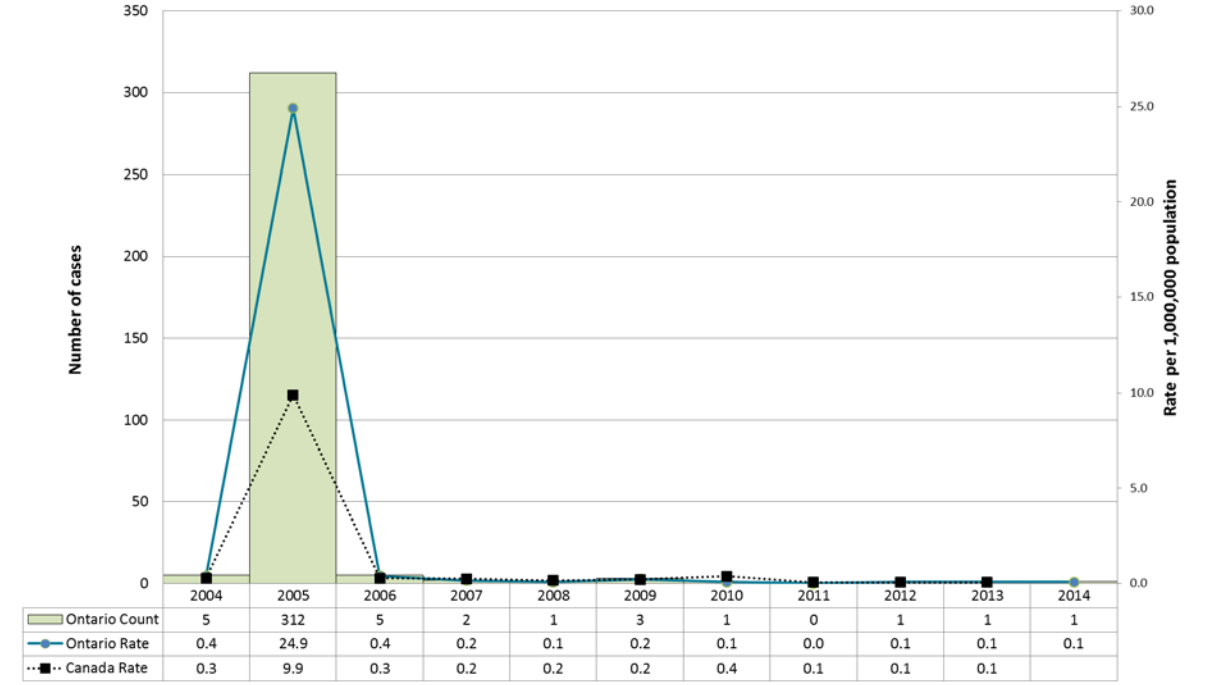
(Figure 44-2): No cases of CRS were reported in 2014. The annual incidence rate of CRS ranged from 0.0 to 15.1 cases per 1,000,000 population between 2004 and 2014.

The single case of rubella in 2014 occurred in an adult male for whom immunization status was reported as unknown. The case was imported (associated with travel to the Philippines) and was genotype 1J.

Additional sources of information

- Public Health Ontario. Documenting the elimination of measles, rubella, and congenital rubella syndrome in Ontario: 2009-2012. Toronto, ON: Queen's Printer for Ontario; 2013.

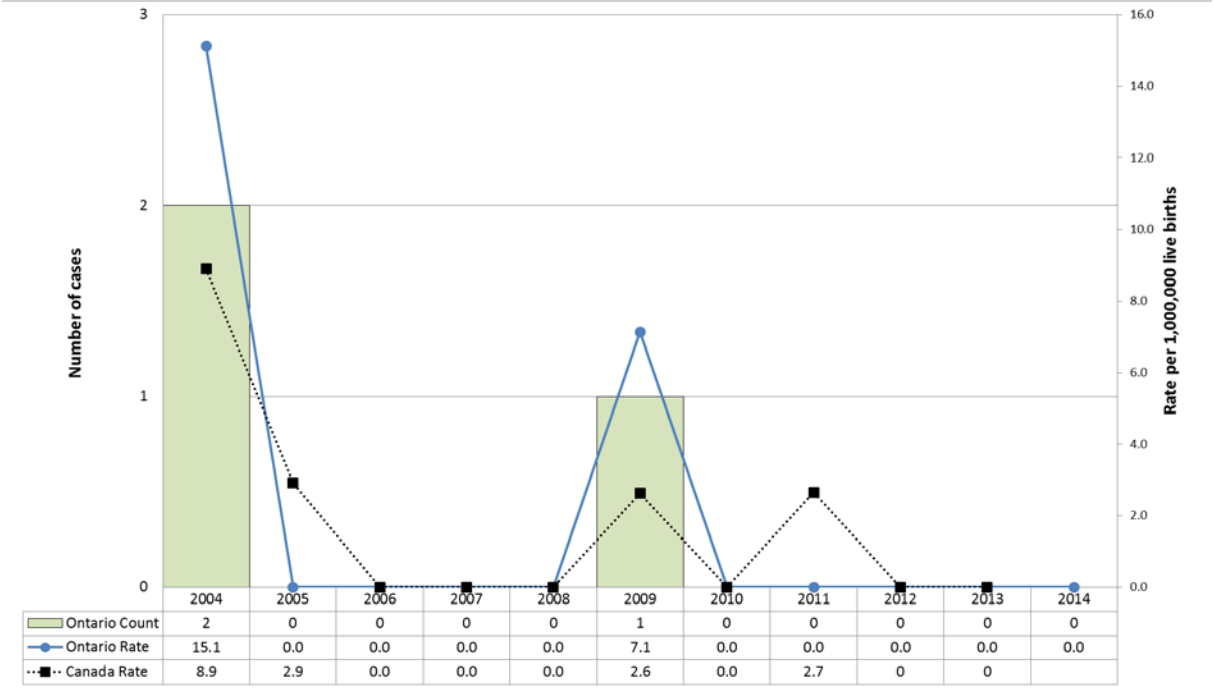
Figure 44-1. Incidence of rubella: Ontario and Canada, 2004-14



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	5	312	5	2	1	3	1	0	1	1	1
Ontario Rate	0.4	24.9	0.4	0.2	0.1	0.2	0.1	0.0	0.1	0.1	0.1
Canada Rate	0.3	9.9	0.3	0.2	0.2	0.2	0.4	0.1	0.1	0.1	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2004-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canada Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received [2015/07/10]; national data available up to 2013.
Note: Nunavut did not report on rubella cases for 2012-13. Its population has been removed for Canada rate calculation

Figure 44-2. Incidence of congenital rubella syndrome: Ontario and Canada, 2004-14



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	2	0	0	0	0	1	0	0	0	0	0
Ontario Rate	15.1	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0
Canada Rate	8.9	2.9	0.0	0.0	0.0	2.6	0.0	2.7	0	0	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Live Births [2004-11], MOHLTC, intelliHEALTH Ontario, extracted [2013/11/29]; 2011 data used as denominator for 2012-14
Canada Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received [2015/07/10]; national data available up to 2013.

Chapter 45.

Salmonellosis

General overview for 2014

Incidence and comparison to Canada (Figure 45-1): In 2014, there were 3,042 confirmed cases of salmonellosis in Ontario, representing an incidence rate of 22.5 cases per 100,000 population. Incidence rates for Ontario from 2008 to 2013 were comparable to the Canadian rates with the exception of 2012 when the Ontario rate was higher.

Age and sex (Figure 45-2): The highest incidence rates were observed in the 0-4 and 5-9 year age groups. Males had higher incidence rates than females in the age groups under 20 years.

Seasonal trends (Figure 45-3): Salmonellosis tends to follow a seasonal pattern, with the majority of cases reported in the warmer months due to increased social gatherings where food is served, and warmer temperatures that promote pathogen growth.[22]

Serotypes (Table 45-1): *S.* Enteritidis (39.7%), *S.* Typhimurium (9.7%), and *S.* Heidelberg (8.7%) were the most common *Salmonella* serotypes identified in 2014. Serotypes for some salmonellosis cases may have been misclassified or left as unspecified, resulting in under-reporting of certain *Salmonella* serotypes.

Geographic distribution (Map 45-1): The highest incidence rates were reported by Thunder Bay District (35.4 cases per 100,000 population), Wellington-Dufferin-Guelph (33.8 cases per 100,000 population), and Huron County (32.5 cases per 100,000 population). Due to population size, the highest number of cases were reported by Toronto (642 cases), Peel Region (352 cases), and York Region (304 cases).

Hospitalizations and deaths: Hospitalization was reported for 10.7% (325/3,042) of cases and death was reported for 0.3% (9/3,042) of cases.

Outbreak activity

In 2014, there were four notable outbreak investigations involving various serotypes of *Salmonella*.

***S*. Typhimurium:** This investigation included 21 cases of *S.* Typhimurium, most of whom reported being exposed to reptiles and/or rodents. The cases were part of a national investigation and originated from an increase that began in 2012. Public health education was provided to snake owners, rodent breeders and other industry representatives.

***Salmonella* (spp.):** A national investigation of several *Salmonella* serotypes began in May 2014. A total of 63 cases of *S.* Newport, *S*. Hartford, *S*. Oranienburg and *S*. Saintpaul were reported from December 2013 to June 2014; 35 of the cases were from Ontario. As a result of this outbreak, the Canadian Food Inspection Agency issued a food recall warning for various chia seed products due to possible *Salmonella* contamination.

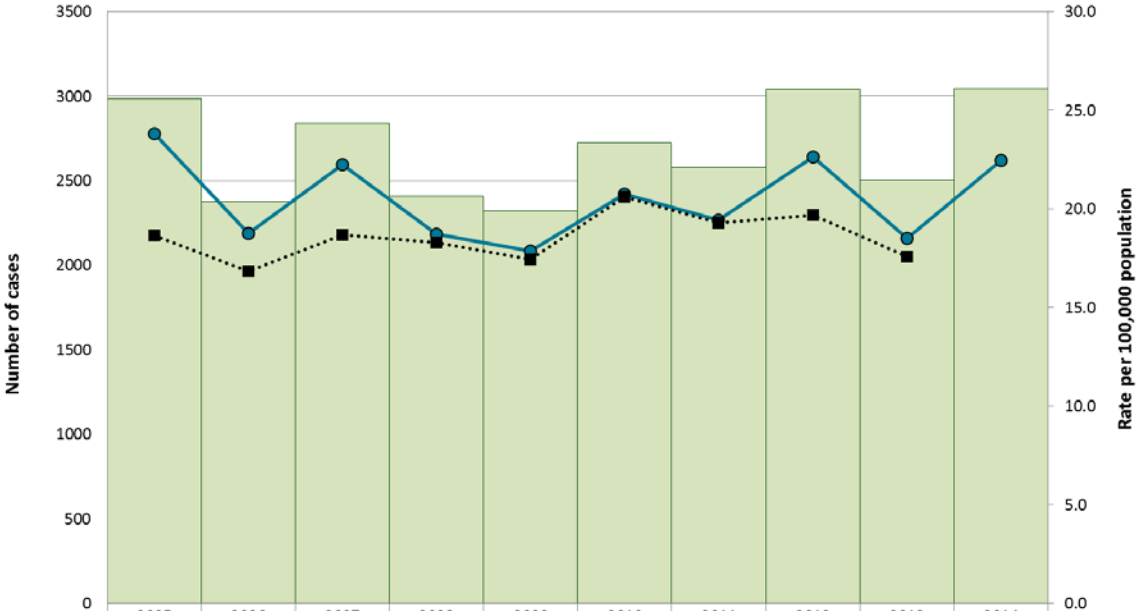
***S*. Thompson:** An outbreak of 156 *S*. Thompson cases was reported in Ontario in 2014. Despite extensive investigation, no definitive source was identified, however, chicken was suspected.

***S*. Enteritidis:** An increase in non-travel related cases of *S*. Enteritidis was investigated in 2014. Store-bought, frozen, processed, breaded chicken was identified as a risk factor that likely contributed to the observed increase.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, May 2012 edition (Volume 1, Issue 6)

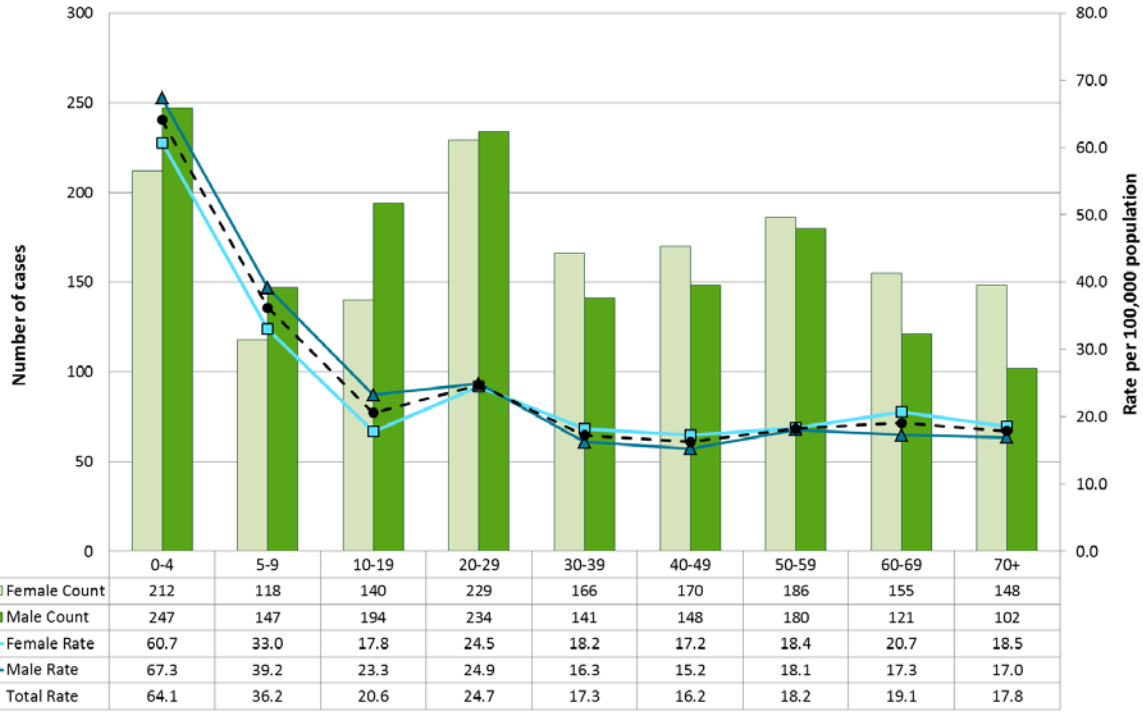
Figure 45-1. Incidence of salmonellosis: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	2984	2374	2841	2409	2322	2725	2577	3037	2505	3042
Ontario Rate	23.8	18.7	22.3	18.7	17.9	20.7	19.4	22.6	18.5	22.5
Canada Rate	18.6	16.8	18.7	18.3	17.4	20.6	19.3	19.7	17.6	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

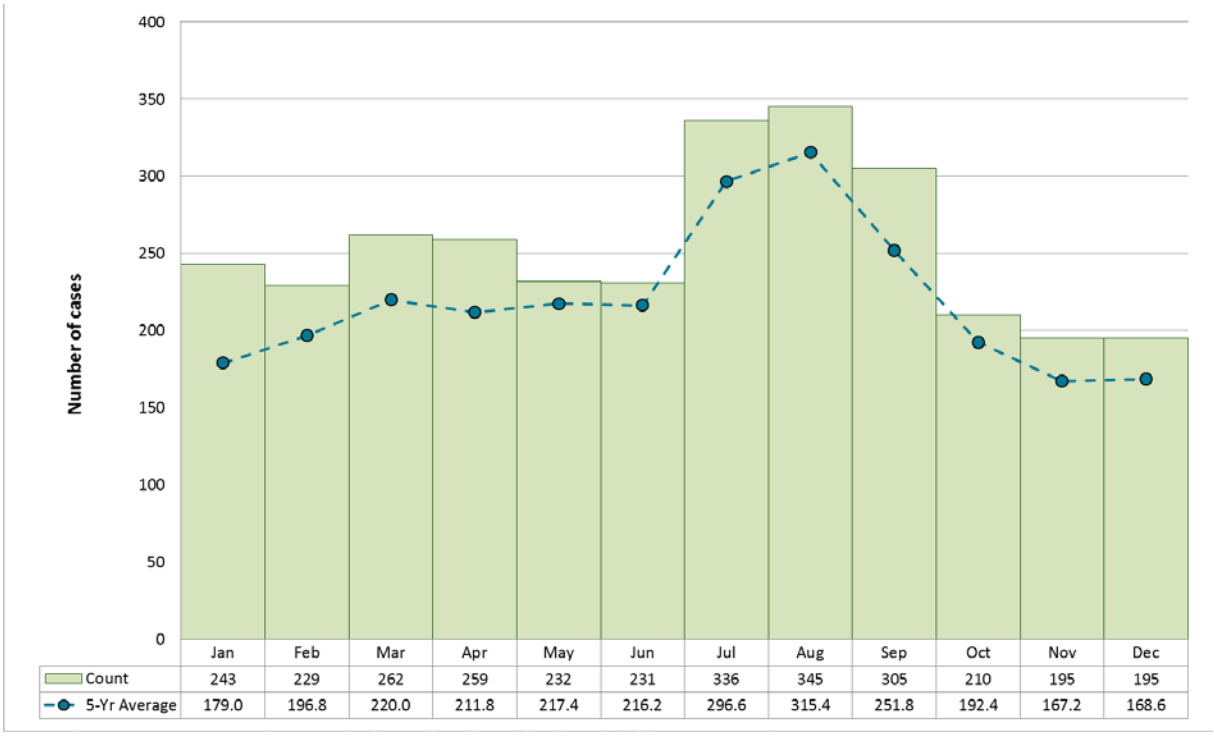
Figure 45-2. Incidence of salmonellosis by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	212	118	140	229	166	170	186	155	148
Male Count	247	147	194	234	141	148	180	121	102
Female Rate	60.7	33.0	17.8	24.5	18.2	17.2	18.4	20.7	18.5
Male Rate	67.3	39.2	23.3	24.9	16.3	15.2	18.1	17.3	17.0
Total Rate	64.1	36.2	20.6	24.7	17.3	16.2	18.2	19.1	17.8

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Three cases of unknown sex and one case of unknown age were excluded.

Figure 45-3. Number of salmonellosis cases by month: Ontario, 2014



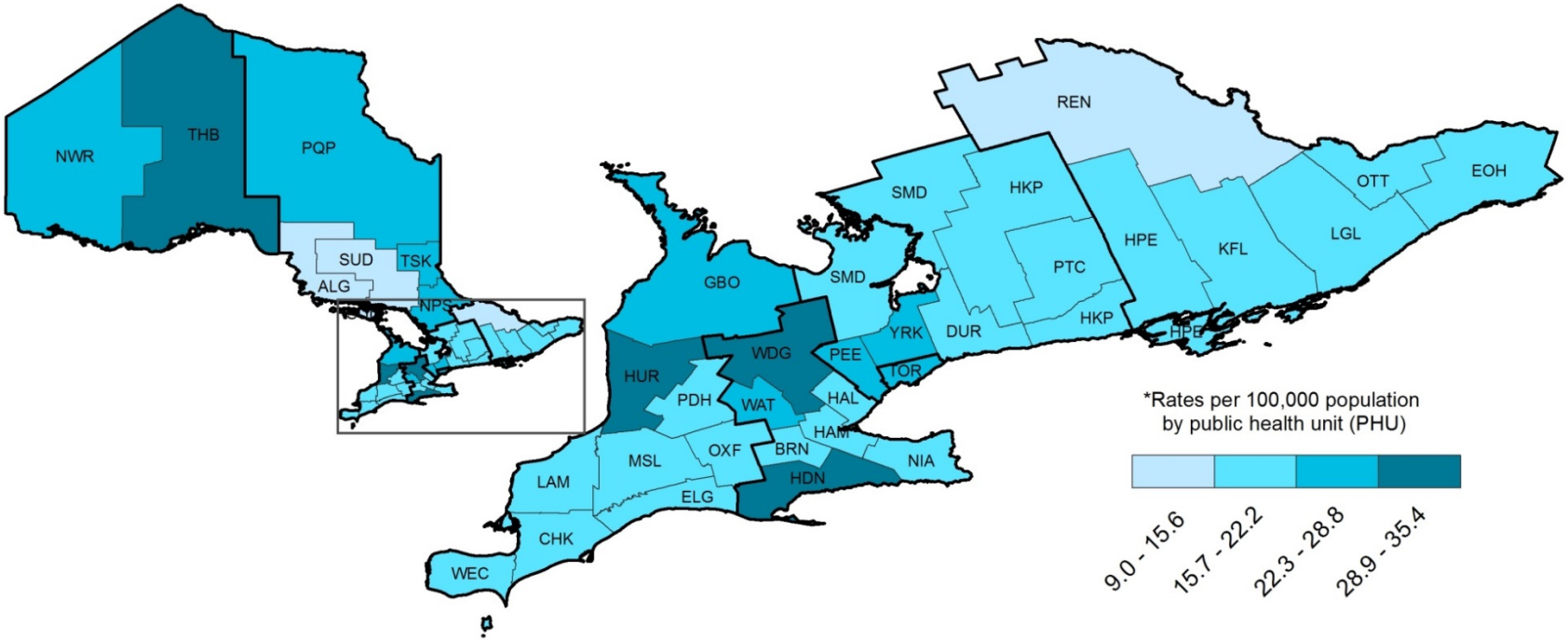
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Table 45-1. Salmonellosis cases by *Salmonella* serotype: Ontario, 2014

***Salmonella* Serotypes**	**Cases**	
	n	**%**
S. Enteritidis	1207	39.7
S. Typhimurium	295	9.7
S. Heidelberg	266	8.7
S. Thompson	219	7.2
S. Group B	108	3.6
S. Newport	83	2.7
S. Infantis	71	2.3
Other serotypes	718	23.6
Unspecified serotypes	75	2.5
Total	**3042**	**100.0**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].

Map 45-1. Incidence of salmonellosis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	14	12.0
BRN	23	16.1
CHK	17	16.1
DUR	140	21.7
ELG	15	16.6
EOH	39	19.0
GBO	43	26.4
HAL	118	21.9
HAM	108	19.8
HDN	34	30.9
HKP	37	20.7
HPE	34	20.8
HUR	19	32.5

PHU	Cases (n)	*Rates
KFL	36	18.0
LAM	27	20.7
LGL	35	20.7
MSL	92	19.9
NIA	76	17.1
NPS	33	25.8
NWR	19	23.4
OTT	182	19.5
OXF	23	20.8
PDH	17	21.8
PEE	352	25.4
PQP	21	24.2
PTC	30	21.6

PHU	Cases (n)	*Rates
REN	13	12.3
SMD	116	21.7
SUD	18	9.0
THB	55	35.4
TOR	642	23.2
TSK	9	26.0
WAT	127	23.7
WDG	94	33.8
WEC	80	19.9
YRK	304	27.5
Ontario	**3042**	**22.5**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 46.

Shigellosis

General overview for 2014

Incidence and comparison to Canada (Figure 46-1): In 2014, there were 285 confirmed cases of shigellosis in Ontario, representing an incidence rate of 2.1 cases per 100,000 population. From 2005 to 2013, rates in Ontario were below the Canadian rates.

Age and sex (Figure 46-2): Individuals of both sexes and from all age groups are susceptible to shigellosis, with most cases occurring among children under the age of ten years.[66] In 2014, the highest incidence rates were observed in the 0-4 and the 40-49 year age groups (3.5 cases per 100,000 population and 3.0 cases per 100,000 population, respectively). Incidence rates in males were higher than in females in the 30 to 59 year age groups.

Seasonal trends (Figure 46-3): While shigellosis is typically more common in the summer months, no seasonal trend was observed in 2014. There was a large peak in July and a smaller peak in December, which may have been the result of travel-related infections.[67] The lowest numbers of cases by month in 2014 were reported in June and August.

Serotypes (Table 46-1): *S. sonnei* (54.0%, 154/285) and *S. flexneri* (37.2%, 106/285) were the most frequently reported serotypes.

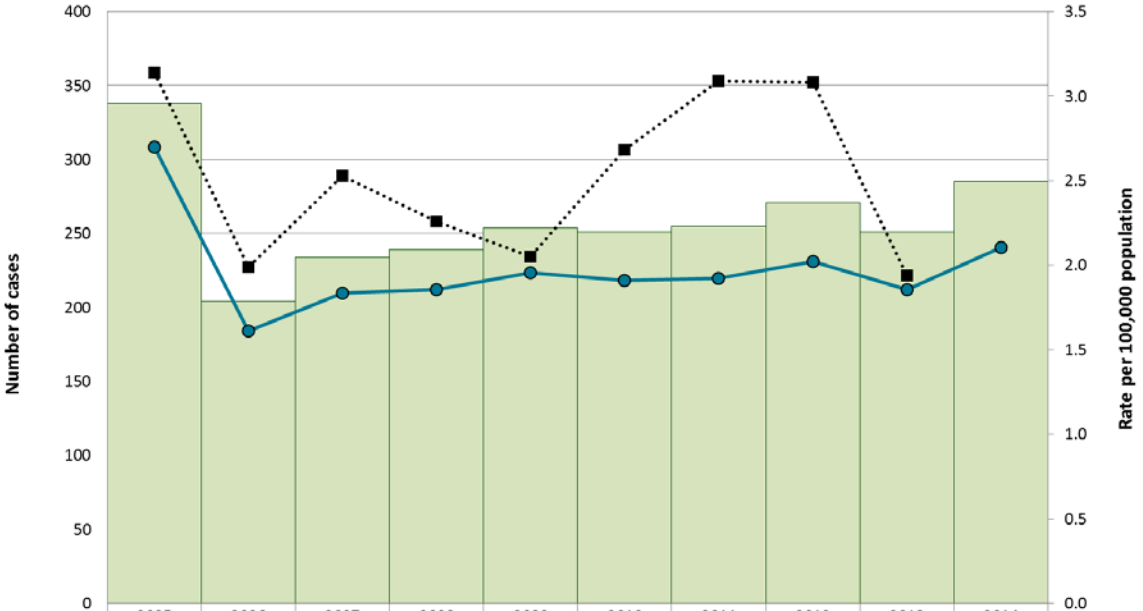
Geographic distribution (Map 46-1): The highest incidence rates were reported by Toronto (3.9 cases per 100,000 population), Oxford County (3.6 cases per 100,000 population), and York Region (3.0 cases per 100,000 population).

Hospitalizations and deaths: Hospitalization was reported for 9.1% (26/285) of cases; no deaths were reported.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, August 2014 edition (Volume 3, Issue 8)

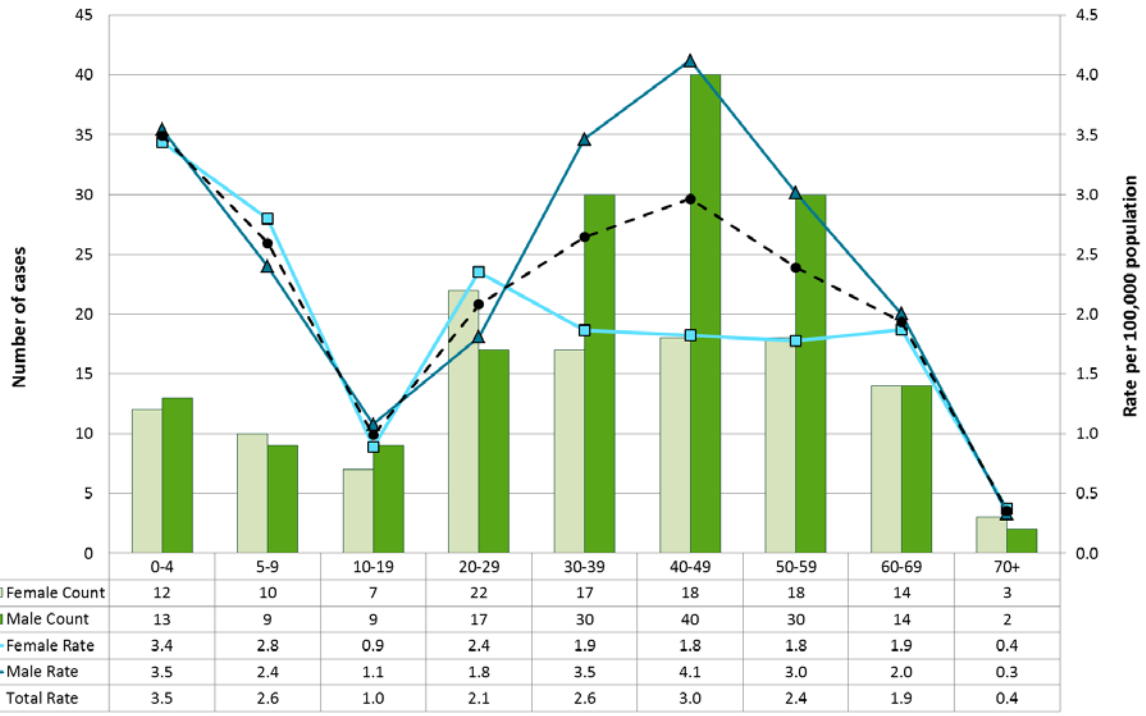
Figure 46-1. Incidence of shigellosis: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	338	204	234	239	254	251	255	271	251	285
Ontario Rate	2.7	1.6	1.8	1.9	2.0	1.9	1.9	2.0	1.9	2.1
Canada Rate	3.1	2.0	2.5	2.3	2.1	2.7	3.1	3.1	1.9	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

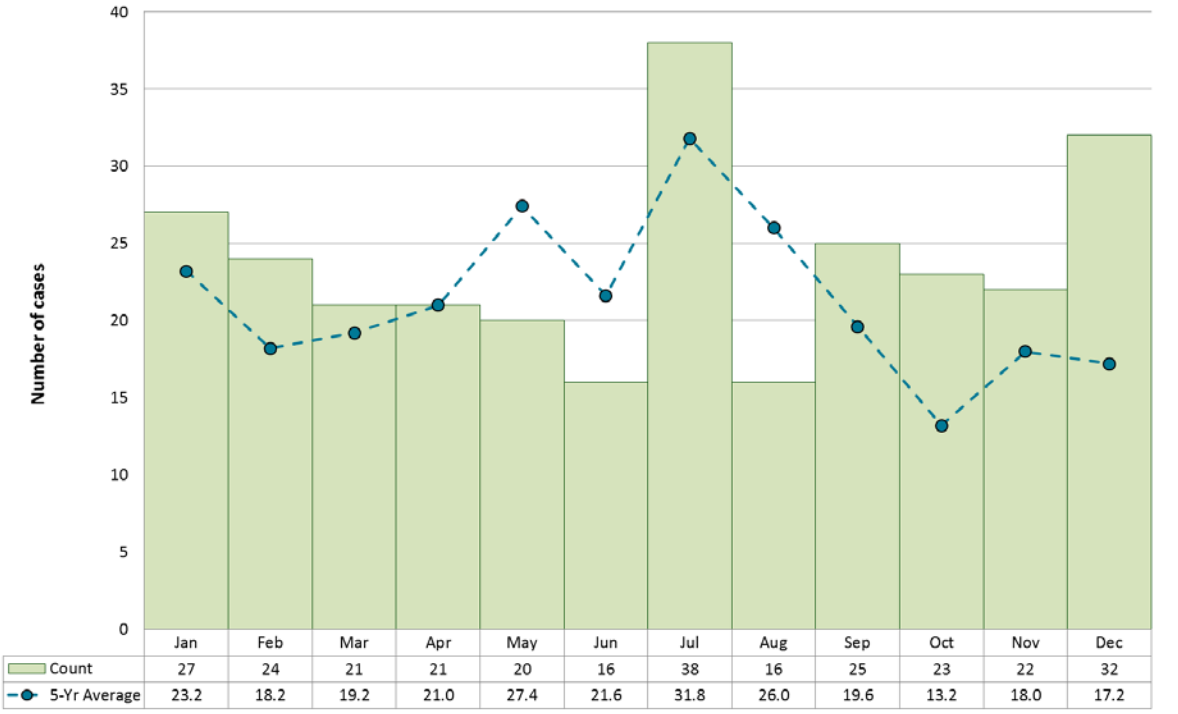
Figure 46-2. Incidence of shigellosis by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	12	10	7	22	17	18	18	14	3
Male Count	13	9	9	17	30	40	30	14	2
Female Rate	3.4	2.8	0.9	2.4	1.9	1.8	1.8	1.9	0.4
Male Rate	3.5	2.4	1.1	1.8	3.5	4.1	3.0	2.0	0.3
Total Rate	3.5	2.6	1.0	2.1	2.6	3.0	2.4	1.9	0.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Figure 46-3. Number of shigellosis cases by month: Ontario, 2014



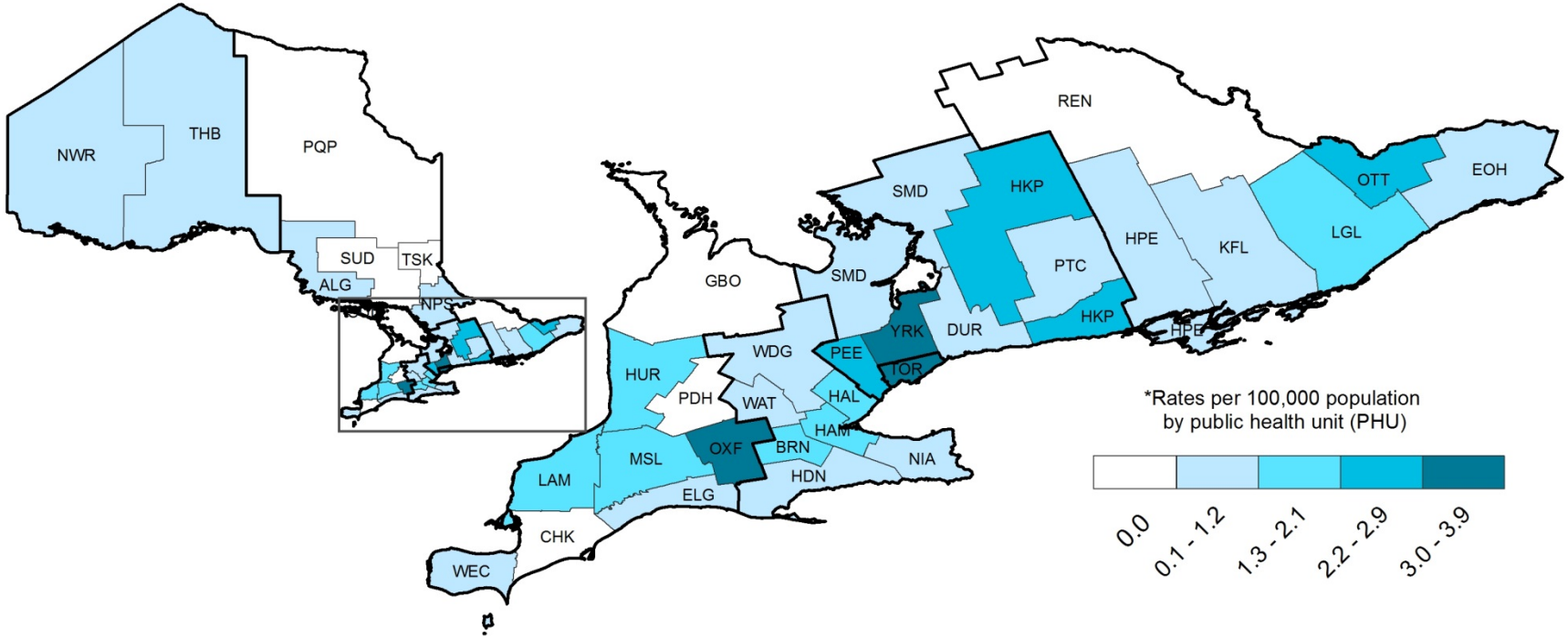
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Table 46-1. Shigellosis cases by *Shigella* serotype: Ontario, 2014

***Shigella* Serotype**	**Cases**	
	n	**%**
S. sonnei	154	54.0
S. flexneri	106	37.2
S. boydii	12	4.2
S. dysenteriae	4	1.4
Other serotype	1	0.4
Unspecified serotype	8	2.8
Total	**285**	**100.0**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].

Map 46-1. Incidence of shigellosis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	1	0.9
BRN	2	1.4
CHK	0	0.0
DUR	6	0.9
ELG	1	1.1
EOH	2	1.0
GBO	0	0.0
HAL	9	1.7
HAM	11	2.0
HDN	1	0.9
HKP	4	2.2
HPE	2	1.2
HUR	1	1.7

PHU	Cases (n)	*Rates
KFL	2	1.0
LAM	2	1.5
LGL	3	1.8
MSL	8	1.7
NIA	4	0.9
NPS	1	0.8
NWR	1	1.2
OTT	27	2.9
OXF	4	3.6
PDH	0	0.0
PEE	38	2.7
PQP	0	0.0
PTC	1	0.7

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	5	0.9
SUD	0	0.0
THB	1	0.6
TOR	107	3.9
TSK	0	0.0
WAT	5	0.9
WDG	1	0.4
WEC	2	0.5
YRK	33	3.0
Ontario	**285**	**2.1**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 47.

Smallpox

General overview for 2014

Smallpox has been eradicated from the world. No confirmed cases have been reported in the province or elsewhere in the world since the global eradication of smallpox was confirmed by the World Health Organization in 1980.[68,69]

Chapter 48.

Streptococcus pneumoniae, invasive

General overview for 2014

Invasive pneumococcal disease (IPD) is caused by the bacterium *Streptococcus pneumoniae* and is one of the 10 most burdensome infectious agents in Ontario.[31] In January 2005, a four-dose 7-valent pneumococcal conjugate vaccine (PCV7) program was introduced as part of Ontario's publicly funded immunization program for infants. This was replaced by a four-dose 10-valent pneumococcal conjugate vaccine (PCV10) program in October 2009, followed by a three-dose 13-valent pneumococcal conjugate vaccine (PCV13) program in November 2010. In 2011, a one-time catch-up dose of PCV13 was implemented for healthy children under three years and for children at higher risk for IPD under five years. Finally, a one dose 23-valent pneumococcal polysaccharide vaccine (PPV23) has been universally available for adults 65 years and older since 1996.[70]

Incidence and comparison to Canada (Figure 48-1): There were 1,083 confirmed cases of IPD in 2014. This represents an overall incidence of 8.0 cases per 100,000 population. Rates in Ontario over the past decade have been relatively stable and tend to be similar to or lower than the national rates.

Age and sex (Figure 48-2): The highest incidences of IPD were observed in adults 65 years and older (23.9 cases per 100,000 population), followed by children under one year of age (12.7 cases per 100,000 population). Adults aged 50-64 years had the third highest rate in the province (11.0 cases per 100,000 population). Overall, males accounted for 56.6% of all cases and consistently had higher rates of disease than females in every age group except adolescents aged 15-19 years. This difference was especially pronounced among children under 5 years.

Seasonal trends (Figure 48-3): IPD follows a seasonal pattern with an increased incidence in the colder months and a decreased incidence during summer. Some evidence suggests that this seasonal pattern is influenced by influenza virus enhancing the risk of bacterial invasion in colonized individuals.[71]

Immunization: Immunization status was determined for 567 out of 1,083 (52.3%) cases in 2014. Of these, 67.4% (382/567) were reported as unimmunized, including 22.9% (11/48) of the cases under five years of age and 58.7% (152/259) of the cases greater than 65 years. A total of 185 (32.6%) cases had at least one dose of pneumococcal vaccine. These estimates should be interpreted with caution given the extent of missing information. Efforts are underway to improve data quality and there has been some improvement since 2013 where immunization status could be determined for 43.2% of cases.

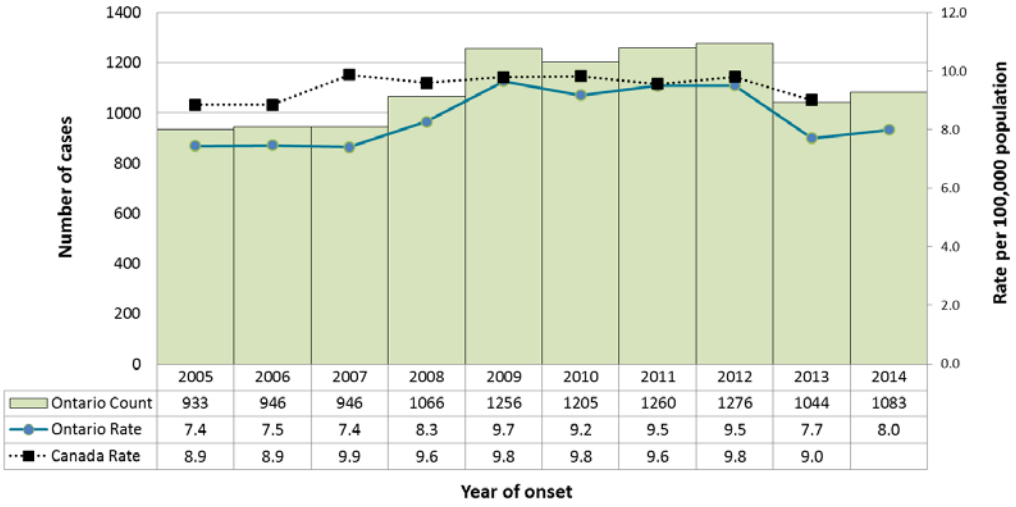
Serotypes: In 2014, serotypes were known for 82.0% (888/1,083) of all cases. Among children under five years of age, a decrease in incidence for PCV7 serotypes (serotypes 4, 6B, 9V, 14, 18C, 19F, and 23F) was observed between 2008 and 2012, with zero cases reported in 2013 and 2014. Incidence in this age group also decreased for PCV13 non-PCV7 serotypes (serotypes 1, 3, 5, 6A, 7F and 19A) after 2009. Reductions in the incidence for PCV7 and PCV13 non-PCV7 serotypes were also observed among adults 65 years and older through the 7 year period and after 2010, respectively, suggesting a herd effect in age groups not targeted for pneumococcal conjugate immunization. In contrast, incidence due to serotypes unique to PPV23 (serotypes 2, 8, 9N, 10A, 11A, 12F, 15B, 17F, 20, 22F and 33F) demonstrated a consistent increase among adults 65 year and older since 2008 (Figure 48-4).

Geographic distribution (Map 48-1): Incidence of IPD varied throughout the province and every public health unit reported at least one case of IPD in 2014. Northwestern and Thunder Bay District reported the highest incidence rates of IPD in Ontario at 27.1 and 12.2

cases per 100,000 population, respectively. This is consistent with findings that IPD is a major health concern in the northern parts of Canada.[72]

Hospitalizations and deaths: In 2014, 73.5% of cases were hospitalized. In particular, 83.3% and 73.8% of persons less than five years and over 65 years were hospitalized, respectively. The overall case fatality ratio was 14.2%. Among adults 65 years and older, the case fatality ratio was 18.9%.

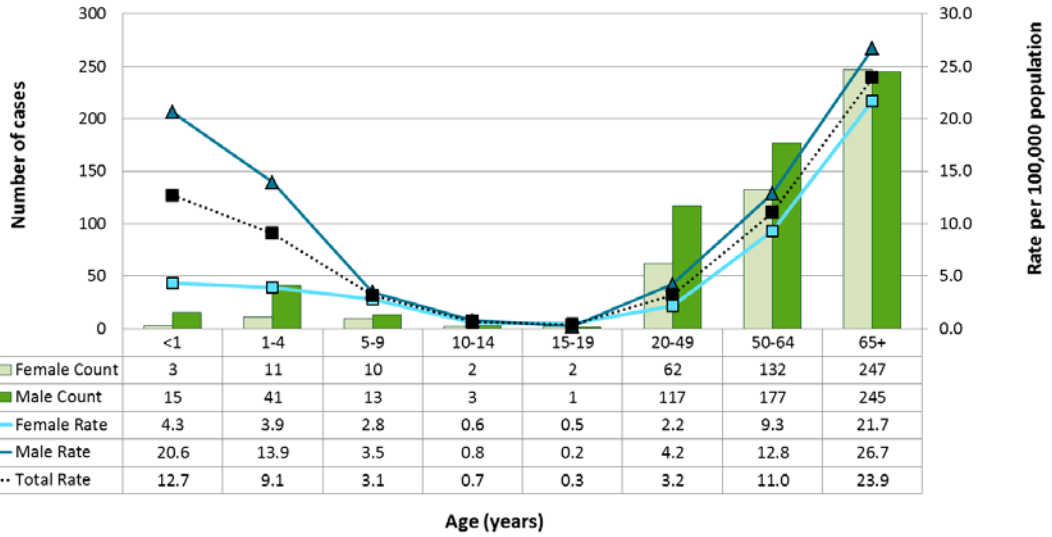
Figure 48-1. Incidence of invasive pneumococcal disease: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	933	946	946	1066	1256	1205	1260	1276	1044	1083
Ontario Rate	7.4	7.5	7.4	8.3	9.7	9.2	9.5	9.5	7.7	8.0
Canada Rate	8.9	8.9	9.9	9.6	9.8	9.8	9.6	9.8	9.0	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canada Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received [2015/07/10]; national data available up to 2013.
Note: Nunavut did not report on cases of IPD for 2012-2013. Its population has been removed for Canada rate calculation

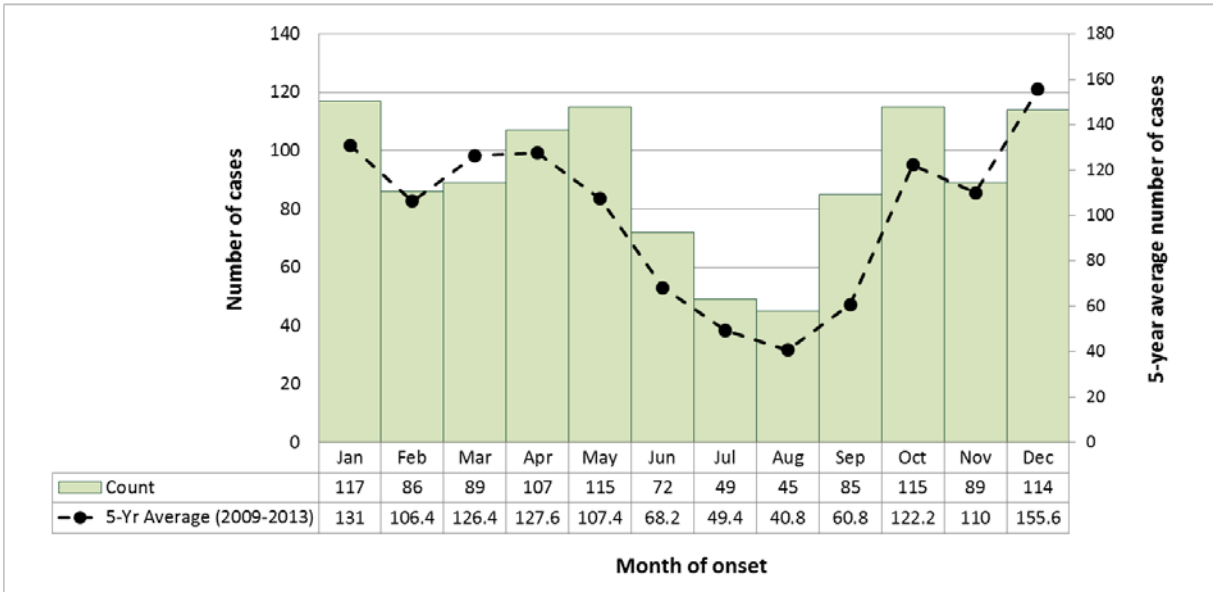
Figure 48-2. Incidence of invasive pneumococcal disease by age and sex: Ontario, 2014



	<1	1-4	5-9	10-14	15-19	20-49	50-64	65+
Female Count	3	11	10	2	2	62	132	247
Male Count	15	41	13	3	1	117	177	245
Female Rate	4.3	3.9	2.8	0.6	0.5	2.2	9.3	21.7
Male Rate	20.6	13.9	3.5	0.8	0.2	4.2	12.8	26.7
Total Rate	12.7	9.1	3.1	0.7	0.3	3.2	11.0	23.9

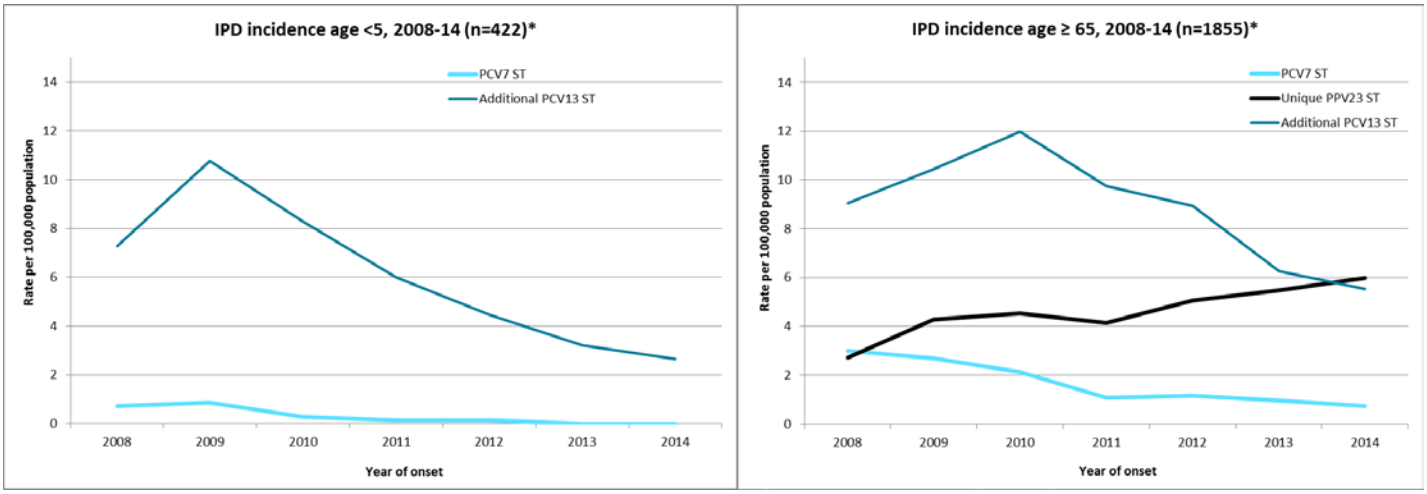
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2006-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes two cases of unknown sex.

Figure 48-3. Number of invasive pneumococcal disease by month: Ontario, 2014



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Figure 48-4. Invasive pneumococcal disease incidence by age group and vaccine-preventable serotype (ST): Ontario, 2008-14

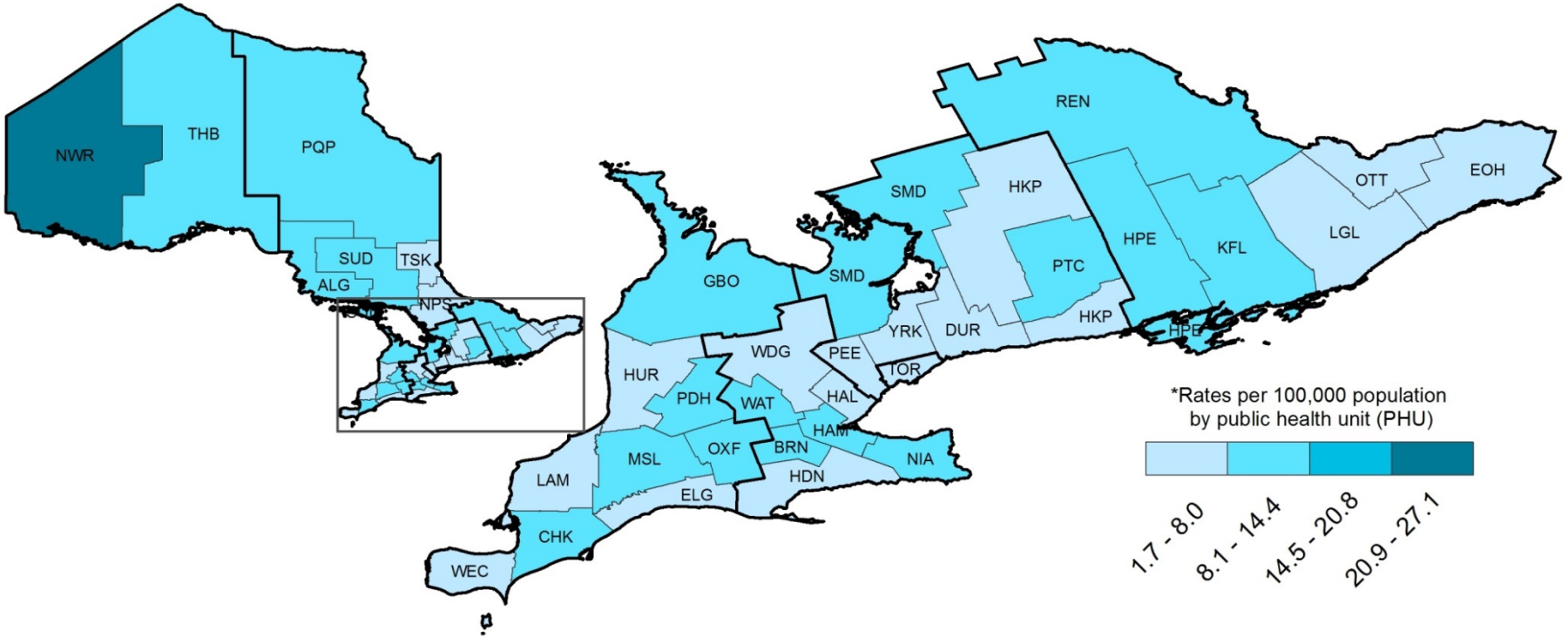


*__Note:__ Additional PPV23 and non-vaccine-preventable serotypes not shown. Nongroupable/typeable and unspecified serotypes excluded.

*__Note:__ Non-vaccine-preventable serotypes not shown. Nongroupable/typeable and unspecified serotypes excluded.

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2008-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Map 48-1. Incidence of invasive pneumococcal disease by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	11	9.4
BRN	15	10.5
CHK	10	9.5
DUR	48	7.4
ELG	7	7.7
EOH	13	6.3
GBO	18	11.1
HAL	41	7.6
HAM	58	10.6
HDN	4	3.6
HKP	14	7.8
HPE	14	8.6
HUR	1	1.7

PHU	Cases (n)	*Rates
KFL	21	10.5
LAM	10	7.7
LGL	13	7.7
MSL	49	10.6
NIA	41	9.2
NPS	5	3.9
NWR	22	27.1
OTT	74	7.9
OXF	9	8.1
PDH	7	9.0
PEE	82	5.9
PQP	7	8.1
PTC	16	11.5

PHU	Cases (n)	*Rates
REN	10	9.5
SMD	52	9.7
SUD	20	10.0
THB	19	12.2
TOR	223	8.0
TSK	1	2.9
WAT	48	9.0
WDG	17	6.1
WEC	23	5.7
YRK	60	5.4
Ontario	**1083**	**8.0**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 49.

Syphilis, infectious

General overview for 2014

Incidence (Figure 49-1): In 2014, 858 confirmed cases of infectious syphilis cases were reported in Ontario, corresponding to an incidence rate of 6.3 cases per 100,000 population. Of the 858 cases of infectious syphilis, 32.6% (280/858) were classified as primary syphilis, 34.6% (297/858) as secondary syphilis, 31.5% (270/858) as early latent syphilis, and 1.3% (11/858) as infectious neurosyphilis. There were no cases of congenital syphilis reported in 2014.

Following slowly rising incidence rates from 2005 to 2008, the 2009 reported incidence rate of infectious syphilis increased by 71.4%, from 3.5 cases per 100,000 population in 2008 to 6.0 cases per 100,000 population in 2009, an increase primarily attributable to an ongoing outbreak of infectious syphilis among men who have sex with men (MSM).[73-75] From 2009 to 2014, the reported incidence of infectious syphilis in Ontario was stable at approximately 6 cases per 100,000 population. Annual incidence rates for Ontario are not directly comparable to national rates as the latter includes cases of infectious, non-infectious and unspecified syphilis.

Age and sex (Figure 49-2): In 2014, the reported incidence of infectious syphilis was over 30 times higher among males (12.4 cases per 100,000 population) than females (0.4 cases per 100,000 population), with males accounting for 96.2% (825/858) of all cases reported in Ontario (data not shown). Among males, incidence was highest in the 25-29 year age group with a rate of 25.9 cases per 100,000 population; for females, incidence was highest in the 20-24 year age group with a rate of 1.7 cases per 100,000 population.

Geographic distribution (Map 49-1): In 2014, cases of infectious syphilis were reported in 77.8% (28/36) of Ontario's public health units. The highest incidence rates were reported in Toronto, Waterloo Region and City of Hamilton, with rates of 20.9, 5.8, and 5.5 cases per 100,000 population, respectively.

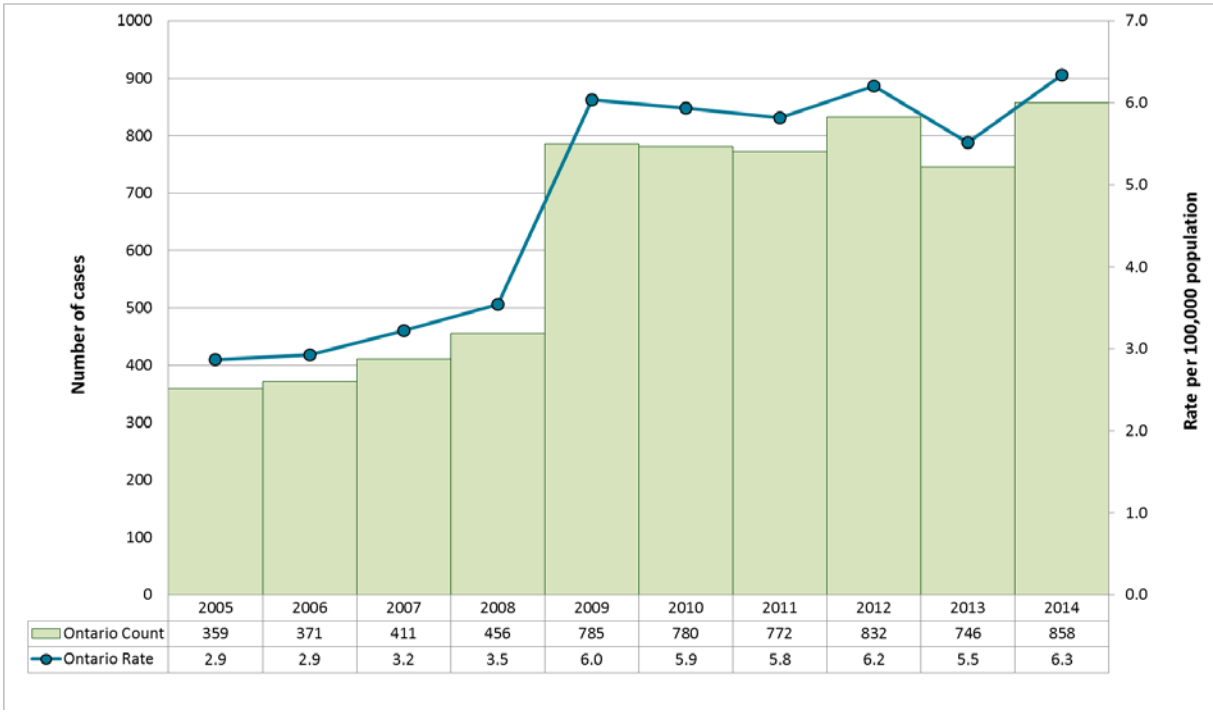
Highlights

Human Immunodeficiency Virus (HIV) co-infection is common among infectious syphilis cases.[2-3] Among cases of infectious syphilis reported in 2014, 38.9% (334/858) were reported to be co-infected with HIV (i.e., diagnosed with HIV prior to or within one year of their syphilis diagnosis). Many infectious syphilis cases may not know their HIV status or may have been tested anonymously; therefore the number of co-infected cases is likely higher than reported above.

Additional methodological issues

Cases of syphilis may be under-reported, or there may be delays in case reporting, due to challenges associated with staging the infection. Staging the infection at diagnosis can be complex, particularly among those with early or previous infections, which can result in misclassification. In addition, syphilis staging may take up to several months, resulting in a lag in completion of case data entry by public health units.

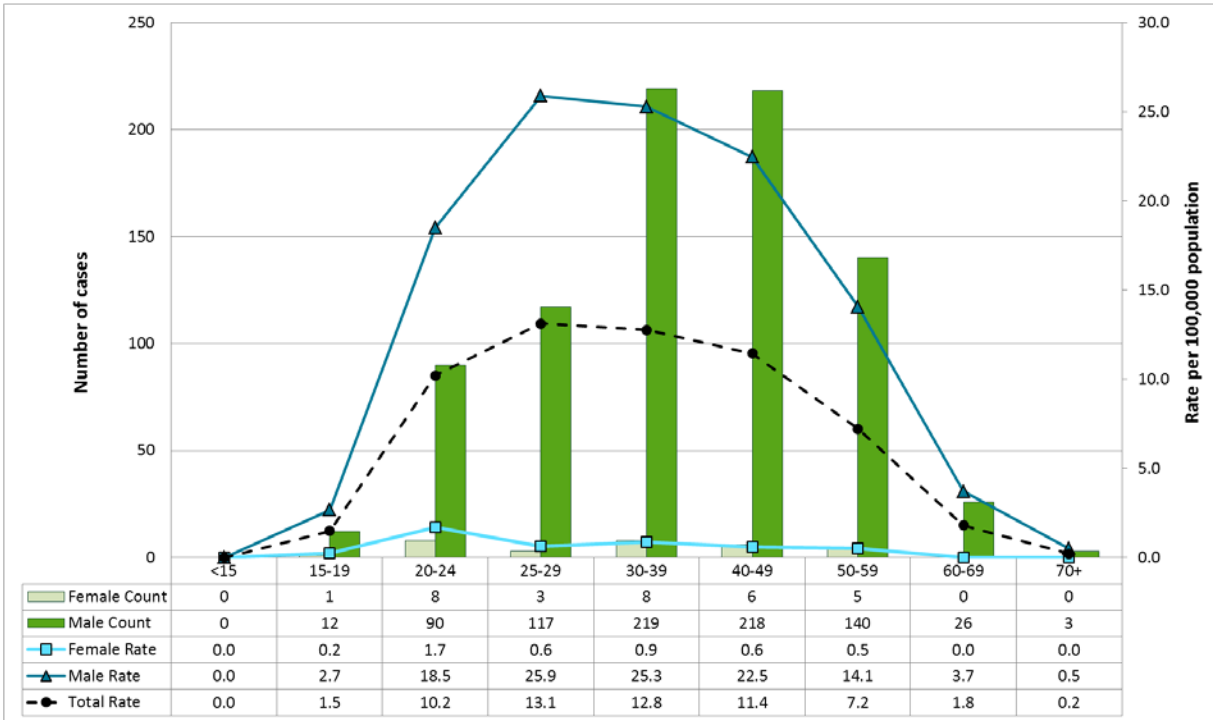
Figure 49-1. Incidence of syphilis, infectious: Ontario, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	359	371	411	456	785	780	772	832	746	858
Ontario Rate	2.9	2.9	3.2	3.5	6.0	5.9	5.8	6.2	5.5	6.3

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-14], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: National data excluded as it does not distinguish between infectious and non-infectious syphilis.

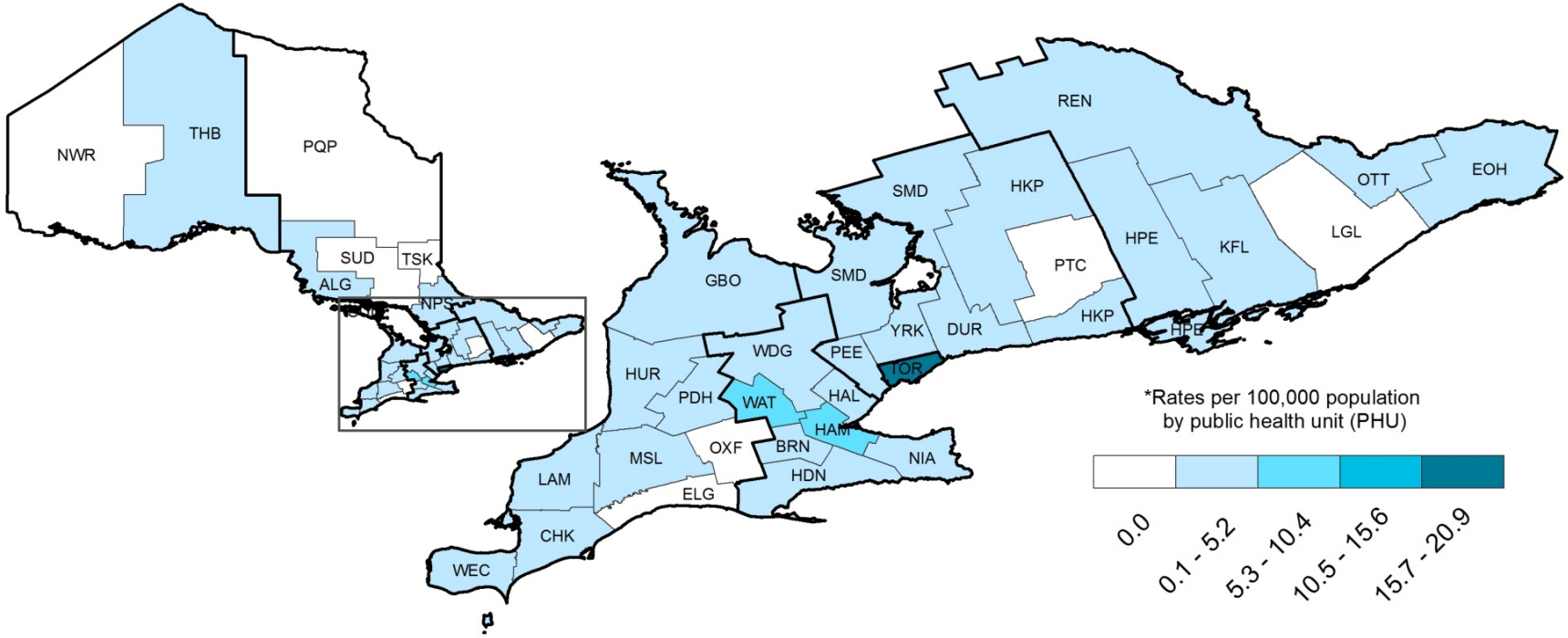
Figure 49-2. Incidence of syphilis, infectious by age and sex: Ontario, 2014



	<15	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	0	1	8	3	8	6	5	0	0
Male Count	0	12	90	117	219	218	140	26	3
Female Rate	0.0	0.2	1.7	0.6	0.9	0.6	0.5	0.0	0.0
Male Rate	0.0	2.7	18.5	25.9	25.3	22.5	14.1	3.7	0.5
Total Rate	0.0	1.5	10.2	13.1	12.8	11.4	7.2	1.8	0.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes two cases of unknown sex.

Map 49-1. Incidence of syphilis, infectious by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	5	4.3
BRN	1	0.7
CHK	3	2.8
DUR	12	1.9
ELG	0	0.0
EOH	3	1.5
GBO	2	1.2
HAL	12	2.2
HAM	30	5.5
HDN	4	3.6
HKP	3	1.7
HPE	4	2.4
HUR	1	1.7

PHU	Cases (n)	*Rates
KFL	5	2.5
LAM	2	1.5
LGL	0	0.0
MSL	19	4.1
NIA	8	1.8
NPS	2	1.6
NWR	0	0.0
OTT	48	5.1
OXF	0	0.0
PDH	4	5.1
PEE	33	2.4
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	1	0.9
SMD	8	1.5
SUD	0	0.0
THB	5	3.2
TOR	578	20.9
TSK	0	0.0
WAT	31	5.8
WDG	5	1.8
WEC	12	3.0
YRK	17	1.5
Ontario	**858**	**6.3**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 50.

Tetanus

General overview for 2014

Under Ontario's publicly funded immunization program, tetanus toxoid-containing vaccine is routinely administered in combination with vaccines against diphtheria, pertussis, polio and *Haemophilus influenzae* type b to children at two, four, six and 18 months of age. Subsequent booster doses are administered at 4-6 and 14-16 years of age, with additional booster doses recommended every 10 years throughout life for continued protection.[20,76]

Incidence and comparison to Canada (Figure 50-1): In 2014, five cases of tetanus were reported in Ontario, representing an incidence rate of 0.4 cases per 1,000,000 population. The annual incidence rates of tetanus in Ontario ranged between 0.0 and 0.4 cases per 1,000,000 population from 2005 to 2014, with the highest incidence observed in 2014. Ontario incidence rates were comparable to national rates over the 10-year period.

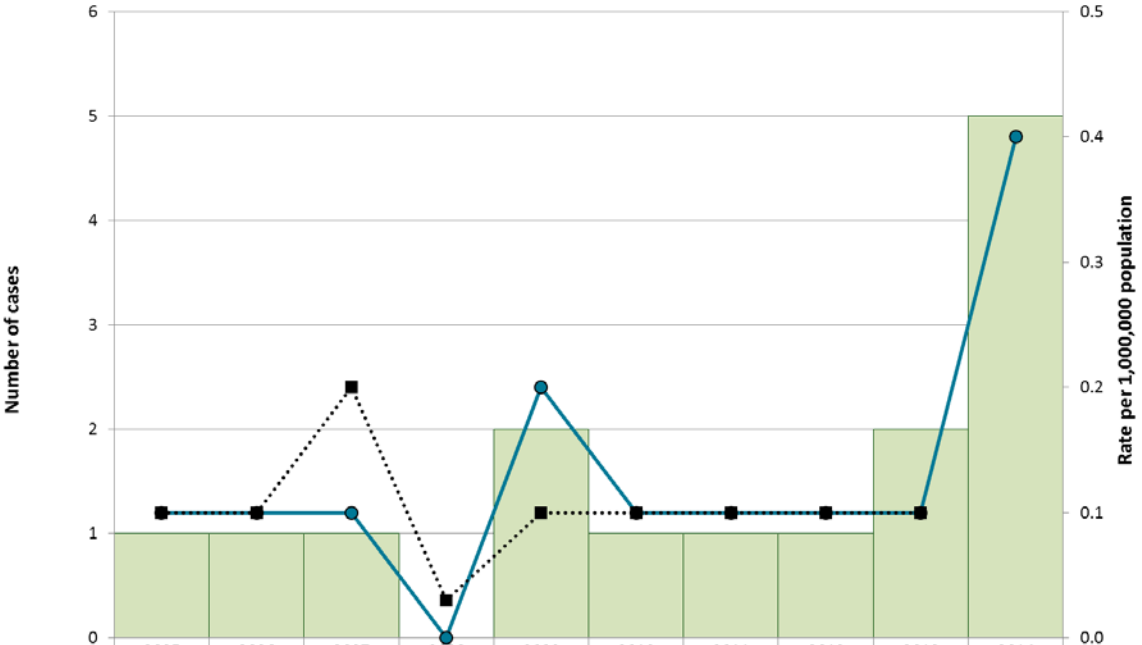
Age and sex: The cases ranged in age between 4 and 81 years, with a median age of 39 years. Only one case was in a child under 18 years of age. Three of the five cases were male.

Immunization: Of the five cases reported in 2014, three cases were unimmunized (including the child) and two cases had unknown immunization status. Immunization details are essential to determine if cases were attributable to failure to vaccinate or the result of vaccine failure.

Geographic distribution: Five cases were reported from four different public health units in 2014, with Lambton County reporting two cases. The public health unit-specific incidence rates ranged from 0.0 to 15.3 cases per 1,000,000 population, and the highest incidence rate was reported by Lambton County. Thirty-two public health units reported no cases of tetanus in 2014.

Hospitalizations and deaths: Four of the five cases were reported as hospitalized in 2014. One death was reported in an adult over 80 years of age.

Figure 50-1. Incidence of tetanus: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	1	1	1	0	2	1	1	1	2	5
Ontario Rate	0.1	0.1	0.1	0.0	0.2	0.1	0.1	0.1	0.1	0.4
Canada Rate	0.1	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.1	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.
Note: Nunavut did not report on tetanus cases for 2012-2013. Its population has been removed for the Canada rate calculation.

Chapter 51.

Trichinosis

General overview for 2014

There were no cases of trichinosis reported in Ontario in 2014. From 2005 to 2013, three confirmed cases were reported in the province.

Chapter 52.

Tuberculosis

General overview for 2014

Incidence and comparison to Canada (Figure 52-1): In 2014, a total of 579 cases of active tuberculosis (TB) were reported in Ontario, corresponding to an incidence rate of 4.3 cases per 100,000 population. Between 2005 and 2014 the annual incidence rate of reported active TB cases in Ontario decreased from a high of 5.5 cases per 100,000 population in 2005 to a low of 4.3 cases per 100,000 population in 2014. Over this same time period, incidence rates of active TB in Ontario were higher than the Canadian rates from 2005 to 2007 and from 2010 to 2011.

Age and sex (Figure 52-2): The overall reported incidence of active TB in 2014 was higher for males than females, with rates of 4.9 and 3.7 cases per 100,000 population, respectively (data not shown). Males accounted for 56.1% (325/579) of cases. Active TB cases ranged in age from less than one year to 96 years, with a median age of 49 years (data not shown). The highest overall age-specific incidence rates of active TB were reported among adults 70 years of age and over (9.8 cases per 100,000 population), followed by adults between 20 and 29 years of age (5.5 cases per 100,000 population). Among those 40 years of age and older, the reported incidence rate among males consistently exceeded those of females.

Country of birth (Table 52-1): Individuals born outside of Canada accounted for the largest proportion of active TB cases reported in Ontario in 2014 (88.3%, 511/579 cases). The top five countries of birth among foreign-born TB cases reported from 2009 to 2014 were India (21.9%, 728/3,324), the Philippines (16.9%, 563/3,324), China (10.3%, 342/3,324), Vietnam (5.9%, 195/3,324), and Pakistan (4.4%, 147/3,324). These countries are among the 27 countries with a high burden of multidrug-resistant TB (MDR-TB) as identified by the World Health Organization.[77] In 2014, the Public Health Ontario Laboratory identified six MDR-TB cases and one extensively drug-resistant TB (XDR-TB) case (data not shown); however, this may include some cases with an initial TB diagnosis prior to 2014. Although the incidence rates of MDR-TB and XDR-TB are currently low in Ontario,[78] rates may increase with continued immigration from high MDR-TB burden countries.

Geographic distribution (Map 52-1): In 2014, the highest incidence rates of active TB were reported in Peel Region and Toronto, with 9.4 and 9.2 cases per 100,000 population, respectively. Toronto and large urban centres in Peel Region tend to attract new immigrants and have established communities of residents originating from countries with a high prevalence of TB, which may account for the increased burden of active TB in these public health units.[79]

Deaths: Of active TB cases diagnosed in 2014, 8.1% (47/579) were reported as fatal.

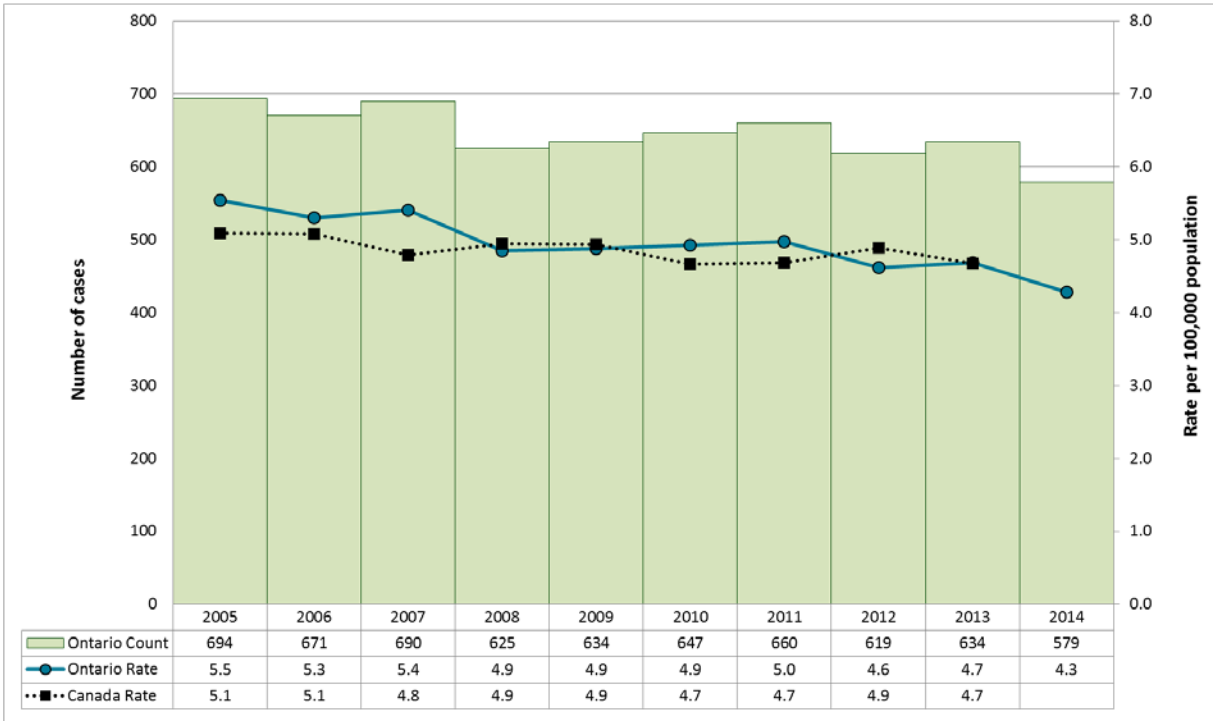
Additional methodological issues

Although most cases of active TB reported in Ontario are in persons born outside Canada, First Nations peoples, particularly those living on-reserve, represent another population disproportionately affected by TB.[80] However, since TB cases among First Nations peoples living on-reserve fall within federal jurisdiction, it is likely that cases in this population are under-reported in Ontario. Furthermore, those who live on or off-reserve may not be identified as being First Nations in iPHIS due to incomplete data on origin.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, March 2012 edition
- PHO's Monthly Infectious Diseases Surveillance Report, March 2015 edition

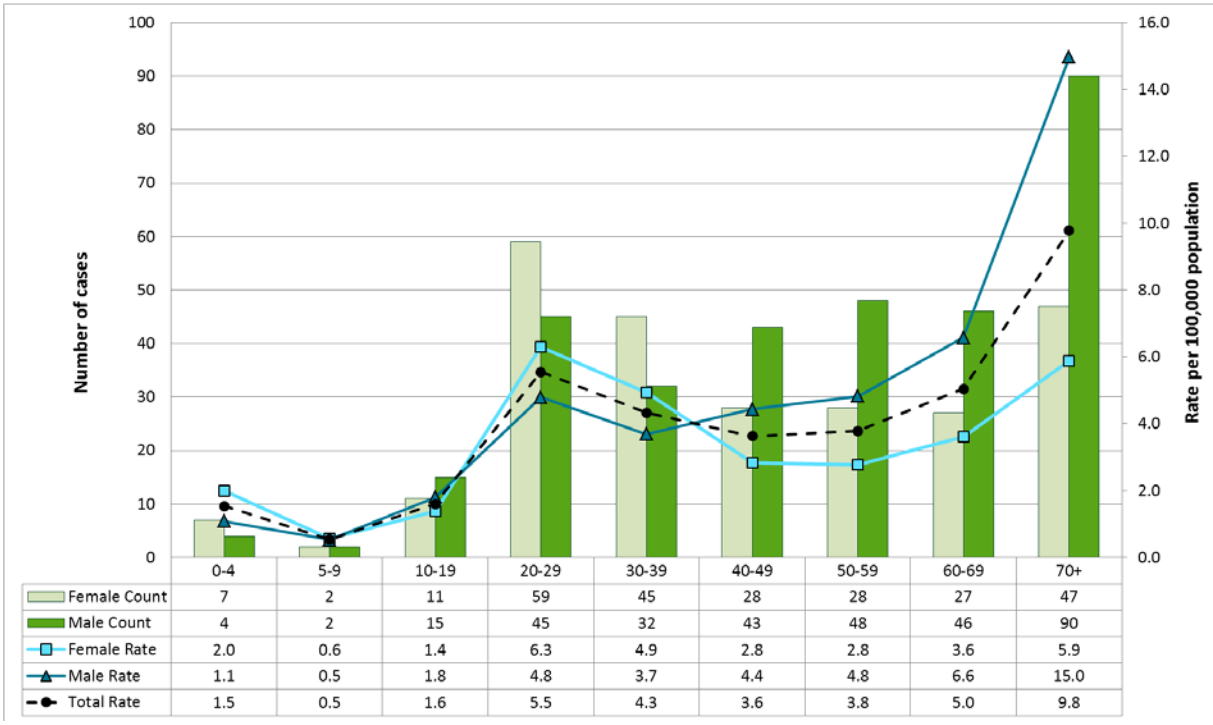
Figure 52-1. Incidence of tuberculosis: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	694	671	690	625	634	647	660	619	634	579
Ontario Rate	5.5	5.3	5.4	4.9	4.9	4.9	5.0	4.6	4.7	4.3
Canada Rate	5.1	5.1	4.8	4.9	4.9	4.7	4.7	4.9	4.7	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

Figure 52-2. Incidence of tuberculosis by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	7	2	11	59	45	28	28	27	47
Male Count	4	2	15	45	32	43	48	46	90
Female Rate	2.0	0.6	1.4	6.3	4.9	2.8	2.8	3.6	5.9
Male Rate	1.1	0.5	1.8	4.8	3.7	4.4	4.8	6.6	15.0
Total Rate	1.5	0.5	1.6	5.5	4.3	3.6	3.8	5.0	9.8

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

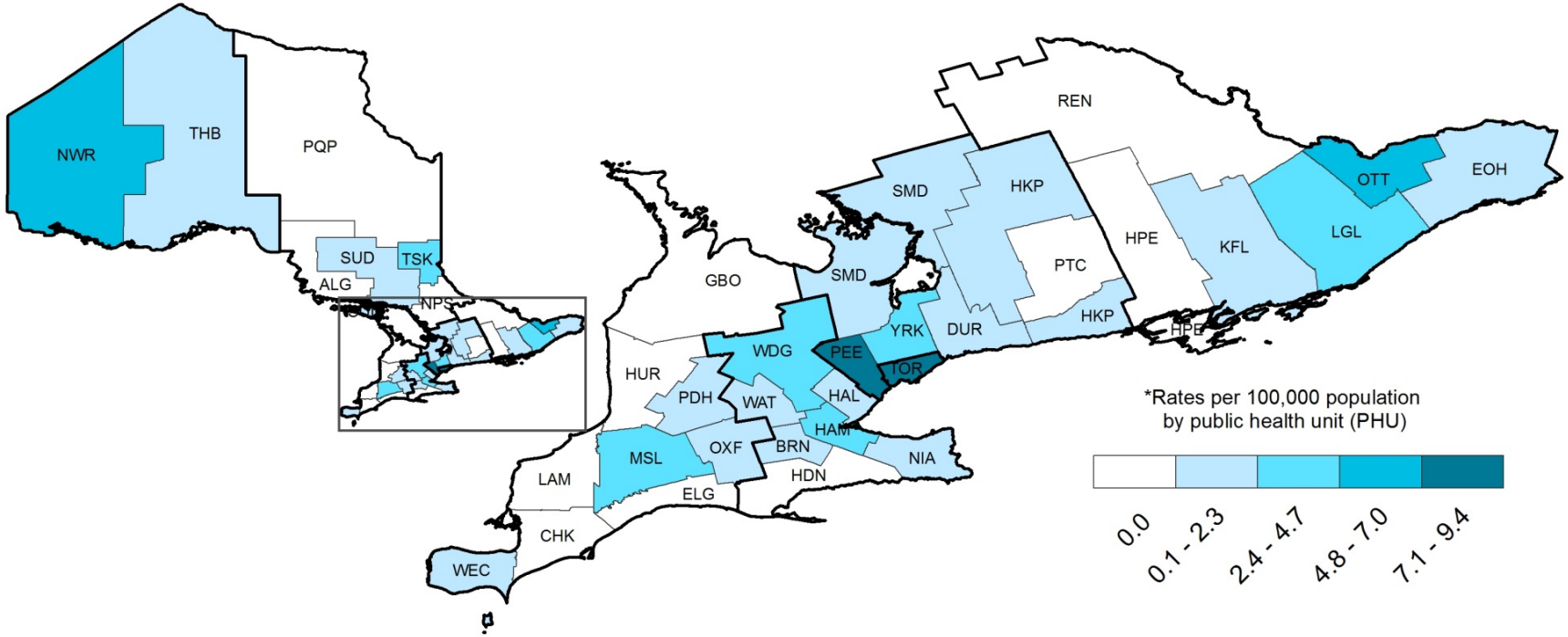
Table 52-1. Tuberculosis cases by country of birth: Ontario, 2009-14

Country of Birth	Diagnosis Year						Total
	2009	2010	2011	2012	2013	2014	
Born Outside Canada							
India	122	114	119	112	122	139	728
Philippines	88	81	90	97	111	96	563
China	58	57	56	58	61	52	342
Vietnam	28	42	38	35	27	25	195
Pakistan	17	26	25	33	26	20	147
Somalia	20	18	19	17	17	17	108
Sri Lanka	12	21	24	18	15	7	97
Ethiopia	15	12	12	18	16	14	87
Hong Kong	13	17	13	12	17	10	82
Bangladesh	11	14	7	14	10	6	62
Other	163	173	178	133	133	124	904
*Unknown**	1	0	4	1	2	1	9
Total born outside Canada	***548***	***575***	***585***	***548***	***557***	***511***	***3324***
Born in Canada							
Inuit	1	1	4	2	0	1	9
Non-Aboriginal	71	52	58	57	46	49	333
Registered/Status Indian†, Other Aboriginal	10	8	7	4	15	7	51
*Unknown***	0	2	1	0	3	0	6
Total born in Canada	***82***	***63***	***70***	***63***	***64***	***57***	***399***
Origin unknown/missing	**4**	**9**	**5**	**8**	**13**	**11**	**50**
TOTAL	**634**	**647**	**660**	**619**	**634**	**579**	**3773**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/09/25].

Note: * Unknown, born outside Canada: includes cases born outside of Canada but for which the country of birth is not provided or is unknown. †Registered/Status Indian may include cases that are classified as "Other Aboriginal". "Other Aboriginal" may include cases that are classified as "Other Aboriginal", or "Aboriginal unknown". **Unknown, born in Canada: includes cases born in Canada but for which the aboriginal status is not provided or is unknown.

Map 52-1. Incidence of tuberculosis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	3	2.1
CHK	0	0.0
DUR	11	1.7
ELG	0	0.0
EOH	1	0.5
GBO	0	0.0
HAL	9	1.7
HAM	17	3.1
HDN	0	0.0
HKP	1	0.6
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	1	0.5
LAM	0	0.0
LGL	4	2.4
MSL	12	2.6
NIA	5	1.1
NPS	0	0.0
NWR	4	4.9
OTT	51	5.5
OXF	2	1.8
PDH	1	1.3
PEE	130	9.4
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	3	0.6
SUD	2	1.0
THB	1	0.6
TOR	256	9.2
TSK	1	2.9
WAT	10	1.9
WDG	7	2.5
WEC	8	2.0
YRK	39	3.5
Ontario	**579**	**4.3**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 53.

Tularemia

General overview for 2014

There were no cases of tularemia reported in Ontario in 2014. From 2005 to 2013, four confirmed cases were reported in the province.

Chapter 54.

Typhoid fever

General overview for 2014

Incidence and comparison to Canada (Figure 54-1): *Salmonella enterica* serotype Typhi is the causative agent of typhoid fever. In 2014, there were 72 confirmed cases of typhoid fever in Ontario, representing an incidence rate of 0.5 cases per 100,000 population. Annual incidence rates in Ontario were above the corresponding Canadian rates from 2005 to 2013.

Age and sex (Figure 54-2): The highest incidence rates were observed in the 0-4 and 5-9 year age groups. In these age groups there were 1.3 and 1.6 cases per 100,000 population, respectively. Overall, males accounted for a higher proportion of all cases at 61.1% compared to 38.9% for females.

Seasonal trends (Figure 54-3): Although typhoid fever is generally travel-associated, no particular seasonal trend was noted in Ontario in 2014.

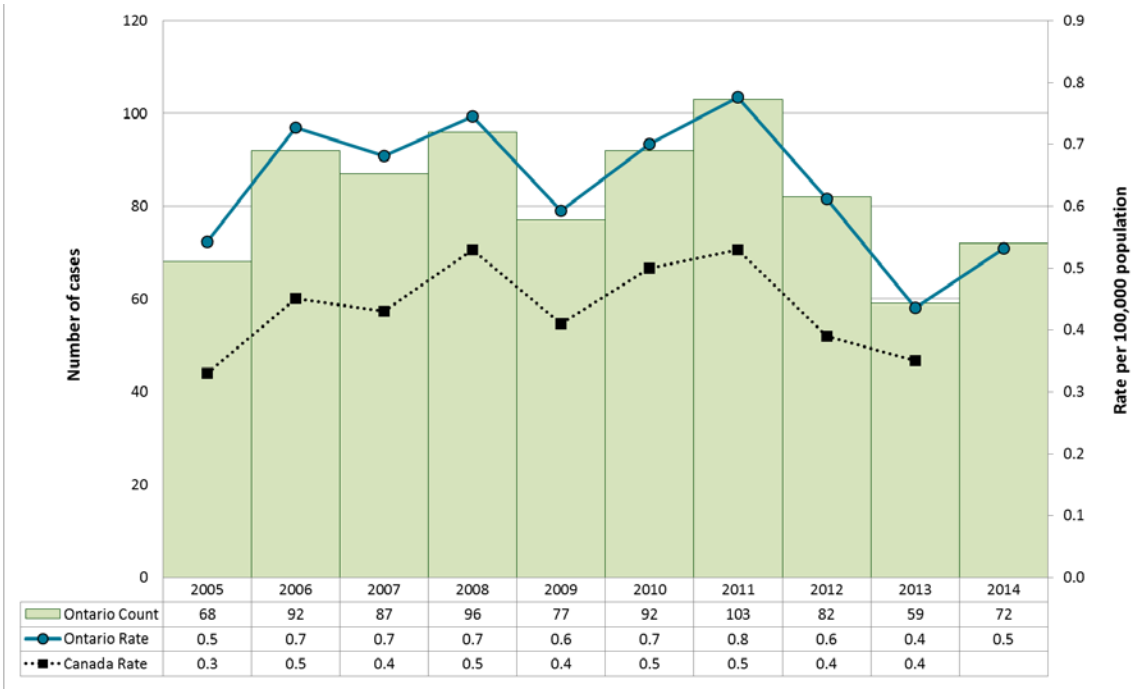
Geographic distribution (Map 54-1): The highest number of cases were reported by Peel Region (31 cases) and Toronto (25 cases), which together accounted for 77.8% of cases reported in 2014.

Hospitalizations and deaths: Hospitalization was reported for 40.3% (29/72) of cases and there were no deaths reported.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, February 2013 edition (Volume 2, Issue 2)

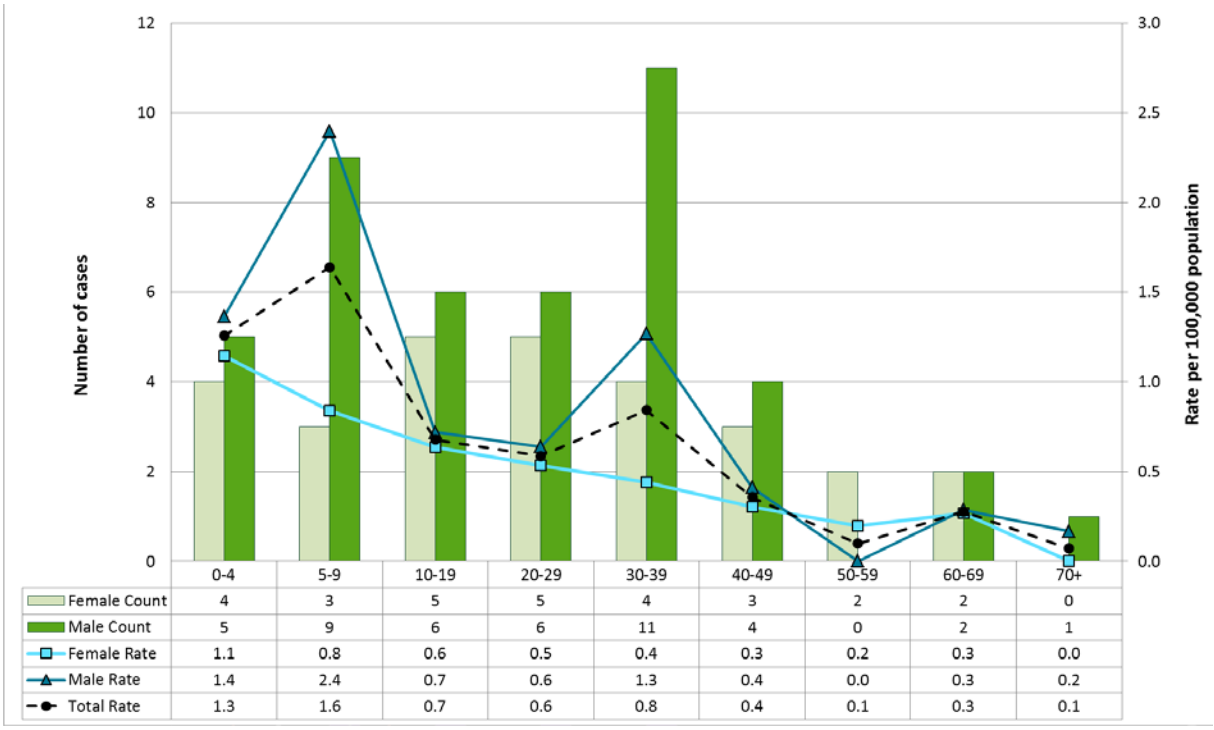
Figure 54-1. Incidence of typhoid fever: Ontario and Canada, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	68	92	87	96	77	92	103	82	59	72
Ontario Rate	0.5	0.7	0.7	0.7	0.6	0.7	0.8	0.6	0.4	0.5
Canada Rate	0.3	0.5	0.4	0.5	0.4	0.5	0.5	0.4	0.4	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

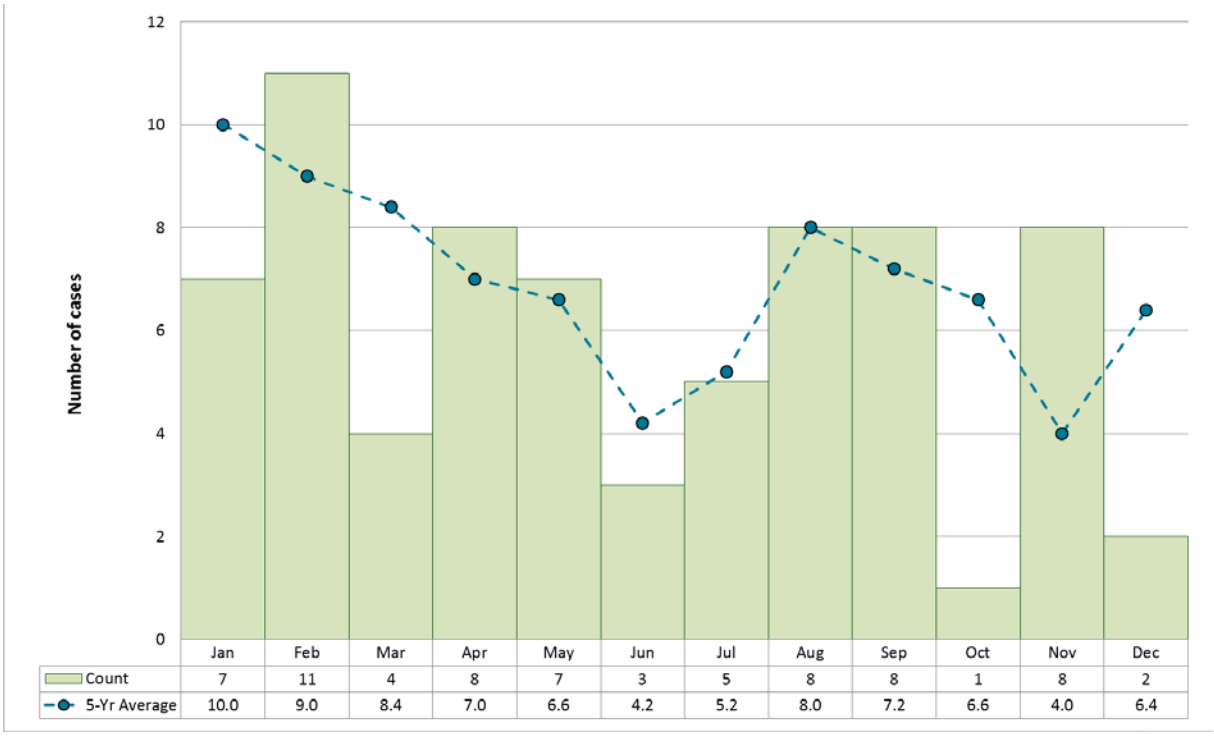
Figure 54-2. Incidence of typhoid fever by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	4	3	5	5	4	3	2	2	0
Male Count	5	9	6	6	11	4	0	2	1
Female Rate	1.1	0.8	0.6	0.5	0.4	0.3	0.2	0.3	0.0
Male Rate	1.4	2.4	0.7	0.6	1.3	0.4	0.0	0.3	0.2
Total Rate	1.3	1.6	0.7	0.6	0.8	0.4	0.1	0.3	0.1

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

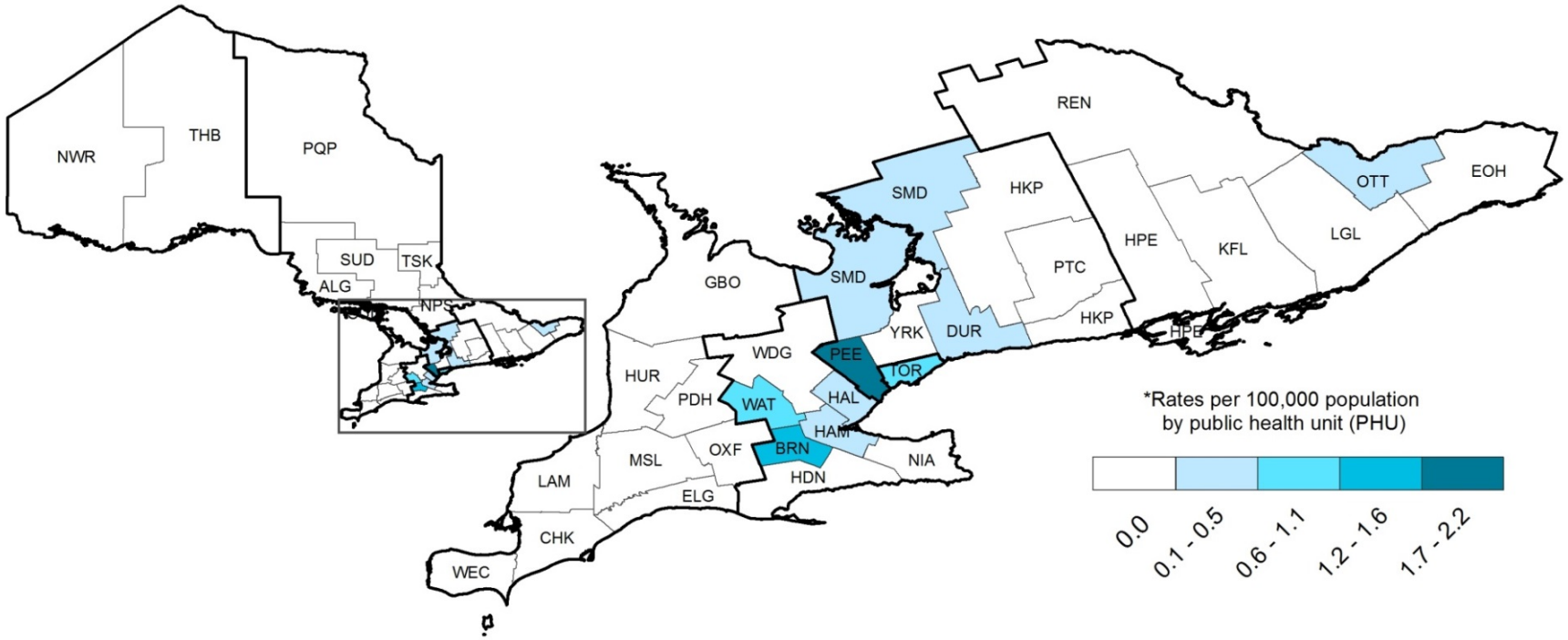
Figure 54-3. Number of typhoid fever cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	7	11	4	8	7	3	5	8	8	1	8	2
5-Yr Average	10.0	9.0	8.4	7.0	6.6	4.2	5.2	8.0	7.2	6.6	4.0	6.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 54-1. Incidence of typhoid fever by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	2	1.4
CHK	0	0.0
DUR	3	0.5
ELG	0	0.0
EOH	0	0.0
GBO	0	0.0
HAL	2	0.4
HAM	1	0.2
HDN	0	0.0
HKP	0	0.0
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	0	0.0
LAM	0	0.0
LGL	0	0.0
MSL	0	0.0
NIA	0	0.0
NPS	0	0.0
NWR	0	0.0
OTT	1	0.1
OXF	0	0.0
PDH	0	0.0
PEE	31	2.2
PQP	0	0.0
PTC	0	0.0

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	2	0.4
SUD	0	0.0
THB	0	0.0
TOR	25	0.9
TSK	0	0.0
WAT	5	0.9
WDG	0	0.0
WEC	0	0.0
YRK	0	0.0
Ontario	**72**	**0.5**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 55.

Varicella (Chickenpox)

General overview for 2014

A vaccine against varicella was authorized for use in Canada in December 1998.[81] In September 2004, a publicly funded varicella vaccination program was introduced in Ontario for children at 15 months of age without a history of varicella. A two-dose varicella vaccination program was introduced in August 2011, with the first dose recommended at 15 months of age and the second dose at four to six years of age, given in combination with measles, mumps, and rubella as MMRV vaccine.[20] All children born on or after January 1, 2000 were also eligible to receive a second dose of publicly funded varicella vaccine.[20]

In Ontario, cases of varicella are reported individually and in aggregate numbers through iPHIS.[82] Prior to 2005, aggregate cases were reported in the Reportable Disease Information System (RDIS). Individually-reported cases represent the more severe spectrum of disease because laboratory-confirmed cases, hospitalized cases, and cases with complications, including death, are required to be reported individually.[83] In addition, all public heath units (PHUs) are required to report monthly aggregate counts of varicella, regardless of whether any cases were observed in a given month. Aggregate counts represent the total number of cases occurring in a public health unit jurisdiction, broken down by predefined age groups. Aggregate counts do not contain individual case details (e.g., immunizations, hospitalizations, etc.) and may include cases that have been entered as individual cases, as well as those that do not meet the criteria for individual case reporting.[84] Reports received from health care providers, schools, child care facilities, and parents are included in aggregate varicella counts. This chapter primarily presents varicella data reported as aggregate cases. Aggregate counts for 2005 and 2006 were excluded due to data incompleteness resulting from the transition from RDIS to iPHIS. Aggregate reporting of varicella in iPHIS began in late 2006.

Incidence (Figure 55-1): In 2014, there were 262 confirmed cases of varicella reported at the individual level in Ontario, representing an incidence of 1.9 cases per 100,000 population. The annual incidence of varicella cases reported at the individual-level varicella in Ontario has remained relatively stable over the past decade. In addition to the individual-level reports, there were 2,449 aggregate cases of varicella reported in 2014, for an incidence of 18.1 cases per 100,000 population, the lowest reported incidence in over twenty years. Aggregate incidence rates ranged from a high of 257.4 cases per 100,000 in 1995 to a low of 18.1 cases per 100,000 in 2014. While varicella is a nationally notifiable disease, it is not notifiable at the provincial/territorial level in all Canadian jurisdictions. As such, there is considerable heterogeneity in reported varicella data from year to year. In addition, the Canadian data for varicella contain both aggregate and individual level data from reporting jurisdictions. Therefore, the Canadian data are not comparable to either individual or aggregate data from Ontario.

Age (Figure 55-2): In 2014 among the 2,449 cases reported in aggregate, the highest incidence of varicella was observed in the 5-9 year age group with 144.7 cases per 100,000 population, accounting for 43.7% of all cases with known age group. During the same year this age group accounted for only 5.4% of the population. Infants under one year of age, who are too young to be vaccinated, had the lowest age-specific incidence among children under 15 years of age. The median age among the 262 individually-reported cases was 19 years, ranging from 1.7 months to 88.5 years.

Seasonal trends (Figure 55-3): Based on the five-year average, the number of varicella cases was highest in April and declined over the summer, with the lowest counts reported in August. In 2014, the lowest counts were also reported in August, but a peak in case counts was observed in January.

Geographic distribution (Map 55-1): The PHU incidence rates of cases reported in aggregate ranged widely from 0.0 to 115.9 cases per 100,000 population in 2014. It is unclear whether the absence of aggregate cases observed in six PHUs (Haldimand-Norfolk, Halton Region, Huron County, Lambton County, Middlesex-London, and Perth District) reflects a true absence of disease or a lack of reporting. Five of these six PHUs reported individual cases.

Hospitalizations and deaths: Data on hospitalization and death are not available for cases reported in aggregate. Of the 262 individually-reported cases in 2014, 22 (8.4%) were reported as hospitalized and one case was reported as fatal, resulting in a case fatality ratio of 0.4%. The case fatality ratio would be 0.04% if the total number of aggregate cases had been used as the denominator rather than the individually-reported cases.

Additional methodological issues

Aggregate varicella data are useful in identifying trends in varicella incidence; however, these data are prone to substantial under-reporting and lack precision. Although the degree of under-reporting is unknown, it is likely that the burden of varicella in Ontario is substantially underestimated. Additionally, aggregate cases cannot be reconciled with individual-level data (e.g., laboratory results, immunization data), and may include some duplicate cases reported from more than one source, as well as misclassified cases (e.g., herpes zoster cases).

Aggregate varicella cases were included in this report only if they met the following conditions:[85]

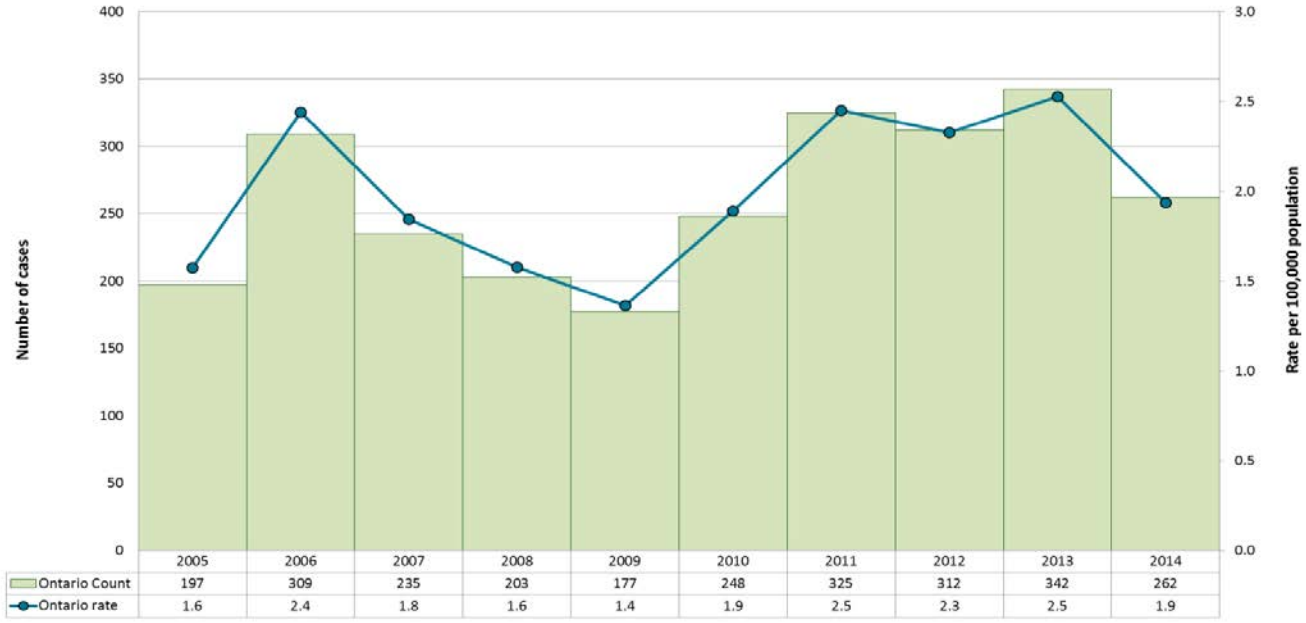
1. Only those counts that have the "Outbreak Classification" field entered as "CONFIRMED".

2. Only those counts that have the "Role" field entered as "OTHER".

Additional sources of information

- A spot of bother: why varicella vaccine programs matter, CCDR, October 2015 issue
- Wormsbecker AE, Wang J, Rosella LC, Kwong JC, Seo CY, Crowcroft NS, et al. (2015) Twenty Years of Medically-Attended Pediatric Varicella and Herpes Zoster in Ontario, Canada: A Population-Based Study. PLoS ONE 10(7): e0129483. doi:10.1371/journal.pone.0129483

Figure 55-1a. Incidence of individual-level varicella (chickenpox): Ontario, 2005-14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	197	309	235	203	177	248	325	312	342	262
Ontario rate	1.6	2.4	1.8	1.6	1.4	1.9	2.5	2.3	2.5	1.9

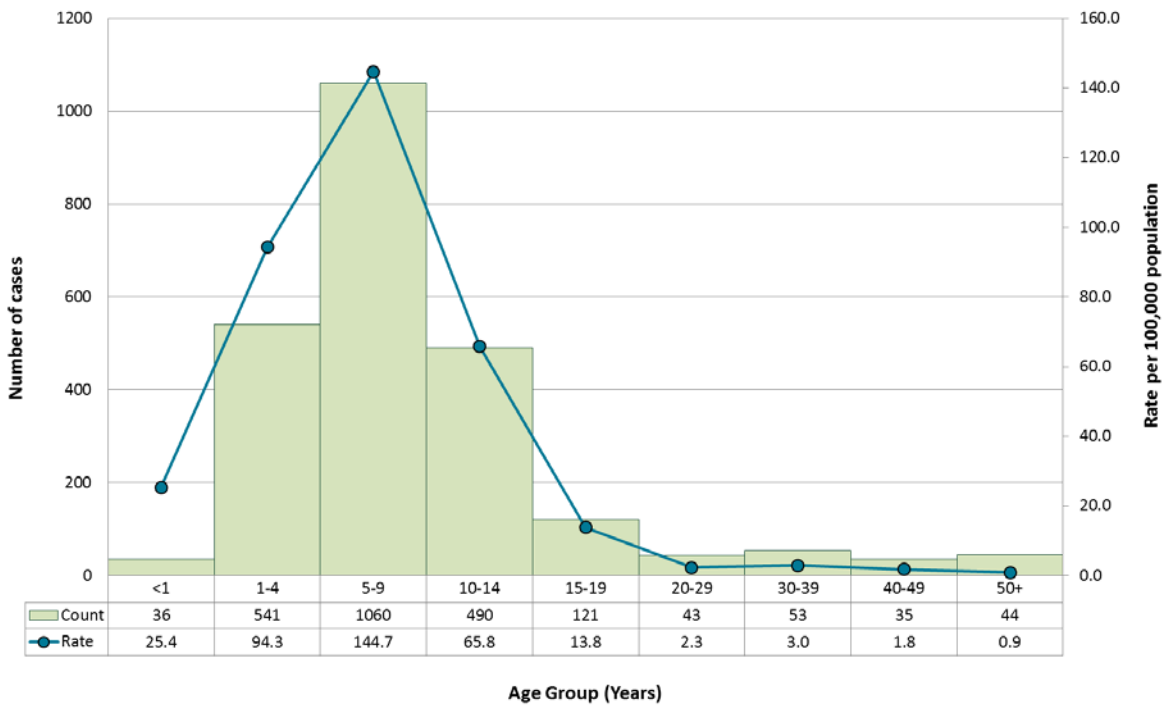
Ontario Cases [2005-2014]: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/07/09].
Ontario Population [2004-14]: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Because of considerable heterogeneity in varicella reporting at the national level, the national incidence rate is not presented for comparison

Figure 55-2b. Incidence of aggregate varicella (chickenpox): Ontario, 1994-2014

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	27826	28229	12351	20695	21950	16700	26812	12319	16274	14743	17819			9784	7335	7451	7547	5451	4501	2844	2449
Ontario rate	257.0	257.4	111.4	184.3	193.1	145.2	229.5	103.5	134.6	120.4	143.8			76.7	56.9	57.3	57.5	41.1	33.6	21.0	18.1

Ontario Cases [1994-2004]: MOHLTC, Ontario Public Health Portal, accessed [2012/05/24].
Ontario Cases [2007-14]: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/07/09].
Ontario Population [1994-2003]: MOHLTC, intelliHEALTH Ontario, extracted [2013/09/16].
Ontario Population [2004-14]: Population Estimates [2004-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Aggregate counts for 2005 are not available. Aggregate counts for 2006 are incomplete as the reporting began in late 2006.
Note: Because of considerable heterogeneity in varicella reporting at the national level, the national incidence rate is not presented for comparison.

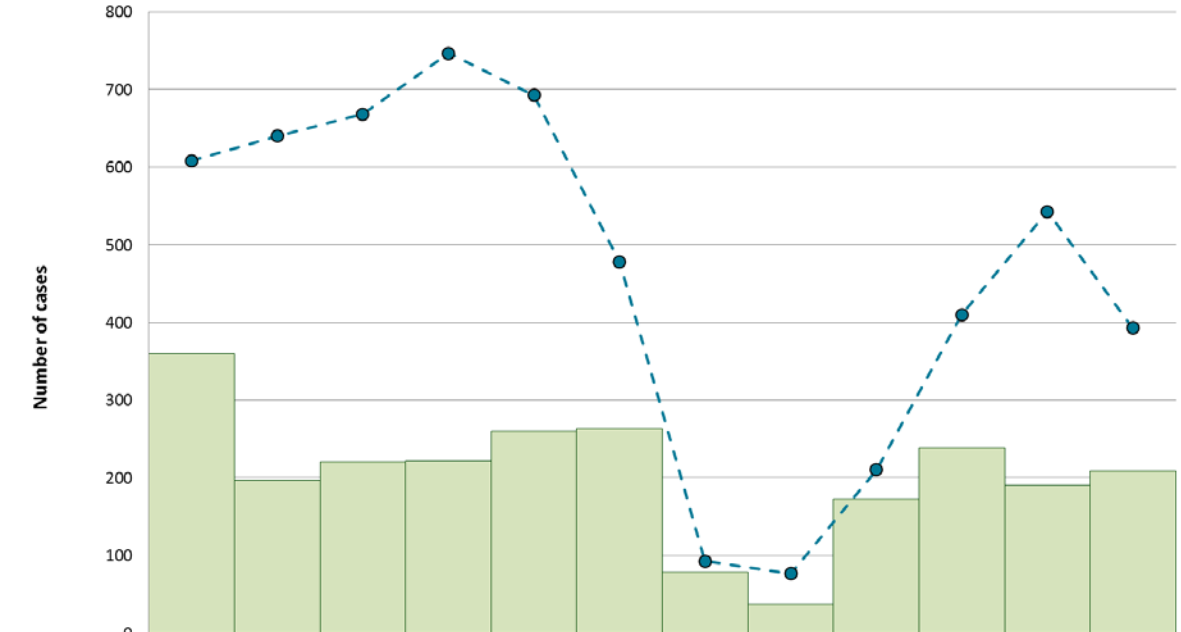
Figure 55-2. Incidence of aggregate varicella (chickenpox) by age group: Ontario, 2014



	<1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50+
Count	36	541	1060	490	121	43	53	35	44
Rate	25.4	94.3	144.7	65.8	13.8	2.3	3.0	1.8	0.9

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/07/09].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Note: Excludes 26 cases of unknown age group.

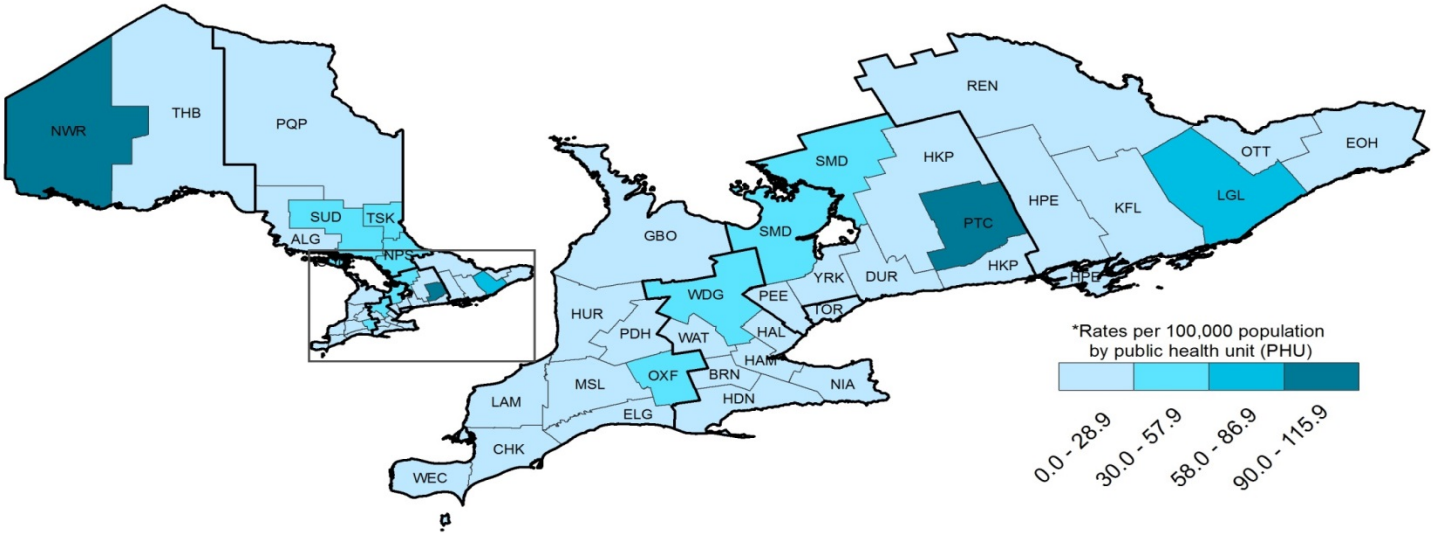
Figure 55-3. Number of aggregate varicella (chickenpox) by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	360	197	221	222	260	263	79	37	173	238	190	209
5-Yr Average	608	640	668	747	693	478	93	77	210	410	543	393

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/07/09].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 55-1. Incidence of aggregate varicella (chickenpox) by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	12	10.3
BRN	23	16.1
CHK	15	14.2
DUR	91	14.1
ELG	14	15.5
EOH	53	25.9
GBO	32	19.7
HAL	0	0.0
HAM	124	22.7
HDN	0	0.0
HKP	11	6.1
HPE	21	12.9
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	8	4.0
LAM	0	0.0
LGL	146	86.3
MSL	0	0.0
NIA	34	7.6
NPS	45	35.1
NWR	94	115.9
OTT	68	7.3
OXF	51	46.1
PDH	0	0.0
PEE	234	16.9
PQP	17	19.6
PTC	126	90.7

PHU	Cases (n)	*Rates
REN	22	20.9
SMD	204	38.2
SUD	93	46.6
THB	29	18.7
TOR	531	19.2
TSK	11	31.8
WAT	73	13.7
WDG	89	32.0
WEC	70	17.4
YRK	108	9.8
Ontario	**2449**	**18.1**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/07/09].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 56.

Verotoxin-producing E.coli

General overview for 2014

Incidence and comparison to Canada (Figure 56-1): In 2014, there were 127 confirmed cases of verotoxin-producing *E. coli* infections (VTEC) in Ontario, representing an incidence rate of 0.9 cases per 100,000 population. Overall, annual incidence rates of VTEC in Ontario declined over the last ten years, with rates remaining below the Canadian rates for the period 2005-13.

Age and sex (Figure 56-2): The highest incidence rates were observed among children under ten years of age. The challenges of maintaining good hygiene practices for young children, as well as the increased likelihood of parents seeking health care for their children may account for the higher incidence observed among the younger age groups. There were no apparent differences in incidence rates between males and females across age groups.

Seasonal trends (Figure 56-3): VTEC tends to follow a seasonal pattern, with an increase in the warmer months. In 2014, 62.2% of cases (79/127) were reported between June and September.

Serotypes: Of the 121 confirmed VTEC cases in 2014 where serotype information was available, 109 (90.1%) were *E. coli* O157. However, non-O157 VTEC serotypes are likely underrepresented in Ontario data as testing for these serotypes is not routinely conducted. Testing for non-O157 VTEC can be requested from the Public Health Ontario Laboratory if clinically suspected (e.g., for cases of hemolytic uremic syndrome (HUS) or severe bloody diarrhea where *E. coli* O157 has not been identified).[86]

Geographic distribution (Map 56-1): The highest incidence rates were reported by Perth District (6.4 cases per 100,000 population), Huron County (5.1 cases per 100,000 population), and Oxford County (4.5 cases per 100,000 population). Due to population size, the highest number of cases were reported by Toronto (21 cases), Peel Region (14 cases), and York Region (12 cases).

Hospitalizations and deaths: Hospitalization was reported for 29.1% (37/127) of cases and no deaths were reported.

2014 outbreak activity

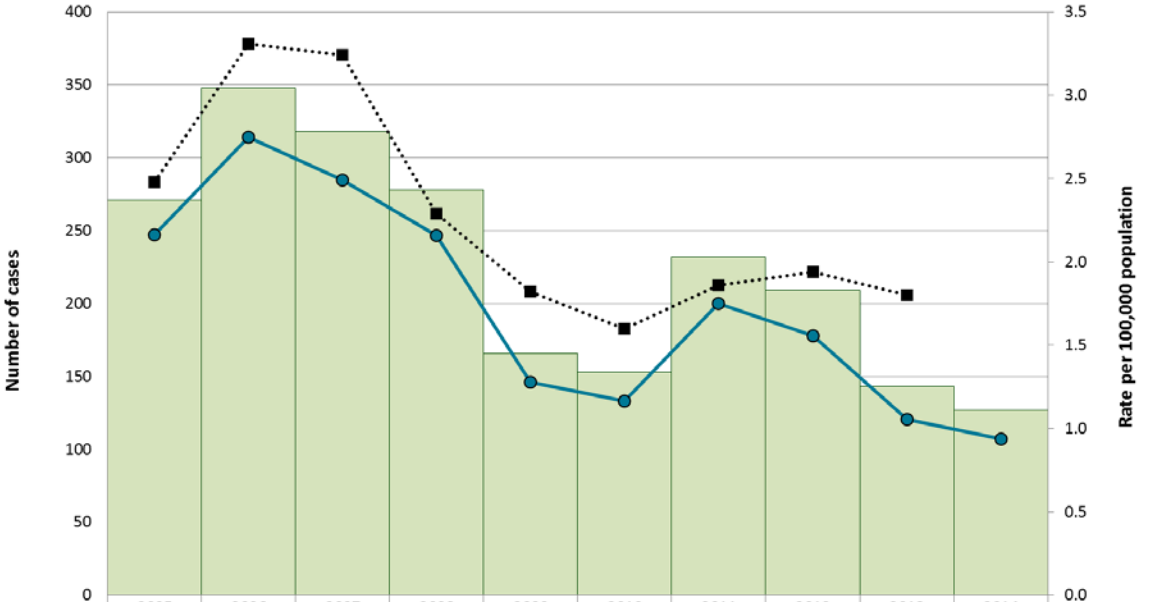
In March 2014, five cases of *E. coli* O157:H7 from Ontario were investigated as part of a national investigation of seven cases with onset dates from mid-February to early March 2014. The investigation failed to identify the source of the outbreak, although fast food exposures including consumption of ground beef and lettuce were investigated as potential causes of illness.[87]

Consumption of unpasteurized apple cider purchased from the same vendor was linked to *E. coli* O157:H7 infections in three confirmed and two epidemiologically linked (probable) cases in October 2014. The implicated apple cider was recalled and no further illnesses were associated with it.

Additional sources of information

- PHO's Monthly Infectious Diseases Surveillance Report, July 2013 edition (Volume 2, Issue 7)

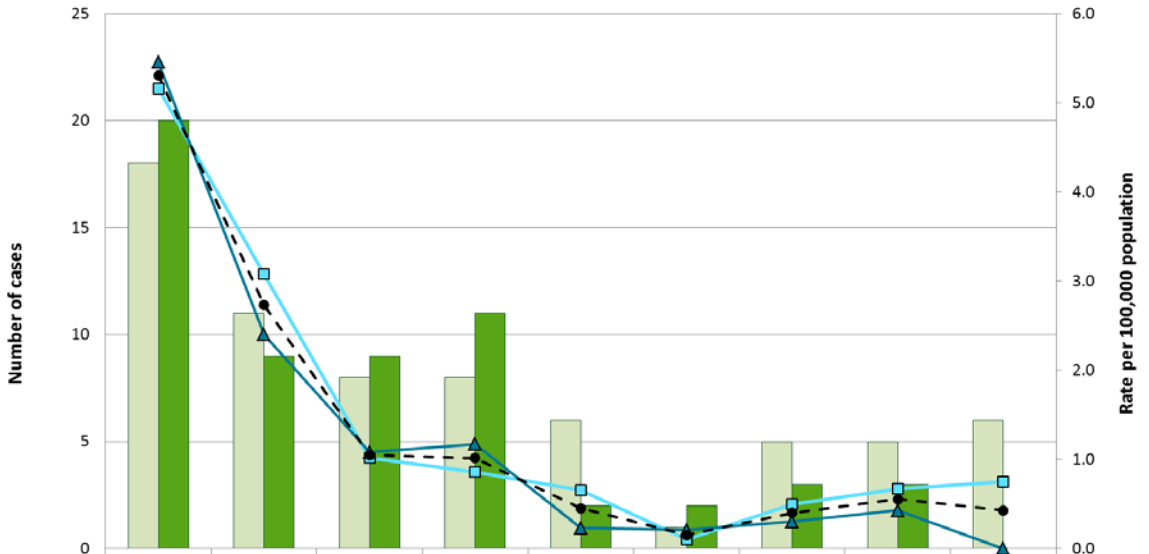
Figure 56-1. Incidence of VTEC: Ontario and Canada, 2005-—14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	271	348	318	278	166	153	232	209	143	127
Ontario Rate	2.2	2.7	2.5	2.2	1.3	1.2	1.7	1.6	1.1	0.9
Canada Rate	2.5	3.3	3.2	2.3	1.8	1.6	1.9	1.9	1.8	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2015/07/10]; national data available up to 2013.

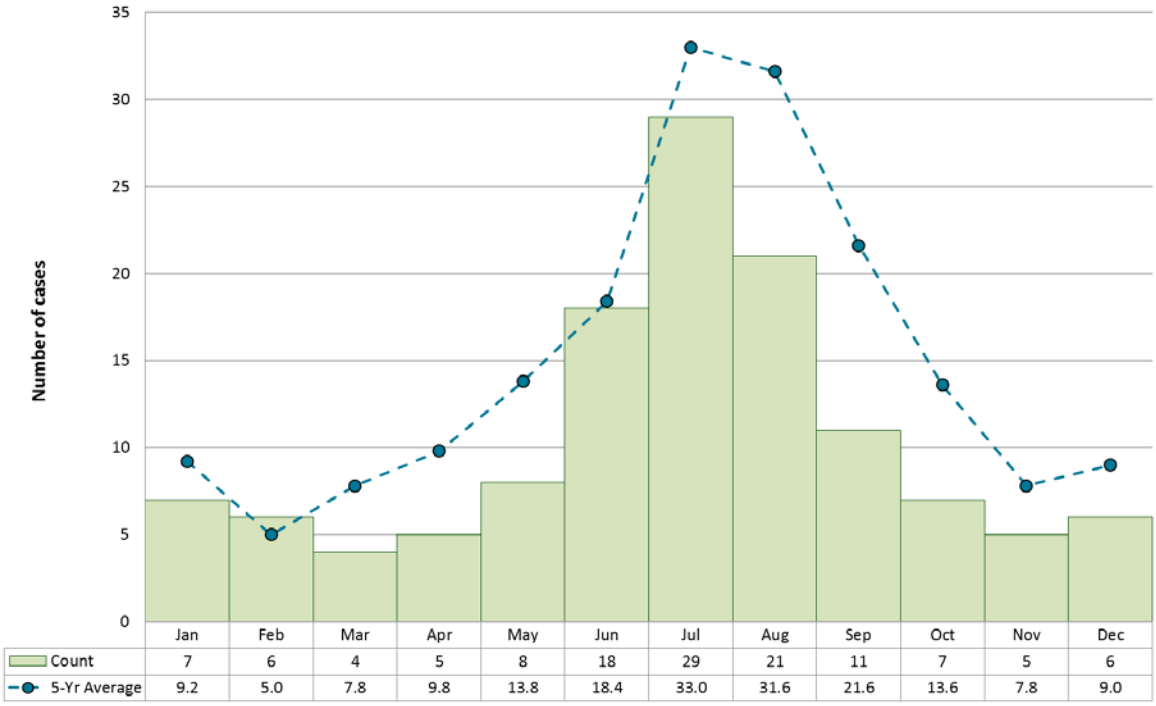
Figure 56-2. Incidence of VTEC by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	18	11	8	8	6	1	5	5	6
Male Count	20	9	9	11	2	2	3	3	0
Female Rate	5.2	3.1	1.0	0.9	0.7	0.1	0.5	0.7	0.8
Male Rate	5.5	2.4	1.1	1.2	0.2	0.2	0.3	0.4	0.0
Total Rate	5.3	2.7	1.0	1.0	0.4	0.2	0.4	0.6	0.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

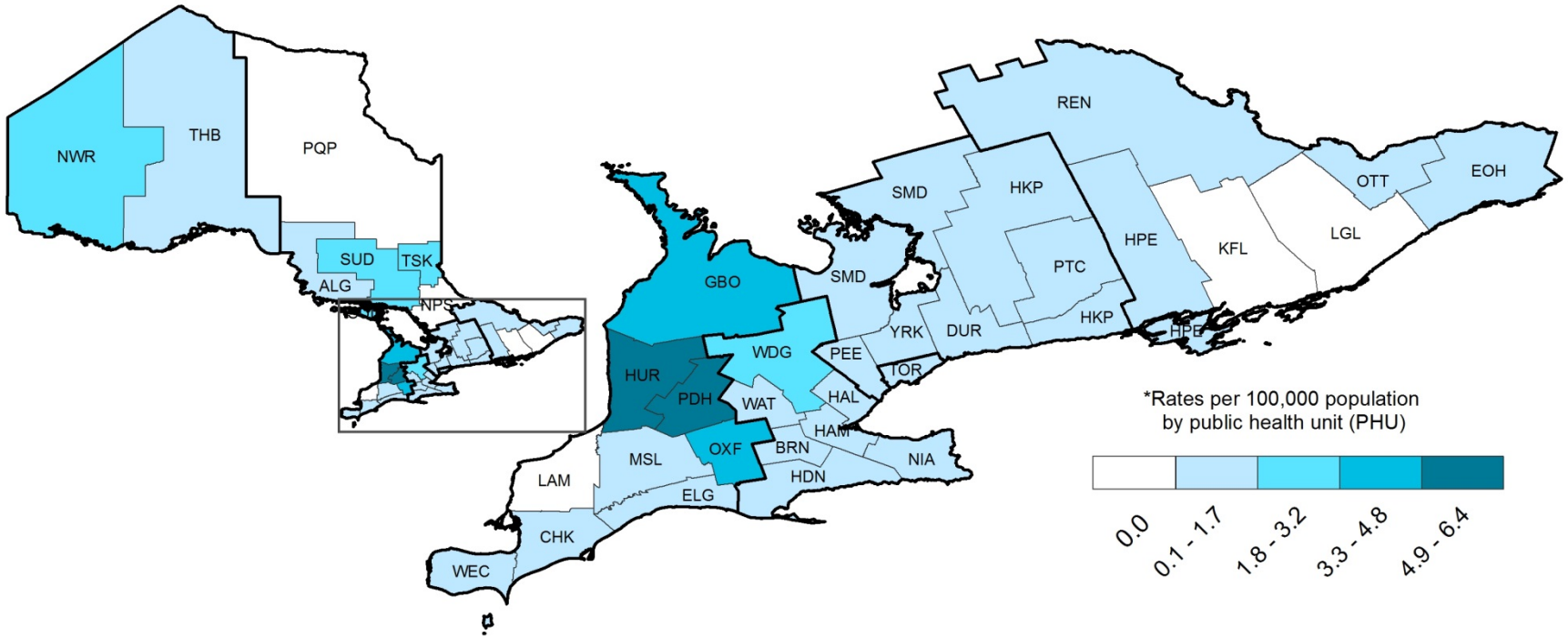
Figure 56-3. Number of VTEC cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	7	6	4	5	8	18	29	21	11	7	5	6
5-Yr Average	9.2	5.0	7.8	9.8	13.8	18.4	33.0	31.6	21.6	13.6	7.8	9.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 56-1. Incidence of VTEC by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	1	0.9
BRN	2	1.4
CHK	1	0.9
DUR	1	0.2
ELG	1	1.1
EOH	3	1.5
GBO	6	3.7
HAL	4	0.7
HAM	1	0.2
HDN	1	0.9
HKP	2	1.1
HPE	1	0.6
HUR	3	5.1

PHU	Cases (n)	*Rates
KFL	0	0.0
LAM	0	0.0
LGL	0	0.0
MSL	6	1.3
NIA	1	0.2
NPS	0	0.0
NWR	2	2.5
OTT	3	0.3
OXF	5	4.5
PDH	5	6.4
PEE	14	1.0
PQP	0	0.0
PTC	2	1.4

PHU	Cases (n)	*Rates
REN	1	0.9
SMD	3	0.6
SUD	5	2.5
THB	1	0.6
TOR	21	0.8
TSK	1	2.9
WAT	7	1.3
WDG	8	2.9
WEC	3	0.7
YRK	12	1.1
Ontario	**127**	**0.9**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

Chapter 57.

West Nile virus illness

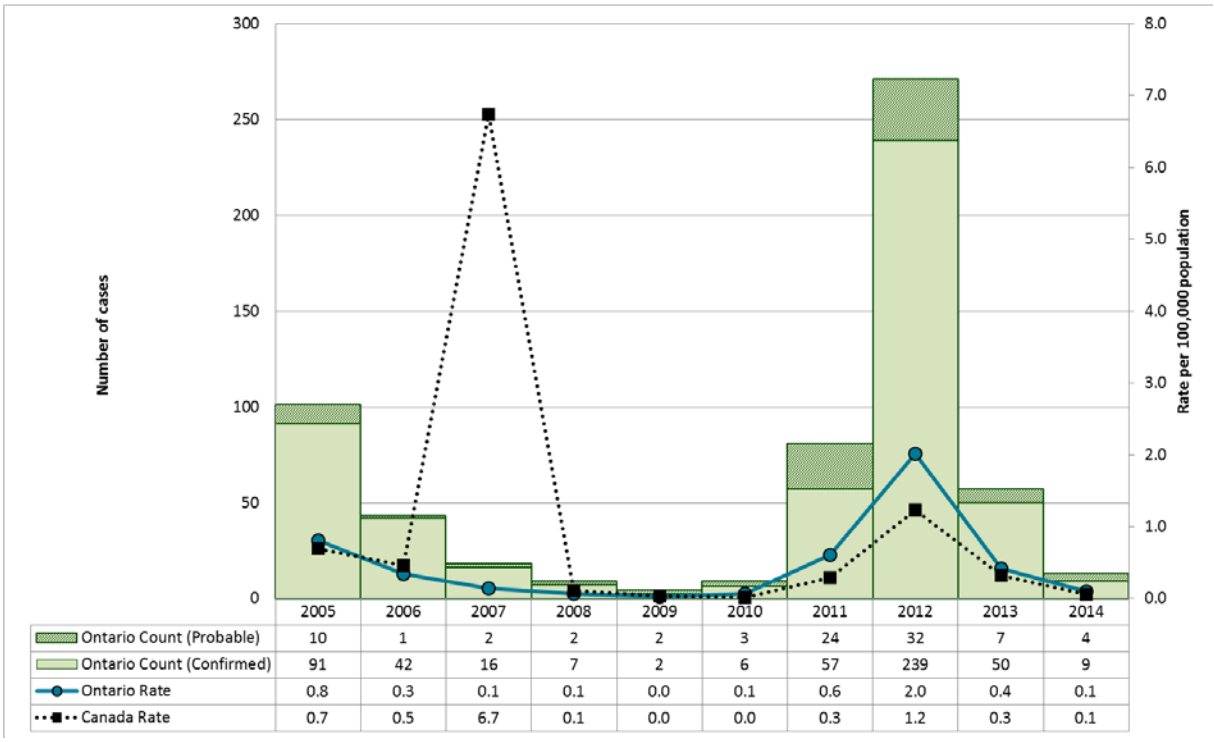
General overview for 2014

Incidence and comparison to Canada (Figure 57-1): In 2014, there were nine confirmed and four probable cases of West Nile virus (WNV) illness in Ontario, representing a combined incidence rate of 0.1 cases per 100,000 populations. Among the reported cases, five reported neurological symptoms, three reported non-neurological symptoms, one case was asymptomatic, and presenting symptoms were unspecified for four cases. Since reporting began in 2002, the incidence of WNV illness has fluctuated, with 2014 being one of the lowest incidence years. Nationally, the overall trend in the annual incidence of WNV illness from 2005 to 2014 was comparable to that of Ontario, but with notable differences in incidence rates in 2007, 2011 and 2012.

Additional sources of information

- PHO's Annual Vector-Borne Disease 2014 Summary Report
- PHO's Weekly WNV Surveillance Reports
- PHO's Monthly Infectious Diseases Surveillance Report, December 2012 edition (Volume 1, Issue 13)
- PHO's Guide for Public Health Units: Considerations for Adult Mosquito Control

Figure 57-1. Incidence of confirmed and probable West Nile virus illness: Ontario and Canada, 2005-–14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count (Probable)	10	1	2	2	2	3	24	32	7	4
Ontario Count (Confirmed)	91	42	16	7	2	6	57	239	50	9
Ontario Rate	0.8	0.3	0.1	0.1	0.0	0.1	0.6	2.0	0.4	0.1
Canada Rate	0.7	0.5	6.7	0.1	0.0	0.0	0.3	1.2	0.3	0.1

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03]. Incidence rates for Ontario are based on confirmed and probable case counts.
Canadian Cases: National Counts [2005-2014], Public Health Agency of Canada, Canadian Notifiable Disease Section, accessed by PHO [2015/10/06].
Canadian rates: National Population Estimates [2005-2014], Statistics Canada, Table 051-0001 - Estimates of population, by age group and sex for July 1, Canada, provinces and territories, annual, CANSIM (database), accessed by PHO [2015/10/06].

Chapter 58.

Yellow fever

General overview for 2014

Incidence: In 2014, there were three confirmed cases of yellow fever reported in Ontario, corresponding to an incidence rate of 0.2 cases per 1,000,000 population.

Two cases were reported in 2012, the only other year since 2005 in which confirmed cases were reported. All five cases of yellow fever reported in the ten-year period from 2005 to 2014 have been travel-related.

Chapter 59.

Yersiniosis

General overview for 2014

Incidence (Figure 59-1): In 2014, there were 146 confirmed cases of yersiniosis in Ontario, representing an incidence rate of 1.1 cases per 100,000 population. Annual incidence rates for yersiniosis declined by approximately 60% over the ten-year period from 2005 to 2014. No national data are available because yersiniosis is not a nationally notifiable disease.

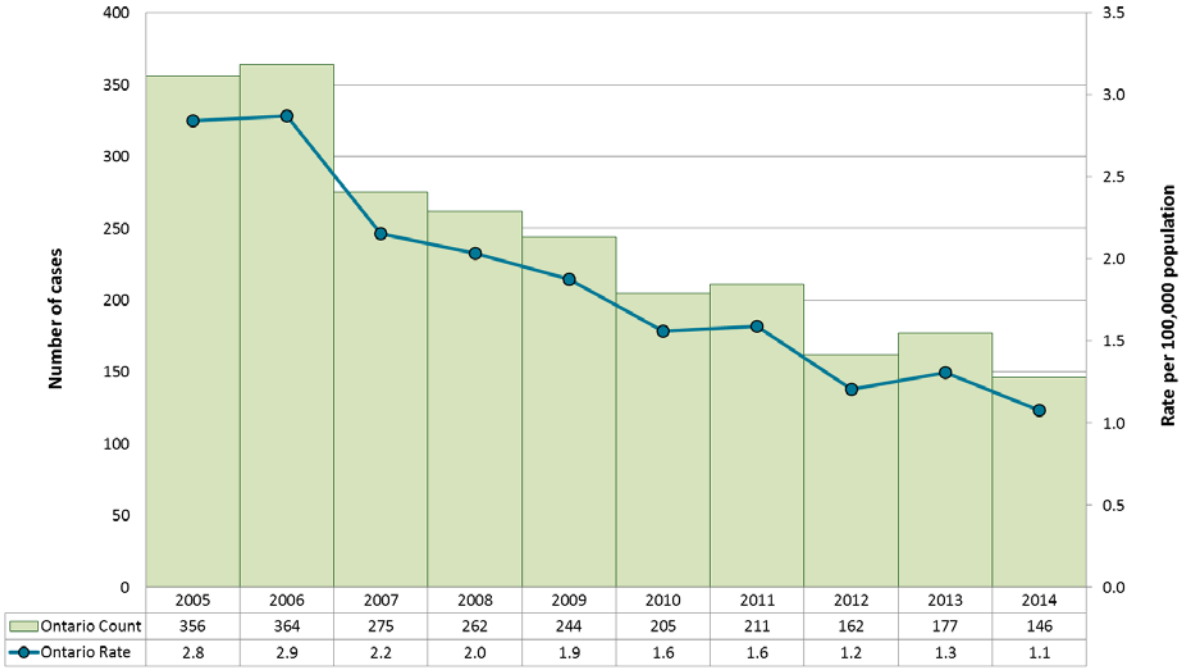
Age and sex (Figure 59-2): The highest overall incidence rates were observed in the 0- 4 and 5-9 year age groups (5.3 and 2.9 cases per 100,000 population, respectively). Incidence rates by sex differed across the age groups, with no discernable pattern.

Seasonal trends (Figure 59-3): Although a seasonal increase for yersiniosis tends to occur during the winter in temperate climates,[88] such an increase was not observed in Ontario in 2014. However, from May through to July, the number of cases reported was higher than the five-year historical monthly average.

Geographic distribution (Map 59-1): The highest incidence rates were reported by Timiskaming (2.9 cases per 100,000 population), York Region (2.8 cases per 100,000 population) and Northwestern (2.5 cases per 100,000 population). However, due to larger populations, the highest number of cases were reported in Toronto (45 cases), York Region (31 cases), and Peel Region (14 cases), which together represented 61.6% (90/146) of yersiniosis cases reported in 2014.

Hospitalizations and deaths: Hospitalization was reported for 4.1% (6/146) of cases and no deaths were reported.

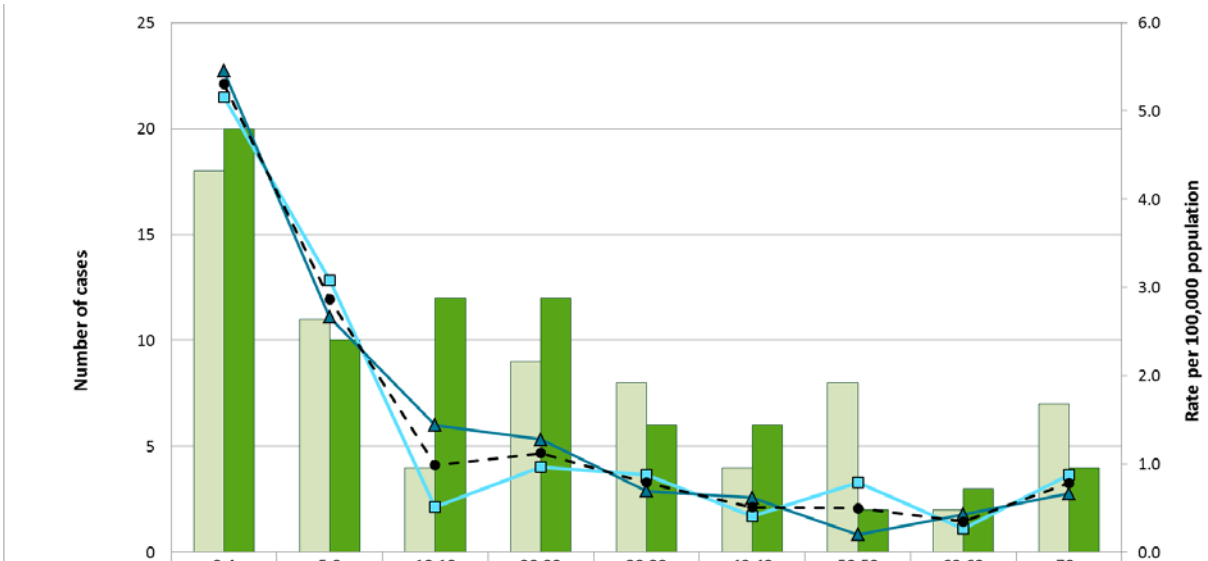
Figure 59-1. Incidence of yersiniosis: Ontario, 2005-–14



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ontario Count	356	364	275	262	244	205	211	162	177	146
Ontario Rate	2.8	2.9	2.2	2.0	1.9	1.6	1.6	1.2	1.3	1.1

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2005-13], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

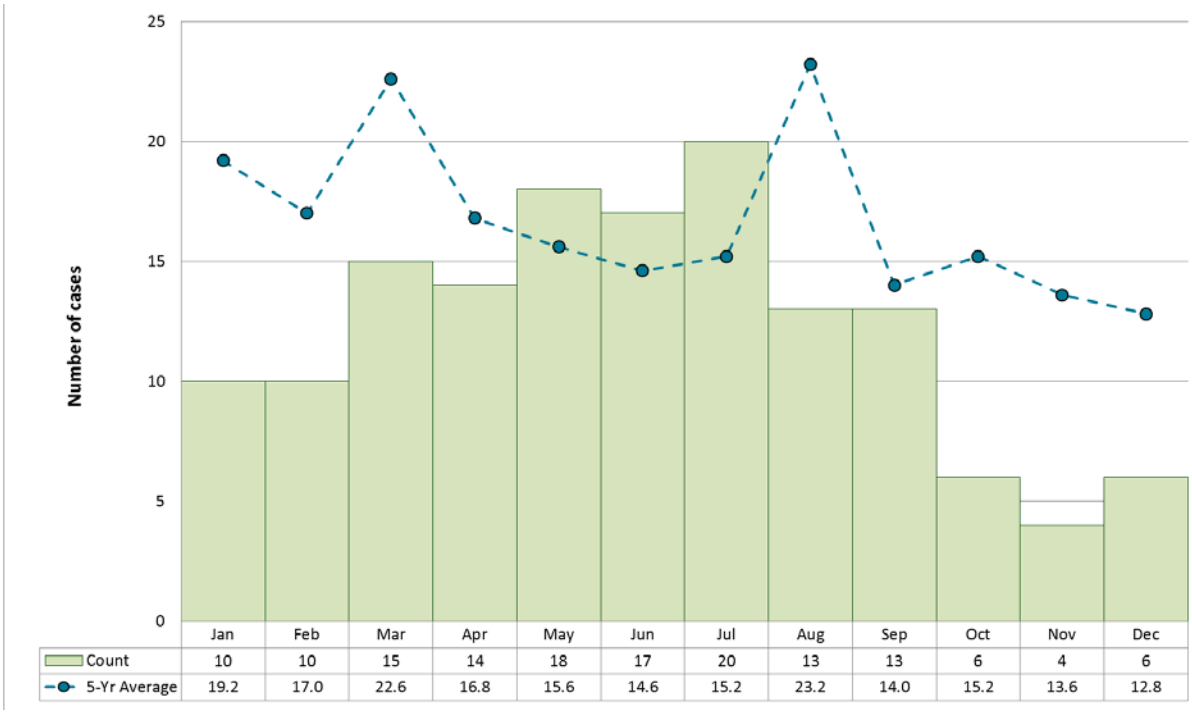
Figure 59-2. Incidence of yersiniosis by age and sex: Ontario, 2014



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	18	11	4	9	8	4	8	2	7
Male Count	20	10	12	12	6	6	2	3	4
Female Rate	5.2	3.1	0.5	1.0	0.9	0.4	0.8	0.3	0.9
Male Rate	5.5	2.7	1.4	1.3	0.7	0.6	0.2	0.4	0.7
Total Rate	5.3	2.9	1.0	1.1	0.8	0.5	0.5	0.3	0.8

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

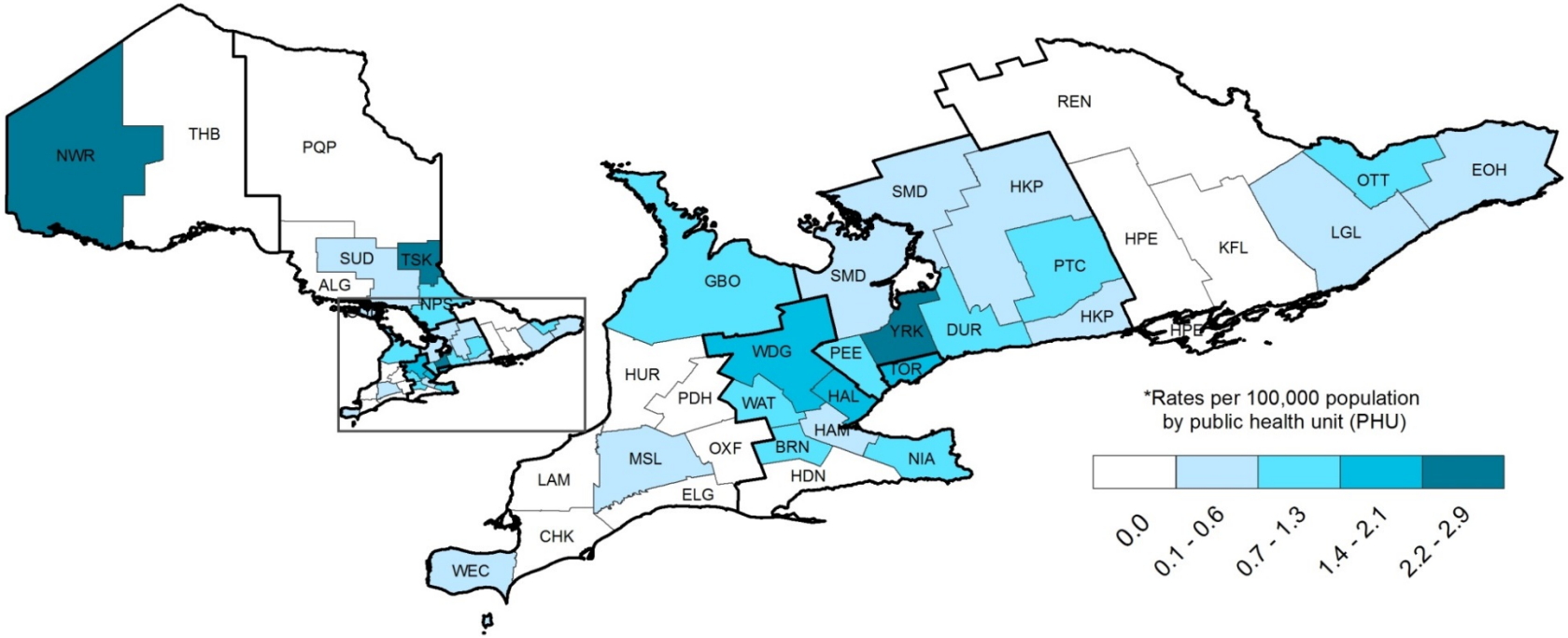
Figure 59-3. Number of yersiniosis cases by month: Ontario, 2014



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	10	10	15	14	18	17	20	13	13	6	4	6
5-Yr Average	19.2	17.0	22.6	16.8	15.6	14.6	15.2	23.2	14.0	15.2	13.6	12.8

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
5-Yr Average: Represents the five-year (2009-13) average of the number of cases reported in the corresponding month.

Map 59-1. Incidence of yersiniosis by public health unit of residence: Ontario, 2014



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	1	0.7
CHK	0	0.0
DUR	5	0.8
ELG	0	0.0
EOH	1	0.5
GBO	2	1.2
HAL	9	1.7
HAM	1	0.2
HDN	0	0.0
HKP	1	0.6
HPE	0	0.0
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	0	0.0
LAM	0	0.0
LGL	1	0.6
MSL	2	0.4
NIA	4	0.9
NPS	1	0.8
NWR	2	2.5
OTT	8	0.9
OXF	0	0.0
PDH	0	0.0
PEE	14	1.0
PQP	0	0.0
PTC	1	0.7

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	2	0.4
SUD	1	0.5
THB	0	0.0
TOR	45	1.6
TSK	1	2.9
WAT	6	1.1
WDG	5	1.8
WEC	2	0.5
YRK	31	2.8
Ontario	**146**	**1.1**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2015/05/13].
Ontario Population: Population Estimates [2013], Statistics Canada, distributed by MOHLTC, received [2014/07/03].

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Appendix 1
Technical notes

Data sources

Ontario reportable disease data

The main source for reportable diseases data in this report is the integrated Public Health Information System (iPHIS), the electronic reporting system for reportable diseases in Ontario. iPHIS replaced the Reportable Diseases Information System (RDIS) and was implemented in phases throughout 2005 starting on April 1, with full implementation by all 36 local public health units (PHUs) by the end of that year.

Reporting

In Ontario, over 70 diseases have been specified as reportable under Regulation 559/91 pursuant to the *Health Protection and Promotion Act* (HPPA), R.S.O 1990. Health care providers, laboratories, and other individuals (including school principals and superintendents of institutions) with a duty to report reportable diseases must make such reports to the local public health unit within which they operate. Public health units provide case management services in accordance with the HPPA, Ontario Regulation 569, the Ontario Public Health Standards, and the Infectious Diseases Protocol to persons in their jurisdiction with reportable diseases. Required case data are subsequently reported to the province through iPHIS.

Laboratory confirmation

Laboratory confirmation of reportable diseases most frequently occurs at public health laboratories operated by PHO. For some diseases, laboratory confirmation can take place at hospitals or private laboratories as well. In other instances, reference services and specialized testing of clinical specimens takes place at reference laboratories across Canada.

Data extraction

The iPHIS data used in this report were extracted May 13, 2015 except as noted. Data for *Clostridium difficile* infection outbreaks were extracted from iPHIS on July 7, 2015 and on September 23, 2015 for chronic hepatitis B infections. Historical counts for influenza for the 2003–04, 2008–09, and 2009–10 seasons were extracted from iPHIS on November 13, 2013. For the 2008–09 and 2009–10 seasons, during which the influenza A(H1N1)pdm09 pandemic took place, aggregate reporting was used to report many influenza A(H1N1)pdm09 cases; these historical counts were compiled based on data extracted on September 3, 2009, September 9, 2010, and August 10, 2011, and represent a combination of aggregate and case level data for all influenza types.

For selected diseases, additional data sources were used to supplement iPHIS data to increase either completeness of case ascertainment or data quality:

- For invasive *Haemophilus influenzae* type B disease (Hib) and invasive meningococcal disease (IMD), iPHIS data were linked to Public Health Ontario Laboratories (PHOL) data to identify additional confirmed cases of disease and to help to rule out cases that were incorrectly classified. Due to some degree of under-reporting in iPHIS and the use of additional data from PHOL, the case counts presented during these years may not be consistent with case counts derived solely using iPHIS data. Further information regarding linkage is included in the disease-specific chapters for Hib and IMD.

- For influenza and legionellosis, PHOL percent positivity data were extracted from the Laboratory Information Management System (LIMS) on September 14, 2014 and September 10, 2015, respectively. For chlamydia and gonorrhea, percent positivity data were downloaded from STI Online on September 21, 2015, based on data extracted from LIMS on July 31, 2015.

- For varicella, in addition to the 2007-14 data that were extracted from iPHIS, 1993-2004 RDIS data were downloaded from the eHealth Ontario Portal on May 24, 2012 (see below for additional information on varicella under the section "Descriptive Measures: Case counts: Varicella").

Population and live birth data

IntelliHEALTH Ontario is a repository of health-related data that describes the population and delivery of health care services in Ontario. Population and live birth counts for Ontario are originally sourced from Statistics Canada, and were obtained either from the Ontario Ministry of Health and Long-Term Care (MOHLTC) or through IntelliHEALTH Ontario. General population estimates were received from MOHLTC on July 3, 2014. Live birth data were extracted by PHO from IntelliHEALTH Ontario on November 29, 2013. These two sources of population data were used as denominators to calculate overall, age-, sex- and PHU-specific crude incidence rates, where applicable. The general population estimates and the live birth data used in this report were the most current available to PHO at the time of report writing. Therefore, incidence rates for 2014 are based on the 2013 population estimates or live birth data.

National comparator data

Comparator incidence rates for Canada are provided in the report whenever available. These data were obtained directly from the Canadian Notifiable Disease Section of the Public Health Agency of Canada (PHAC) on July 10 2015. For influenza, West Nile Virus illness (WNV), HIV/AIDS, Creutzfeldt-Jakob disease (CJD) and acute flaccid paralysis (AFP), comparator incidence rates for Canada were obtained from the PHAC disease-specific program area or website.

For most diseases in this report, comparator incidence rates for Canada are presented for the years 2005 to 2013 in trend over time graphs. Depending on the disease and when it became nationally notifiable, national incidence rates may not be available for all or a part of this period. As a result, comparisons between trends in provincial and national incidence rates are made only for years for which national incidence rates are provided. National rates are also not provided for diseases where the data provided do not distinguish between different forms of the disease, such as syphilis (i.e., infectious and non-infectious) and hepatitis B (i.e., acute and chronic) or between aggregate and individual reporting of cases (i.e. varicella).

Incidence rates for Canada presented in this report may differ from reports published by PHAC. Where such discrepancies exist, incidence rates published in more recent national reports supersede those in this report. A list of diseases that are nationally notifiable can be found on PHAC's website.

Case definitions

Appendix 2 lists the reportable diseases and associated case classifications that were reportable in Ontario for 2014. Current provincial case definitions are available online in Appendix B of the Infectious Diseases Protocol. Please note that some of the definitions currently available online no longer reflect the case definitions that were in effect during 2014.

Changes to provincial surveillance case definitions and disease classifications have occurred over the years to reflect the changing epidemiology of infectious diseases and the use of more current laboratory diagnostic practices and technology. Cases are classified in iPHIS according to the MOHLTC surveillance case definitions used at the time the case was identified. PHUs are responsible for ensuring that cases reported to the province meet the relevant case definition. Consideration of changes to provincial case definitions and associated case classifications over time are important when interpreting disease trends presented in this report.

Case classifications

Unless otherwise stated, case counts include only the confirmed case classification. Probable cases are included in the total counts presented in this report for Lyme disease, mumps, pertussis, amebiasis, IMD, and West Nile Virus (WNV) illness. Reporting on probable cases for these diseases (except WNV illness) was

instituted following case definition changes in 2009 because cases that previously met the confirmed case definition were subsequently required to be reported as probable. For pertussis, cases reported as epi-linked confirmed are included in total case counts since these cases meet the provincial case definition for a confirmed case (i.e. a clinical case with an epidemiologic link to a laboratory-confirmed case).

- For Lyme disease, mumps, and pertussis, the impact of this change was substantial, such that probable cases since 2009 constituted a significant proportion of total case counts. As a result, probable case counts are included in total counts (since January 1, 2009 for Lyme disease, and since April 28, 2009 for mumps and pertussis) in order to ensure valid comparisons over time for these diseases.

- Probable cases since January 1, 2009 are included in counts for amebiasis owing to the change in interpretation of laboratory test results that previously reported the causative agent as *E. histolytica/E. dispar* with no distinction between the two. Cases with test results that do not differentiate between the non-pathogenic *E. dispar* and the pathogenic *E. histolytica* are now counted as probable, whereas they were previously counted as confirmed. The impact of this change was significant and as a result, probable case counts since 2009 are included in total counts to ensure valid comparisons over time for amebiasis.

- Probable cases since April 28, 2009 are included in counts for IMD to ensure comparability for assessing trends over time, since cases currently classified as probable would have been classified as confirmed prior to the case definition change in 2009.

For the vast majority of diseases similarly impacted by the 2009 case definition changes, the impact on overall counts was negligible and, as such, probable cases for these diseases are not included in this report.

For measles, rubella and congenital rubella syndrome (CRS), probable cases are excluded from the historical temporal trend despite being reportable at the provincial level, since these diseases have been eliminated from Canada and strict criteria are required to identify cases. No probable cases were reported in 2014 for these diseases.

For hepatitis B, confirmed acute cases are captured under the Classification Description of "CONFIRMED" in iPHIS. The confirmed chronic hepatitis B cases described in this report are those reported in iPHIS with the "CARRIER" Classification Description. When a case progresses from acute to chronic infection, PHUs create a chronic "CARRIER" case, in addition to the existing acute "CONFIRMED" case. Therefore, counts of acute and chronic hepatitis B cases are not mutually exclusive and should not be summed as this would result in double-counting of some cases.

Both AIDS and HIV cases are reported under the Disease field in iPHIS as "HIV/AIDS". HIV cases that have not progressed to AIDS have an Encounter Type and a Diagnosis Status of "CARRIER". HIV cases that progress to AIDS have an updated Encounter Type of "CASE" and an updated Diagnosis Status of "CONFIRMED". To determine accurate counts, cases of HIV/AIDS with either an Encounter Type of "CARRIER" and a Diagnosis Status of "CARRIER" or an Encounter Type of "CASE" and a Diagnosis Status of "CONFIRMED" are counted as HIV cases using the "Encounter Date" (the date the HIV encounter was reported). HIV/AIDS encounters with an Encounter Type of "CASE" and a Diagnosis Status of "CONFIRMED" are counted as AIDS cases based on the "Diagnosis Status Date" (the date the case was diagnosed with AIDS). Therefore, counts of AIDS and HIV cases are not mutually exclusive and should not be summed as this would result in double-counting of cases.

Descriptive measures

The descriptive measures used throughout the report to characterize the epidemiology of reportable infectious diseases in Ontario are listed below.

Case counts

This measure refers to the number of confirmed or probable cases of a disease reported in a calendar year or within a sub-group or during a specified time frame.

For tuberculosis (TB), only active cases are included in the reporting of confirmed cases (i.e., latent TB infections are not included), and for syphilis, only infectious cases (i.e., primary, secondary, early latent, and infectious neurosyphilis) and congenital cases are included in the reporting of confirmed cases.

For influenza, cases are counted in the influenza season within which they occurred, rather than by calendar year. Influenza seasons run from September 1 of one year to August 31 of the following year. For example, the 2012–13 influenza season started on September 1, 2012 and ended on August 31, 2013.

Varicella

For varicella, cases are reported provincially as both individual and aggregate cases. Additional information on determining case counts for varicella is available in the disease-specific chapter of the Infectious Diseases Protocol.

Clostridium difficile infection (CDI) outbreaks and cases

Details on determining counts for CDI outbreaks and cases are available in the disease-specific chapter of the Infectious Diseases Protocol.

Crude incidence rates (generally reported as rates per 100,000 population per year)

Crude incidence rates are calculated by dividing the total case count in a year by the total number of people at risk of acquiring the disease in that year. As specified in the "Case Classifications" section above, the total case count for some diseases may include confirmed and probable cases. In this report, most rates are presented per 100,000 population, unless otherwise specified. For instance, diseases where counts are too small for rates per 100,000 to be informative (e.g., if many of the incidence rates presented in a chapter are less than 0.1 cases per 100,000 population) may have rates presented per 1,000,000 population instead. The formulas for calculating overall and population-specific rates used throughout the report are noted below (using the example of rates presented in a specified time period per 100,000 population).

$$\frac{\text{Number of cases in specified time period and population}}{\text{Total number of people in that population during the same time period}} \times 100{,}000$$

Overall rate: Number of all new cases in a specified time period divided by the Ontario population for that time period, multiplied by 100,000.

Group-specific rate: Number of new cases in a sub-group (e.g., age group, sex, or PHU) in a specified time period divided by the population for that sub-group for that time period, multiplied by 100,000.

Neonatal rate: Number of new congenital or neonatal cases of a disease (cases occurring up to 28 days old) in a specified time period divided by the total number of live births for that time period, multiplied by 100,000.

Live births are used as the denominator to calculate incidence rates for neonatal diseases because the neonatal population count (up to 28 days old) could not be determined from available vital statistics data.

In general, incidence rate is defined as the number of new cases of disease occurring in a specified period. Throughout the report, the term "incidence rate" refers to an annual rate (e.g., the number of cases observed for every 100,000 Ontarians per year), unless otherwise specified. Cases are attributed to a particular year based on their episode date as outlined in the section "Data Management: Reference Period" below. There are some exceptions to reporting of incident cases; for example, HIV, chronic hepatitis B, hepatitis C, tuberculosis, late latent syphilis, and neurosyphilis are often undiagnosed for extended periods and their detection by public health is generally not indicative of the actual time the infection was acquired. Therefore in some instances, cases included in this report for a particular year are individuals who acquired their infections in earlier years, and the data represent new diagnosis rates

rather than rates of new infection. Therefore for hepatitis C, hepatitis B and HIV, the rates in this report are referred to as “reported rates” rather than “incidence rates”.

Public health unit distribution

Unless otherwise specified, this measure refers to the number of new cases reported by each PHU in 2013 (or a multi-year time period, where indicated). Crude incidence rates are also provided for each PHU, and are calculated as per the group-specific incidence rate formula described above.

Orientation of case counts by PHU is based on the Diagnosing Health Unit (DHU), which refers to the case's health unit of residence at the time of illness onset, and does not necessarily reflect the location of exposure or diagnosis. iPHIS Bulletin #13 provides additional detail on scenarios in which a health unit is considered the DHU.[89] Cases for which the DHU was reported as MOHLTC (to signify a case that is not a resident of Ontario) or Muskoka Parry Sound (a health unit that no longer exists) have been excluded.

Incidence rates by PHU are presented in both tables and maps, where a disease has sufficiently high enough counts to do so. In the maps, incidence rates are grouped into four categories; a fifth category representing zero incidence is included for some diseases (e.g., eliminated diseases such as measles and rubella; non-endemic diseases such as malaria; and diseases with relatively lower counts such as listeriosis). Generally, the categories for each disease are defined by splitting the range between zero and the highest PHU incidence rate into equal intervals. Where a disease has consistently high PHU incidence rates, such that the inclusion of zero in the range to define categories would affect the ability to illustrate meaningful variations between PHUs, the range may be defined based on the lowest and highest PHU incidence rates, with this range being divided into equal intervals.

Age distribution

Age groups for most diseases are based on standard five- and ten-year age groupings. For vaccine-preventable diseases, age groups are constructed with consideration of the epidemiology of the disease, and in some cases, the birth cohort(s) and implementation year of Ontario publicly funded immunization programs.

Monthly incidence

For selected diseases, the number of cases that occurred during each month in 2014 is compared to monthly averages for the previous five years/seasons. For influenza, the five-year monthly averages for comparison include only the non-pandemic seasons from 2005–2006 to 2011–2012. The influenza A(H1N1)pdm09 pandemic occurred during the 2008–2009 and 2009–2010 seasons, resulting in influenza counts that were significantly higher than non-pandemic seasons. Exclusion of these seasons allows for the determination of baseline monthly averages that are more in line with expected trends for non-pandemic seasons. For CDI, the number of outbreaks each month is compared to the monthly average outbreak count for the previous five years.

Immunization status

For vaccine-preventable diseases, immunization status is determined through an assessment of immunization administration dates that were entered in iPHIS. In the absence of any immunization dates, cases with an affirmative response to being “unimmunized” as a risk factor are classified as unimmunized. In the event administration dates and risk factors were not entered, the case is determined to have an unknown immunization status. The number of valid doses takes into consideration the related vaccination agent, appropriate interval between the most recent dose and onset of illness, and age at immunization, which varies among diseases.

Hospitalization

This measure refers to the proportion of cases that were reported as hospitalized. In this report, a case is considered hospitalized if at least one hospital admission date was recorded for the case of interest. It should be noted that under-reporting of hospitalizations may occur in iPHIS, as hospitalizations and admission dates may not always be reported, particularly if the case was hospitalized after follow up by the PHU.

Deaths

The case fatality ratio refers to the proportion of cases that were reported as fatal within a specified period. For most diseases described in this report, a case is counted as having died where an Outcome of "FATAL" is reported at the case level, except when the only type/cause of death (Type of Death for Outbreak module, Cause of Death for the STD module) entered in the iPHIS case record is "REPORTABLE DISEASE WAS UNRELATED TO CAUSE OF DEATH." For tuberculosis, any case with a Date of Death entered in iPHIS is counted as fatal, except when the only cause of death entered in the iPHIS case record is "REPORTABLE DISEASE WAS UNRELATED TO CAUSE OF DEATH." The criteria for TB are different from those of most other diseases because the TB module is set up differently in iPHIS, and the general criteria could not be applied. It should be noted that there may be variability among PHUs in terms of follow-up of cases to determine outcomes for all diseases as well as how the deaths are categorized in the type/cause of death fields.

Cases from 2014 for whom treatment is ongoing or the disease is chronic may become fatal at a point in time after the extraction of data; these deaths would not be reflected in this report. Case fatality data for hepatitis B, hepatitis C, HIV/AIDS, and TB are likely to be particularly impacted by this issue.

For CDI cases, any outbreak-linked confirmed cases that were reported with an outcome of fatal, or that had a date of death entered during the outbreak period, are counted as a fatal case; however, deaths reported are classified as "all-cause" and may or may not be directly attributable to CDI.

Subtype/serotype/serogroup/senotype

The number and proportion of cases that represent distinct variations of a specific species, subtype, serotype, serogroup, or genotype of a pathogen that causes a reportable disease are provided for select diseases.

Risk Factors

For CDI, the number and proportion of cases that reported each behavioural and medical risk factor are provided.

Analysis software

Data analysis and presentation for this report were completed using SAS version 9.3, and Microsoft Excel 2010 with the PowerPivot add-on. Identified differences in rates and counts from one period to another, between Ontario and Canada, and between population sub-groups are absolute and do not imply statistical significance.

Data management

Reference period

The majority of information in this report reflects the number of incident cases reported in Ontario through iPHIS with Episode Dates from January 1 to December 31, 2014. Unless otherwise specified, historical data cover the period from 2005 to 2013. Passive surveillance systems such as iPHIS generally accommodate the entry of several dates to estimate the symptom onset date when it is not available. In Ontario, cases of most reportable diseases are classified by time using the Episode Date, which is an estimate of the symptom onset date of disease. In order to determine the Episode Date, the following hierarchy is in place in iPHIS:

Symptom Onset Date
Specimen Collection Date
Lab Test Date (date laboratory testing was performed)
Reported Date (date the case was reported to the PHU).

During data extraction, the earliest available date in the hierarchy was selected as the episode date for each case. For example, if an onset date was entered, it was selected as the episode date instead of the specimen collection date, and so on. In some situations, the episode dates captured can be much later than the date of symptom onset (e.g., when the only date available is the reported date).

Two reportable diseases are not classified by time based on the Episode Date: AIDS/HIV and TB. For HIV, incident case counts are based on the Encounter Date, defined as the date a case became known to public health. AIDS and TB incident case counts are based on the Diagnosis Status Date and Diagnosis Date, which is the date of a case's diagnosis for AIDS and TB, respectively.

Case ascertainment criteria

This report includes all confirmed (and probable, as applicable) reports of reportable diseases made through iPHIS with an episode date in 2014 (or other appropriate date as noted above for HIV/AIDS and TB), with the following exclusions:

1. Cases who were not residents of Ontario at the time of diagnosis

Cases reported with a Disposition Status of "ENTERED IN ERROR," "DOES NOT MEET DEFINITION," "DUPLICATE-DO NOT USE," or any variation on these values

- Events reported as adverse events following immunization (AEFIs) and related data, which are published in a separate vaccine safety report
- Cases reported as encephalitis, meningitis, or food poisoning
- Institutional outbreaks of gastroenteritis (where the Aetiologic Agent was not "CLOSTRIDIUM DIFFICILE") and respiratory illness
- Severe acute respiratory syndrome (SARS).
- Cases with a missing outbreak number in iPHIS (i.e., sporadic cases should also have a "sporadic outbreak number" assigned in iPHIS).

Appendix 2 provides a list of all reportable diseases in Ontario for 2014, and notes the reportable diseases that are excluded from this report.

Re-infections and co-infections

For the majority of reportable diseases, immunity is not conferred following infection or wanes over time, resulting in continued susceptibility and potential for re-infection. It is assumed that cases representing re-infection, as opposed to relapse, were assessed by PHUs before entry into iPHIS based on several factors, including the time period between the two episodes, and the incubation period for the disease in question. As a result, data in this report are assumed to be representations of true re-infections or new episodes of a disease. Thus a single person with more than one episode of the same disease in a single year may contribute more than one case of a particular disease to the total provincial count for that year; for example, this may occur for individuals with chlamydia, gonorrhea, or salmonellosis. For diseases like *Salmonella*, co-infections with two different serotypes (e.g., *Salmonella* Typhimurium and *Salmonella* Hadar) are reported as two separate episodes of the reportable disease. In addition, co-infections with more than one etiologic agent at the same time (e.g., *Mycobacterium tuberculosis* complex and HIV) are reported as two different episodes, one for each reportable disease caused by the co-infecting agents.

Exposure determination - Vaccine-preventable diseases

For measles, rubella, and CRS, importation status is determined through a review of information entered in the exposures, risk factors, case notes, and comments fields in iPHIS.

Imported or import-related case

This definition applies to cases of measles, rubella and CRS. An imported case of measles or rubella is a person who travelled outside Canada 7-21 and 14-21 days prior to symptom onset for measles and rubella, respectively. These definitions were modified from those provided by PAHO to reference travel outside Canada rather than the Americas, and to be consistent with the incubation periods specified in Appendix A of the Infectious Diseases Protocol (Measles, April 2014; Rubella, January 2013).[90,91] An import-related case is one that resulted from transmission by an imported case (i.e., epidemiologically linked). For CRS, an imported case is one whose mother was outside **Canada** during the period when she may have had exposure to rubella that affected her pregnancy (from 23 days prior to conception or until week 24 of gestation).[92]

Data limitations

Accuracy of data

PHO provides PHUs with preliminary case counts for the previous year in February or March for review and cleaning. These data are subsequently re-extracted in May/June and reported to PHAC as Ontario's case counts for the previous year. However, iPHIS is a dynamic disease reporting system which allows ongoing updates to data previously entered. As a result, any data extracted from iPHIS, including the data used in this report, represent a snap shot at the time of extraction and may differ from previous or subsequent reports. Discrepancies in disease counts and rates provided in this report and other published data may exist due to:

- Enhanced data cleaning for this report for select analyses, such as the linkage of iPHIS and laboratory data and subsequent reconciliation in iPHIS
- Late reporting
- Local and/or provincial-led data cleaning initiatives; and
- Differences in data extraction dates.

Where such variability exists, data provided in the most recent version of this report, other PHO surveillance products (e.g., Monthly Infectious Diseases Surveillance Report), or published research may be a more appropriate source depending on how the methodology, data caveats, and/or extraction dates align with the intended use of the data.

Small counts

For some diseases, the observed variability in population-specific incidence rates should be interpreted with caution owing to small counts, which may be exacerbated by small denominators (population). For this reason, population-specific rates are not routinely presented for diseases with small overall counts. Instead, counts over time may be combined into larger totals to provide more stable point estimates of burden (e.g., total case count over ten years).

Under-reporting

Passive surveillance systems such as iPHIS that primarily rely on mandatory physician and laboratory reports of illness can be characterized by under-reporting of the true burden of illness. Case counts only represent known cases reported to PHUs and recorded in iPHIS. The resulting degree of under-reporting may vary from disease to disease due to a variety of factors such as disease awareness, medical care seeking behaviours, availability of health care, methods of laboratory testing, reporting behaviours, clinical practice, and severity of illness.[93,94] However, the extent of under-reporting for individual reportable diseases has not been fully assessed in Ontario.

Duplicates

The possibility of duplicates exists because duplicate sets are not identified and excluded unless they were resolved prior to data extraction either at the local or provincial level.

Missing data (data not reported by PHUs)

Data quality (completeness) for some fields is lower than others. Hospitalization and death are under-reported in iPHIS, with the degree of under-reporting influenced by the severity of illness and associated outcomes (e.g., less under-reporting if illness or outcomes are more severe) and the timing of the event (i.e., there is likely less under-reporting if hospitalization or death occurs shortly after symptom onset, or before investigation of the case is complete). Under-reporting of risk factors, immunization status, and specific laboratory data items (e.g., serotype, genotype) also occurs frequently. In general, the degree of under-reporting is influenced by a combination of factors including incomplete follow-up of cases (e.g., case is not reachable), incomplete or late entry of data in iPHIS, and the occurrence of outcomes after follow-up has been completed. A high proportion of missing or incomplete data may result in conclusions or interpretations that are not representative of all cases. In this report, missing data may be handled in one of four ways:

1. Reporting the number or proportion of cases with missing data to provide perspective (e.g., age, sex)
2. Suppressing the data altogether
3. Excluding missing counts from the denominator when determining proportions; and
4. Merging data from multiple data sets or fields to create more complete data.

Appendix 2

Reportable diseases and reportable classifications: Ontario, 2014

Reportable diseases as specified under Ontario Regulation 559/91 and amendments under the *Health Protection and Promotion Act*.

Reportable disease	Reportable case classifications		
	Confirmed	Probable	Suspect
Acquired immunodeficiency syndrome (HIV/AIDS)	✓	×	×
Acute Flaccid Paralysis (AFP)[6]	✓	×	×
Adverse events following immunization (AEFIs)[2]	✓	×	×
Amebiasis[1,7]	✓	✓	×
Anthrax	✓	✓	✓
Botulism	✓	✓	✓
Brucellosis	✓	✓	×
Campylobacter enteritis	✓	✓	×
Chancroid	✓	✓	×
Chickenpox (Varicella)	✓	×	×
Chlamydia trachomatis infections	✓	×	×
Cholera	✓	✓	×
Clostridium difficile Infection (CDI) outbreaks in public hospitals	✓	×	×
Cryptosporidiosis	✓	✓	×
Cyclosporiasis	✓	✓	×
Cytomegalovirus (CMV) infection, congenital[3]	✓	✓	×
Diphtheria	✓	✓	×
Encephalitis[2] • Primary, viral • Post-infectious • Vaccine-related • Subacute sclerosing panencephalitis • Unspecified	✓	✓	×
Food poisoning, all causes[2]	✓	✓	✓
Gastroenteritis, institutional outbreaks[4]	N/A	N/A	N/A
Giardiasis	✓	✓	×
Gonorrhea	✓	×	×
Group A Streptococcal disease, invasive (iGAS)	✓	✓	×
Group B Streptococcal (GBS) disease, neonatal	✓	✓	×
Haemophilus influenzae b disease (Hib), invasive	✓	✓	×
Hantavirus pulmonary syndrome (HPS)	✓	×	×
Hemorrhagic fevers, including: • Ebola virus disease	✓	✓	✓

Reportable disease	Reportable case classifications		
	Confirmed	Probable	Suspect
• Marburg virus disease • Other viral causes			
Hepatitis A	✓	✓	×
Hepatitis B[5]	✓	×	×
Hepatitis C	✓	×	×
Hepatitis D (Delta hepatitis)[3]	✓	×	×
Herpes, neonatal[3]	✓	×	×
Influenza	✓	×	×
Lassa fever	✓	✓	✓
Legionellosis	✓	✓	×
Leprosy	✓	✓	×
Listeriosis	✓	✓	×
Lyme disease[1,7]	✓	✓	×
Malaria	✓	✓	×
Measles	✓	✓	×
Meningitis, acute[2] • Bacterial • Viral • Other	✓	✓	×
Meningococcal disease, invasive (IMD) [7]	✓	✓	×
Mumps[1,7]	✓	✓	×
Ophthalmia neonatorum	✓	✓	×
Paralytic Shellfish Poisoning (PSP)[6]	✓	✓	×
Paratyphoid fever	✓	✓	×
Pertussis (whooping cough)[1,7]	✓	✓	×
Plague	✓	✓	×
Pneumococcal disease, invasive (IPD)	✓	×	×
Poliomyelitis, acute	✓	✓	×
Psittacosis/Ornithosis	✓	✓	×
Q-fever	✓	✓	×
Rabies	✓	✓	×
Respiratory infection outbreaks in institutions[2]	N/A	N/A	N/A
Rubella	✓	✓	×
Rubella, congenital syndrome[8]	✓	✓	×
Salmonellosis	✓	✓	×
Severe acute respiratory syndrome (SARS)[2]	✓	✓	×
Shigellosis	✓	✓	×
Smallpox	✓	✓	✓
Syphilis, infectious	✓	×	×
Tetanus	✓	×	×
Transmissible spongiform encephalopathy, including: • Creutzfeldt-Jakob disease (CJD), all types	✓	✓	✓
Trichinosis	✓	✓	×

Reportable disease	Reportable case classifications		
	Confirmed	Probable	Suspect
Tuberculosis	✓	×	✓
Tularemia	✓	✓	×
Typhoid fever	✓	✓	×
Verotoxin-producing *E. coli* infection indicator conditions (VTEC), including Hemolytic Uremic Syndrome (HUS)	✓	✓	×
West Nile Virus (WNV) illness[1,7]	✓	✓	×
Yellow Fever	✓	✓	×
Yersiniosis	✓	✓	×

Source: MOHLTC. Infectious Diseases Protocol, 2013. Appendix B: Provincial Case Definitions.
✓ Reportable classifications; × Non-reportable classifications.
1: Routine reporting of case counts at the provincial level includes both confirmed and probable cases; confirmed cases only are for the other reportable diseases.
2: Reportable diseases not included in this report.
3: Note that these diseases were removed from the Ontario Reportable Disease List on December 4, 2013.
4: Under this reportable disease, only CDI outbreaks in long-term care homes (LTCHs) are included in this report.
5: Chronic Case (carrier) classification added in 2012.
6: These diseases were added to the Ontario Reportable Disease List on December 4, 2013.
7: Both confirmed and probable cases of these diseases are included in this report.
8: Probable classification became reportable as of January 2013, but probable cases are not included in this report; refer to the Case Classifications section above for more details.

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