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Reportable Disease Trends in Ontario

2012

Technical Report
December 2014

Public Health Ontario

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Reportable Disease Trends in Ontario

2012

Contributing Authors

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Acknowledgements

Surveillance Services wish 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 the Communicable and Infectious Diseases department, Analytic Services, Communications, Library Services, and Public Health Ontario Laboratories for their collaboration in the development, review, and interpretation of the reportable disease trends presented here.

November 2014

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.

Contents

List of Figures

List of Tables

List of Maps

Report introduction

About this report

The 2012 Reportable Diseases 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 as follows:

- To summarize infectious diseases in Ontario in 2012 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.

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 2012 cases, along with brief commentary, interpretation, and references to other related Public Health Ontario (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 provincial-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 a more appropriate source 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 Appendix 1: Technical notes.

The 2012 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 2012 report to help us make future editions more useful to you. Please contact Surveillance Services at SurveillanceServices@oahpp.ca.

List of acronyms

AIDS – Acquired Immunodeficiency Syndrome

CDI – *Clostridium difficile* infection

CFA – Complete-for-age

CFA-not VP – Complete-for-age, not vaccine-preventable

CFA-VF – Complete-for-age, vaccine failure

CJD – Creutzfeldt-Jakob disease

CJDSS – Canadian CJD Surveillance System

CMV – Cytomegalovirus

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*

HUS – Haemolytic 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

LIMS – Laboratory Information Management System

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

NAP1 – North American Pulsed Field type 1 (*C. difficile* strain)

NML – National Microbiology Laboratory

OICC – Outbreak Investigation Coordination Committee

ON-OICC – Ontario Outbreak Investigation Coordination Committee

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 Laboratories

PHU – Public health unit

RDIS – Reportable Diseases Information System

RSV – Respiratory syncytial virus

STI – Sexually transmitted infections

TB – Tuberculosis

VHFs – Viral hemorrhagic fevers

VTEC – Verotoxin-producing *E. coli* infections

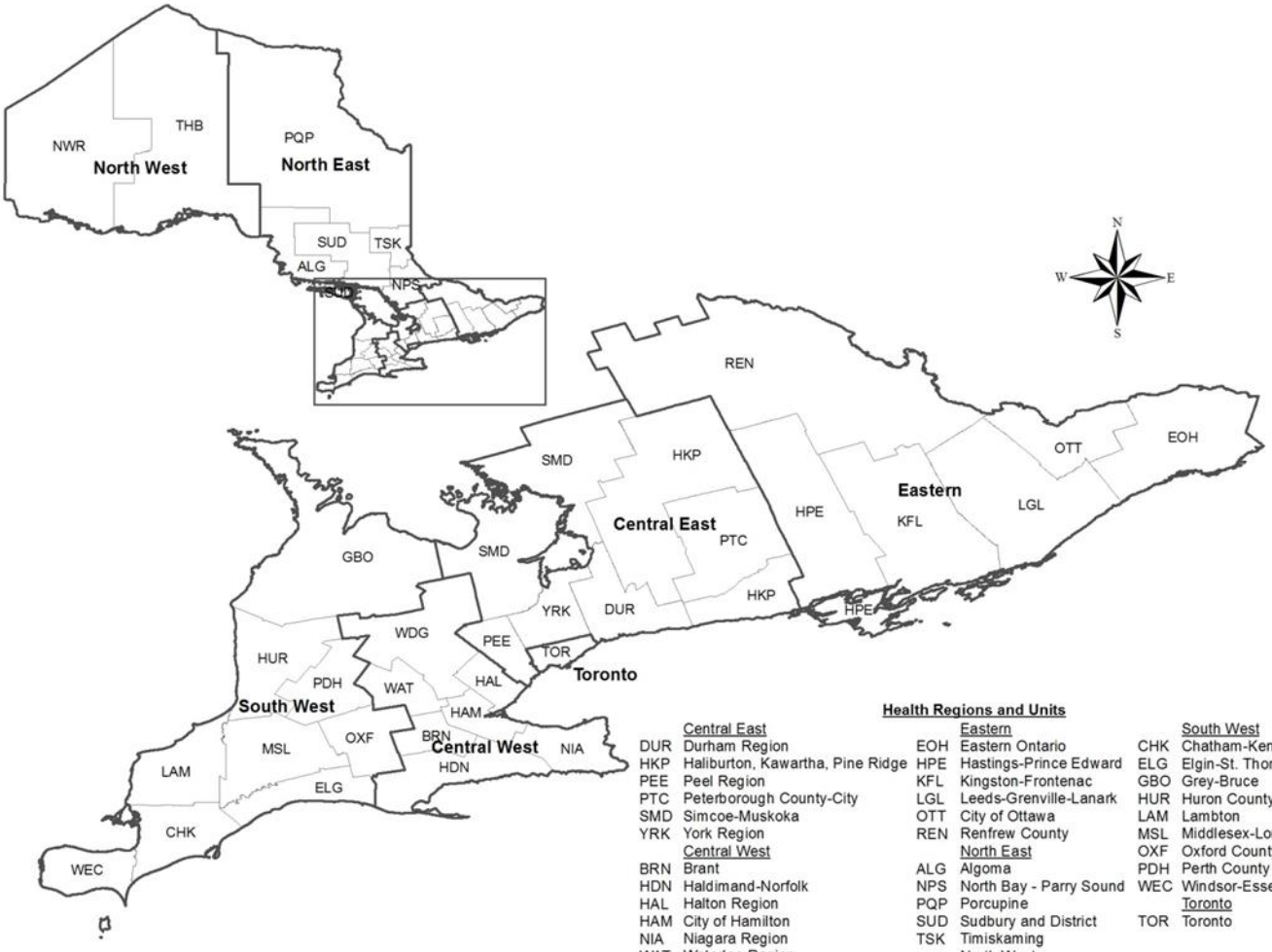
WHO – World Health Organization

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

Human Immunodeficiency Virus (HIV)

In 2012, 781 cases of HIV were reported in Ontario, corresponding to an incidence rate of 5.8 cases per 100,000 population (Figure 1-1). The incidence rate of HIV was relatively stable from 2003 to 2006, and then decreased by 28.0% from 8.0 cases per 100,000 population in 2006 to 5.8 cases per 100,000 population in 2012. Provincial incidence rates were higher than national rates from 2003 to 2007, but have been similar to the rest of Canada since 2008.

In 2012, males accounted for 77.3% (604/781) of reported HIV cases in Ontario (Figure 1-2). The incidence rate of HIV among males (9.1 cases per 100,000 population) in 2012 was more than 3.5 times higher than the incidence rate among females (2.6 cases per 100,000 population). Overall, cases ranged in age from 6 to 84 years. Among males, the incidence of HIV was highest among those in the 25–29, 30–39, and 40–49 year age groups; among females, the incidence was highest among those in the 30–39 year age group.

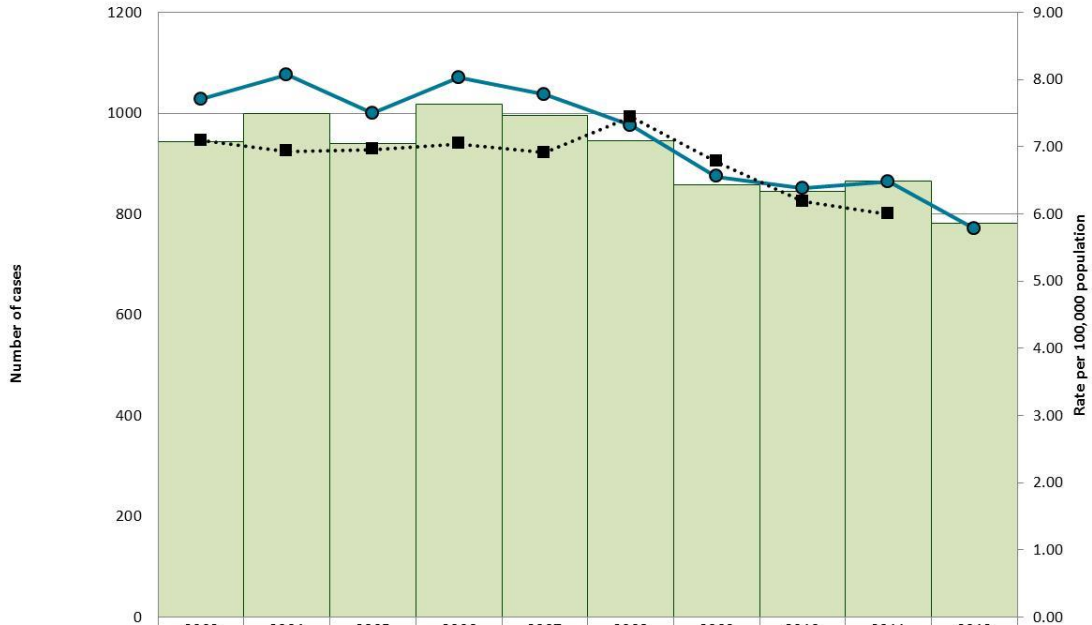
Cases of HIV were reported in 29 public health units, with 63.4% of cases (495/781) reported in Toronto (Map 1-1). The public health units reporting the highest incidence rates of HIV in Ontario in 2012 were Toronto, Sudbury and District, and Middlesex-London, with 17.7, 8.1, and 6.3 cases per 100,000 population, respectively.

Two cases of HIV were fatal in 2012 and had HIV identified as a contributing cause of death; however, they were not recorded in iPHIS as AIDS cases. It is likely that these cases had an AIDS indicative disease and that this information was not captured in iPHIS.

There are several challenges associated with HIV surveillance. HIV incidence rates may not always reflect new cases of infection, as individuals with HIV may be diagnosed and reported to public health units long after becoming infected with the virus. Anonymous testing for HIV also presents challenges for surveillance. HIV rates may be underestimated because anonymous test results are not always reliably entered in iPHIS. HIV rates may be overestimated in some jurisdictions when individuals travel outside of their own public health unit of residence to seek anonymous testing elsewhere. Duplication may occur when nominal confirmatory tests are entered in iPHIS for cases previously entered based on anonymous test results.

For more information about HIV/AIDS in Ontario, additional data and reports are available from the Ontario HIV Epidemiologic Monitoring Unit at the Dalla Lana School of Public Health, University of Toronto.

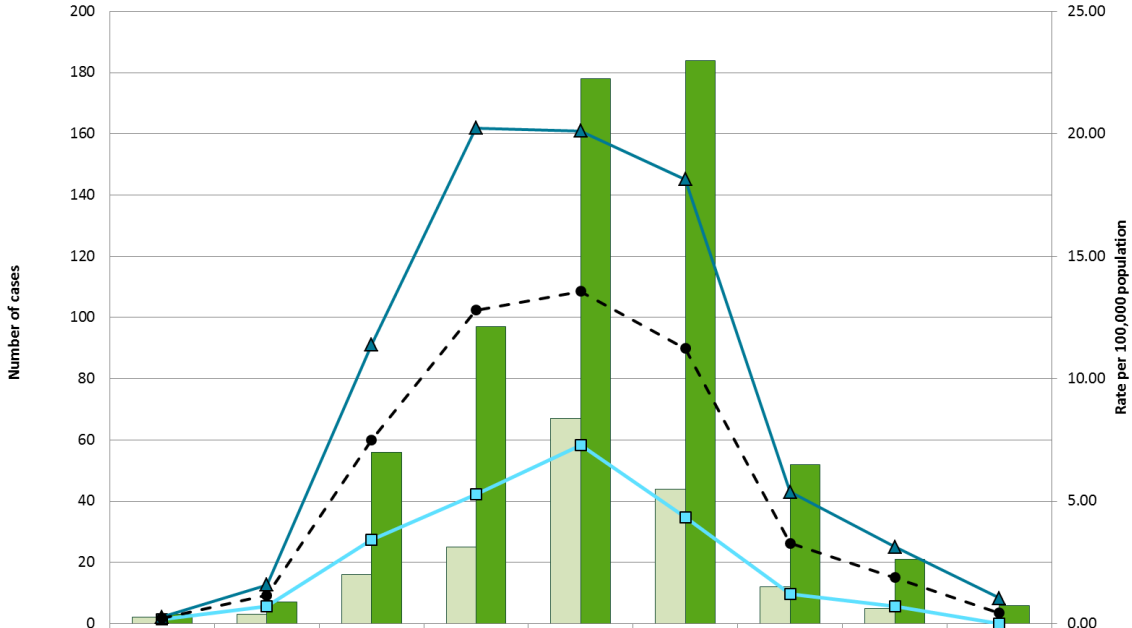
Figure 1-1. Incidence of HIV: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	943	1000	939	1017	995	946	857	844	866	781
Ontario Rate	7.70	8.07	7.49	8.03	7.78	7.31	6.56	6.38	6.48	5.78
Canada (Excl. ON) Rate	7.09	6.93	6.96	7.05	6.91	7.44	6.78	6.19	5.99	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

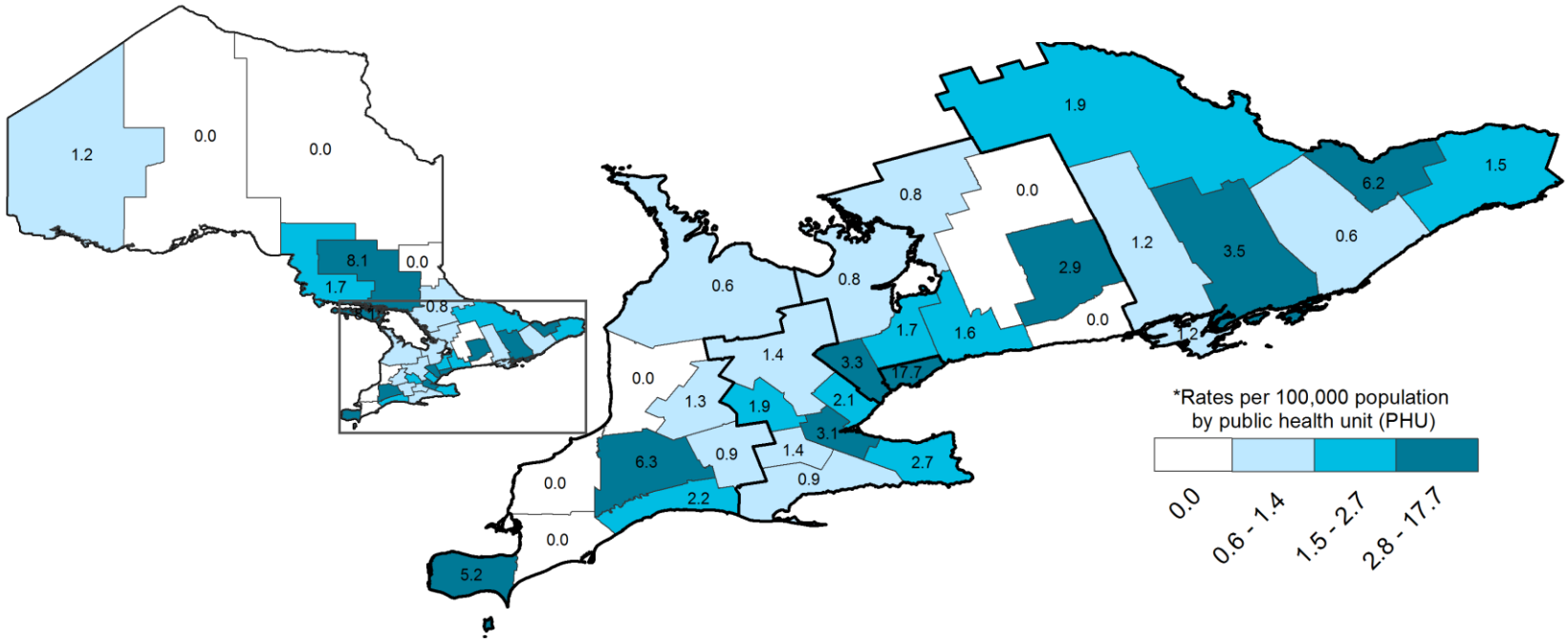
Figure 1-2. Incidence of HIV by Age and Sex: Ontario, 2012



	<15	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	2	3	16	25	67	44	12	5	0
Male Count	3	7	56	97	178	184	52	21	6
Female Rate	0.19	0.71	3.42	5.28	7.28	4.33	1.22	0.70	0.00
Male Rate	0.27	1.59	11.40	20.23	20.11	18.14	5.37	3.14	1.03
Total Rate	0.23	1.16	7.50	12.81	13.57	11.23	3.28	1.88	0.44

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes three cases of unknown age and/or sex.

Map 1-1 Incidence of HIV by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	2	1.72
BRN	2	1.41
CHK	0	0.00
DUR	10	1.57
ELG	2	2.19
EOH	3	1.49
GBO	1	0.61
HAL	11	2.09
HAM	17	3.12
HDN	1	0.91
HKP	0	0.00
HPE	2	1.24
HUR	0	0.00

PHU	Cases (n)	*Rates
KFL	7	3.53
LAM	0	0.00
LGL	1	0.59
MSL	29	6.25
NIA	12	2.69
NPS	1	0.79
NWR	1	1.22
OTT	57	6.20
OXF	1	0.92
PDH	1	1.30
PEE	46	3.31
PQP	0	0.00
PTC	4	2.86

PHU	Cases (n)	*Rates
REN	2	1.93
SMD	4	0.76
SUD	16	8.08
THB	0	0.00
TOR	495	17.73
TSK	0	0.00
WAT	10	1.86
WDG	4	1.43
WEC	21	5.20
YRK	18	1.66

Ontario	**781**	**5.78**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Acquired Immunodeficiency Disease Syndrome (AIDS)

In 2012, there were 68 newly diagnosed cases of AIDS reported in Ontario, corresponding to an incidence rate of 0.5 cases per 100,000 population (Figure 1-3). Despite annual variability and several plateaus, the overall incidence rate of reported AIDS cases decreased by 70.6% from 1.7 cases per 100,000 population in 2003 to 0.5 cases per 100,000 population in 2012. This decrease is largely due to improved access to and treatment for HIV infection, which slows down the progression to AIDS.[1] During this period, annual incidence rates of AIDS were consistently higher in Ontario compared to the rest of Canada.

In 2012, males accounted for 91.2% (62/68) of reported AIDS cases in Ontario (Figure 1-4); the remaining cases occurred in females, with the exception of one case in a transgendered individual (not included in data for Figure 1-4). The incidence rate among males (0.9 cases per 100,000 population) was more than 13 times higher than the incidence rate among females (0.1 cases per 100,000 population). Reported cases of AIDS ranged in age from 7 to 78 years. Among males, the incidence rates of AIDS were highest among those in the 30–39 and 40–49 year age groups; whereas in females, the incidence rate was highest among those in the 30–39 year age group.

In 2012, newly diagnosed cases of AIDS were reported in 20 of Ontario's public health units, with the largest proportion of cases (39.7%, 27/68) reported in Toronto (Map 1-2). The highest incidence rates were reported by Elgin-St. Thomas, Brant County, and Northwestern public health units, with 2.2, 1.4, and 1.2 cases per 100,000 population, respectively. The high rates observed in these public health units correspond to small case counts in jurisdictions with relatively small populations.

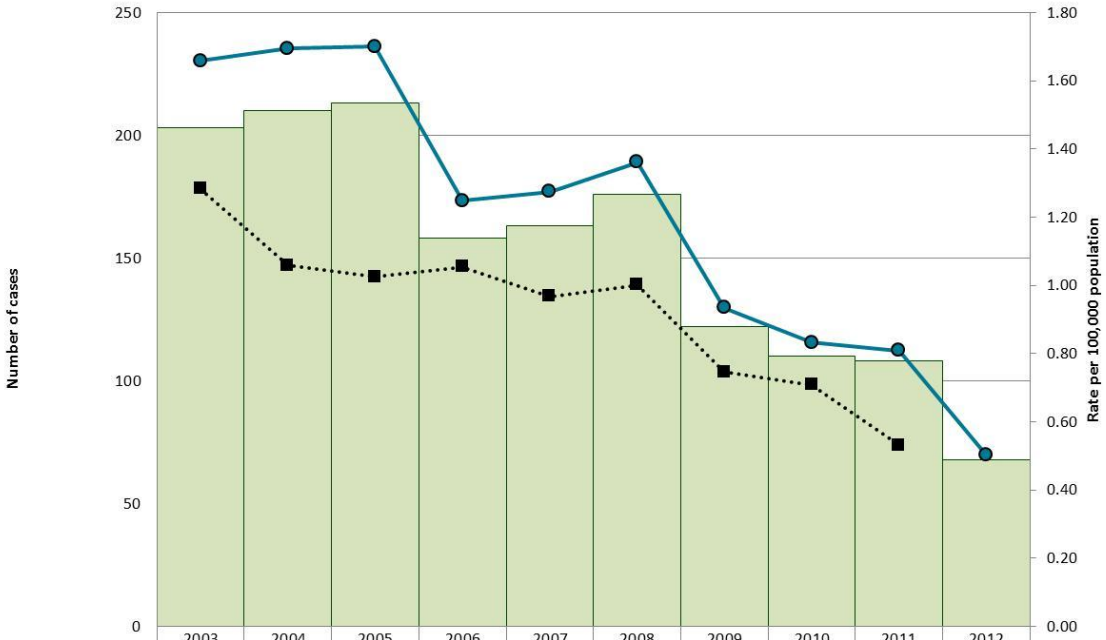
In 2012, 75.0% (51/68) of AIDS cases received their HIV diagnosis within 30 days of being diagnosed with AIDS (data not shown). These data suggest that a substantial proportion of AIDS cases may not have had previous knowledge of their HIV infection, and that the infection had progressed sufficiently to result in an AIDS indicative disease. However, some of these cases may have been screened for HIV outside of Ontario.

In 2012, seven cases diagnosed with AIDS in Ontario were reported as fatal, where AIDS was identified as the underlying or contributing cause of death.

The number of AIDS cases reported to public health units is likely underestimated. A diagnosis of AIDS in someone infected with HIV can be changeable as a result of effective and well-tolerated anti-retroviral therapies and effective treatments for AIDS indicative diseases, such as multiple/recurrent bacterial infections, esophageal candidiasis, chronic herpes simplex, Kaposi's sarcoma, and others.[2] Although these AIDS indicative diseases may have historically been diagnosed in the later stages of HIV infection, ultimately leading to death, more recently they may 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.

For more information about HIV/AIDS in Ontario, additional data and reports are available from the Ontario HIV Epidemiologic Monitoring Unit at the Dalla Lana School of Public Health, University of Toronto.

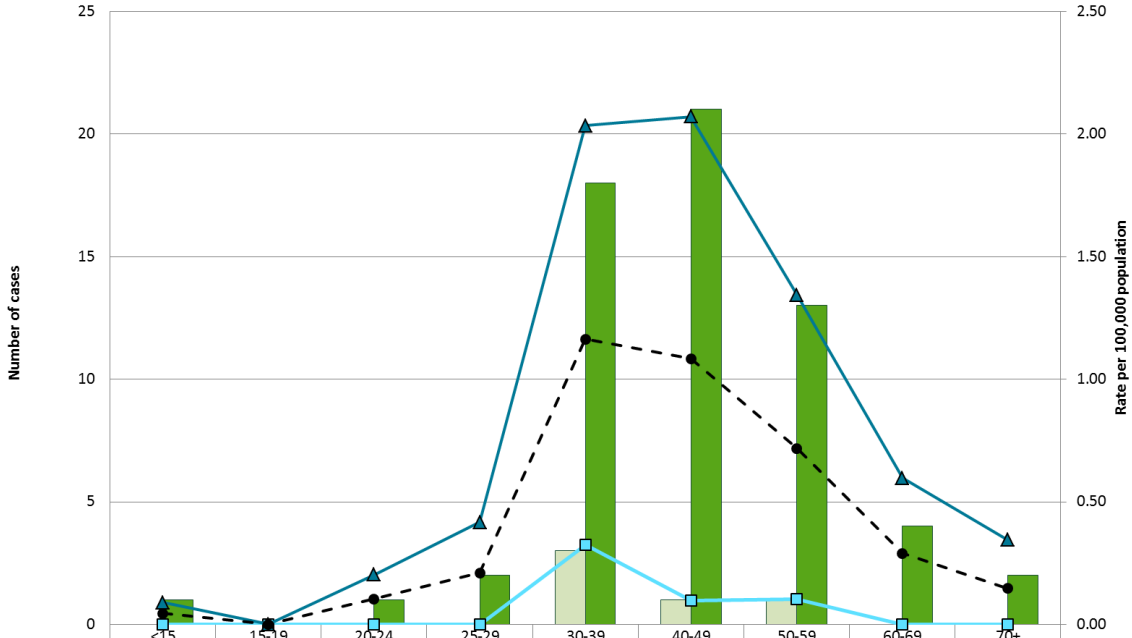
Figure 1-3. Incidence of AIDS: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	203	210	213	158	163	176	122	110	108	68
Ontario Rate	1.66	1.69	1.70	1.25	1.27	1.36	0.93	0.83	0.81	0.50
Canada (Excl. ON) Rate	1.28	1.06	1.02	1.05	0.97	1.00	0.75	0.71	0.53	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

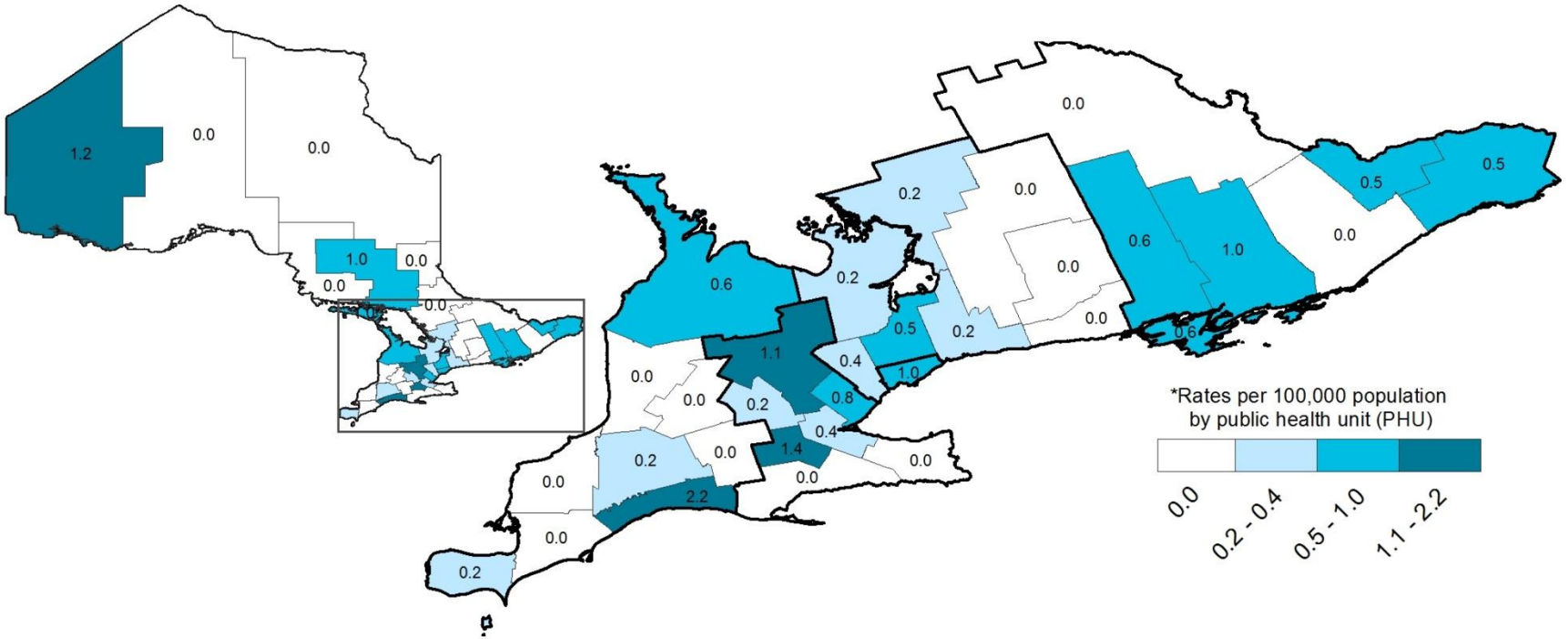
Figure 1-4. Incidence of AIDS by Age and Sex: Ontario, 2012



	<15	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	0	0	0	0	3	1	1	0	0
Male Count	1	0	1	2	18	21	13	4	2
Female Rate	0.00	0.00	0.00	0.00	0.33	0.10	0.10	0.00	0.00
Male Rate	0.09	0.00	0.20	0.42	2.03	2.07	1.34	0.60	0.34
Total Rate	0.05	0.00	0.10	0.21	1.16	1.08	0.72	0.29	0.15

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes one case of unknown age and/or sex.

Map 1-2 Incidence of AIDS by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.00
BRN	2	1.41
CHK	0	0.00
DUR	1	0.16
ELG	2	2.19
EOH	1	0.50
GBO	1	0.61
HAL	4	0.76
HAM	2	0.37
HDN	0	0.00
HKP	0	0.00
HPE	1	0.62
HUR	0	0.00

PHU	Cases (n)	*Rates
KFL	2	1.01
LAM	0	0.00
LGL	0	0.00
MSL	1	0.22
NIA	0	0.00
NPS	0	0.00
NWR	1	1.22
OTT	5	0.54
OXF	0	0.00
PDH	0	0.00
PEE	5	0.36
PQP	0	0.00
PTC	0	0.00

PHU	Cases (n)	*Rates
REN	0	0.00
SMD	1	0.19
SUD	2	1.01
THB	0	0.00
TOR	27	0.97
TSK	0	0.00
WAT	1	0.19
WDG	3	1.07
WEC	1	0.25
YRK	5	0.46
Ontario	**68**	**0.50**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 2.

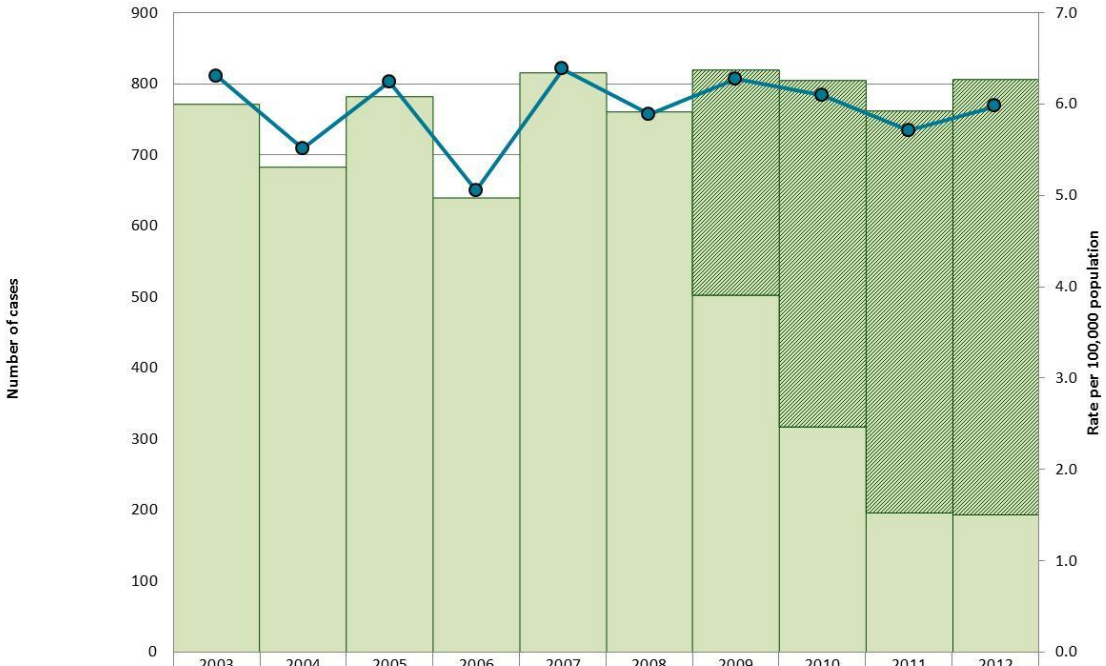
Amebiasis

Amebiasis, caused by the parasite *Entamoeba histolytica*, was the fourth most commonly reported enteric disease in Ontario in 2012. There were a total of 807 cases reported, with 195 confirmed cases and 612 probable cases, representing a combined incidence rate of 6.0 cases per 100,000 population (Figure 2-1). No comparable national data are available as amebiasis is not a nationally notifiable disease. Approximately 2% (13/807) of amebiasis cases were reported as hospitalized, and no deaths were reported.

In early 2009, the provincial case definition was revised to include both confirmed and probable cases to reflect laboratory testing practices in Ontario. While this change 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 (Figure 2-1). In addition, the change in case definition may have initially resulted in misclassification of cases in the first two years after the revision. To differentiate between *E. histolytica* and *E. dispar* (the non-pathogenic organism of the same genus) and be considered a confirmed case of *E. histolytica*, a follow-up specimen prior to treatment initiation is required. These specimens are rarely collected for submission, resulting in a higher proportion of probable cases than confirmed cases.

As amebiasis is known to be a disease mostly affecting young to middle-aged adults,[3] the lowest incidence rates in Ontario were observed in children nine years of age and younger (Figure 2-2). Sex-specific rates were higher for adult males compared to adult females of the same age group. One possible explanation for the observed trend is person-to-person transmission within the men who have sex with men (MSM) community.[3,4] Amebiasis is consistently reported throughout the year with no notable seasonal trends (Figure 2-3). The 2012 incidence rates by public health unit of residence are presented in Map 2-1.

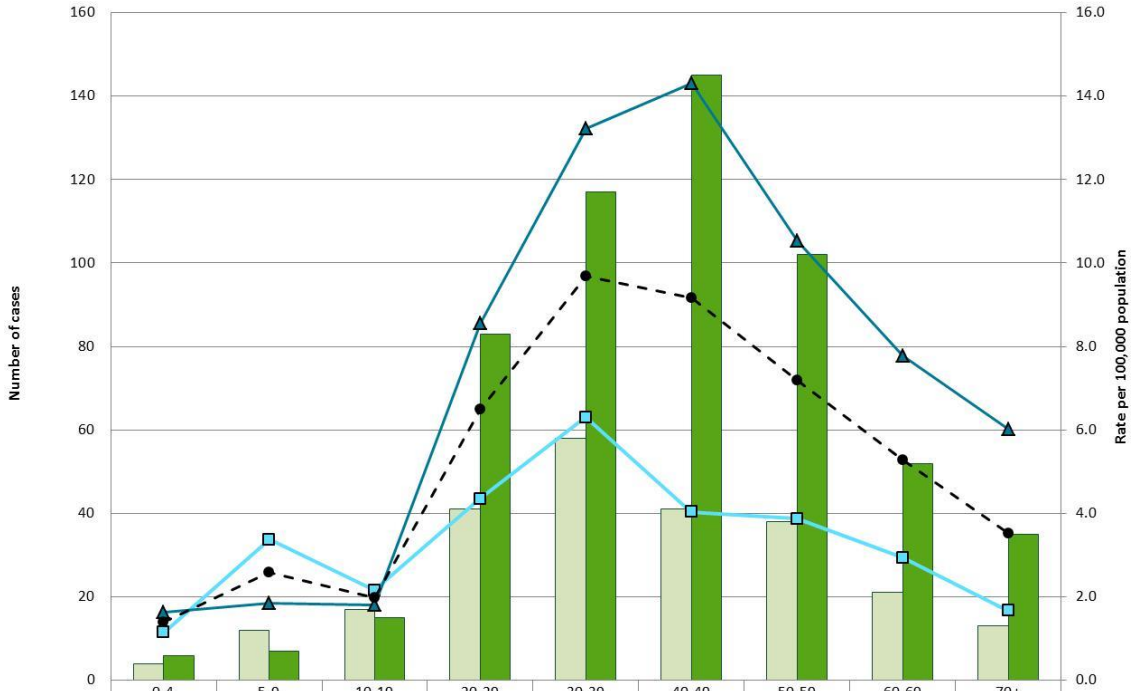
Figure 2-1. Incidence of Confirmed and Probable Amebiasis: Ontario, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count (Probable)							316	487	565	612
Ontario Count (Confirmed)	772	683	782	640	816	761	504	319	198	195
Ontario Rate	6.3	5.5	6.2	5.1	6.4	5.9	6.3	6.1	5.7	6.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, Date Extracted: [2013/09/26].
Note: Amebiasis is not a nationally notifiable disease. Due to changes in the case definition in 2009, probable cases are included in the total case counts from 2009 onwards. Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

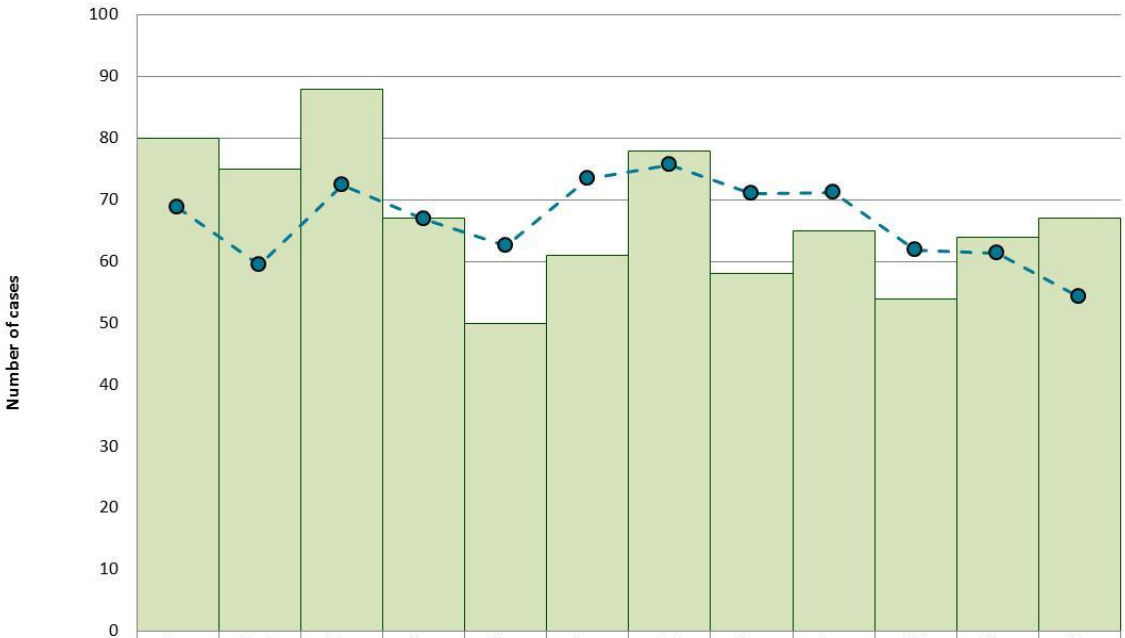
Figure 2-2. Incidence of Confirmed and Probable Amebiasis by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	4	12	17	41	58	41	38	21	13
Male Count	6	7	15	83	117	145	102	52	35
Female Rate	1.1	3.4	2.2	4.4	6.3	4.0	3.9	2.9	1.7
Male Rate	1.6	1.9	1.8	8.6	13.2	14.3	10.5	7.8	6.0
Total Rate	1.4	2.6	2.0	6.5	9.7	9.2	7.2	5.3	3.5

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, Date Extracted: [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

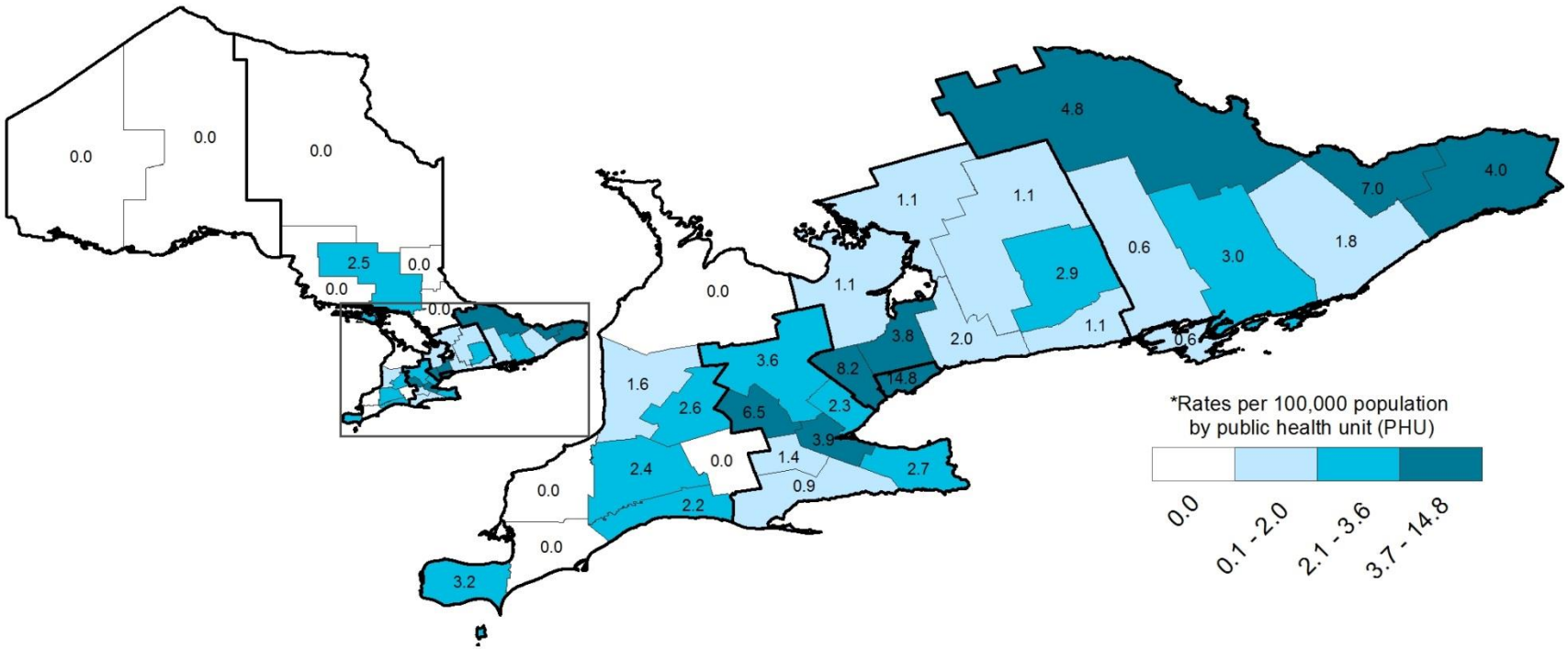
Figure 2-3. Number of Confirmed and Probable Amebiasis Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	80	75	88	67	50	61	78	58	65	54	64	67
5-Yr Average	68.8	59.4	72.4	66.8	62.6	73.4	75.6	71.0	71.2	61.8	61.4	54.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 2-1. Incidence of Confirmed and Probable Amebiasis by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	2	1.4
CHK	0	0.0
DUR	13	2.0
ELG	2	2.2
EOH	8	4.0
GBO	0	0.0
HAL	12	2.3
HAM	21	3.9
HDN	1	0.9
HKP	2	1.1
HPE	1	0.6
HUR	1	1.7

PHU	Cases (n)	*Rates
KFL	6	3.0
LAM	0	0.0
LGL	3	1.8
MSL	11	2.4
NIA	12	2.7
NPS	0	0.0
NWR	0	0.0
OTT	64	7.0
OXF	0	0.0
PDH	2	2.6
PEE	114	8.2
PQP	0	0.0
PTC	4	2.9

PHU	Cases (n)	*Rates
REN	5	4.8
SMD	6	1.1
SUD	5	2.5
THB	0	0.0
TOR	413	14.8
TSK	0	0.0
WAT	35	6.5
WDG	10	3.6
WEC	13	3.2
YRK	41	3.8
Ontario	**807**	**6.0**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 3.

Anthrax

There were no cases of anthrax reported in Ontario in 2012. No human cases of anthrax have been reported in Ontario since electronic reporting began in 1991.

Chapter 4.

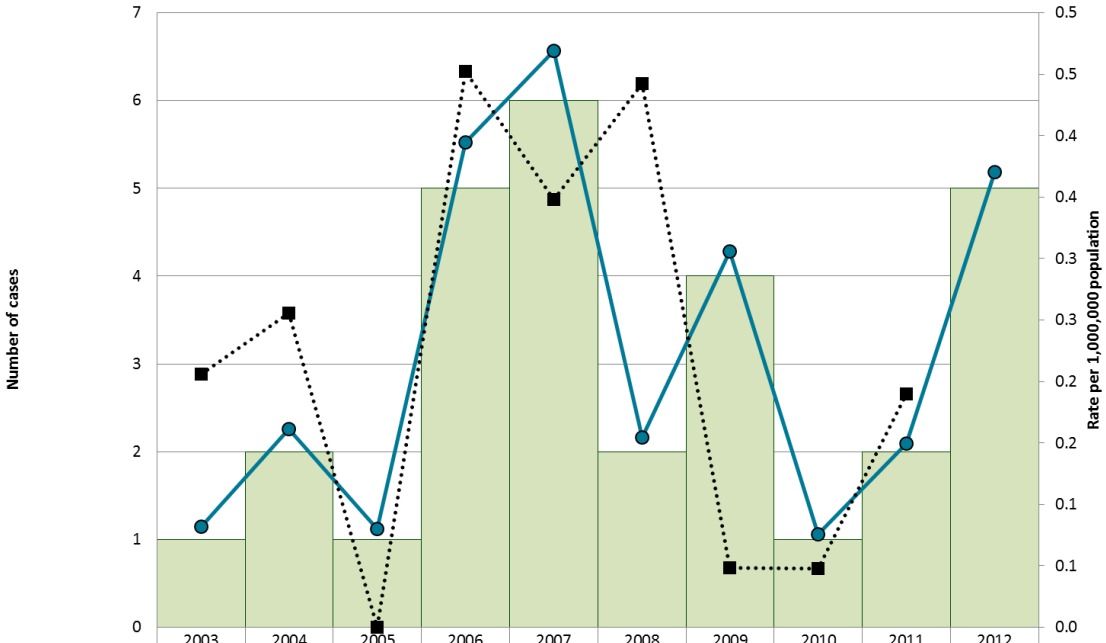
Botulism

Twenty-nine cases of botulism were reported in Ontario from 2003 to 2012 (Figure 4-1). Of the five cases reported in 2012, four were foodborne botulism cases and one was a case of infant botulism. Three of the five botulism cases in 2012 were reported as hospitalized and no deaths were reported.

Three of the four foodborne botulism cases in 2012 were from the same outbreak associated with a private family gathering in celebration of Sham el-Nessim, an Egyptian holiday marking the beginning of spring. The implicated food item was identified as fesikh, a traditionally prepared salted and fermented fish which is commonly consumed during this festival. Notably, fesikh has been reported as the cause of foodborne botulism in past outbreaks in other countries.[5,6] However, this is the first documented outbreak associated with fesikh to occur in Canada. As a result of this outbreak investigation, Health Canada has issued advisories to Canadians about the high risk of botulism from un-eviscerated salted fish products.[7]

The Ministry of Health and Long-Term Care's Botulism Guide for Health Care Professionals (September 2013) can be used as a reference guide when managing a case suspected of botulism.[8] Additional information on botulism can be found in the April 2013 issue of Public Health Ontario's Monthly Infectious Diseases Surveillance Report.[9]

Figure 4-1. Incidence of Botulism: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	1	2	1	5	6	2	4	1	2	5
Ontario Rate	0.1	0.2	0.1	0.4	0.5	0.2	0.3	0.1	0.1	0.4
Canada (Excl. ON) Rate	0.2	0.3	0.0	0.5	0.3	0.4	0.0	0.0	0.2	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

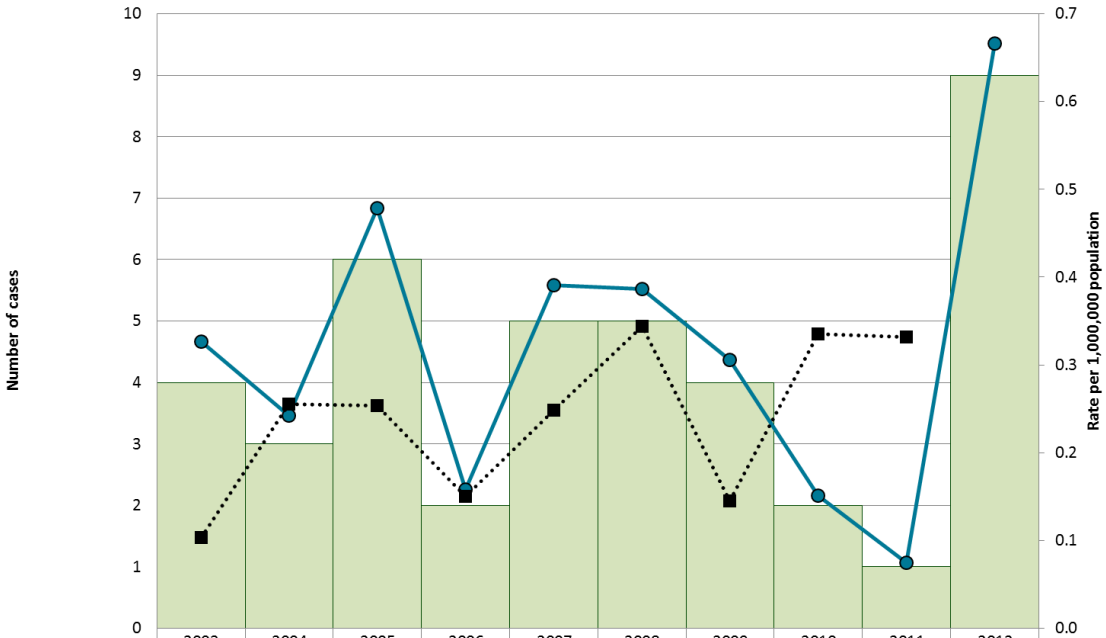
Chapter 5.

Brucellosis

There were nine confirmed cases of brucellosis reported in Ontario in 2012 corresponding to an incidence rate of 0.7 cases per 1,000,000 population (Figure 5-1). There is a low endemic risk of brucellosis in Ontario as all recently reported cases with exposure information available have been travel-related. Brucellosis has been eradicated from livestock in Canada since 1985.[10]

In 2012, two out of nine brucellosis cases were hospitalized and no deaths were reported. Additional information on brucellosis can be found in May 2013 issue of Public Health Ontario's Monthly Infectious Diseases Surveillance Report.[11]

Figure 5-1. Incidence of Brucellosis: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	4	3	6	2	5	5	4	2	1	9
Ontario Rate	0.3	0.2	0.5	0.2	0.4	0.4	0.3	0.2	0.1	0.7
Canada (Excl. ON) Rate	0.1	0.3	0.3	0.2	0.2	0.3	0.1	0.3	0.3	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Chapter 6.

Campylobacter enteritis

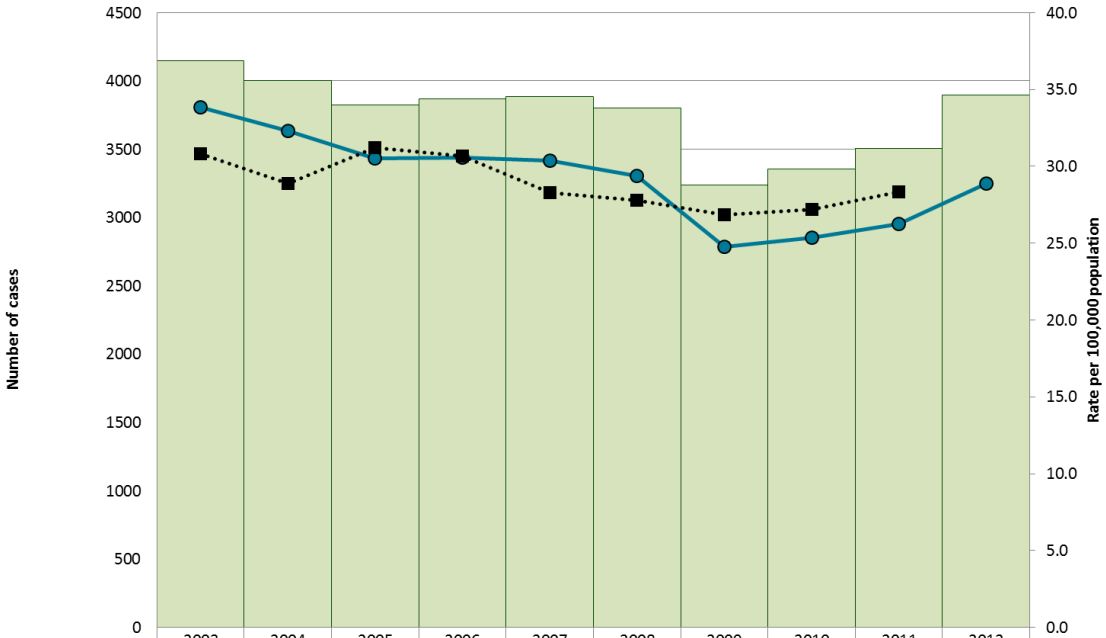
In 2012, *Campylobacter* enteritis was the most commonly reported enteric disease in Ontario with 3,898 confirmed cases reported, representing an incidence rate of 28.9 cases per 100,000 population. Over the nine years from 2003 to 2011, the annual incidence rate for *Campylobacter* enteritis in Ontario and the rest of Canada has been comparable (Figure 6-1).

Similar to previous years,[12] the incidence rate of *Campylobacter* enteritis was highest among children under the age of five years at 38.0 cases per 100,000 population. Young adults in the 20–29 year age group had the second highest age-specific incidence rate at 36.8 per 100,000 population (Figure 6-2). Incidence rates were higher in males compared to females across most age groups. These age- and gender-specific trends have also been observed in other developed countries.[13,14]

In 2012, 6% (227/3,898) of confirmed *Campylobacter* enteritis cases were hospitalized and no deaths were reported.

Campylobacter enteritis occurs throughout the year, but tends to follow a seasonal pattern with increased incidence in the warmer months from June to October (Figure 6-3). Analyesis based on 2011 Ontario data indicates that risk factors of *Campylobacter* enteritis are associated with animal contact, travel outside of the country, and consumption of raw or undercooked poultry/eggs.[12] Huron County (72.7 cases per 100,000 population), Perth District (58.4 cases per 100,000 population), and Wellington-Dufferin-Guelph (44.5 cases per 100,000 population) reported the highest incidence rates of *Campylobacter* enteritis in 2012 (Map 6-1). These public health unit jurisdictions include rural farming communities, where contact with animals and their environments, a key route of transmission for *Campylobacter* enteritis, is more likely.[15] In contrast, as expected based on their population size, the highest number of cases was reported in Toronto (947 cases), Peel Region (365 cases), and York Region (359 cases), representing 43% (1,671/3,898) of *Campylobacter* enteritis cases in 2012.

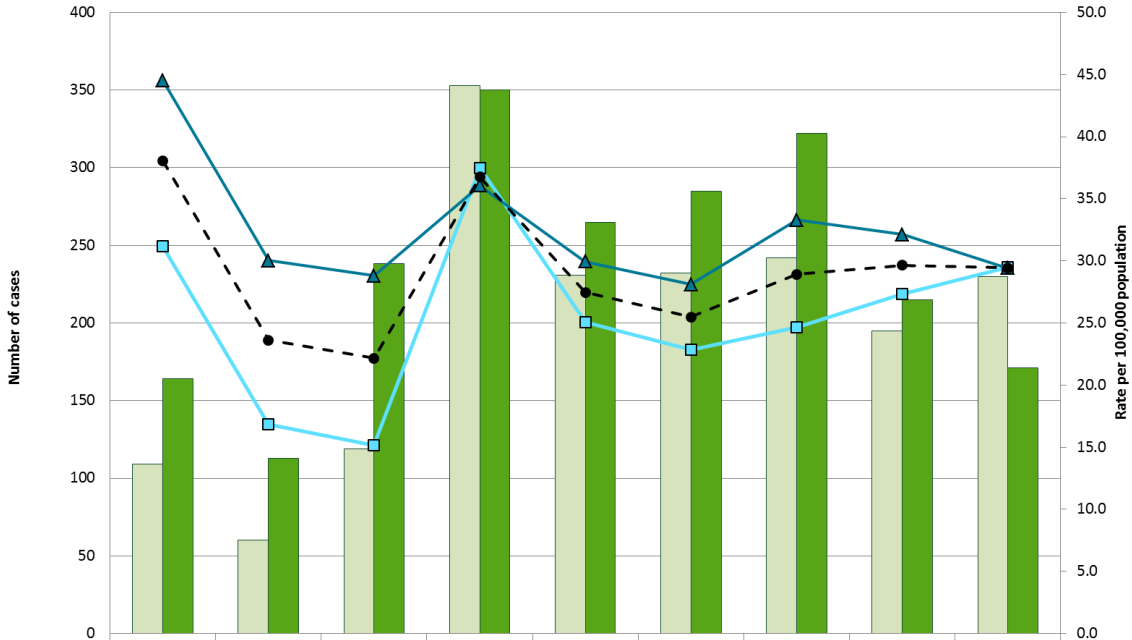
Figure 6-1. Incidence of *Campylobacter* enteritis: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	4146	4003	3824	3871	3886	3800	3238	3356	3508	3898
Ontario Rate	33.9	32.3	30.5	30.6	30.4	29.4	24.8	25.4	26.2	28.9
Canada (Excl. ON) Rate	30.8	28.9	31.2	30.7	28.3	27.8	26.8	27.2	28.4	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

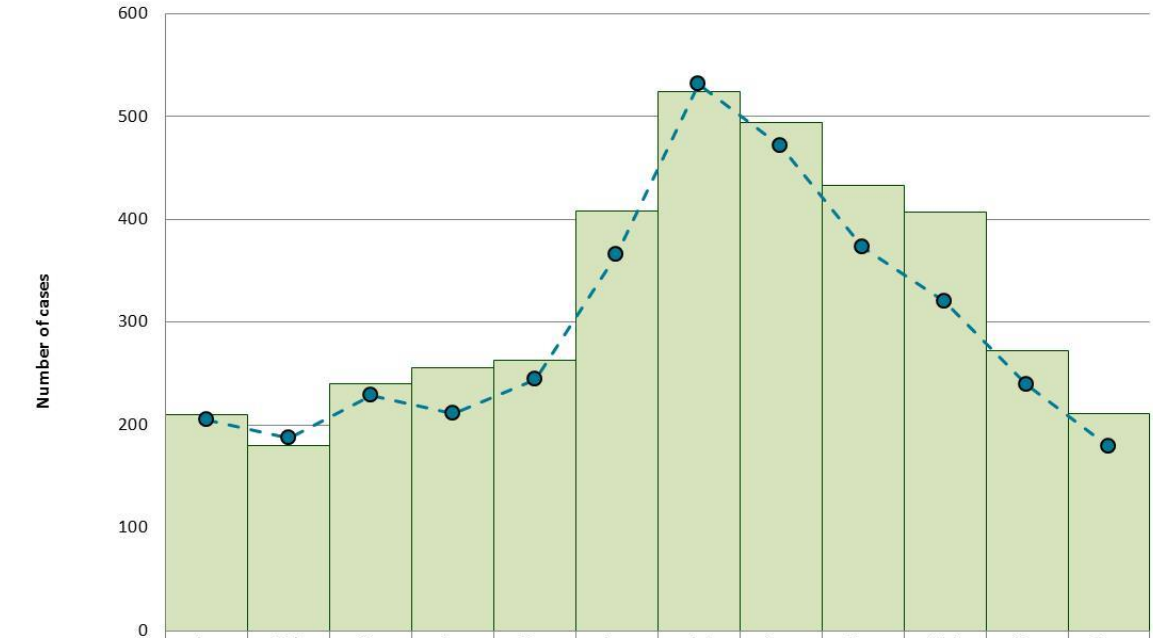
Figure 6-2. Incidence of *Campylobacter* enteritis by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	109	60	119	353	231	232	242	195	230
Male Count	164	113	238	350	265	285	322	215	171
Female Rate	31.2	16.8	15.1	37.5	25.1	22.8	24.6	27.3	29.5
Male Rate	44.5	30.0	28.8	36.1	29.9	28.1	33.3	32.1	29.4
Total Rate	38.0	23.6	22.1	36.8	27.5	25.5	28.9	29.6	29.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes four cases of unknown age and/or sex. Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

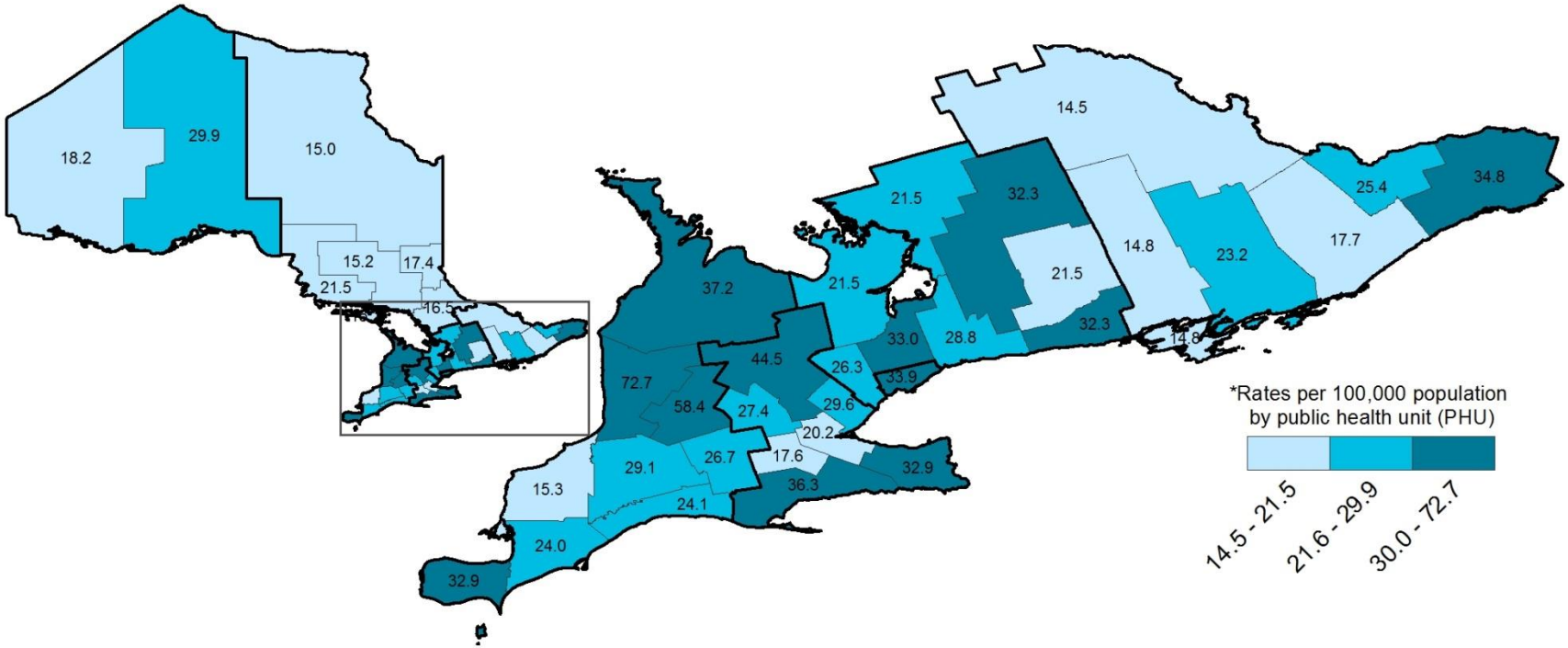
Figure 6-3. Number of *Campylobacter* enteritis Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	210	180	240	256	263	408	524	494	433	407	272	211
5-Yr Average	205.4	187.6	228.4	211	244.8	365.2	532	471.2	373.4	319.6	239.6	179.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 6-1. Incidence of *Campylobacter* enteritis by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	25	21.5
BRN	25	17.7
CHK	26	24.0
DUR	184	28.8
ELG	22	24.1
EOH	70	34.8
GBO	61	37.2
HAL	156	29.6
HAM	110	20.2
HDN	40	36.3
HKP	58	32.3
HPE	24	14.8
HUR	44	72.7

PHU	Cases (n)	*Rates
KFL	46	23.2
LAM	20	15.3
LGL	30	17.7
MSL	135	29.1
NIA	147	32.9
NPS	21	16.5
NWR	15	18.2
OTT	234	25.5
OXF	29	26.7
PDH	45	58.4
PEE	365	26.3
PQP	13	15.0
PTC	30	21.5

PHU	Cases (n)	*Rates
REN	15	14.5
SMD	114	21.5
SUD	30	15.2
THB	47	29.9
TOR	947	33.9
TSK	6	17.4
WAT	147	27.4
WDG	125	44.5
WEC	133	32.9
YRK	359	33.1
Ontario	**3898**	**28.9**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 7.

Chancroid

Chancroid is a very rare disease in Canada. Over the past two decades (1993–2002, 2003–12), only one confirmed case of chancroid was reported in Ontario, in 1997.

Chapter 8.

Chlamydia

Chlamydia is the most frequently reported sexually transmitted infection and reportable disease in Ontario. In 2012, 36,549 confirmed cases of chlamydia were reported in Ontario, representing an incidence rate of 270.6 cases per 100,000 population (Figure 8-1). Cases of chlamydia are often undetected and, as a result, under-reported to public health units due to the occurrence of asymptomatic infections. Despite the absence of symptoms, those infected are still able to transmit chlamydia to their sexual contacts.

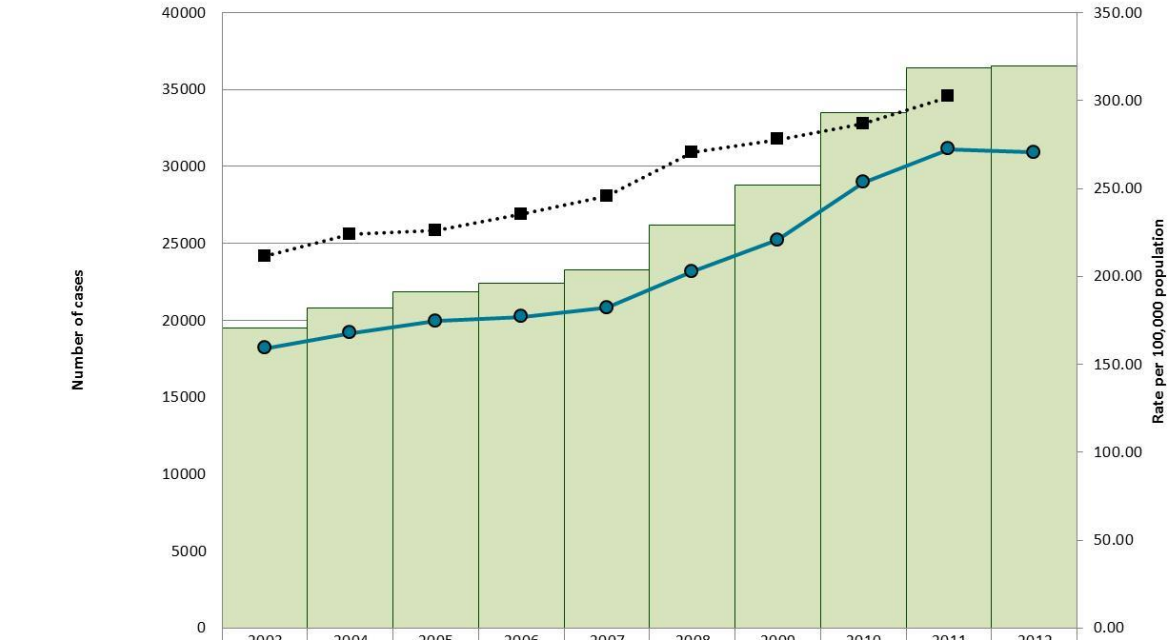
From 2003 to 2012, reported incidence rates of chlamydia increased steadily from 159.1 cases per 100,000 population in 2003 to a peak of 272.4 cases per 100,000 population in 2011, and then decreased slightly in 2012 (Figure 8-1). During this period, the annual incidence of chlamydia increased by an average of 6.2% each year. Reported incidence rates of chlamydia in Ontario have been consistently lower than those in the rest of Canada.

The overall increase in the incidence of reported chlamydia cases in Ontario may be explained, in part, by changes in screening practices and testing methods, which may have led to increased testing over time.[16] The reported incidence of chlamydia was considerably higher among females, with an incidence rate of 338.9 cases per 100,000 population, compared to 200.0 cases per 100,000 population among males. Overall, the reported incidence of chlamydia was highest among those 20–24 years of age, and then decreased steadily with increasing age (Figure 8-2). The relatively high incidence reported among females, particularly those 15–24 years of age, may be explained, in part, by increased detection due to greater access to medical care and routine screening.

Based on testing performed at Public Health Ontario Laboratories (PHOL), the percentage of tests that were positive for chlamydia each month in 2012 was relatively steady, with an overall percent positivity of 6.0% (16,682/278,911) for the year (Figure 8-3). However, testing for chlamydia is also completed at community laboratories throughout the province, which constitutes the majority of testing for chlamydia in Ontario, so trends should be interpreted with caution.

Incidence rates of reported chlamydia cases were highest in the North West region (Map 8-1). Northwestern public health unit had the highest rate at 758.8 cases per 100,000 population, followed by Porcupine and Thunder Bay District public health units, with rates of 474.6 and 450.9 cases per 100,000 population, respectively.

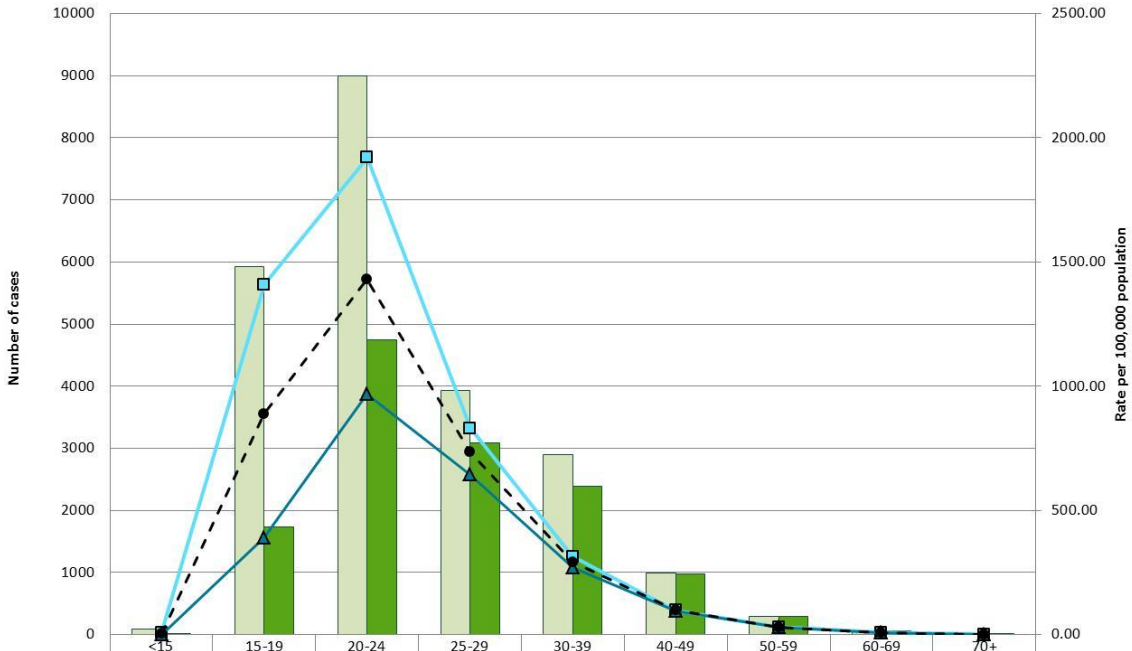
Figure 8-1. Incidence of Chlamydia: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	19479	20807	21885	22409	23298	26213	28822	33496	36414	36549
Ontario Rate	159.11	167.93	174.68	176.93	182.14	202.69	220.54	253.30	272.43	270.62
Canada (Excl. ON) Rate	211.40	223.79	226.12	235.23	245.60	270.42	277.90	286.78	302.13	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

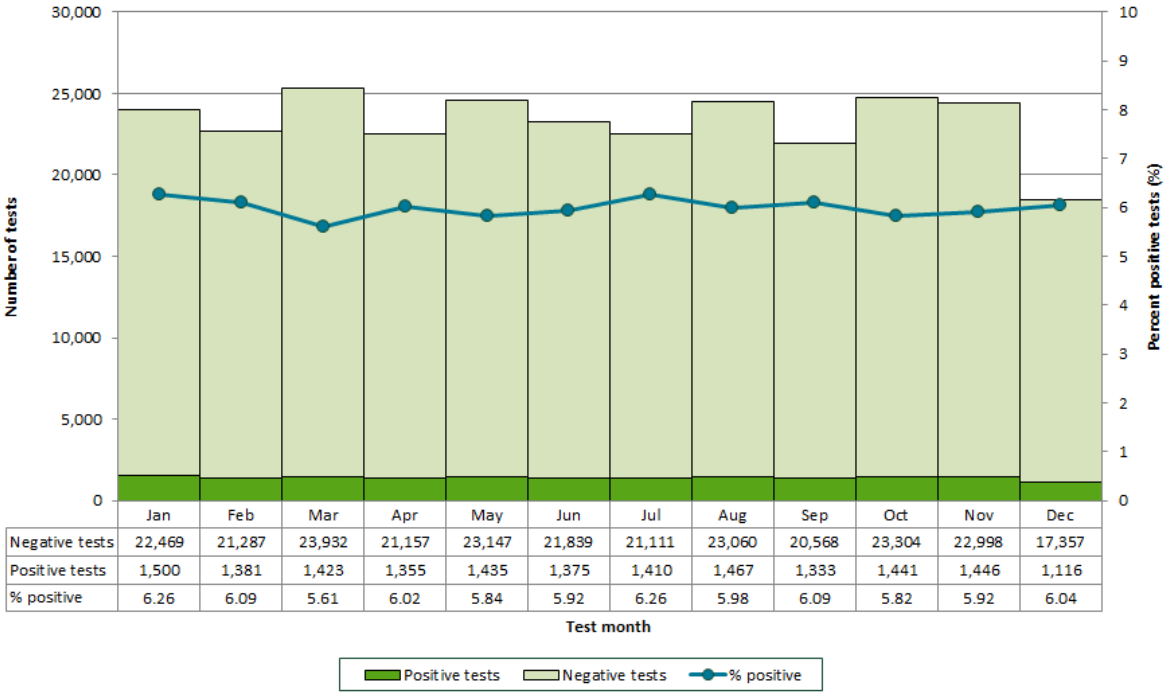
Figure 8-2. Incidence of Chlamydia by Age and Sex: Ontario, 2012



	<15	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	83	5931	8991	3932	2894	999	298	64	11
Male Count	13	1729	4753	3087	2383	981	300	65	8
Female Rate	7.75	1409.76	1920.11	830.80	314.31	98.34	30.33	8.97	1.41
Male Rate	1.15	391.59	967.37	643.94	269.26	96.73	31.00	9.71	1.38
Total Rate	4.36	888.38	1432.28	736.77	292.23	97.54	30.66	9.33	1.40

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes 27 cases of unknown age and/or sex.

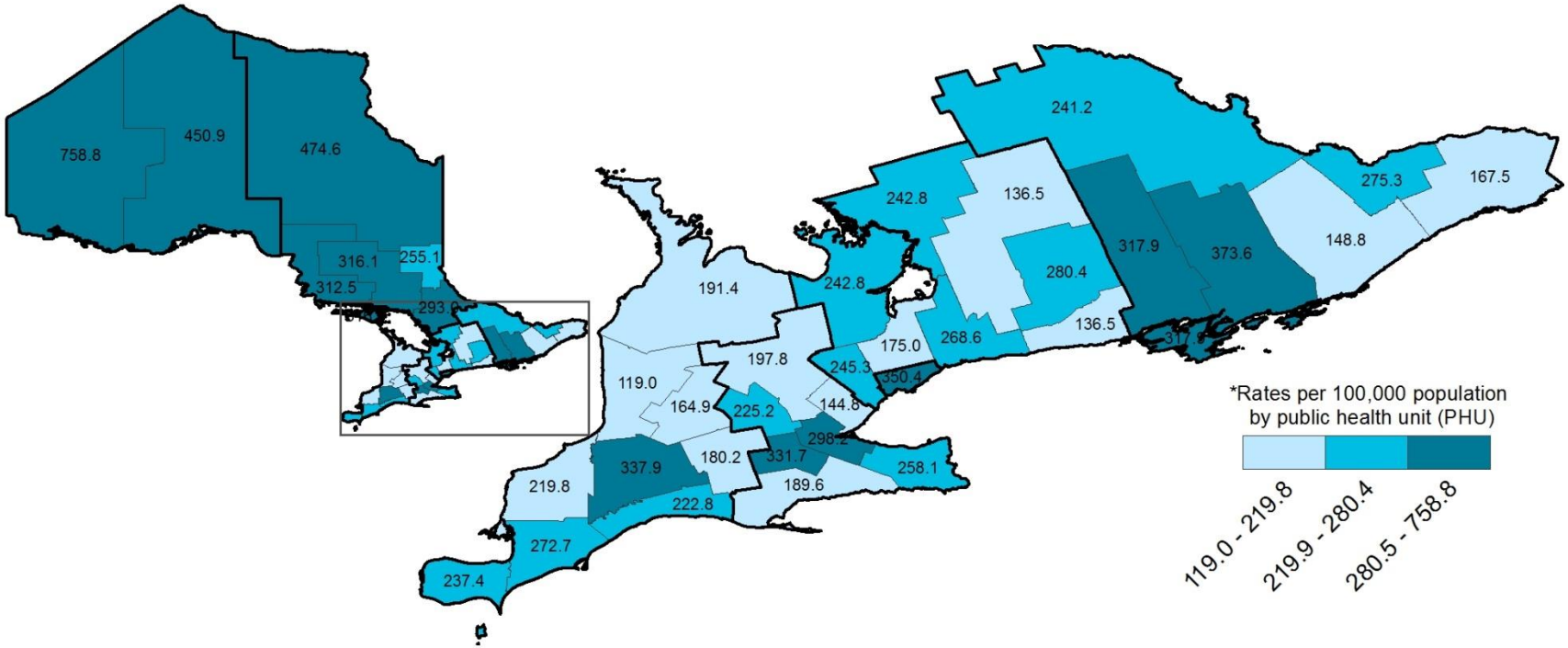
Figure 8-3. Number and Percent of Positive Chlamydia Tests by Month: PHOL, 2012



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Negative tests	22,469	21,287	23,932	21,157	23,147	21,839	21,111	23,060	20,568	23,304	22,998	17,357
Positive tests	1,500	1,381	1,423	1,355	1,435	1,375	1,410	1,467	1,333	1,441	1,446	1,116
% positive	6.26	6.09	5.61	6.02	5.84	5.92	6.26	5.98	6.09	5.82	5.92	6.04

Source: Public Health Ontario Laboratories (PHOL), STI Online, extracted [2013/12/31].
Note: Data only include tests performed at PHOL.

Map 8-1. Incidence of Chlamydia by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	364	312.49
BRN	470	331.74
CHK	296	272.74
DUR	1714	268.56
ELG	203	222.75
EOH	337	167.47
GBO	314	191.44
HAL	762	144.75
HAM	1623	298.23
HDN	209	189.58
HKP	245	136.49
HPE	514	317.93
HUR	72	119.02

PHU	Cases (n)	*Rates
KFL	740	373.57
LAM	288	219.83
LGL	252	148.85
MSL	1567	337.93
NIA	1153	258.13
NPS	372	292.98
NWR	624	758.84
OTT	2532	275.33
OXF	196	180.17
PDH	127	164.87
PEE	3411	245.30
PQP	411	474.55
PTC	392	280.39

PHU	Cases (n)	*Rates
REN	250	241.15
SMD	1286	242.76
SUD	626	316.10
THB	708	450.92
TOR	9779	350.36
TSK	88	255.06
WAT	1209	225.23
WDG	555	197.75
WEC	959	237.40
YRK	1901	175.02
Ontario	**36549**	**270.62**

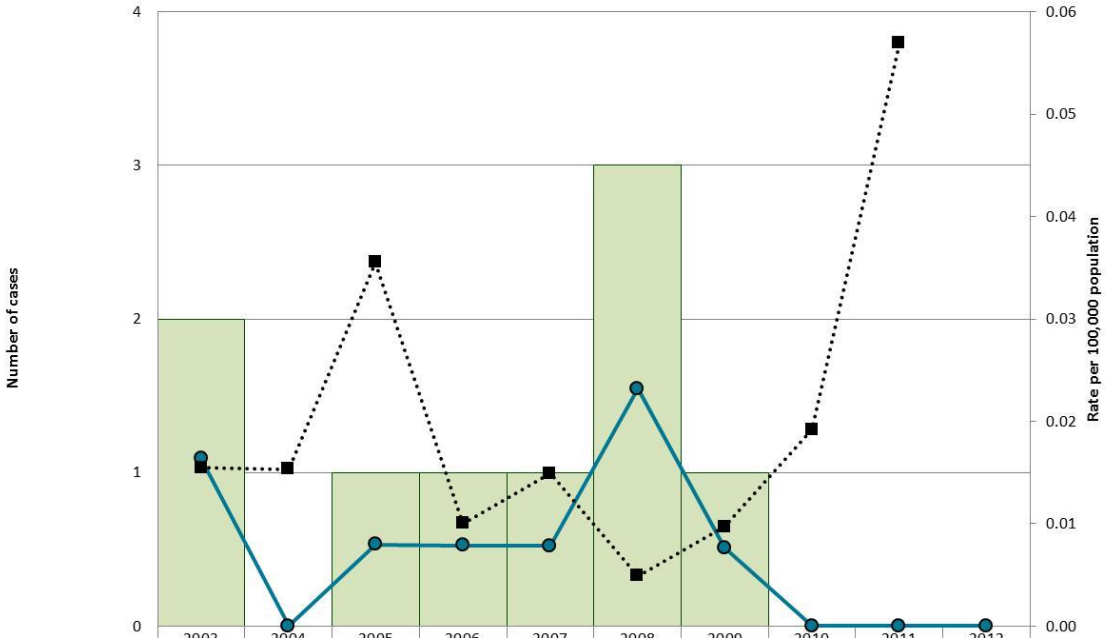
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 9.

Cholera

There were no cases of cholera reported in Ontario in 2012. Since 2003, nine cases have been reported in the province. All of these cases have been travel-related. The incidence rates for cholera in Ontario and Canada from 2003 to 2012 are presented in Figure 9-1. The observed variability in incidence rates should be interpreted with caution due to small case counts.

Figure 9-1. Incidence of Cholera: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	2	0	1	1	1	3	1	0	0	0
Ontario Rate	0.02	0.00	0.01	0.01	0.01	0.02	0.01	0.00	0.00	0.00
Canada (Excl. ON) Rate	0.02	0.02	0.04	0.01	0.01	0.00	0.01	0.02	0.06	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Chapter 10.

Clostridium difficile Infection (CDI) Outbreaks

Clostridium difficile is an anaerobic spore forming bacterium that is known to cause a range of complications from mild diarrhea to colitis and toxic megacolon, which can be fatal.[17] Transmission within hospitals is the major source of *C. difficile* acquisition due to contaminated environmental surfaces and poor hand hygiene practices by health care workers.[17,18] Typically, *Clostridium difficile* infection (CDI) occurs following colonization (through the ingestion of spores) with a strain that is capable of producing toxins and the disruption of normal microbial flora. Individuals who are elderly or hospitalized for a lengthy duration are at an increased risk of acquiring CDI.[17,18] Other predisposing risk factors include recent history of antimicrobial therapy, use of chemotherapeutic drugs or medications that suppress gastric acid secretion and immunosuppression.[17,18] Published reports of all-cause mortality at 30 days among patients diagnosed with CDI range from 9% to 38%.[19]

Rising incidence and mortality rates in Canada over the past decade appear to be associated with the emergence of the North American pulsotype 1 (NAP1) strain, a hypervirulent epidemic *C. difficile* strain.[20,21] The NAP1 strain was first identified in the northeastern United States and Quebec in 2003, but has since spread throughout North America and Europe.[18] In recent years, this strain has been the predominant outbreak strain in Ontario hospitals.[22,23]

C. difficile produces resistant spores which are readily recovered from the hospital environment and the hands of health care workers.[17] Preventative measures focus on the use of contact precautions, patient isolation, appropriate environmental cleaning, and hand hygiene to limit the transmission of CDI within hospitals.[24] Antimicrobial stewardship programs are also considered an essential component of prevention and control of CDI.

From 2009 to 2012, a total of 1,712 confirmed cases associated with 128 CDI outbreaks were reported in Ontario (Table 10-1). Eighty-four per cent (n=107) of all reported CDI outbreaks occurred in hospitals with the remainder occurring in long-term care facilities. Following a change to more sensitive outbreak notification thresholds in January 2010, the number of CDI outbreaks increased in Ontario from 18 in 2009 to 44 outbreaks in 2011 then subsequently decreased to 36 outbreaks in 2012. In addition during this time, hospitals began adopting PCR (polymerase chain reaction), a more sensitive diagnostic test, as a preferred method for CDI diagnosis which may also have resulted in an increase in CDI cases and outbreaks. The average number of confirmed CDI cases linked to an outbreak decreased 47% from a high of 19 cases in 2010 to 10 cases in 2012 (Table 10-1; Figure 10-1). From 2009 to 2012, 24.1% of CDI-outbreak associated cases died from all-causes. All-cause mortality is defined as death due to any cause that occurred in cases who were line listed and met the case definition.

Of the 1,712 reported cases during the four-year period, detailed client information was available for 1,451 cases (85%) associated with a CDI outbreak in a hospital. Among those, females accounted for 51% of cases, with an increased incidence observed in those 80 years and older (Figure 10-2). Among 1,428 cases with a known date of birth, the average age of confirmed CDI cases was 73.7 years of age (median = 78 years, range: 1–108 years) with 83% of cases 60 years and older. Demographic data have been aggregated across all hospital outbreaks and likely reflect the age and gender profiles of the settings that have a higher risk of CDI outbreaks.

Risk factors were documented in 1,099 (75.7%) CDI cases with detailed client information. The most commonly reported risk factors were antibiotic use (82.6%), receiving antiulcer/antacid medication or

proton pump inhibitors (36.2%) and having an immunocompromised status (25.4%) (Table 10-2). All reported cases were linked to a CDI outbreak inherently placing them at risk for acquiring CDI. These data reflect risk factors of CDI outbreak-related cases, which may differ slightly from sporadic cases.

The highest number of confirmed CDI outbreaks occurred in the fall and winter months (n=73) from October to March (Figure 10-3). The seasonal pattern linked to CDI outbreaks is likely related to the seasonality of respiratory illnesses such as influenza and respiratory syncytial virus (RSV).[24,25]

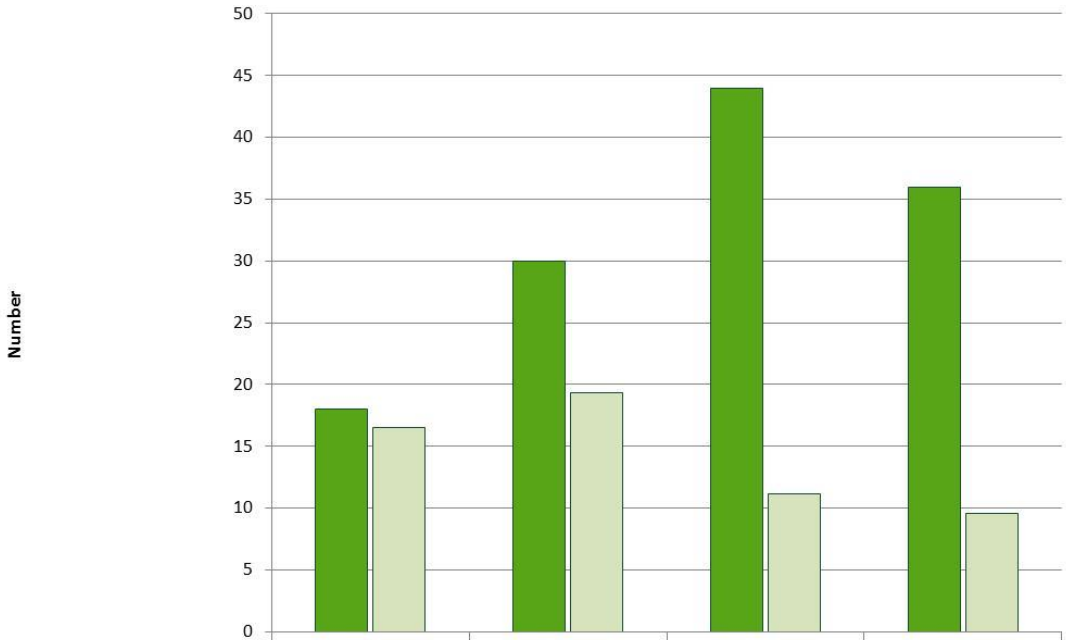
The highest number of CDI outbreaks from 2009 to 2012 was reported by Toronto (n=15), Middlesex-London (n=14), and Hamilton (n=14). These three public health units accounted for 34% of all outbreaks during the four-year period. Ten public health units did not report a CDI outbreak (Map 10-1). Public 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.

Table 10-1. Number of Cases Linked to CDI Outbreaks and All-Cause Mortality: Ontario, 2009–12

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	18	297	17	75	25.3
2010	30	580	19	148	25.5
2011	44	489	11	115	23.5
2012	36	346	10	74	21.4
2009-2012	128	1712	13	412	24.1

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2014/12/19].

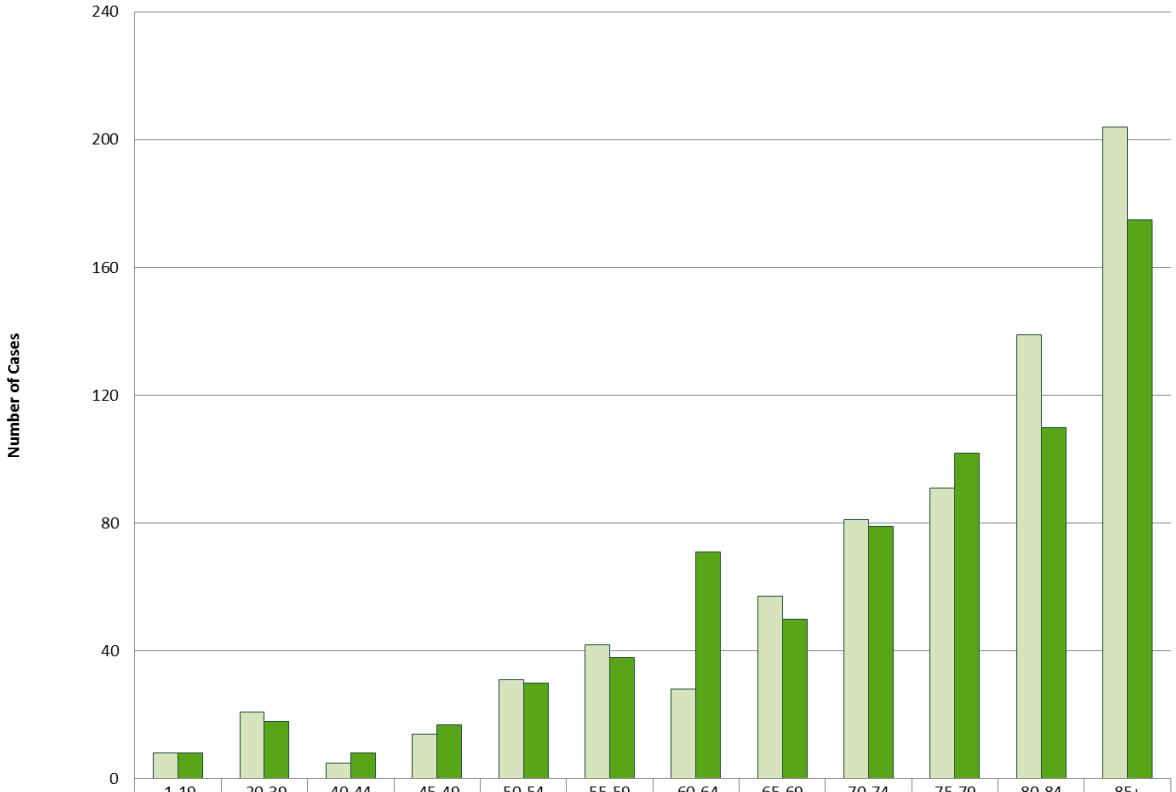
Figure 10-1. Number of Confirmed CDI Outbreaks and Average Number of Cases per CDI Outbreak: Ontario, 2009–12



	2009	2010	2011	2012
Number of Outbreaks	18	30	44	36
Average Number of Cases per Outbreak	17	19	11	10

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2014/12/19].

Figure 10-2. Number of CDI Cases Associated with a Hospital Outbreak by Sex and Age Group: Ontario, 2009–12



	1-19	20-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Female Count	8	21	5	14	31	42	28	57	81	91	139	204
Male Count	8	18	8	17	30	38	71	50	79	102	110	175

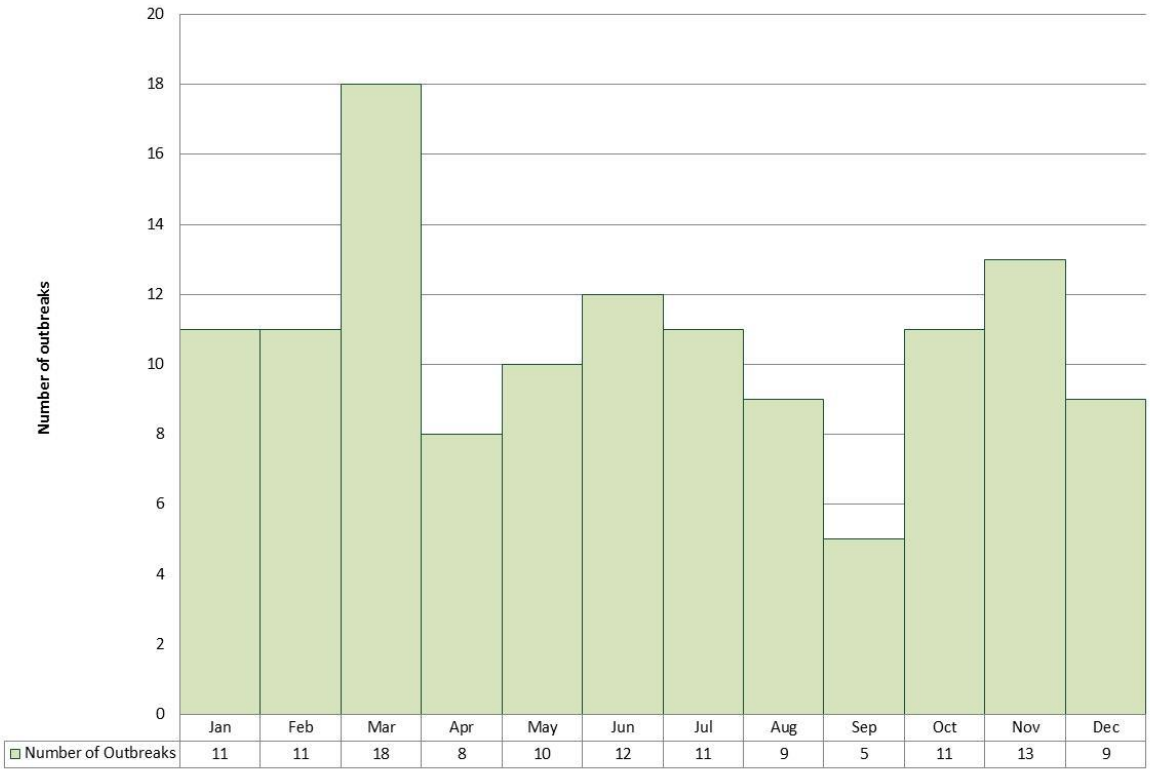
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2014/12/19].

Table 10-2. Risk Factors for Confirmed CDI Cases Associated with a Hospital Outbreak: Ontario, 2009–12 (N=1,099)

Risk factor description	Number of Cases	%
Antibiotic use*	908	82.6
Antacid/Antiulcer medication or Proton pump inhibitors	398	36.2
Immunocompromised status†	279	25.4
Chronic illness/underlying medical condition (specify)	109	9.9
Abdominal/gastrointestinal surgery	85	7.7
Previous/recent hospitalization	83	7.6
Prolonged hospitalization	57	5.2
Close contact with a case	34	3.1
Previous *C. difficile* infection	21	1.9
Feeding tube	8	0.7
Other	202	18.4
Unknown	60	5.5

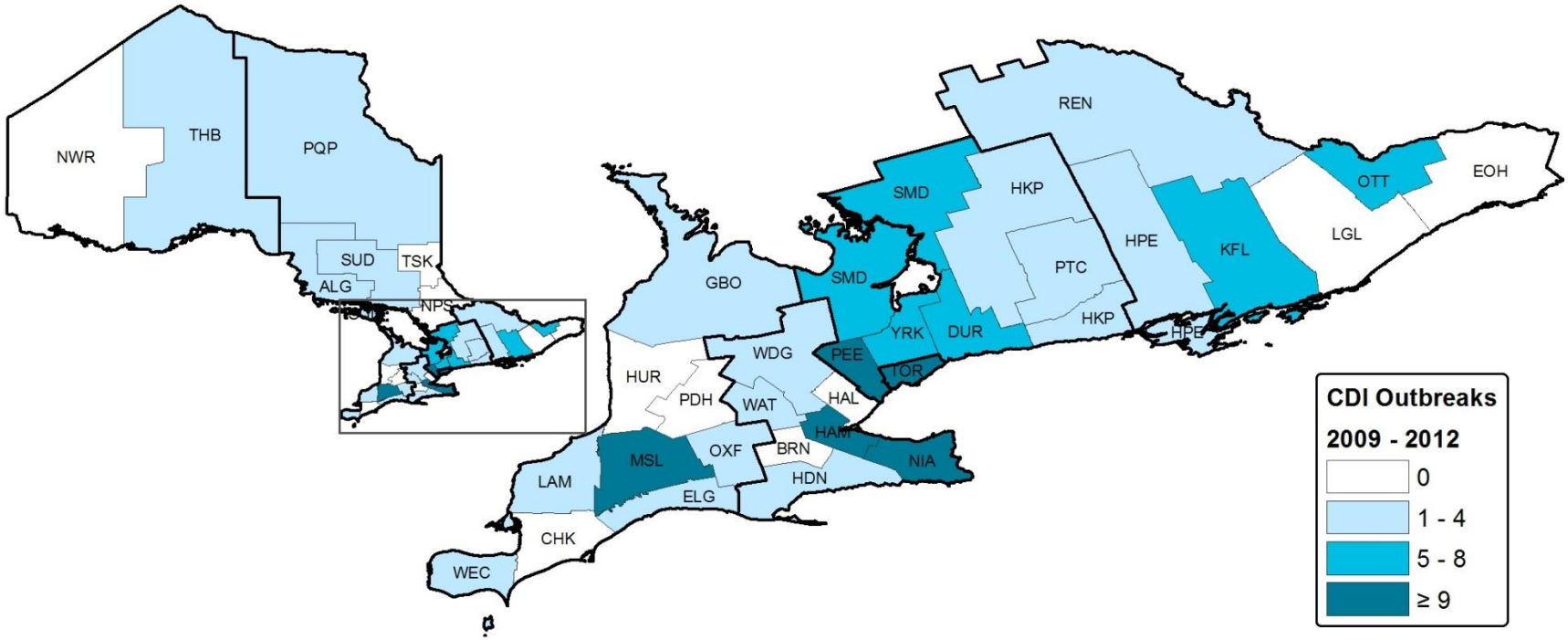
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2014/12/19]
*Includes cases where antimicrobial therapy was selected as a risk factor. Antimicrobial therapy was inactivated as a risk factor in January 2012.
† Includes cases where chemotherapy was selected as a risk factor. Chemotherapy was inactivated as a risk factor in January 2011.

Figure 10-3. Number of Confirmed CDI Outbreaks per Month: Ontario, 2009–12



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2014/12/19].

Map 10-1. Number of CDI Outbreaks by Public Health Unit: Ontario, 2009–12



PHU	Outbreaks	Cases (n)
ALG	1	4
BRN	0	0
CHK	0	0
DUR	8	78
ELG	1	4
EOH	0	0
GBO	2	25
HAL	0	0
HAM	14	154
HDN	1	5
HKP	3	20
HPE	1	3
HUR	0	0

PHU	Outbreaks	Cases (n)
KFL	7	294
LAM	1	24
LGL	0	0
MSL	14	128
NIA	9	133
NPS	0	0
NWR	0	0
OTT	8	56
OXF	2	6
PDH	0	0
PEE	9	191
PQP	2	16
PTC	3	18

PHU	Outbreaks	Cases (n)
REN	3	21
SMD	5	108
SUD	3	32
THB	1	6
TOR	15	245
TSK	0	0
WAT	4	17
WDG	4	35
WEC	2	36
YRK	5	53
Ontario	**128**	**1712**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2014/12/19].

Chapter 11.

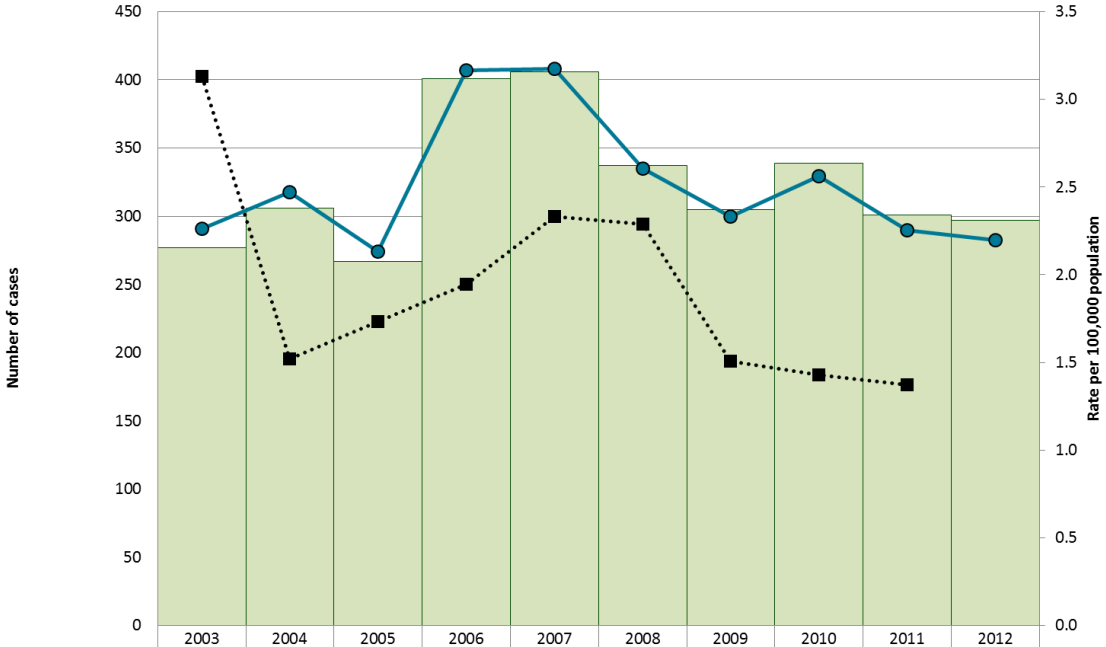
Cryptosporidiosis

In 2012, there were 297 confirmed cases of cryptosporidiosis reported in Ontario, corresponding to an incidence rate of 2.2 cases per 100,000 population. Since 2003, the annual incidence rate for cryptosporidiosis in Ontario has remained relatively stable, although an increase was observed in 2007 and 2008 (Figure 11-1). Since 2004, the provincial incidence rate has remained higher than the national rate.

The highest incidence rates were observed among children under five years at 7.1 cases per 100,000 population. The lowest incidence rates were observed among adults 50 years of age and over and ranged from 0.2 to 0.5 cases per 100,000 population (Figure 11-2). Incidence rates were higher among females compared to males for all age groups, with the exception of young females under ten years of age and adults in the 50–59 year age group (Figure 11-2). In 2012, 6.7% (20/298 cases) of cryptosporidiosis cases reported hospitalization. No deaths were reported.

Cryptosporidiosis consistently shows a seasonal trend, including during 2012, with case counts increasing in the summer months, most notably in August (Figure 11-3). The highest incidence rates for cryptosporidiosis in 2012 were reported in Ontario's South West health region in Huron County (23.1 cases per 100,000 population), followed by Perth District (10.4 cases per 100,000 population), Oxford County (9.2 cases per 100,000 population), and Grey-Bruce (9.2 cases per 100,000 population) (Map 11-1). Rates were also high in the Central West health region in Haldimand-Norfolk (8.2 cases per 100,000 population). The higher rates observed in rural areas are thought to be due to higher cattle density. The observed variability in incidence rates by age, sex, and public health unit should be interpreted with caution due to low case counts in some strata.

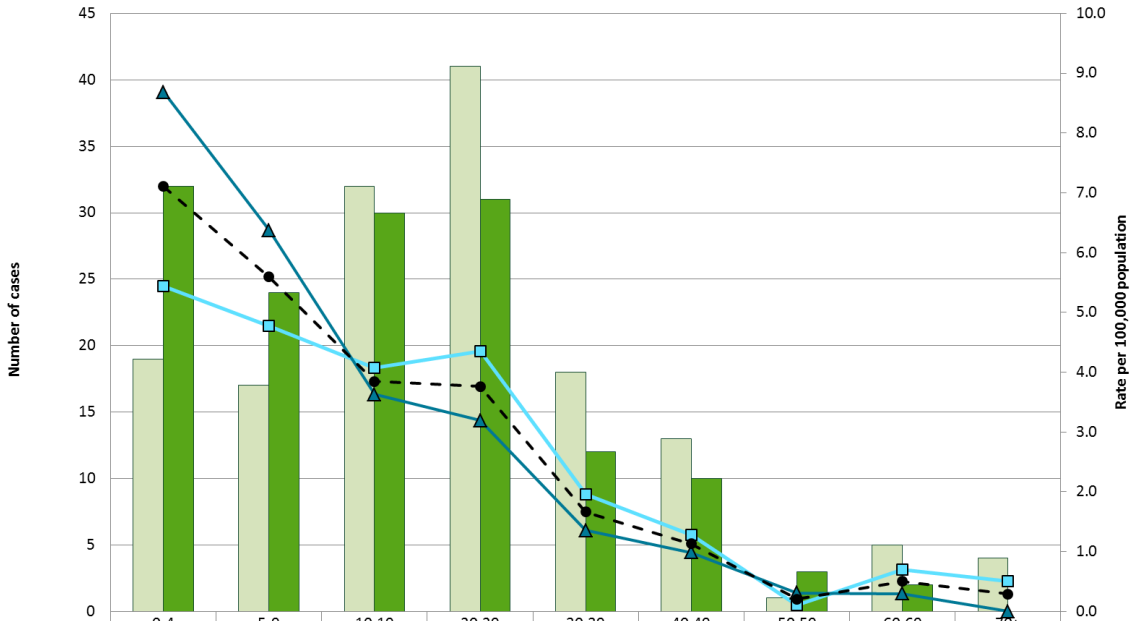
Figure 11-1. Incidence of Cryptosporidiosis: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	277	306	267	401	406	337	305	339	301	297
Ontario Rate	2.3	2.5	2.1	3.2	3.2	2.6	2.3	2.6	2.3	2.2
Canada (Excl. ON) Rate	3.1	1.5	1.7	1.9	2.3	2.3	1.5	1.4	1.4	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

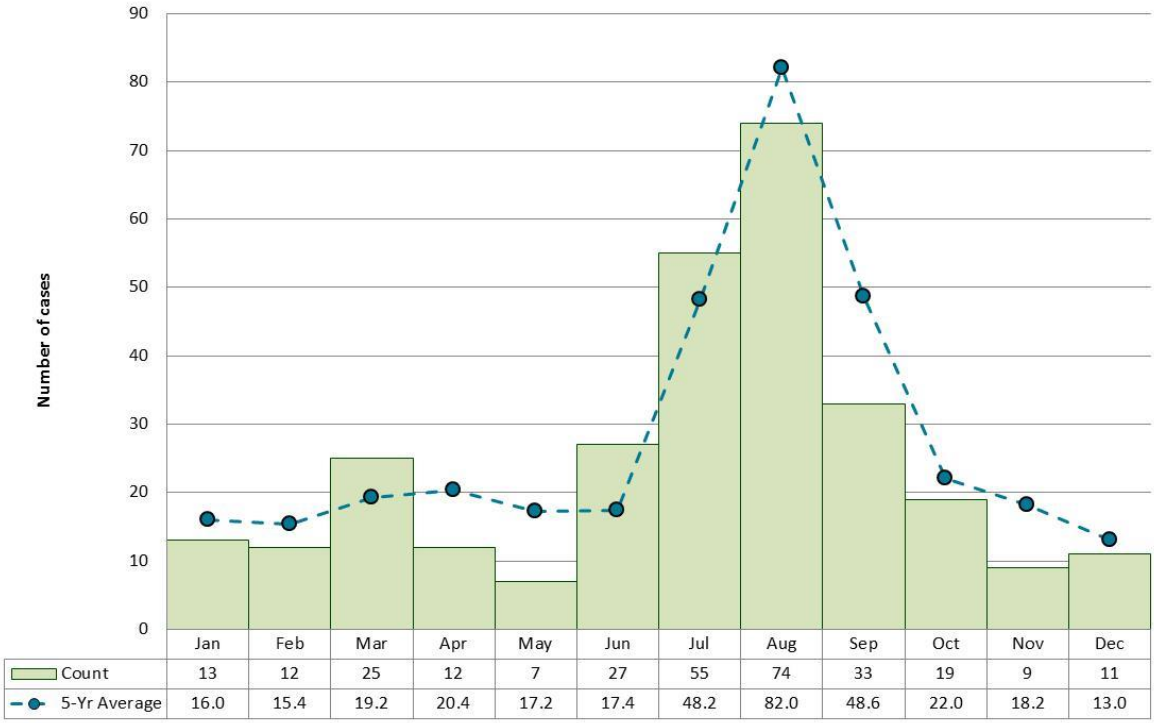
Figure 11-2. Incidence of Cryptosporidiosis by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	19	17	32	41	18	13	1	5	4
Male Count	32	24	30	31	12	10	3	2	0
Female Rate	5.4	4.8	4.1	4.4	2.0	1.3	0.1	0.7	0.5
Male Rate	8.7	6.4	3.6	3.2	1.4	1.0	0.3	0.3	0.0
Total Rate	7.1	5.6	3.8	3.8	1.7	1.1	0.2	0.5	0.3

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes three cases of unknown age and/or sex. Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

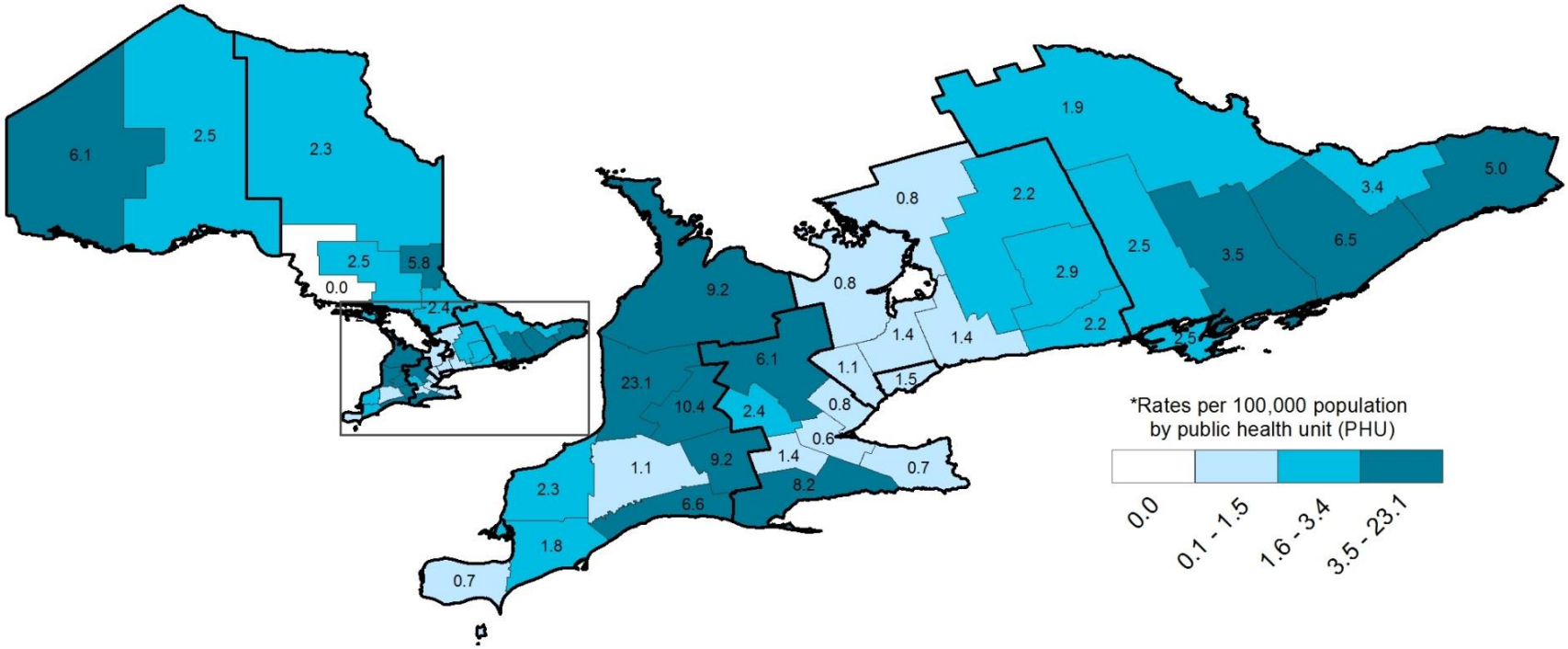
Figure 11-3. Number of Cryptosporidiosis Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	13	12	25	12	7	27	55	74	33	19	9	11
5-Yr Average	16.0	15.4	19.2	20.4	17.2	17.4	48.2	82.0	48.6	22.0	18.2	13.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 11-1. Incidence of Cryptosporidiosis by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	2	1.4
CHK	2	1.8
DUR	9	1.4
ELG	6	6.6
EOH	10	5.0
GBO	15	9.2
HAL	4	0.8
HAM	3	0.6
HDN	9	8.2
HKP	4	2.2
HPE	4	2.5
HUR	14	23.1

PHU	Cases (n)	*Rates
KFL	7	3.5
LAM	3	2.3
LGL	11	6.5
MSL	5	1.1
NIA	3	0.7
NPS	3	2.4
NWR	5	6.1
OTT	31	3.4
OXF	10	9.2
PDH	8	10.4
PEE	16	1.2
PQP	2	2.3
PTC	4	2.9

PHU	Cases (n)	*Rates
REN	2	1.9
SMD	4	0.8
SUD	5	2.5
THB	4	2.6
TOR	42	1.5
TSK	2	5.8
WAT	13	2.4
WDG	17	6.1
WEC	3	0.7
YRK	15	1.4
Ontario	**297**	**2.2**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 12.

Cyclosporiasis

There were 79 cases of cyclosporiasis reported in Ontario in 2012, representing an incidence rate of 0.6 cases per 100,000 population (Figure 12-1). The incidence rate for cyclosporiasis has remained relatively stable over the past ten years with the exception of 2005, 2009, and 2010, which were associated with outbreaks. The incidence rates of cyclosporiasis have been higher in Ontario than for the rest of Canada.

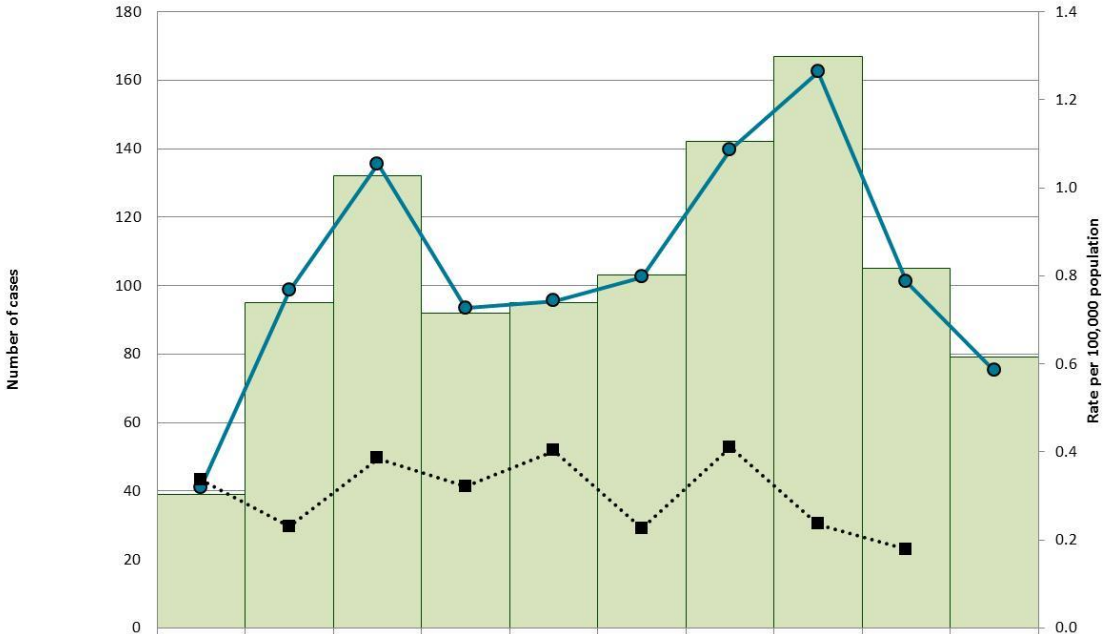
The incidence rate of cyclosporiasis was highest among adults, particularly those in the 40 to 69 year age groups (Figure 12-2). There was no distinct difference in the rate between males and females. In 2012, there were no hospitalizations or deaths reported for this disease.

A seasonal pattern was observed for cyclosporiasis with an increase noted during the spring and early summer months, with a marked peak in June (Figure 12-3). In previous years, approximately 60% of cyclosporariasis cases in Ontario were estimated to be travel-related.[12,26]

Cyclospora is not endemic to Ontario nor is it transmitted via person-to-person spread. As a result, it is expected that all reported cases in the province will either be travel-related or associated with an imported source. Since the initial identification of this pathogen in Ontario in 1996,[27,28] there have been a small number of non-travel sporadic cases of the disease reported each year.[28]

The 2012 incidence rates by public health unit of residence are presented in Map 12-1. The observed variability in incidence rates by age and gender and public health unit should be interpreted with caution due to low case counts.

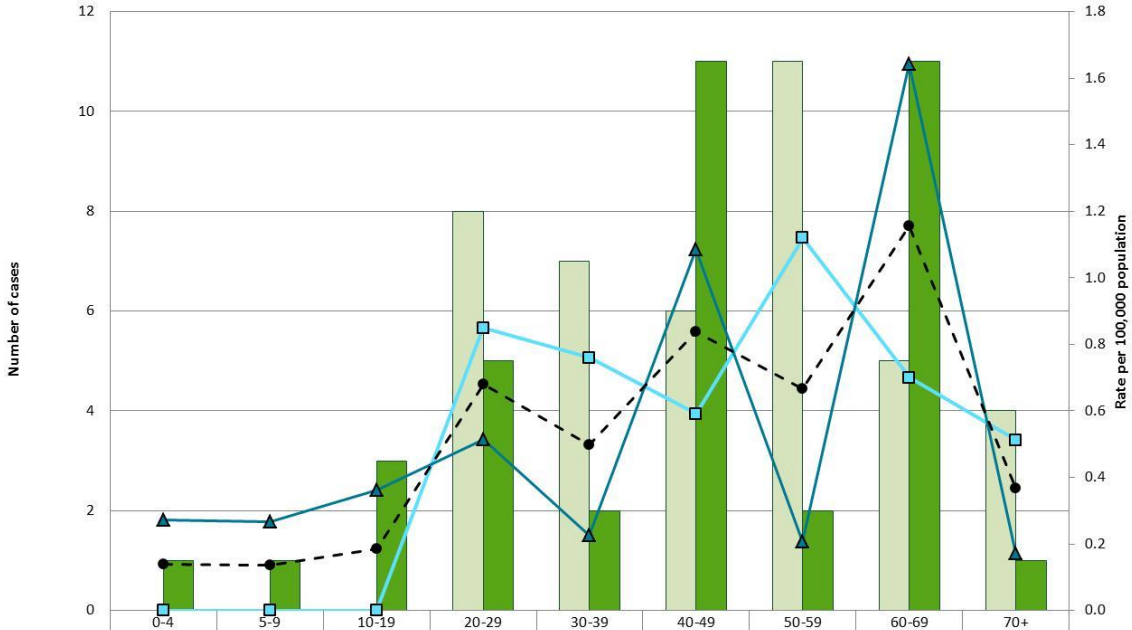
Figure 12-1. Incidence of Cyclosporiasis: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	39	95	132	92	95	103	142	167	105	79
Ontario Rate	0.3	0.8	1.1	0.7	0.7	0.8	1.1	1.3	0.8	0.6
Canada (Excl. ON) Rate	0.3	0.2	0.4	0.3	0.4	0.2	0.4	0.2	0.2	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

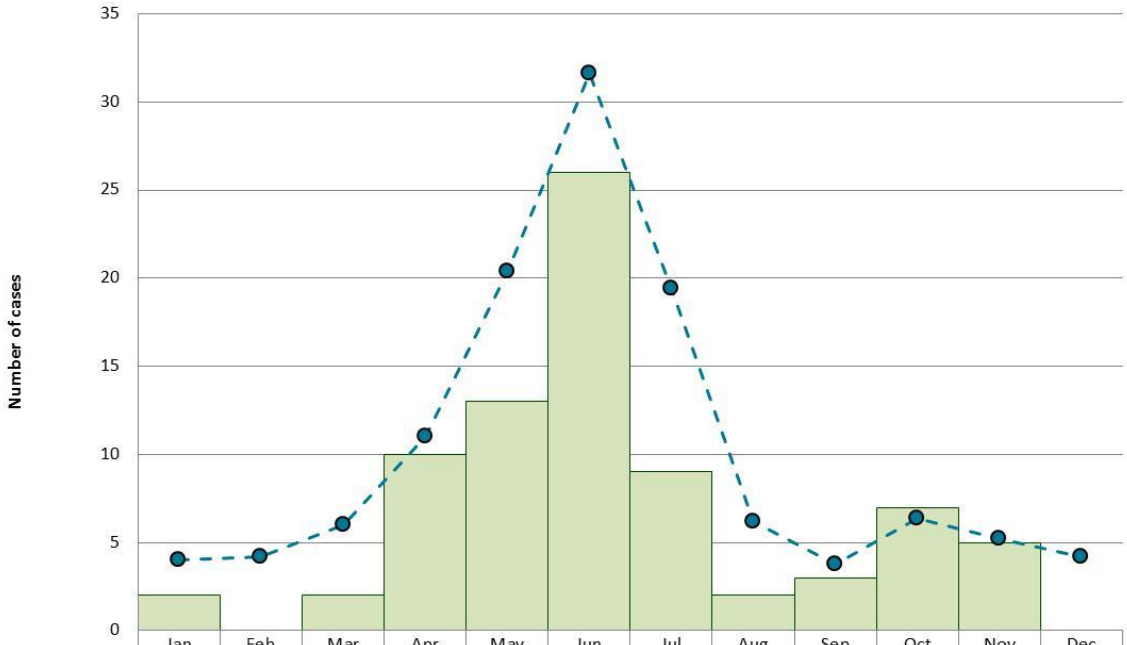
Figure 12-2. Incidence of Cyclosporiasis by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	0	0	0	8	7	6	11	5	4
Male Count	1	1	3	5	2	11	2	11	1
Female Rate	0.0	0.0	0.0	0.8	0.8	0.6	1.1	0.7	0.5
Male Rate	0.3	0.3	0.4	0.5	0.2	1.1	0.2	1.6	0.2
Total Rate	0.1	0.1	0.2	0.7	0.5	0.8	0.7	1.2	0.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes one case of unknown age and/or sex. Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

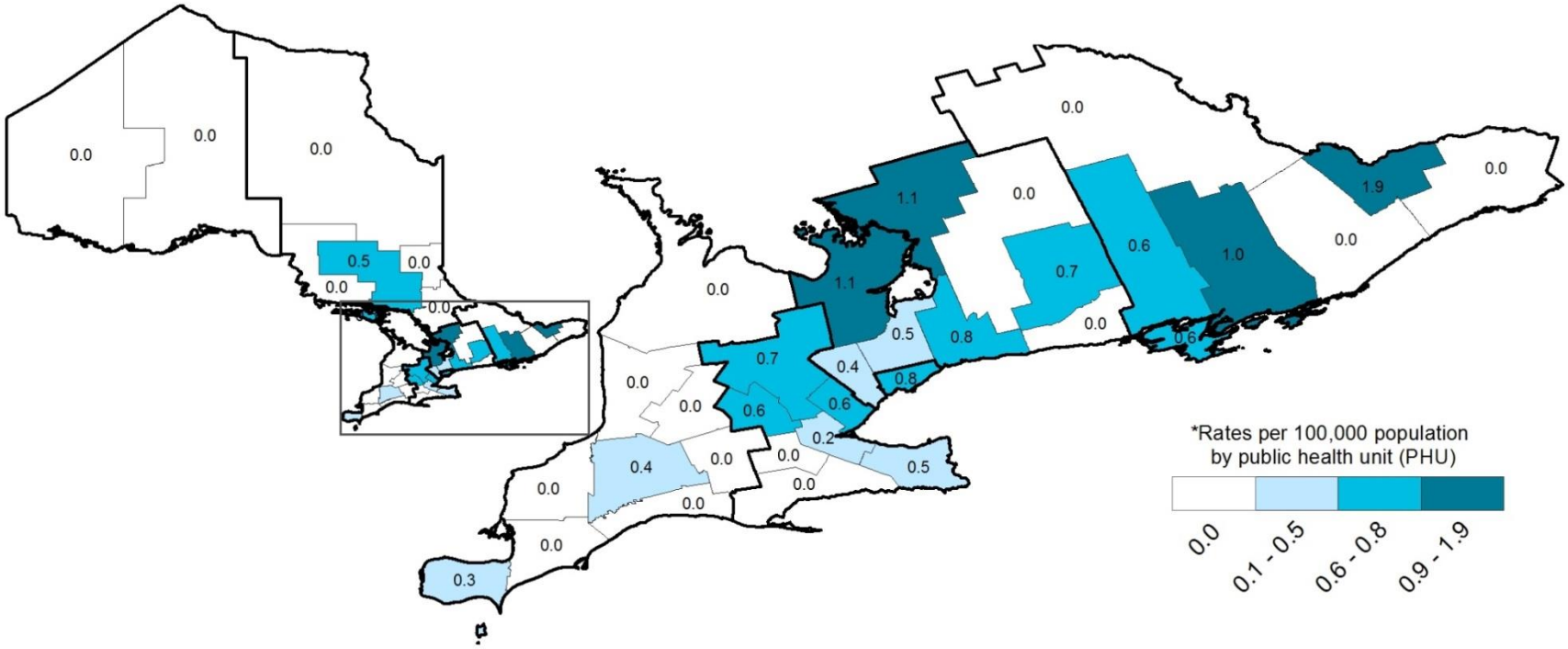
Figure 12-3. Number of Cyclosporiasis Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	2	0	2	10	13	26	9	2	3	7	5	0
5-Yr Average	4.0	4.2	6.0	11.0	20.4	31.6	19.4	6.2	3.8	6.4	5.2	4.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 12-1. Incidence of Cyclosporiasis by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	0	0.0
CHK	0	0.0
DUR	5	0.8
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	1	0.6
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	2	1.0
LAM	0	0.0
LGL	0	0.0
MSL	2	0.4
NIA	2	0.5
NPS	0	0.0
NWR	0	0.0
OTT	17	1.9
OXF	0	0.0
PDH	0	0.0
PEE	6	0.4
PQP	0	0.0
PTC	1	0.7

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	6	1.1
SUD	1	0.5
THB	0	0.0
TOR	21	0.8
TSK	0	0.0
WAT	3	0.6
WDG	2	0.7
WEC	1	0.3
YRK	5	0.5
Ontario	**79**	**0.6**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 13.

Cytomegalovirus Infection, Congenital

In 2012, three cases of congenital cytomegalovirus (CMV) were reported among newborns in Ontario, corresponding to an incidence rate of 2.1 cases per 100,000 live births (Table 13-1). From 2003 to 2012, a total of 67 cases of congenital CMV were reported in Ontario, for an average of 6.7 cases per year over this period. The largest number of cases during this period was reported in 2011, with 11 cases reported.

No comparable national data are available as congenital CMV infections are not nationally notifiable. In 2013, this disease was removed from the Ontario Reportable Diseases List.

Table 13-1. Incidence of Congenital Cytomegalovirus Infection: Ontario, 2003–12

Year	Ontario cases	Ontario rate per 100,000 live births
2003	8	6.13
2004	7	5.29
2005	7	5.24
2006	8	5.91
2007	6	4.34
2008	3	2.14
2009	9	6.43
2010	5	3.59
2011	11	7.86
2012	3	2.14

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Live Births [2003-2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].
Note: Congenital cytomegalovirus is not a nationally notifiable disease.

Chapter 14.

Diphtheria

Diphtheria is a toxin-mediated disease caused by the bacterium *Corynebacterium diphtheria*.[29] It is a rare disease in Canada due to routine immunization. Under Ontario's publicly funded immunization program, diphtheria toxoid-containing vaccine is routinely administered to infants in combination with vaccines against tetanus, pertussis, polio and *Haemophilus influenzae* type b.[30,31] Children receive a dose of diphtheria toxoid-containing vaccine at 2, 4, 6, and 18 months of age, with additional booster doses at 4 to 6 years and 14 to 16 years of age.[30] A booster dose is recommended every ten years throughout life for continued protection.

Four confirmed cases of diphtheria were reported in Ontario between 1991 and 1995. No cases were reported since 1995. Annual Canadian incidence rates of diphtheria remained below 0.02 cases per 100,000 population for the period between 2003 and 2011.

Chapter 15.

Giardiasis

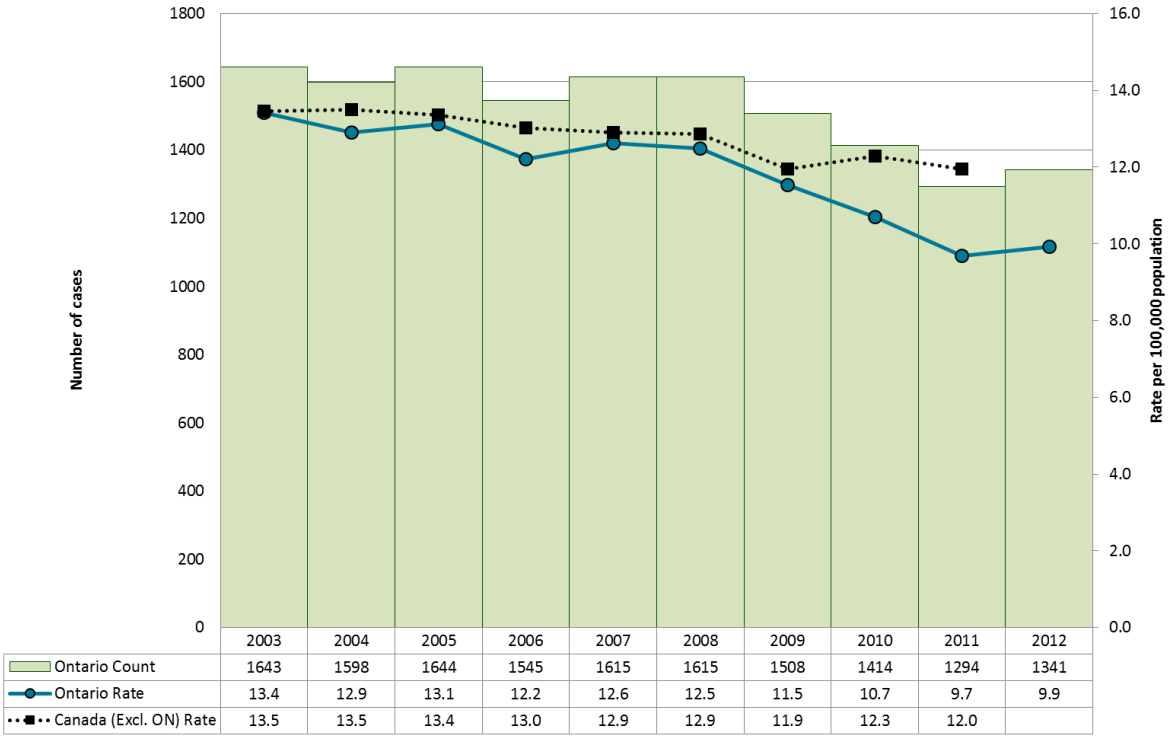
In 2012, giardiasis was the third most commonly reported enteric disease in Ontario, with 1,341 confirmed cases reported and an incidence rate of 9.9 cases per 100,000 population. The provincial incidence rate has been declining over the past ten years, and has become progressively lower than the national rate in 2010 and 2011 (Figure 15-1).

Children less than five years of age had the highest age-specific incidence rate for giardiasis in 2012 at 17.7 cases per 100,000 population (Figure 15-2); a similar age-related trend has been previously reported in Ontario.[12] Daycare attendance,[32] poor hygiene practices, and health care-seeking behaviour of parents may help to explain the higher incidence within this age group. Giardiasis also exhibited a notable sex-specific distribution, with higher incidence rates reported among males compared to females, especially in young to middle-aged adults. Person-to- person transmission among men who have sex with men (MSM) is a risk factor for the transmission of this disease.[2]

In 2012, 1.6% (22/1,341) of confirmed giardiasis cases were hospitalized, and no deaths were reported.

A slight seasonal pattern has been observed for giardiasis in recent years, including 2012, with case counts peaking in the summer months (Figure 15-3). Cases reported during the winter months were largely attributed to international travel, according to a recent study conducted in Ontario.[26] The highest incidence rates for giardiasis in 2012 were reported in Grey Bruce (15.9 cases per 100,000 population), Niagara Region (15.2 cases per 100,000 population), and Toronto (14.3 cases per 100,000 population) (Map 15-1). The observed variability in incidence rates by public health unit geography should be interpreted with caution due to small case counts in some jurisdictions.

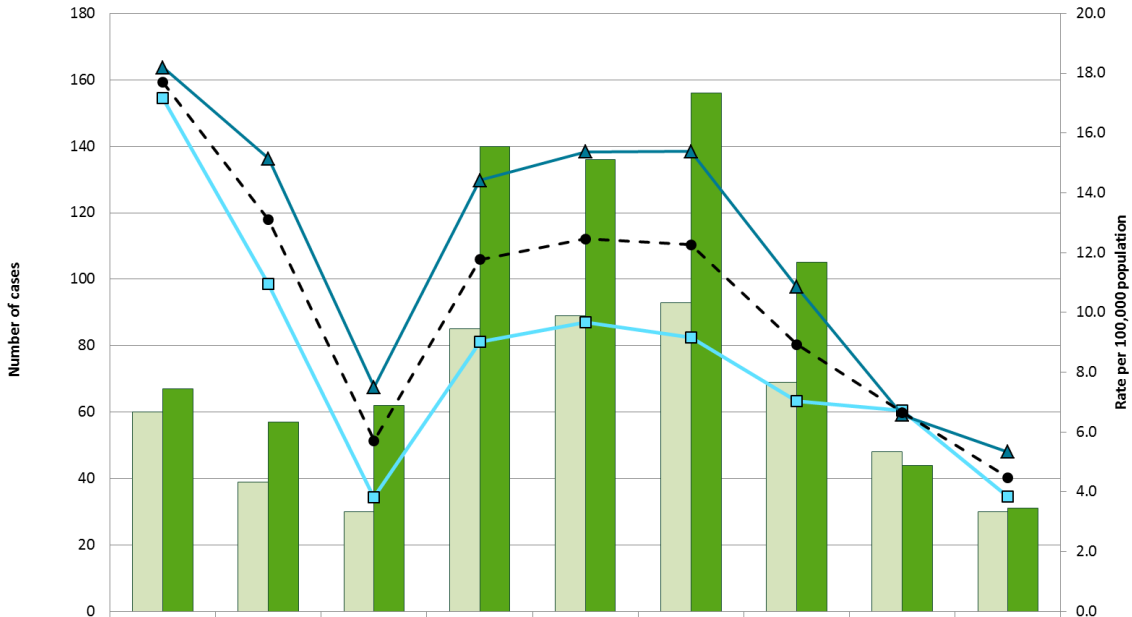
Figure 15-1. Incidence of Giardiasis: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	1643	1598	1644	1545	1615	1615	1508	1414	1294	1341
Ontario Rate	13.4	12.9	13.1	12.2	12.6	12.5	11.5	10.7	9.7	9.9
Canada (Excl. ON) Rate	13.5	13.5	13.4	13.0	12.9	12.9	11.9	12.3	12.0	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

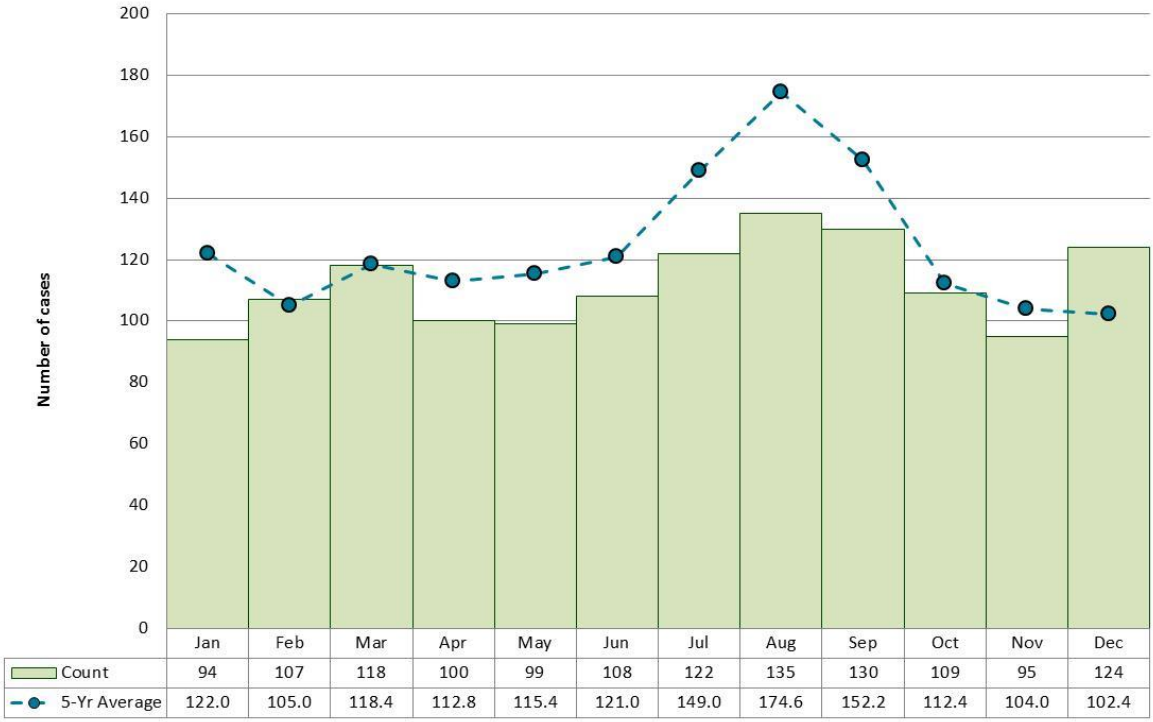
Figure 15-2. Incidence of Giardiasis by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	60	39	30	85	89	93	69	48	30
Male Count	67	57	62	140	136	156	105	44	31
Female Rate	17.2	10.9	3.8	9.0	9.7	9.2	7.0	6.7	3.8
Male Rate	18.2	15.1	7.5	14.4	15.4	15.4	10.9	6.6	5.3
Total Rate	17.7	13.1	5.7	11.8	12.5	12.3	8.9	6.7	4.5

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

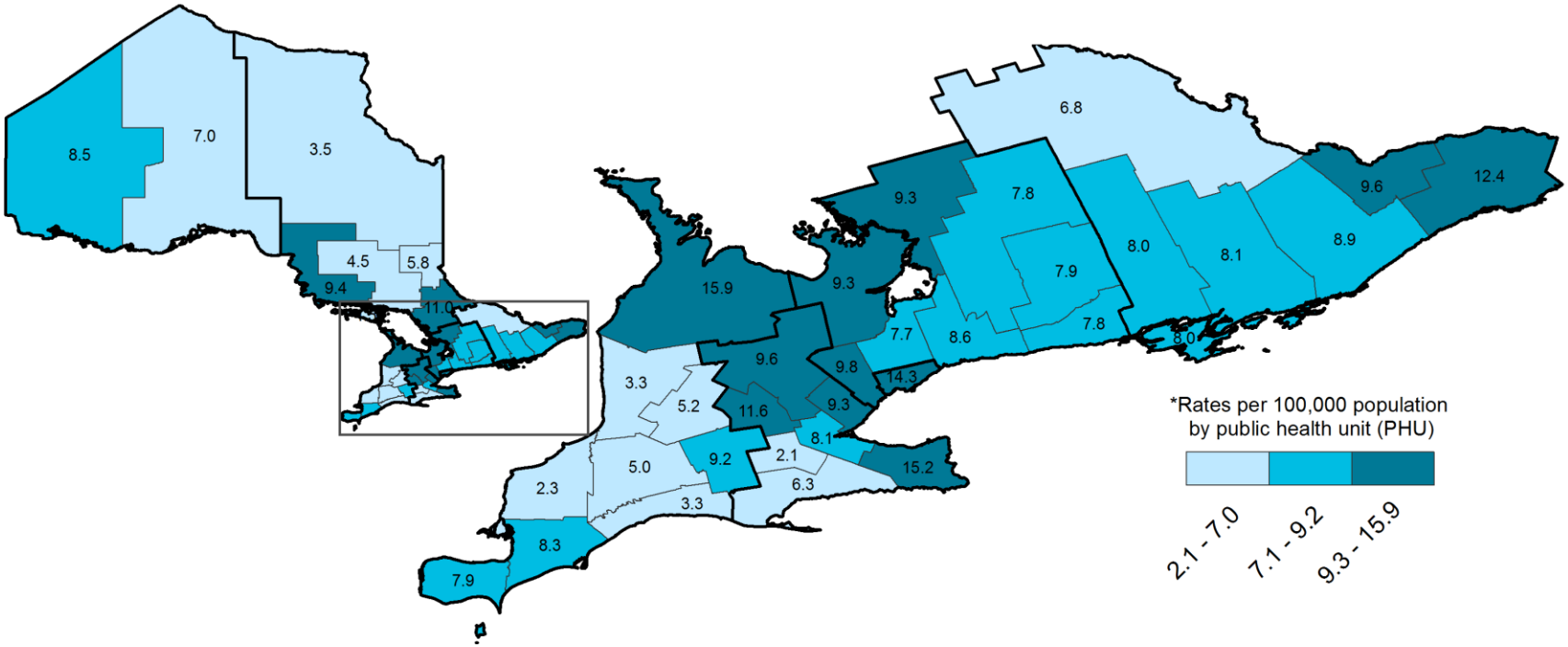
Figure 15-3. Number of Giardiasis Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	94	107	118	100	99	108	122	135	130	109	95	124
5-Yr Average	122.0	105.0	118.4	112.8	115.4	121.0	149.0	174.6	152.2	112.4	104.0	102.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 15-1. Incidence of Giardiasis by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	11	9.4
BRN	3	2.1
CHK	9	8.3
DUR	55	8.6
ELG	3	3.3
EOH	25	12.4
GBO	26	15.9
HAL	49	9.3
HAM	44	8.1
HDN	7	6.4
HKP	14	7.8
HPE	13	8.0
HUR	2	3.3

PHU	Cases (n)	*Rates
KFL	16	8.1
LAM	3	2.3
LGL	15	8.9
MSL	23	5.0
NIA	68	15.2
NPS	14	11.0
NWR	7	8.5
OTT	88	9.6
OXF	10	9.2
PDH	4	5.2
PEE	136	9.8
PQP	3	3.5
PTC	11	7.9

PHU	Cases (n)	*Rates
REN	7	6.8
SMD	49	9.3
SUD	9	4.5
THB	11	7.0
TOR	399	14.3
TSK	2	5.8
WAT	62	11.6
WDG	27	9.6
WEC	32	7.9
YRK	84	7.7
Ontario	**1341**	**9.9**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 16.

Gonorrhea

Gonorrhea is the second most frequently reported sexually transmitted infection in Ontario after chlamydia. In 2012, 4,097 cases of gonorrhea were reported provincially, representing a reported incidence rate of 30.3 cases per 100,000 population (Figure 16-1). Of these, 32.5% (1,331/4,097) were co-infected with chlamydia. 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. Despite the absence of symptoms, those infected are still able to transmit gonorrhea to their sexual contacts.

From 2003 to 2012, the reported incidence rate of gonorrhea in Ontario was relatively steady with small annual fluctuations. During this period, annual incidence rates of gonorrhea ranged from a low of 26.5 cases per 100,000 population in 2005 to a high of 31.5 cases per 100,000 population in 2011 (Figure 16-1). Since 2005, rates of gonorrhea reported in Ontario have been lower than national rates.

The incidence of gonorrhea in 2012 was greater among males, with an incidence rate of 35.8 cases per 100,000 population, compared to 24.9 cases per 100,000 population among females. Similar to chlamydia, the highest incidence of gonorrhea was reported among 20–24 year olds in both males and females (Figure 16-2). Among males, the incidence of gonorrhea remained high in those up to 39 years of age before decreasing. Among females, the incidence increased more dramatically among those 15–19 years of age, peaked among those 20–24 years of age, and then rapidly declined with increasing age. The higher incidence of gonorrhea among males may be partly attributed to transmission among men who have sex with men (MSM).[33]

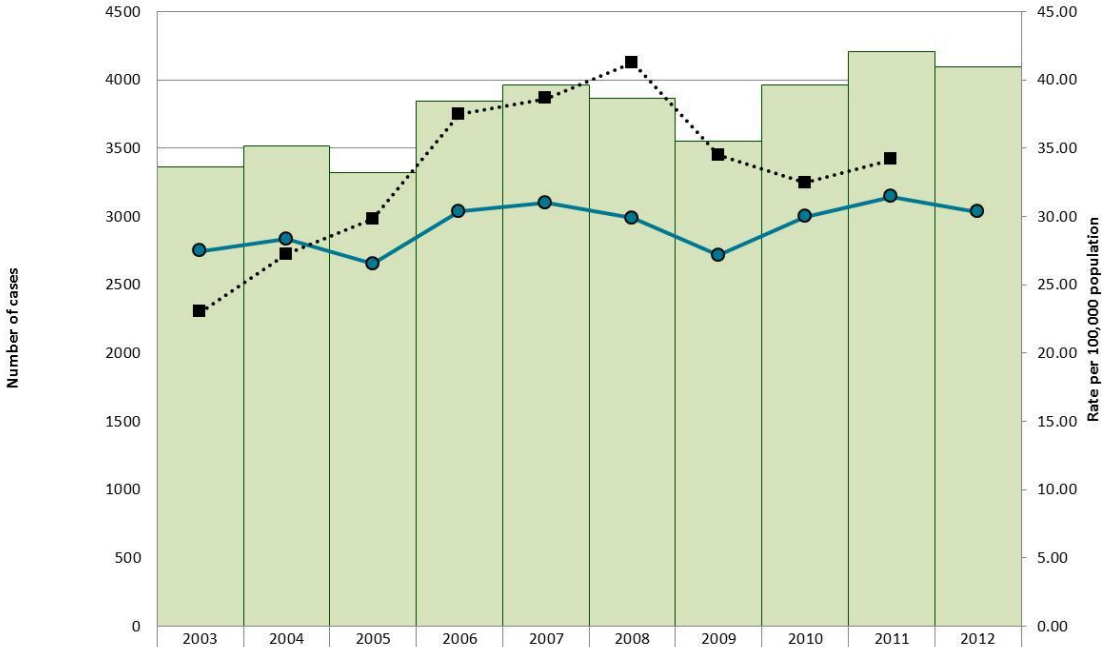
Based on testing performed at Public Health Ontario Laboratories (PHOL), the percentage of tests that were positive for gonorrhea each month in 2012 ranged from 0.7 to 0.9%, with an overall percent positivity of 0.8% for the year (Figure 16-3). However, testing for gonorrhea is also completed at community laboratories throughout the province, which constitutes the majority of testing for gonorrhea in Ontario.

The highest reported incidence rates of gonorrhea occurred in Northwestern, Toronto, and Thunder Bay District public health units, with incidence rates of 87.6, 69.5 and 41.4 cases per 100,000 population, respectively (Map 16-1).

Several factors that may influence the reported incidence of gonorrhea include changes in screening and testing practices among clinicians, follow-up by public health units, as well as increasing resistance to antibiotics available to treat gonorrhea infections.[33] In 2012, 29.8% (349/1,172) of culture specimens received at PHOL were resistant to the previous first-line treatment, ciprofloxacin (data not shown). 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.

While resistance to current preferred treatment options such as cefixime and ceftriaxone has not yet been defined in North America, clinical failures associated with cefixime have been reported.[34] Evolving antibiotic resistance presents challenges to successful gonorrhea treatment, which in turn impacts disease transmission. As a result, new Ontario guidelines for gonorrhea treatment were released by PHO in 2013.[35]

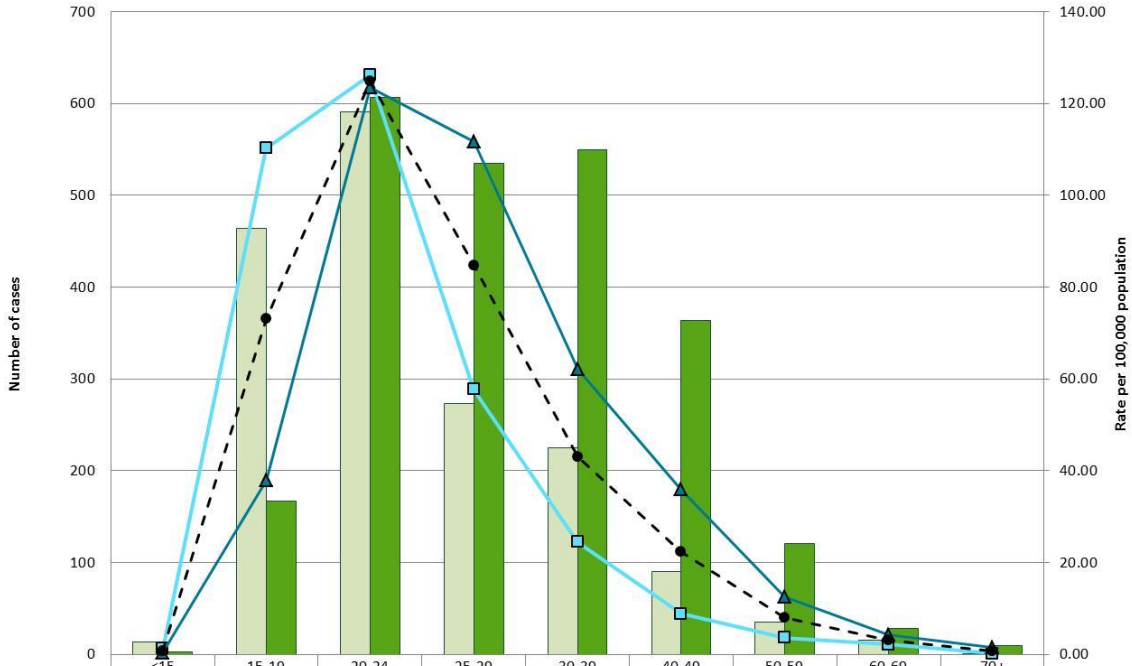
Figure 16-1. Incidence of Gonorrhea: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	3362	3514	3322	3844	3963	3865	3549	3964	4205	4097
Ontario Rate	27.46	28.36	26.52	30.35	30.98	29.89	27.16	29.98	31.46	30.33
Canada (Excl. ON) Rate	22.99	27.24	29.81	37.49	38.65	41.25	34.50	32.47	34.15	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

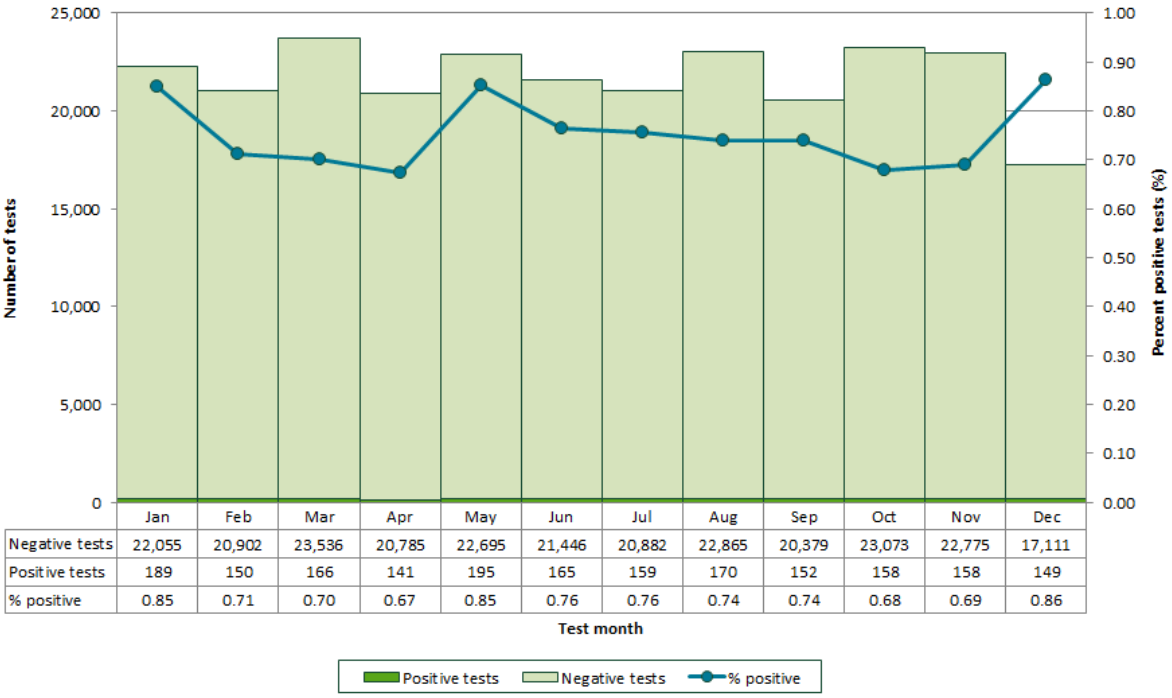
Figure 16-2. Incidence of Gonorrhea by Age and Sex: Ontario, 2012



	<15	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	13	464	591	273	225	90	35	15	1
Male Count	3	167	607	535	550	364	121	28	9
Female Rate	1.21	110.29	126.21	57.68	24.44	8.86	3.56	2.10	0.13
Male Rate	0.27	37.82	123.54	111.60	62.15	35.89	12.50	4.18	1.55
Total Rate	0.73	73.18	124.85	84.81	42.92	22.36	8.00	3.11	0.73

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes six cases of unknown age and/or sex.

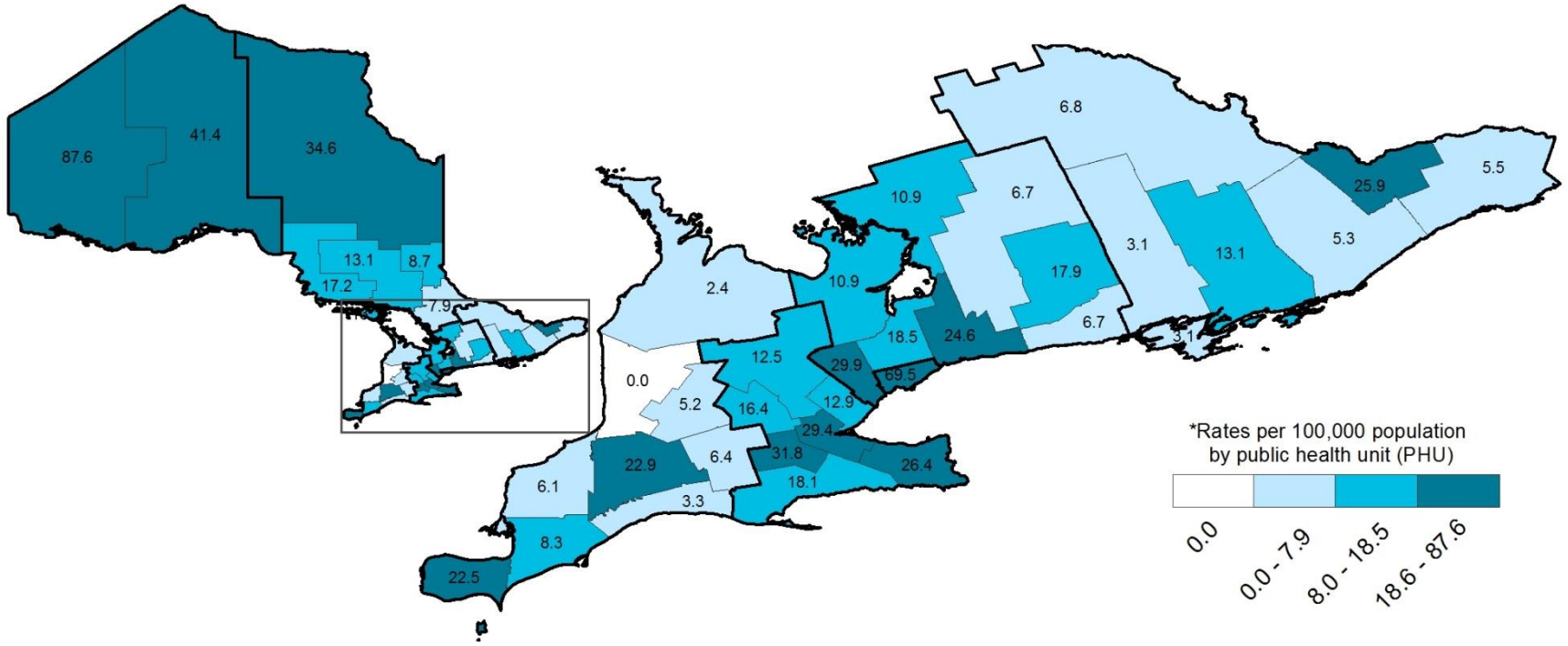
Figure 16-3. Number and Percent of Positive Gonorrhea Tests by Month: Ontario, 2012



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Negative tests	22,055	20,902	23,536	20,785	22,695	21,446	20,882	22,865	20,379	23,073	22,775	17,111
Positive tests	189	150	166	141	195	165	159	170	152	158	158	149
% positive	0.85	0.71	0.70	0.67	0.85	0.76	0.76	0.74	0.74	0.68	0.69	0.86

Source: Public Health Ontario Laboratories (PHOL), STI Online, extracted [2013/12/31].
Note: Data only include tests performed at PHOL.

Map 16-1. Incidence of Gonorrhea by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	20	17.17
BRN	45	31.76
CHK	9	8.29
DUR	157	24.60
ELG	3	3.29
EOH	11	5.47
GBO	4	2.44
HAL	68	12.92
HAM	160	29.40
HDN	20	18.14
HKP	12	6.69
HPE	5	3.09
HUR	0	0.00

PHU	Cases (n)	*Rates
KFL	26	13.13
LAM	8	6.11
LGL	9	5.32
MSL	106	22.86
NIA	118	26.42
NPS	10	7.88
NWR	72	87.56
OTT	238	25.88
OXF	7	6.43
PDH	4	5.19
PEE	416	29.92
PQP	30	34.64
PTC	25	17.88

PHU	Cases (n)	*Rates
REN	7	6.75
SMD	58	10.95
SUD	26	13.13
THB	65	41.40
TOR	1940	69.51
TSK	3	8.70
WAT	88	16.39
WDG	35	12.47
WEC	91	22.53
YRK	201	18.51
Ontario	**4097**	**30.33**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 17.

Group A Streptococcal Disease, Invasive (iGAS)

In 2012, 606 cases of invasive group A streptococcal (iGAS) disease were reported in Ontario, corresponding to an incidence rate of 4.5 cases per 100,000 population (Figure 17-1). From 2003 to 2012, there was an increasing trend in the incidence rate of iGAS, from a low of 2.3 cases per 100,000 population in 2004 to a high of 5.0 cases per 100,000 population in 2011. Overall, incidence rates of iGAS in Ontario have been similar to the rest of Canada; however, the rates were slightly higher in Ontario in 2010 and 2011.

In 2012, the overall incidence rate of iGAS was 14.3% higher in males, with 4.8 cases per 100,000 population, compared to females, with 4.2 cases per 100,000 population (Figure 17-2). The incidence of iGAS was relatively high among infants less than one year of age (based on ten cases in this age group during 2012), decreased among those between 1 and 29 years of age, and then increased steadily with age. The majority of iGAS cases (81.7%, 495/606) in 2012 were reported among those 30 years of age and older. Among females, incidence rates of iGAS were highest in the 30–39 and 70+ age groups; among males, incidence rates were highest in the <1 and 70+ age groups.

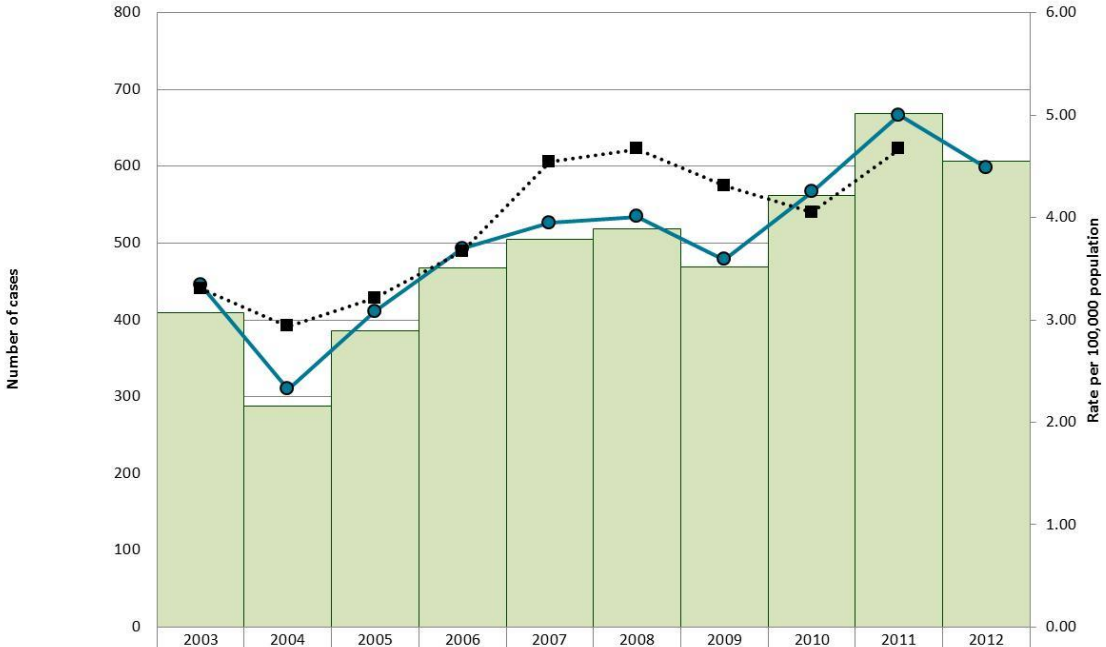
The incidence of iGAS tends to follow a seasonal pattern, with higher case counts in the winter and early spring months (Figure 17-3). In 2012, monthly case counts of iGAS were highest from January to March, reached an annual low in August, and then peaked again in December. Monthly case counts in 2012 exceeded the corresponding monthly five-year (2007–11) historical average by more than 10.0% in seven of twelve months (January–March, July, and October–December).

In 2012, incidence rates of iGAS in Ontario were highest in Northwestern (29.2 cases per 100,000 population), Thunder Bay District (24.2 cases per 100,000 population), and Perth District (11.7 cases per 100,000 population) public health units. However, 17.5% (106/606) of iGAS cases in 2012 were reported from Toronto.

Laboratory testing for iGAS cases may include further differentiation by *emm* type, which assists in determining potential linkages among cases, identifying circulating strains associated with invasive disease, and identifying new strains that may be associated with more severe illness.[36] In 2012, an *emm* type was entered in iPHIS for 39.6% (240/606) of confirmed iGAS cases. *Emm* 1 (15.8%, 38/240), *emm* 89 (15.4%, 37/240), and *emm* 3 (10.4%, 25/240) were the three most commonly reported *emm* types among iGAS cases for which an *emm* type was specified (Table 17-1); however, there is geographic variation in the distribution of *emm* types across the province.[36]

In 2012, 78.5% (476/606) of invasive iGAS cases were hospitalized; 6.6% (40/606) of cases were fatal, with iGAS identified as the underlying or contributing cause of death.

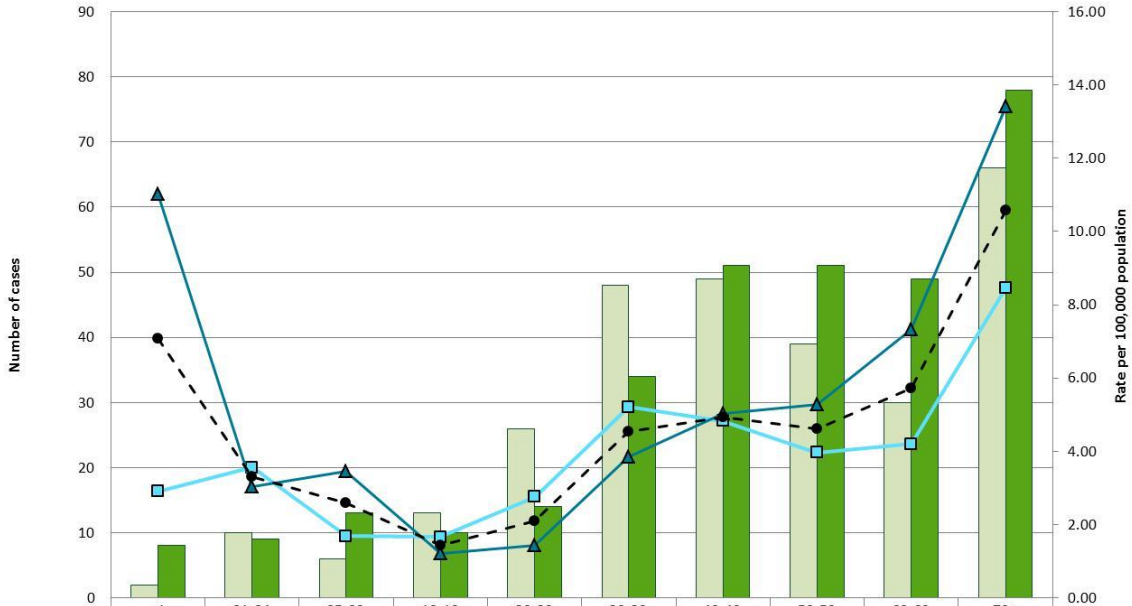
Figure 17-1. Incidence of Group A Streptococcal Disease, Invasive (iGAS): Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	409	288	386	468	505	518	469	562	668	606
Ontario Rate	3.34	2.32	3.08	3.70	3.95	4.01	3.59	4.25	5.00	4.49
Canada (Excl. ON) Rate	3.30	2.94	3.21	3.67	4.54	4.67	4.31	4.05	4.67	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

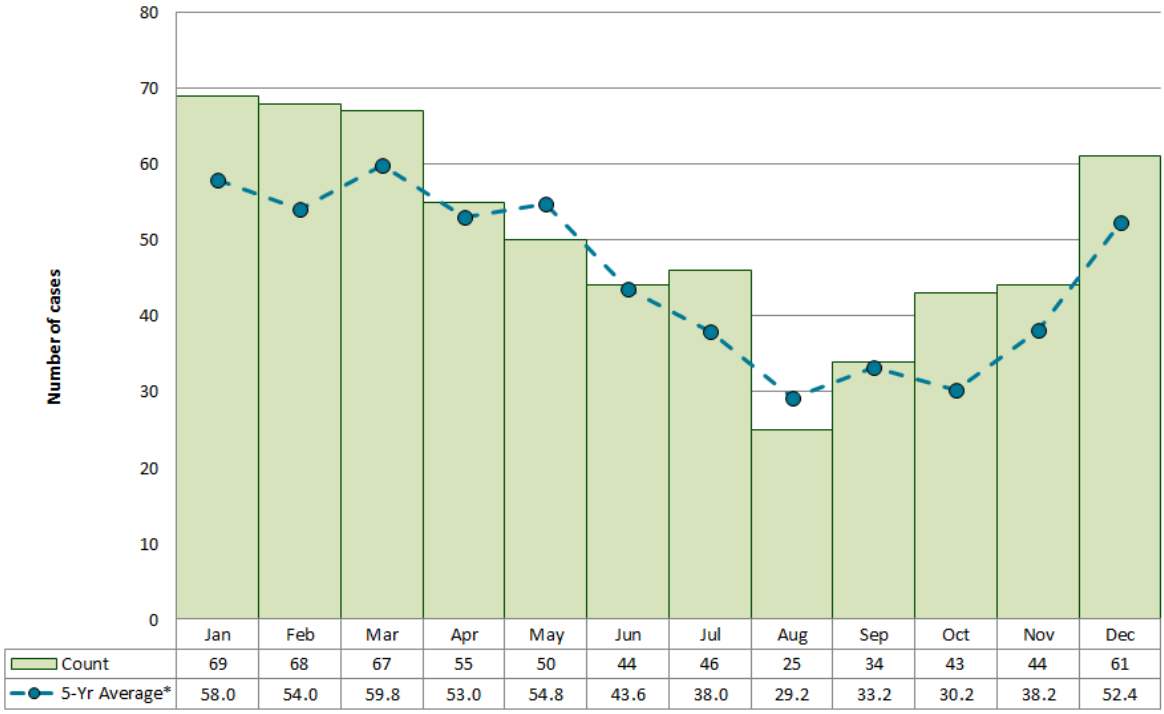
Figure 17-2. Incidence of Group A Streptococcal Disease, Invasive (iGAS) by Age and Sex: Ontario, 2012



	<1	01-04	05-09	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	2	10	6	13	26	48	49	39	30	66
Male Count	8	9	13	10	14	34	51	51	49	78
Female Rate	2.91	3.56	1.68	1.65	2.76	5.21	4.82	3.97	4.20	8.45
Male Rate	11.01	3.04	3.45	1.21	1.44	3.84	5.03	5.27	7.32	13.42
Total Rate	7.07	3.30	2.59	1.43	2.09	4.54	4.93	4.62	5.71	10.57

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Figure 17-3. Number of Group A Streptococcal Disease, Invasive (iGAS) Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	69	68	67	55	50	44	46	25	34	43	44	61
5-Yr Average*	58.0	54.0	59.8	53.0	54.8	43.6	38.0	29.2	33.2	30.2	38.2	52.4

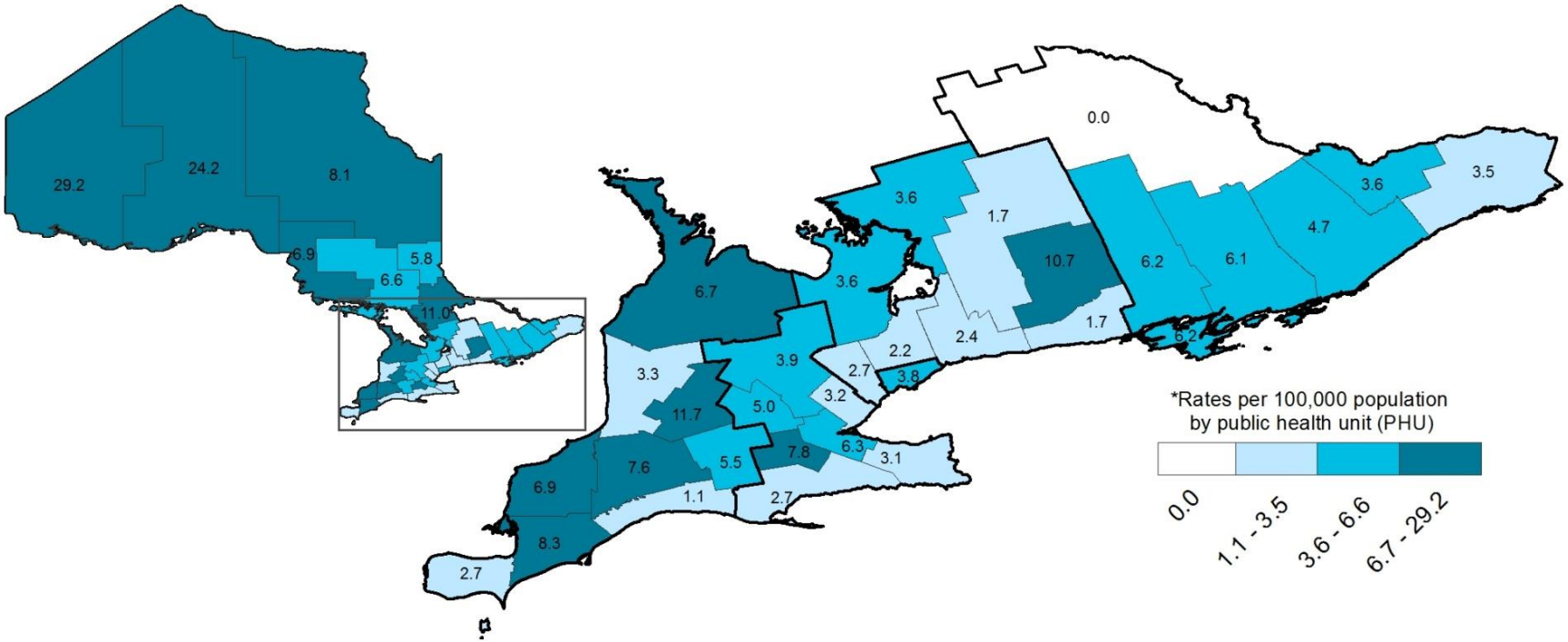
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Table 17-1. Cases of Group A Streptococcal Disease, Invasive (iGAS) by *emm* type: Ontario, 2012

	Cases	
***emm* Type**	**n**	**%**
emm 1	38	6.3
emm 89	37	6.1
emm 3	25	4.1
emm 82	18	3.0
emm 12	15	2.5
emm 87	13	2.1
All other (specified)	94	15.5
Unspecified	366	60.4
Total	**606**	**100.0**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2014/01/16].
Note: "Other" is the sum of emm types with a frequency <2%. "Unspecified" refers to the sum of cases for which *emm* type was reported as 'unspecified' or not reported at all.

Map 17-1. Incidence of Group A Streptococcal Disease, Invasive (iGAS) by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	8	6.87
BRN	11	7.76
CHK	9	8.29
DUR	15	2.35
ELG	1	1.10
EOH	7	3.48
GBO	11	6.71
HAL	17	3.23
HAM	34	6.25
HDN	3	2.72
HKP	3	1.67
HPE	10	6.19
HUR	2	3.31

PHU	Cases (n)	*Rates
KFL	12	6.06
LAM	9	6.87
LGL	8	4.73
MSL	35	7.55
NIA	14	3.13
NPS	14	11.03
NWR	24	29.19
OTT	33	3.59
OXF	6	5.52
PDH	9	11.68
PEE	38	2.73
PQP	7	8.08
PTC	15	10.73

PHU	Cases (n)	*Rates
REN	0	0.00
SMD	19	3.59
SUD	13	6.56
THB	38	24.20
TOR	106	3.80
TSK	2	5.80
WAT	27	5.03
WDG	11	3.92
WEC	11	2.72
YRK	24	2.21
Ontario	**606**	**4.49**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 18.

Group B Streptococcal Disease, Neonatal

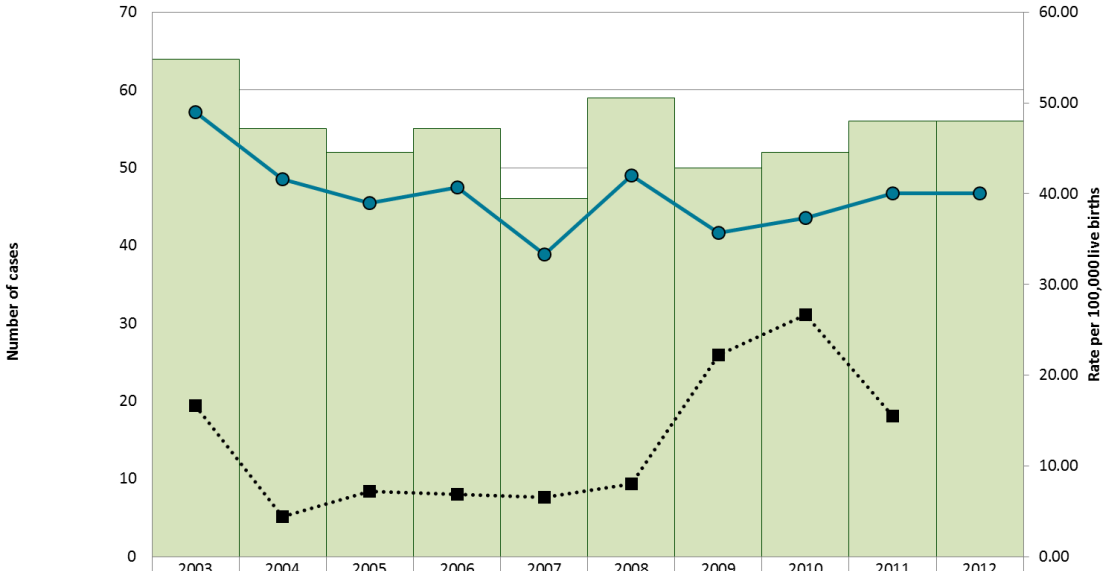
In 2012, there were 56 cases of neonatal group B streptococcal (GBS) disease in Ontario, corresponding to an incidence rate of 40.0 cases per 100,000 live births (Figure 18-1). Despite some year-to-year variation in the incidence of GBS in Ontario from 2003 to 2012, including elevated rates in 2003 and 2008, the incidence of GBS decreased overall from 2003 to 2007, and increased slightly from 2007 to 2012. Rates of neonatal GBS in Ontario were substantially higher compared to the rest of Canada from 2003 to 2011; however, there was a marked increase in rates in the rest of Canada from 2009 to 2011.

The incidence rates of GBS among male and female neonates were similar in 2012 (data not shown). Among the 56 neonatal GBS cases reported in 2012, 50.0% (28/56) were female and 50.0% were male (28/56); however, the incidence rate was slightly higher among females, with 41.1 cases per 100,000 female live births, compared to 39.1 cases per 100,000 male live births.

Group B streptococcal disease can be life threatening, and there were two reported deaths among neonates from this infection.

Cases of neonatal GBS were reported in 18 public health units in 2012. The highest incidence rates were reported from Sudbury and District with 213.2 cases per 100,000 live births, followed by Thunder Bay District, with 129.3 cases per 100,000 live births (Map 18-1). Over one-quarter (16/56) of neonatal GBS cases were reported from Toronto in 2012.

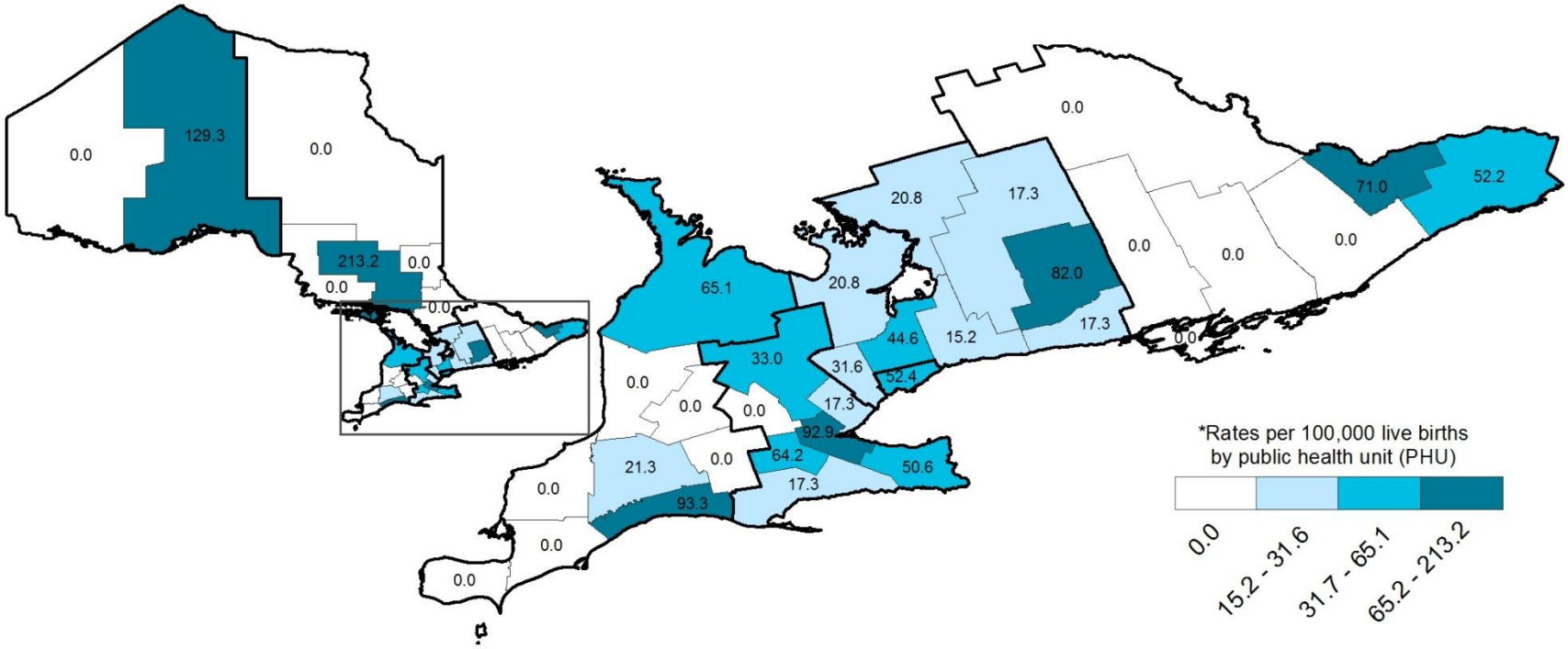
Figure 18-1. Incidence of Group B Streptococcal Disease, Neonatal: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	64	55	52	55	46	59	50	52	56	56
Ontario Rate using LB	49.00	41.60	38.96	40.65	33.30	41.99	35.70	37.36	40.04	40.04
Canada (Excl. ON) Rate	16.64	4.40	7.20	6.85	6.56	8.04	22.22	26.67	15.46	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Live Births [2003-2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

Map 18-1: Incidence of Group B Streptococcal Disease, Neonatal by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.00
BRN	1	64.23
CHK	0	0.00
DUR	1	15.18
ELG	1	93.28
EOH	1	52.22
GBO	1	65.06
HAL	1	17.29
HAM	5	92.87
HDN	0	0.00
HKP	0	0.00
HPE	0	0.00
HUR	0	0.00

PHU	Cases (n)	*Rates
KFL	0	0.00
LAM	0	0.00
LGL	0	0.00
MSL	1	21.30
NIA	2	50.63
NPS	0	0.00
NWR	0	0.00
OTT	7	70.97
OXF	0	0.00
PDH	0	0.00
PEE	5	31.59
PQP	0	0.00
PTC	1	82.03

PHU	Cases (n)	*Rates
REN	0	0.00
SMD	1	20.76
SUD	4	213.22
THB	2	129.28
TOR	16	52.41
TSK	0	0.00
WAT	0	0.00
WDG	1	32.95
WEC	0	0.00
YRK	5	44.60
Ontario	**56**	**40.04**

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

Chapter 19.

Hantavirus Pulmonary Syndrome

There were no cases of Hantavirus Pulmonary Syndrome reported in Ontario in 2012. A case of Hantavirus Pulmonary Syndrome has yet to be identified in Ontario since it became reportable in 2001.

Chapter 20.

Hemorrhagic Fevers

Viral hemorrhagic fevers (VHF) are not endemic to Canada, including Ontario. No cases of viral hemorrhagic fever have been reported in Ontario or in Canada since it was added back to the nationally notifiable disease list in 2002.

Chapter 21.

Hepatitis A

In 2012, 124 confirmed cases of hepatitis A were reported in Ontario, corresponding to an incidence rate of 0.9 cases per 100,000 population. Since 2007, the provincial incidence rate has remained relatively stable. Incidence rates of hepatitis A have been comparable to national incidence dating back to 2003 (Figure 21-1).

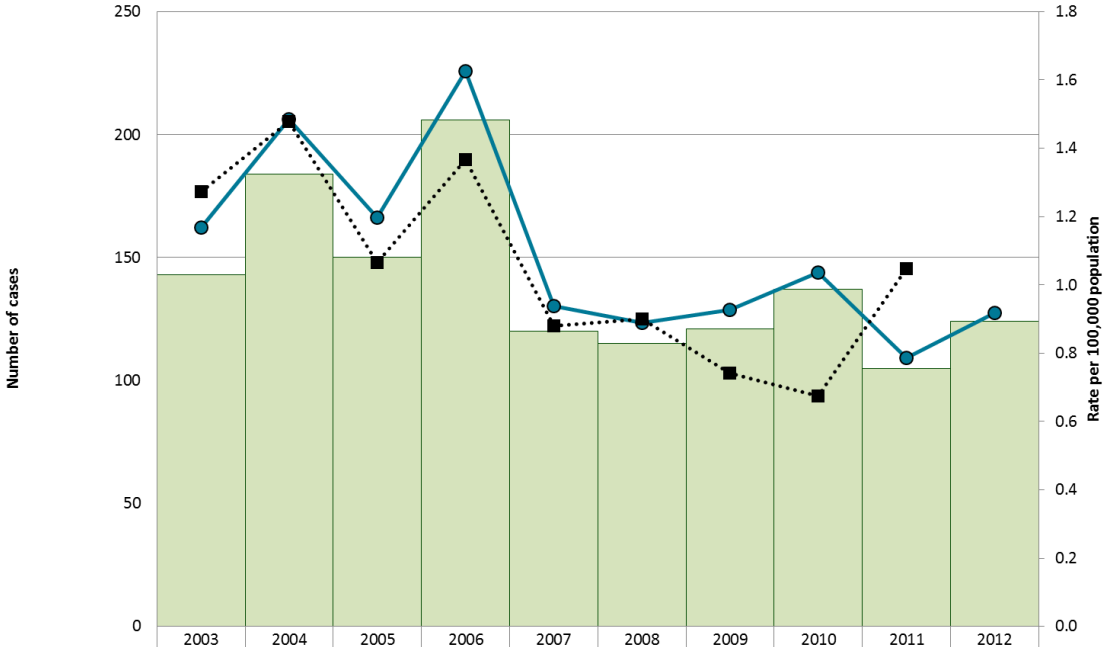
The highest incidence rate of hepatitis A was observed in children less than five years of age in 2012, with an incidence rate of 2.2 cases per 100,000 population (Figure 21-2). Risk factors for hepatitis A include travel to endemic areas, close contact or sexual activity with an infected person, or use of illicit drugs.[37] As well, transmission of hepatitis A among children less than five years of age is facilitated because young children have difficulty following good personal hygiene practices and their infection is often asymptomatic. Attendance at facilities where diapering occurs is also associated with sporadic spread of this disease.[37] Infected people can spread the virus from the latter half of the incubation period until a week after the onset of jaundice; however, infants and children can continue to excrete the virus for as long as six months.[37] In 2013, PHO's Provincial Infectious Diseases Advisory Committee released an updated guide, Hepatitis A Post-exposure Prophylaxis;[38] this document provides guidance on the post-exposure management of hepatitis A cases, including the management of hepatitis A in childcare settings.

Females aged 10–19 years accounted for more than twice the number of reported cases than males in the same age group in 2012. Of the 21 female cases in this age group, 76% (16/21) were travel-related, with Pakistan being the most commonly reported travel destination (six cases). Seventy per cent (7/10) of male cases in this age group were travel-related. In 2012, 32% (40/124) of hepatitis A cases were hospitalized and one death was reported.

Historically, the incidence of hepatitis A infections has shown a seasonal pattern in Ontario with a peak in late summer and early fall.[26] In 2012, the monthly trend of hepatitis A was influenced by an outbreak that occurred from February to April (Figure 21-3). Six non-travel cases with a rare RNA fingerprint were linked to the investigation. The RNA fingerprint could not be determined for additional cases, which may have been linked to the outbreak. Fresh imported blackberries were considered to be the most likely source of illness; the products were offered for sale through a common grocery chain and distributor. Further details on this outbreak are available in the June 2012 issue of Public Health Ontario's Monthly Infectious Diseases Surveillance Report.[39] Outbreaks of hepatitis A linked to either fresh or frozen berries have been previously reported[40] and continue to occur.[41]

Map 21-1 provides the geographic distribution of hepatitis A cases in Ontario. The observed variability in incidence rates by age, gender, and public health unit should be interpreted with caution due to small case counts.

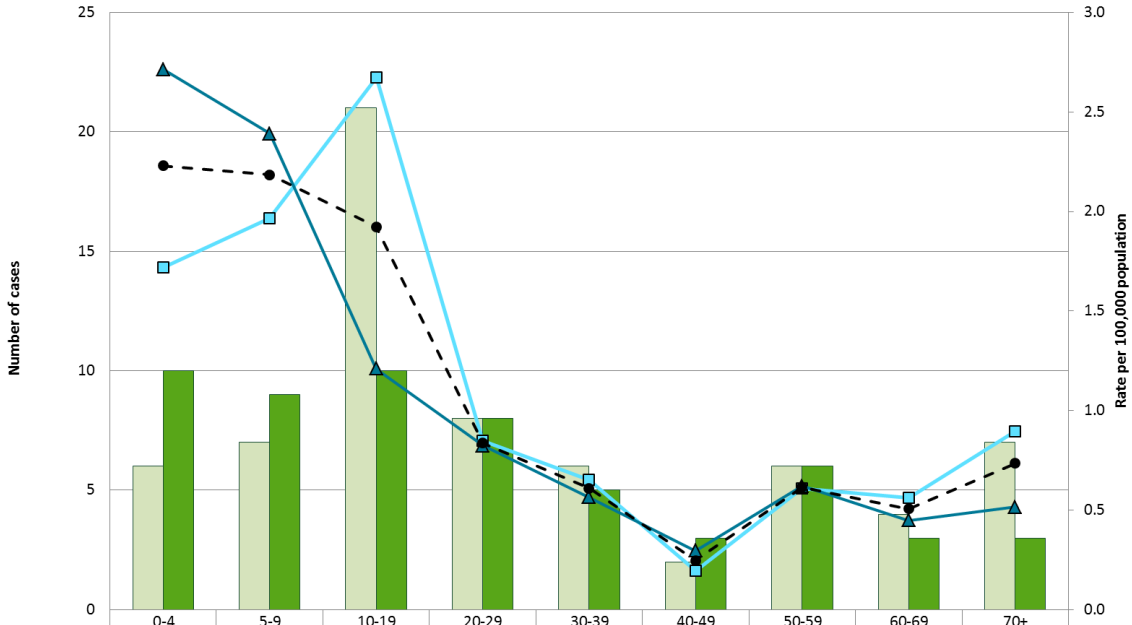
Figure 21-1. Incidence of Hepatitis A: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	143	184	150	206	120	115	121	137	105	124
Ontario Rate	1.2	1.5	1.2	1.6	0.9	0.9	0.9	1.0	0.8	0.9
Canada (Excl. ON) Rate	1.3	1.5	1.1	1.4	0.9	0.9	0.7	0.7	1.0	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

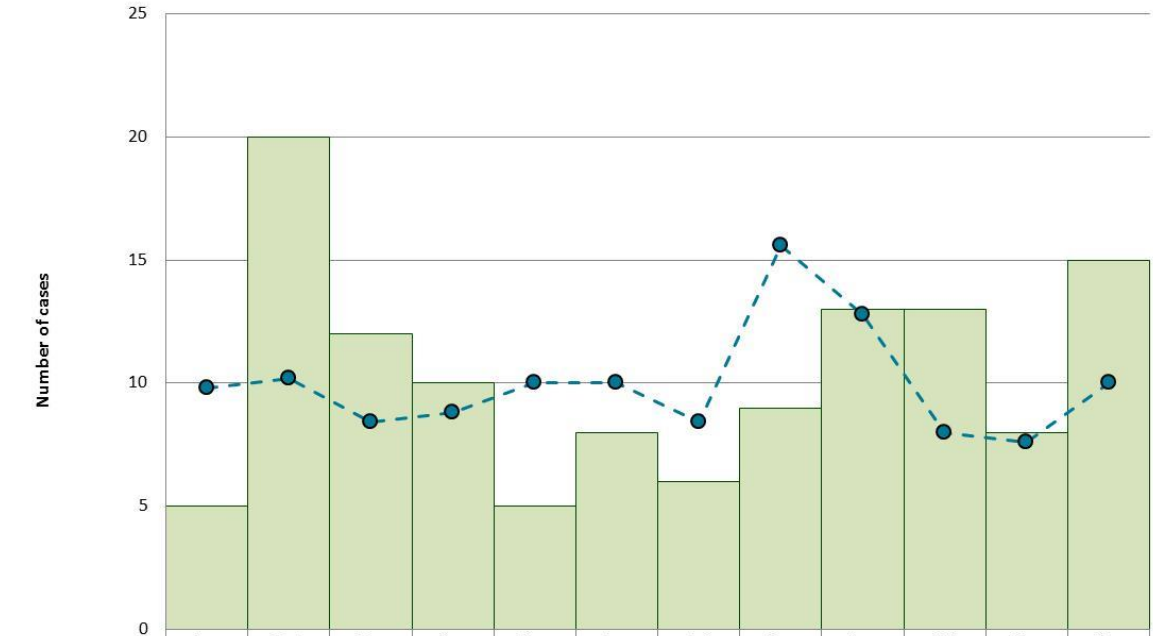
Figure 21-2. Incidence of Hepatitis A by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	6	7	21	8	6	2	6	4	7
Male Count	10	9	10	8	5	3	6	3	3
Female Rate	1.7	2.0	2.7	0.8	0.7	0.2	0.6	0.6	0.9
Male Rate	2.7	2.4	1.2	0.8	0.6	0.3	0.6	0.4	0.5
Total Rate	2.2	2.2	1.9	0.8	0.6	0.2	0.6	0.5	0.7

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

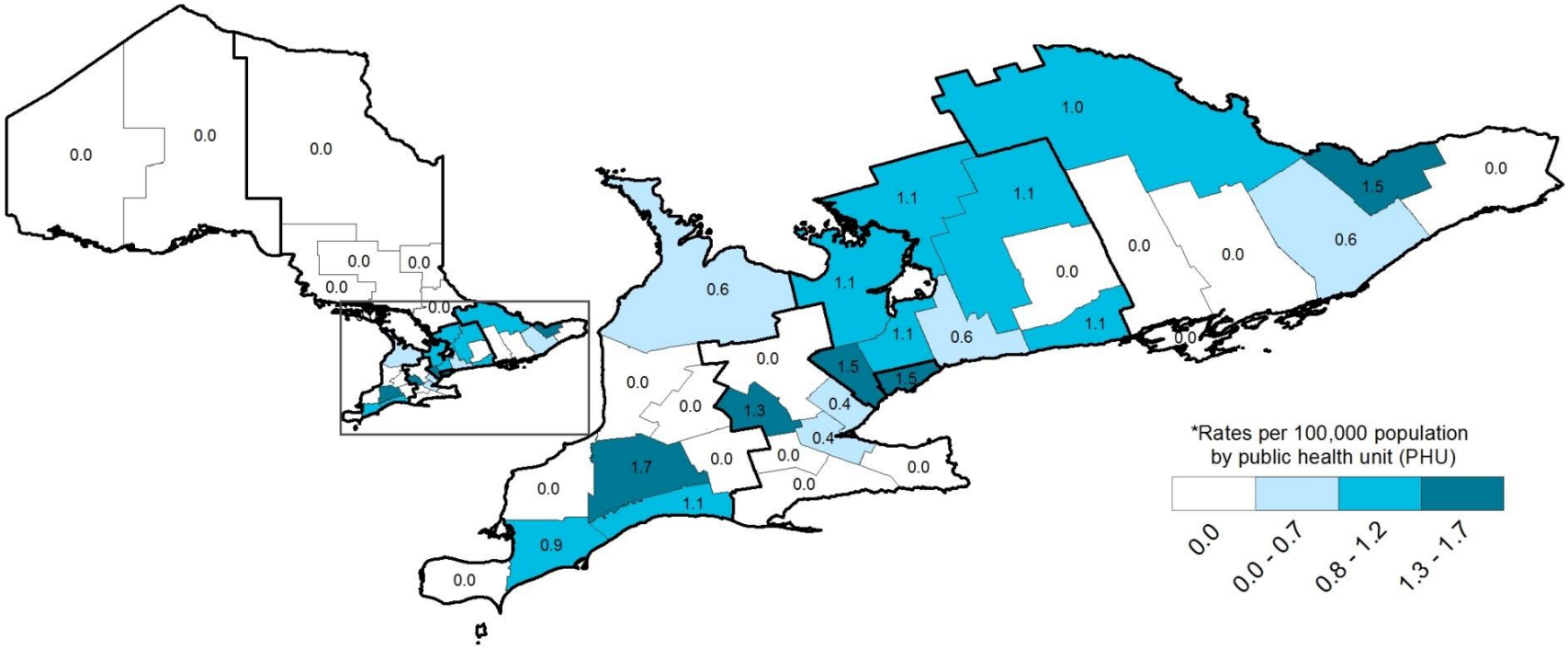
Figure 21-3. Number of Hepatitis A Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	5	20	12	10	5	8	6	9	13	13	8	15
5-Yr Average	9.8	10.2	8.4	8.8	10.0	10.0	8.4	15.6	12.8	8.0	7.6	10.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 21-1. Incidence of Hepatitis A by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0
BRN	0	0
CHK	1	0.9
DUR	4	0.6
ELG	1	1.1
EOH	0	0
GBO	1	0.6
HAL	2	0.4
HAM	2	0.4
HDN	0	0
HKP	2	1.1
HPE	0	0
HUR	0	0

PHU	Cases (n)	*Rates
KFL	0	0
LAM	0	0
LGL	1	0.6
MSL	8	1.7
NIA	0	0
NPS	0	0
NWR	0	0
OTT	14	1.5
OXF	0	0
PDH	0	0
PEE	21	1.5
PQP	0	0
PTC	0	0

PHU	Cases (n)	*Rates
REN	1	1.0
SMD	6	1.1
SUD	0	0
THB	0	0
TOR	41	1.5
TSK	0	0
WAT	7	1.3
WDG	0	0
WEC	0	0
YRK	12	1.1
Ontario	**124**	**0.9**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 22.

Hepatitis B

Hepatitis B has been identified as the fourth most burdensome infectious disease in Ontario based on the associated morbidity and mortality.[42] Hepatitis B infection is preventable by vaccination, and a publicly funded immunization program is available in Ontario for grade seven students and high-risk individuals.[43]

Hepatitis B diagnosis and classification is based on various laboratory tests that measure serological responses and the presence of viral antigens in the blood over time; however, available serological tests may result in unclear interpretation for purposes of case classification. Acute hepatitis B is often asymptomatic and, while some infections may resolve, others may progress to chronic infection, therefore classification as an acute case or chronic carrier may change over time.[44]

Acute Hepatitis B

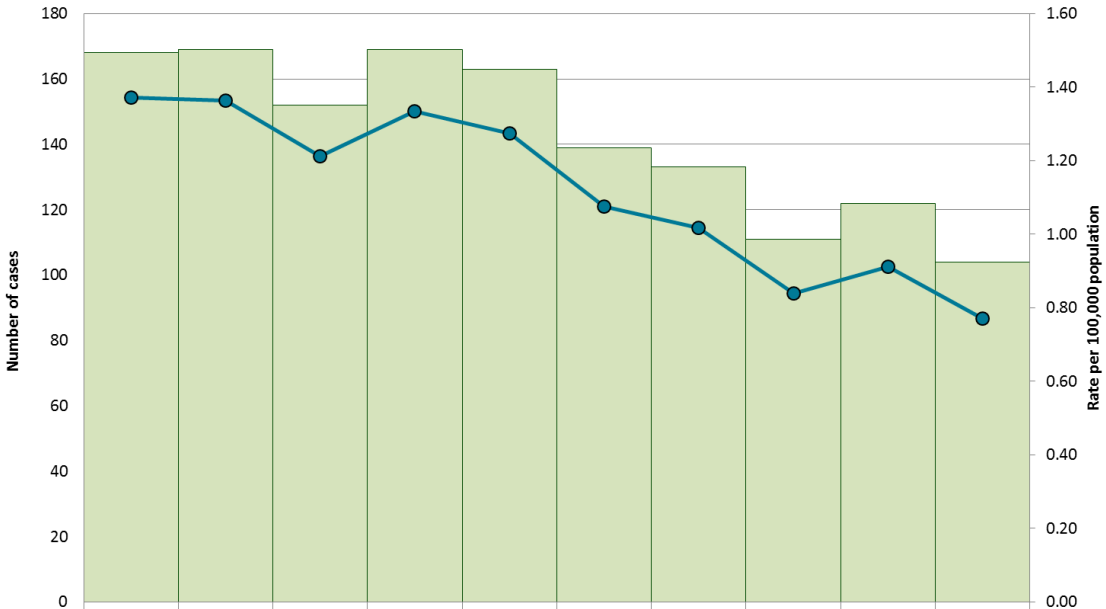
In 2012, 104 cases of acute hepatitis B infections were reported in Ontario, representing an incidence rate of 0.8 cases per 100,000 population (Figure 22-1). From 2003 to 2012, the annual incidence rates of reported cases of acute hepatitis B decreased by an average of 5.7% each year, from a high of 1.4 cases per 100,000 population in 2003 to a low of 0.8 cases per 100,000 population in 2012 (Figure 22-1). National incidence rates of hepatitis B do not distinguish between acute, chronic, and unspecified cases, and are therefore not comparable to Ontario rates.

The incidence rate of reported acute hepatitis B cases was higher among males than females in 2012 (Figure 22-2). Males accounted for 59.6% (62/104) 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. Overall, the incidence of reported hepatitis B was highest in the 30–39 year age group, with 1.8 cases per 100,000 population. In females, the reported incidence of hepatitis B was highest among those 25–29 years of age (1.9 cases per 100,000); in males, the incidence was highest among those 30–39 years of age (2.2 cases per 100,000 population).

In 2012, acute hepatitis B was reported in over three-quarters (75.0%, 27/36) of public health units in Ontario (Map 22-1). The highest incidence rates were observed in Kingston, Frontenac and Lennox & Addington, Thunder Bay District, and Wellington-Dufferin-Guelph public health units, which had rates of 8.1, 5.1, and 3.9 cases per 100,000 population, respectively.

In 2012, 8.0% (8/104 cases) of acute hepatitis B cases were hospitalized and no fatal cases were reported.

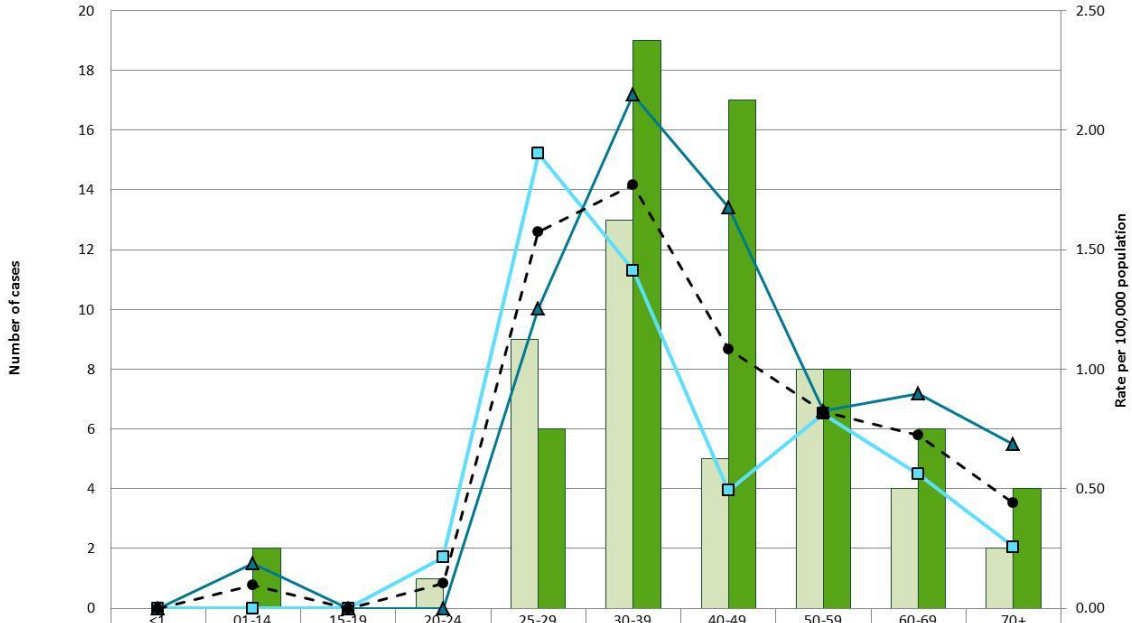
Figure 22-1. Incidence of Hepatitis B (Acute): Ontario, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	168	169	152	169	163	139	133	111	122	104
Ontario Rate	1.37	1.36	1.21	1.33	1.27	1.07	1.02	0.84	0.91	0.77

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
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.

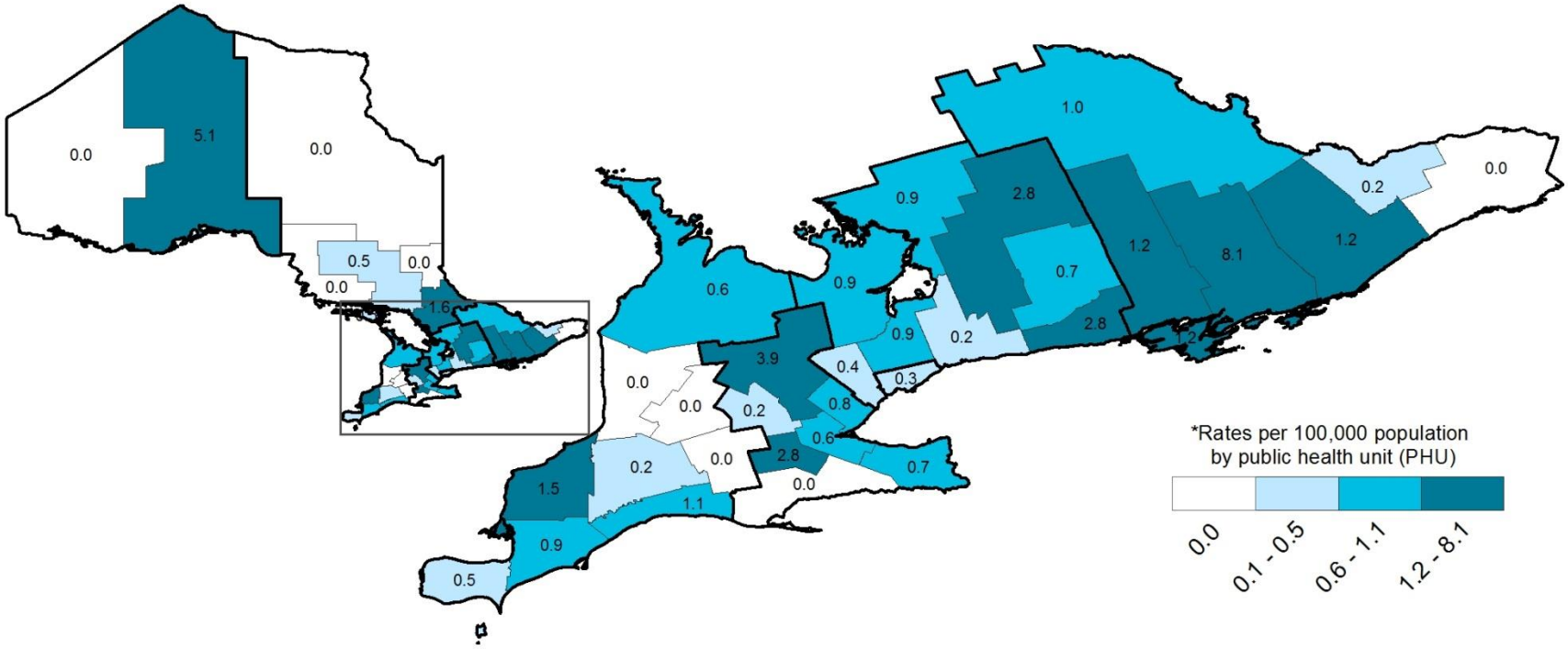
Figure 22-2. Incidence of Hepatitis B (Acute) by Age and Sex: Ontario, 2012



	<1	01-14	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	0	0	0	1	9	13	5	8	4	2
Male Count	0	2	0	0	6	19	17	8	6	4
Female Rate	0.00	0.00	0.00	0.21	1.90	1.41	0.49	0.81	0.56	0.26
Male Rate	0.00	0.19	0.00	0.00	1.25	2.15	1.68	0.83	0.90	0.69
Total Rate	0.00	0.10	0.00	0.10	1.57	1.77	1.08	0.82	0.72	0.44

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Map 22-1. Incidence of Hepatitis B (Acute) by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.00
BRN	4	2.82
CHK	1	0.92
DUR	1	0.16
ELG	1	1.10
EOH	0	0.00
GBO	1	0.61
HAL	4	0.76
HAM	3	0.55
HDN	0	0.00
HKP	5	2.79
HPE	2	1.24
HUR	0	0.00

PHU	Cases (n)	*Rates
KFL	16	8.08
LAM	2	1.53
LGL	2	1.18
MSL	1	0.22
NIA	3	0.67
NPS	2	1.58
NWR	0	0.00
OTT	2	0.22
OXF	0	0.00
PDH	0	0.00
PEE	5	0.36
PQP	0	0.00
PTC	1	0.72

PHU	Cases (n)	*Rates
REN	1	0.96
SMD	5	0.94
SUD	1	0.50
THB	8	5.10
TOR	9	0.32
TSK	0	0.00
WAT	1	0.19
WDG	11	3.92
WEC	2	0.50
YRK	10	0.92
Ontario	**104**	**0.77**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chronic Hepatitis B

In 2012, to identify chronic cases of hepatitis B, a carrier case classification was added to the hepatitis B case definition for Ontario.[44] This is the first year for which chronic hepatitis B cases are included in provincial disease surveillance.

The risk of developing chronic hepatitis B after acute infection is higher if infected at a younger age, and decreases with increasing age of infection.[45] While chronic carriers are most likely to have acquired their infection at birth or in early childhood,[46,47] the acute infection may not have been previously recognized or reported. The reported incidence of chronic hepatitis B is determined based on when case information is provided to public health units in Ontario, while initial infection with the hepatitis B virus likely occurred considerably earlier, and may or may not have been previously identified.

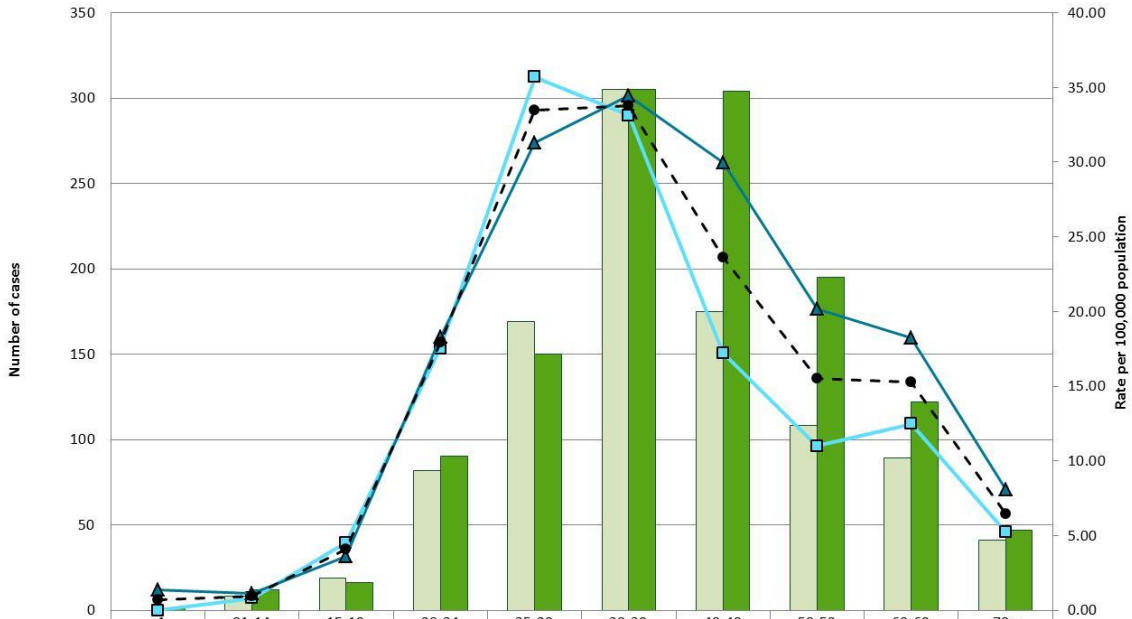
In 2012, 2,240 cases of chronic hepatitis B were reported in Ontario, representing an incidence rate of newly reported chronic carriers of 16.6 cases per 100,000 population. As with acute hepatitis B, provincial rates of chronic hepatitis B are not directly comparable to national rates.

The incidence of chronic hepatitis B was higher among males than females, with sex-specific incidence rates of 18.7 and 14.6 cases per 100,000 population, respectively. Overall, the age-specific incidence rates for reporting of chronic hepatitis B were highest among those between 25 and 39 years of age (Figure 22-3), with over one-quarter (27.2%, 610/2,240) of all the cases being reported in the 30–39 year age group. Among females, the incidence rate for reporting of chronic carriers was highest in the 25–29 year age group, with 35.7 cases per 100,000 population; among males, the rate was highest in the 30–39 year age group, with 34.5 cases per 100,000 population.

The highest incidence rates of reporting of chronic hepatitis B were in Toronto, York Region, and Peel Region public health units, with rates of 41.2, 36.3 and 17.0 cases per 100,000 population, respectively (Map 22-2). Almost 80% (79.5%, 1,781/2,240) of chronic carriers in 2012 were reported from these three public health units.

In 2012, only three 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 public health units and, as a result, they are unlikely to be captured accurately in iPHIS.

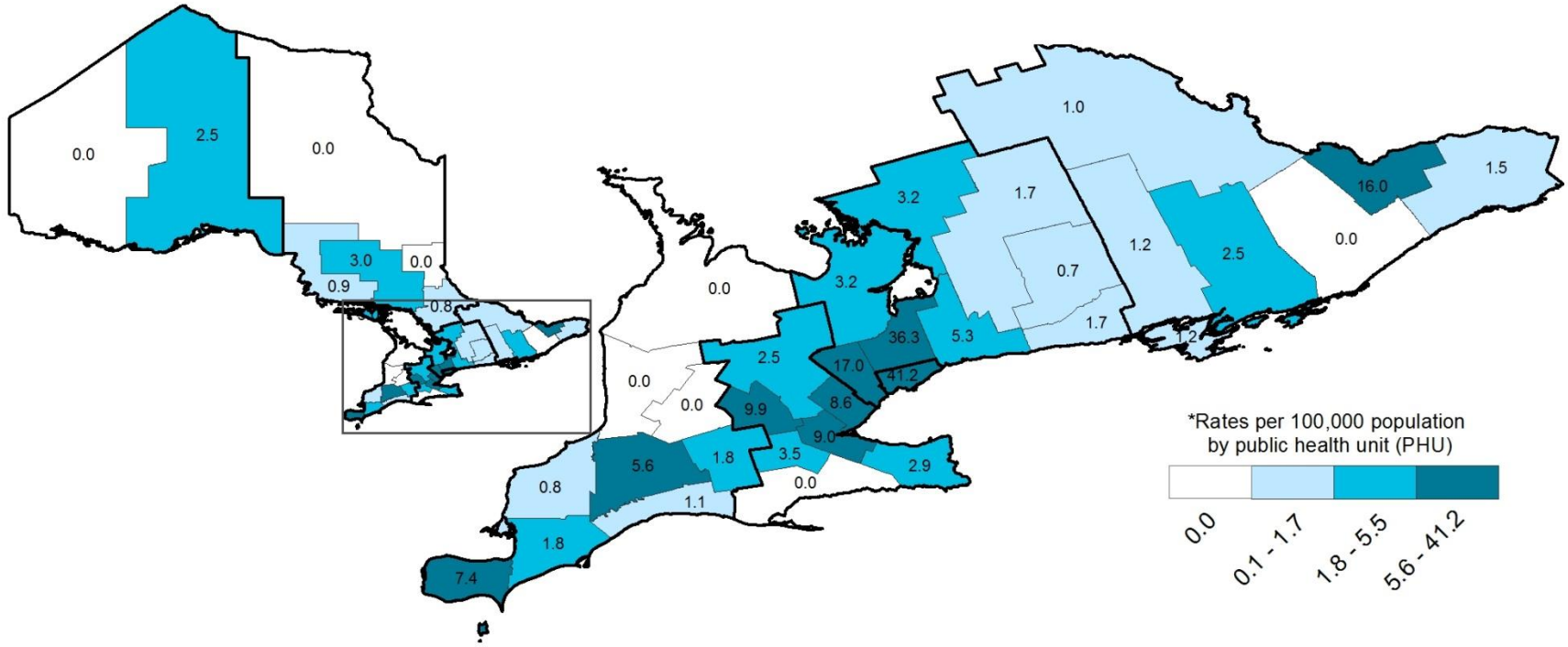
Figure 22-3. Incidence of Hepatitis B (Chronic) by Age and Sex: Ontario, 2012



	<1	01-14	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	0	8	19	82	169	305	175	108	89	41
Male Count	1	12	16	90	150	305	304	195	122	47
Female Rate	0.00	0.80	4.52	17.51	35.71	33.13	17.23	10.99	12.47	5.25
Male Rate	1.38	1.14	3.62	18.32	31.29	34.46	29.98	20.15	18.22	8.09
Total Rate	0.71	0.97	4.06	17.92	33.48	33.78	23.60	15.54	15.25	6.46

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes two cases of unknown age and/or sex.

Map 22-2. Incidence of Hepatitis B (Chronic) by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	1	0.86
BRN	5	3.53
CHK	2	1.84
DUR	34	5.33
ELG	1	1.10
EOH	3	1.49
GBO	0	0.00
HAL	45	8.55
HAM	49	9.00
HDN	0	0.00
HKP	3	1.67
HPE	2	1.24
HUR	0	0.00

PHU	Cases (n)	*Rates
KFL	5	2.52
LAM	1	0.76
LGL	0	0.00
MSL	26	5.61
NIA	13	2.91
NPS	1	0.79
NWR	0	0.00
OTT	147	15.98
OXF	2	1.84
PDH	0	0.00
PEE	237	17.04
PQP	0	0.00
PTC	1	0.72

PHU	Cases (n)	*Rates
REN	1	0.96
SMD	17	3.21
SUD	6	3.03
THB	4	2.55
TOR	1150	41.20
TSK	0	0.00
WAT	53	9.87
WDG	7	2.49
WEC	30	7.43
YRK	394	36.27
Ontario	**2240**	**16.59**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 23.

Hepatitis C

According to the Ontario Burden of Infectious Disease Study (ONBOIDS), hepatitis C is one of the most burdensome infectious diseases in Ontario based on measures of morbidity and mortality.[42]

Hepatitis C cases reported to public health units may include acute, chronic, and resolved infections. The presence of antibodies to the hepatitis C virus is required to meet the case definition for hepatitis C;[48] however, this laboratory test does not distinguish between acute, chronic, and resolved infections. As a result, reported hepatitis C rates may reflect cases that were infected in the past but are newly diagnosed, rather than cases that have been newly infected. While RNA testing can help to distinguish between acute, chronic, and resolved infections, it may not be routinely ordered and negative results are not reportable. Therefore, hepatitis C incidence rates based on antibody testing may overestimate infectious acute or chronic hepatitis C; on the other hand, reported hepatitis C rates can also be underestimates of true rates because more than 90% of initial infections are asymptomatic and so can remain undiagnosed for a long period of time.[49]

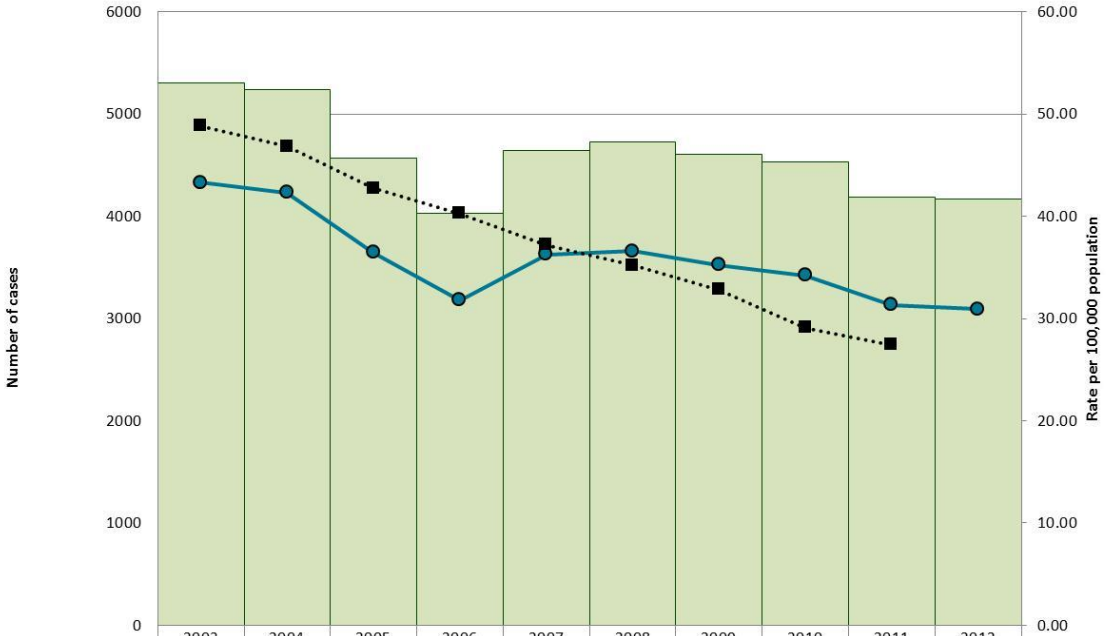
In 2012, 4,172 hepatitis C infections were reported in Ontario, representing a reported incidence rate of 30.9 cases per 100,000 population (Figure 23-1). From 2003 to 2012, the reported incidence rate of hepatitis C in Ontario decreased by an average of 3.4% each year, from 43.3 cases per 100,000 in 2003 to 30.9 cases per 100,000 population in 2012. There has been a similar decreasing trend in reported hepatitis C incidence in the rest of Canada; however, annual reported incidence rates in Ontario have been higher than the rest of Canada since 2008.

Hepatitis C is more commonly reported among males. In 2012, males accounted for 59.9% of hepatitis C cases reported in Ontario, with an overall incidence rate of 37.5 cases per 100,000 population, compared to an incidence of 24.3 cases per 100,000 population among females (Figure 23-2). Overall, the incidence of hepatitis C was highest among those 50–59 years of age. Among males, the incidence rate was highest in the 50–59 year age group at 70.1 cases per 100,000 population; among females, the incidence rate was highest in the 20–24 year age group at 41.2 cases per 100,000 population, followed closely by females aged 25–29 years with a rate of 40.4 per 100,000 population. Twelve cases under the age of one were reported, likely reflecting mother-to-child transmission.

In terms of geographic distribution, the highest incidence rates in Ontario were reported by Thunder Bay, Kingston, Frontenac Lennox & Addington, and Algoma public health units, with 98.1, 72.7, and 58.4 cases per 100,000 population, respectively (Map 23-1).

In 2012, 1.2% (51/4,172 cases) of hepatitis C cases were hospitalized and six fatal cases were reported. It should be noted that 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.

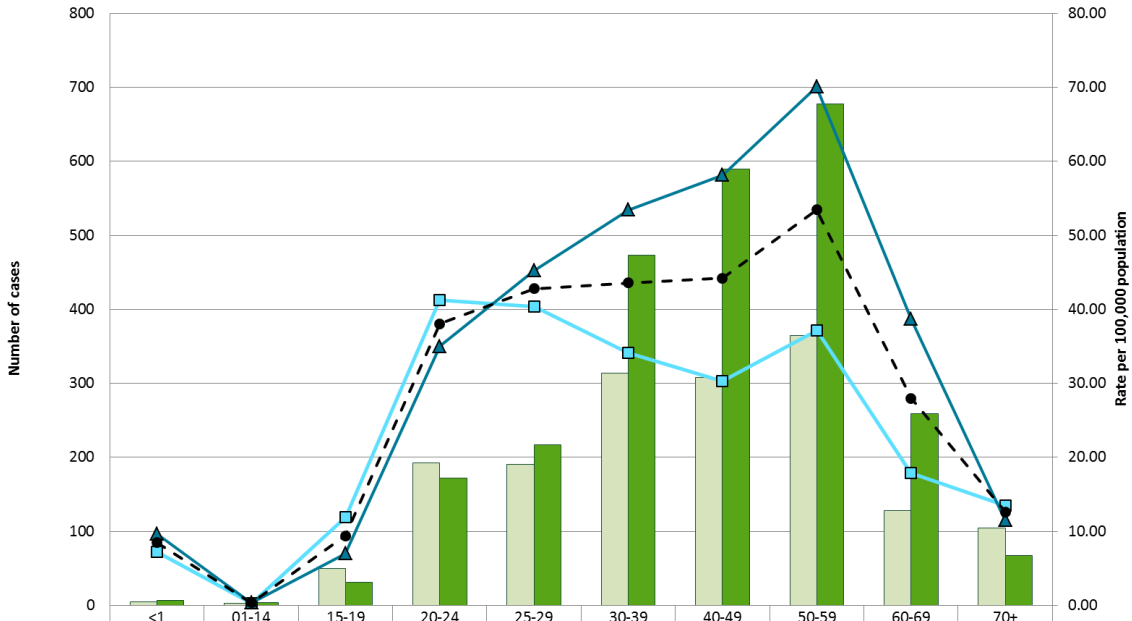
Figure 23-1. Incidence of Hepatitis C: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	5300	5240	4566	4025	4639	4729	4607	4526	4188	4172
Ontario Rate	43.29	42.29	36.44	31.78	36.27	36.57	35.25	34.23	31.33	30.89
Canada (Excl. ON) Rate	48.81	46.84	42.73	40.24	37.19	35.17	32.82	29.10	27.41	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

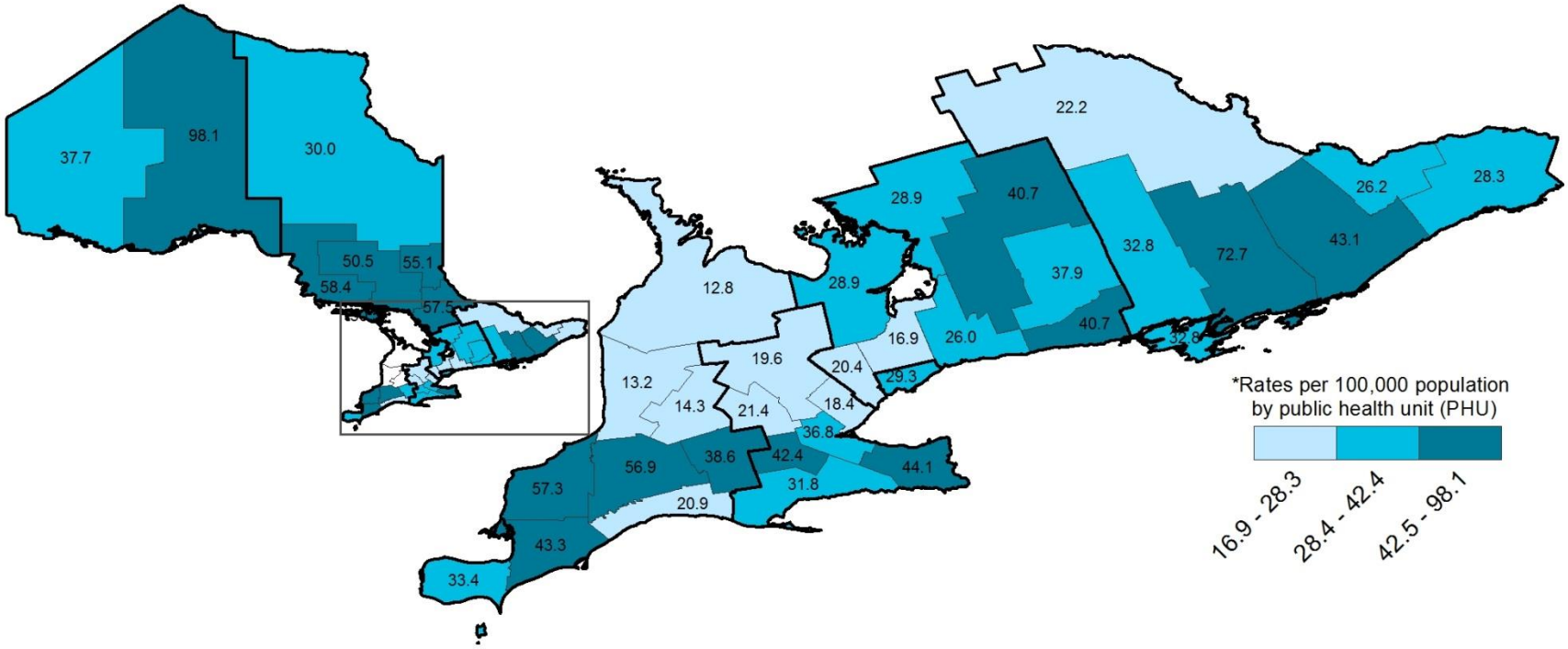
Figure 23-2. Incidence of Hepatitis C by Age and Sex: Ontario, 2012



	<1	01-14	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	5	3	50	193	191	314	308	365	128	105
Male Count	7	4	31	172	217	473	590	678	259	67
Female Rate	7.27	0.30	11.88	41.22	40.36	34.10	30.32	37.15	17.93	13.45
Male Rate	9.63	0.38	7.02	35.01	45.27	53.45	58.18	70.07	38.69	11.53
Total Rate	8.48	0.34	9.39	38.04	42.83	43.58	44.24	53.48	27.98	12.63

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes 12 cases of unknown age and/or sex.

Map 23-1. Incidence of Hepatitis C by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	68	58.38
BRN	60	42.35
CHK	47	43.31
DUR	166	26.01
ELG	19	20.85
EOH	57	28.33
GBO	21	12.80
HAL	97	18.43
HAM	200	36.75
HDN	35	31.75
HKP	73	40.67
HPE	53	32.78
HUR	8	13.22

PHU	Cases (n)	*Rates
KFL	144	72.69
LAM	75	57.25
LGL	73	43.12
MSL	264	56.93
NIA	197	44.10
NPS	73	57.49
NWR	31	37.70
OTT	241	26.21
OXF	42	38.61
PDH	11	14.28
PEE	284	20.42
PQP	26	30.02
PTC	53	37.91

PHU	Cases (n)	*Rates
REN	23	22.19
SMD	153	28.88
SUD	100	50.49
THB	154	98.08
TOR	817	29.27
TSK	19	55.07
WAT	115	21.42
WDG	55	19.60
WEC	135	33.42
YRK	183	16.85
Ontario	**4172**	**30.89**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 24.

Hepatitis D

Hepatitis D is a rare disease in Ontario. In 2012, four cases of hepatitis D were reported in the province, corresponding to an incidence rate of 0.3 cases per 1,000,000 population. From 2003 to 2012, a total of 35 cases of hepatitis D were reported in Ontario with an average of 3.5 cases per year. The largest proportion of cases (22.9%, 8/35) over this period were reported in 2005 (Figure 24-1).

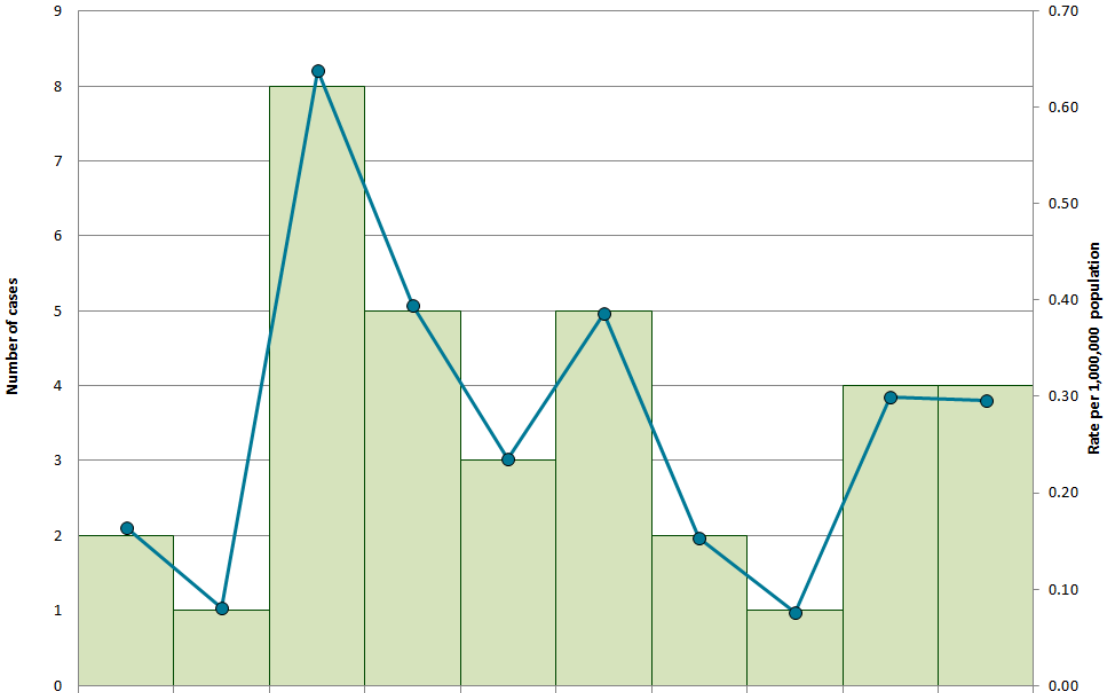
Among all cases, 71.4% (25/35) occurred among males and 85.7% (30/35) were between 20 and 59 years of age.

All 35 hepatitis D cases reported in Ontario from 2003 to 2012 had evidence of an acute or chronic hepatitis B infection. The vast majority of reported cases of hepatitis D had a super-infection (91.4%, 32/35), whereby an individual chronically infected with hepatitis B is infected with hepatitis D. Only three (8.6%) of the reported hepatitis D cases were co-infected with hepatitis B, whereby the individual acquired acute hepatitis B and hepatitis D concurrently.

In addition, 45.7% (16/35) of the hepatitis D cases also had evidence of a prior or concurrent hepatitis C infection; however, based on the data available, it is unknown if these were acute or chronic cases of hepatitis C.

No comparable national data are available as hepatitis D is not nationally notifiable. In 2013, hepatitis D was removed from the Ontario Reportable Diseases List.

Figure 24-1. Incidence of Hepatitis D: Ontario, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	2	1	8	5	3	5	2	1	4	4
Ontario Rate	0.16	0.08	0.64	0.39	0.23	0.39	0.15	0.08	0.30	0.30

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Hepatitis D is not a nationally notifiable disease.

Chapter 25.

Herpes, Neonatal

In 2012, five cases of neonatal herpes were reported in Ontario, corresponding to an incidence rate of 3.6 cases per 100,000 live births (Table 25-1). From 2003 to 2012, a total of 62 cases of neonatal herpes were reported, for an average of 6.2 cases per year over this period. The largest number of cases during this period was reported in 2004.

No comparable national data are available as neonatal herpes is not nationally notifiable. In 2013, this disease was removed from the Ontario Reportable Diseases List.

Table 25-1. Incidence of Herpes, Neonatal: Ontario, 2003–12

Year	Ontario cases	Ontario rate per 100,000 live births
2003	2	1.53
2004	11	8.32
2005	5	3.75
2006	5	3.70
2007	3	2.17
2008	8	5.69
2009	6	4.28
2010	9	6.47
2011	8	5.72
2012	5	3.57

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Live Births [2003-2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].
Note: Neonatal herpes is not a nationally notifiable disease.

Chapter 26.

Influenza

Reporting of laboratory-confirmed influenza cases to local public health units significantly underestimates the burden of influenza in Ontario, since many individuals with influenza-like illness never seek care or have confirmatory laboratory testing completed.

During the 2011–12 influenza season, which ran from September 1, 2011, to August 31, 2012, 3,945 cases of laboratory-confirmed influenza were reported in Ontario, corresponding to an incidence rate of 29.2 cases per 100,000 population (Figure 26-1). The incidence of influenza fluctuates from season to season due to a variety of factors, including variations in circulating strains and the degree of vaccine match. From the 2002–03 to 2011–12 seasons, the highest incidence rates of influenza were observed over the 2008–09 and 2009–10 seasons, which can primarily be attributed to the H1N1 influenza pandemic.

While influenza cases are reported throughout the year in Ontario, influenza activity is seasonal and peaks during the colder months. The incidence of influenza was highest in February, March, and April of the 2011–12 season, and 86.3% (3,405/3,945) of all cases were reported in these months (Figure 26-2). Compared to previous non-pandemic influenza seasons, the 2011–12 season started later and had considerably more cases than expected in March.

The 2011–12 influenza season was notable because influenza B was the dominant circulating influenza type and accounted for 74.4% (2,936/3,945) of influenza cases in Ontario (Table 26-1). The percentage of specimens submitted to the Public Health Ontario Laboratories (PHOL) that was positive for influenza B (i.e., percent positivity) peaked in week 11 at 28.3%, while influenza A percent positivity peaked in week 10 at 6.8% (Figure 26-3). As of May 31, 2012, of the 558 influenza B isolates from Ontario that were characterized at the National Microbiology Laboratory (NML), 356 (63.8%) were B/Wisconsin/01/2010-like which is of the Yamagata lineage. This was not the lineage included in the influenza B component of that season's trivalent influenza vaccine.

Reported incidence rates of influenza were similar for males and females, at 28.6 and 29.6 cases per 100,000 population, respectively, although age-specific differences between males and females were observed. The highest incidence rates of laboratory-confirmed influenza were observed among children under the age of five and adults over the age of 65 (Figure 26-4). Higher rates of reported disease in these age groups may be reflective of healthcare-seeking behaviour, testing practices in general and testing as part of institutional outbreaks. Also, certain age groups may present with more severe disease requiring hospitalization and/or intensive care, resulting in a higher likelihood of being tested and confirmed as a case of influenza. Cases ranged in age from seven days to 104 years, and had a median age of 32 years, which is relatively young compared to a median age of 55 years during the 2010–11 season.[50] This can be explained by the predominance of influenza B circulating during the 2011–12 season, which tends to affect younger individuals.[51]

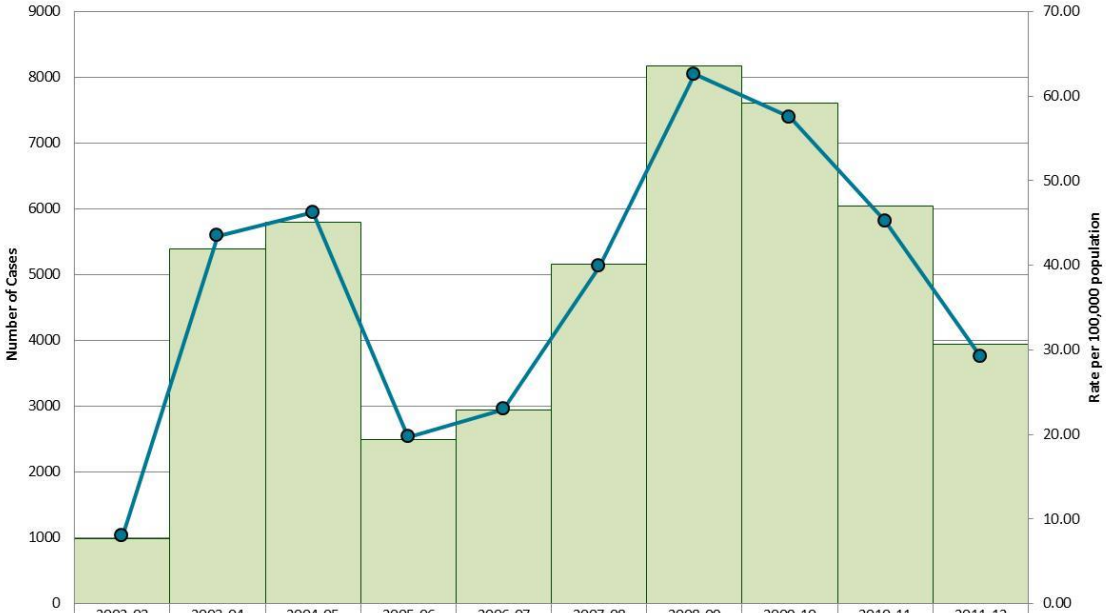
Among public health units, the reported incidence of influenza for the 2011–12 season was highest in Perth District, North Bay-Parry Sound District, and Huron County, with rates of 61.0, 50.4, and 49.6 cases per 100,000 population, respectively (Map 26-1). Although these rates may reflect true geographical differences in influenza activity, it may also result from differences in testing practices by clinicians, health seeking behaviours, and other social determinants of health.

During the 2011–12 season, 31.5% (1,242/3,945 cases) of laboratory-confirmed influenza cases were hospitalized and 1.0% (41/3,945) of cases were fatal. Due to the large volume of confirmed cases of influenza that are reported in some PHUs each season, as well as

challenges with case follow-up, it is often difficult to obtain information on hospitalizations and deaths resulting in underestimation of the severity of influenza.

Additional information about influenza during the 2011–12 influenza season can be found online in the Ontario Influenza Bulletin 2011–12 Surveillance Season Summary.[52]

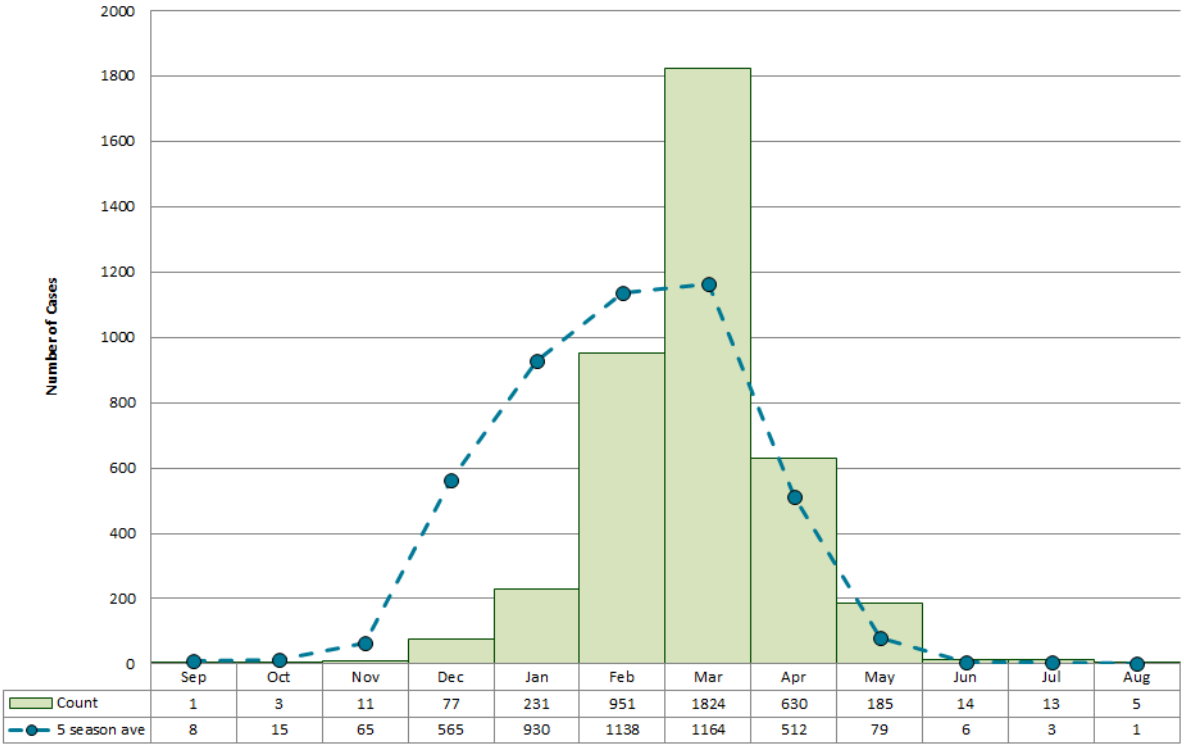
Figure 26-1. Incidence of Influenza: Ontario, 2002–03 to 2011–12



	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Ontario Count	981	5387	5796	2500	2938	5157	8181	7606	6046	3945
Ontario Rate	8.01	43.48	46.26	19.74	22.97	39.88	62.60	57.52	45.23	29.21

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: National rates for influenza are not available at this time.

Figure 26-2. Number of Influenza Cases by Month: Ontario, 2011–12



	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Count	1	3	11	77	231	951	1824	630	185	14	13	5
5 season ave	8	15	65	565	930	1138	1164	512	79	6	3	1

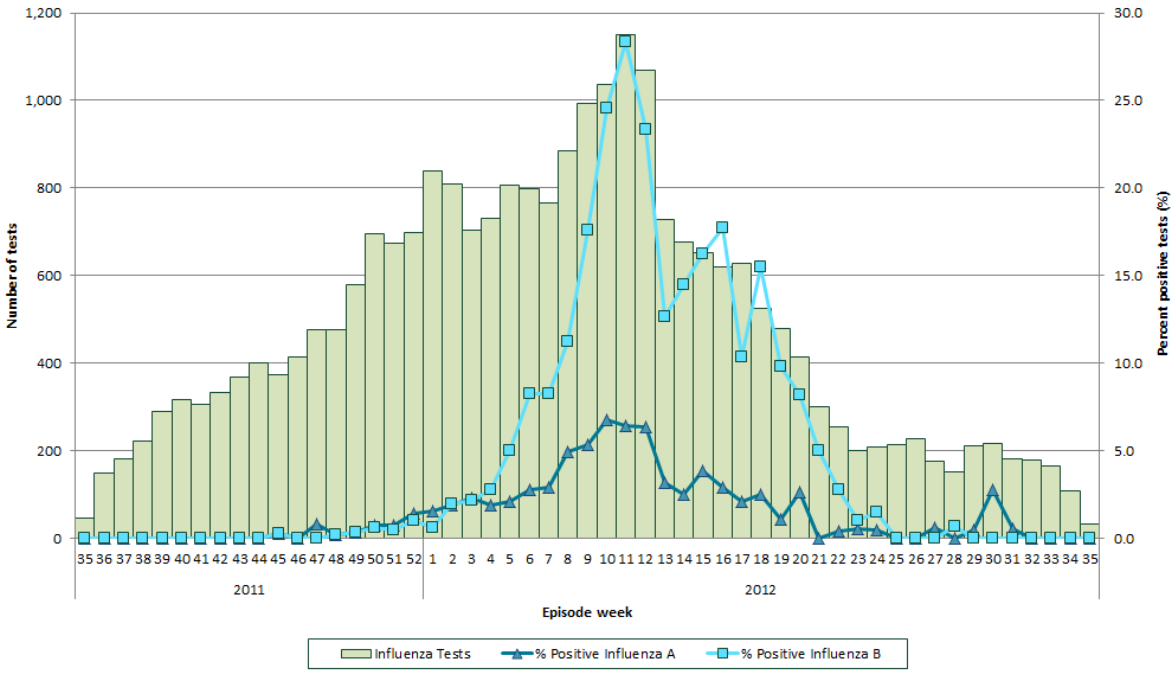
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Note: Monthly five year averages were calculated using the most recent five non-pandemic influenza seasons (2004–05 to 2010–11, with the 2008–09 and 2009–10 seasons excluded).

Table 26-1. Influenza Cases by Type: Ontario, 2011–12

Influenza Type	Cases	
	Number	Percent
Influenza A	1,105	25.5
Influenza B	2,936	74.4
Influenza A and B	4	0.1
Total	**3945**	**100.0**

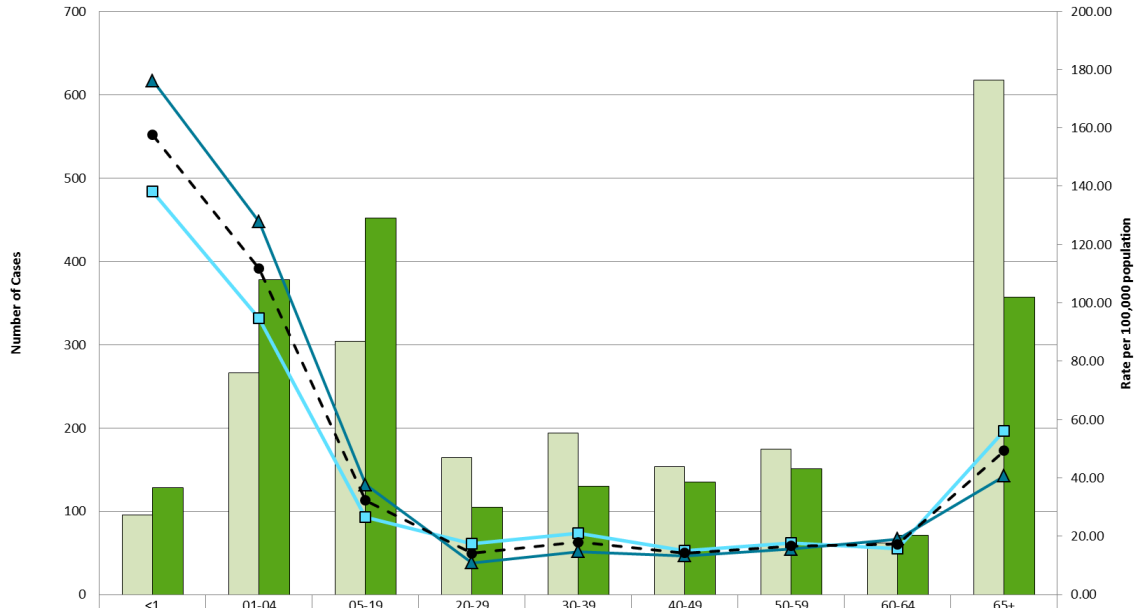
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Figure 26-3. Number of Influenza Tests and Percent of Positive Tests by Episode Week: Ontario, 2011–12 season



Source: Public Health Ontario Laboratories (PHOL), Laboratory Information Management System, extracted [2014/01/15].
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. Episode week is assigned based on the week the specimen was received at the laboratory.

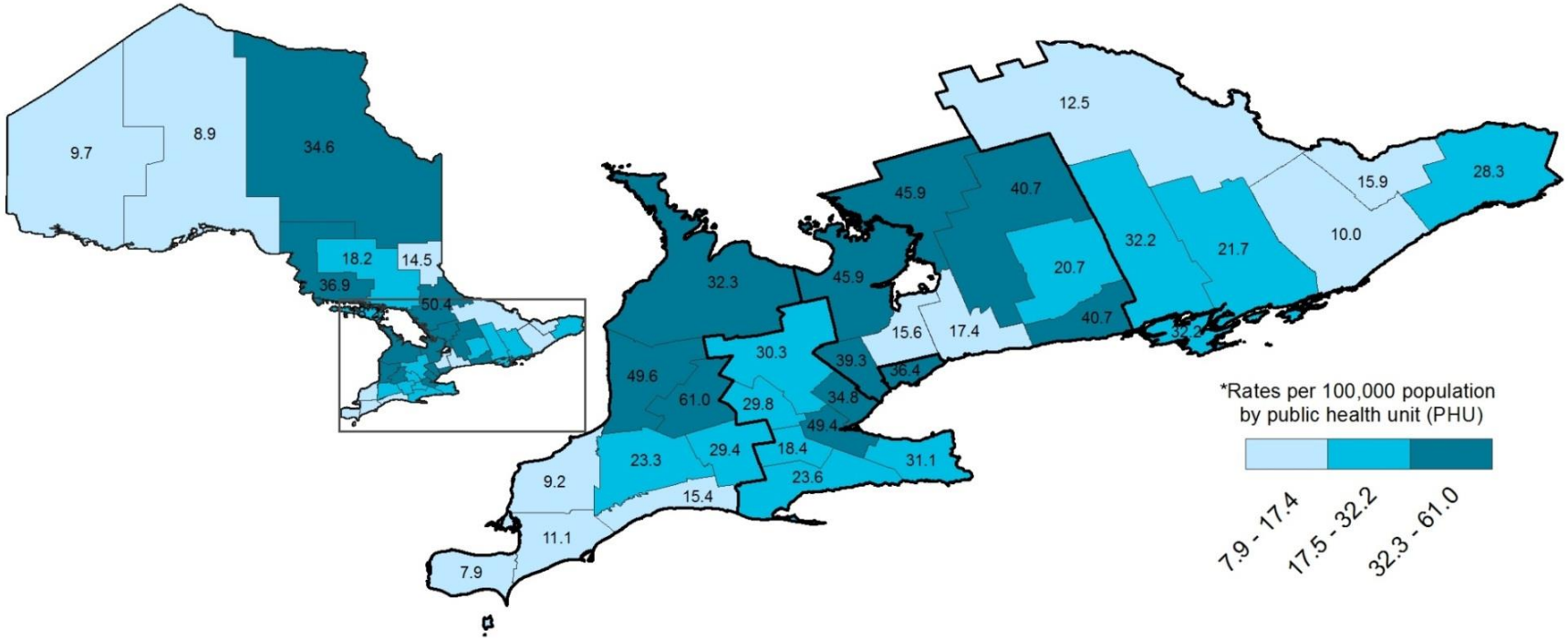
Figure 26-4. Incidence of Influenza by Age and Sex: Ontario, 2011–12



	<1	01-04	05-19	20-29	30-39	40-49	50-59	60-64	65+
Female Count	95	266	304	164	194	153	174	62	617
Male Count	128	378	452	105	130	135	151	71	357
Female Rate	138.09	94.80	26.62	17.42	21.07	15.06	17.71	15.66	56.16
Male Rate	176.15	127.81	37.59	10.82	14.69	13.31	15.60	19.00	40.70
Total Rate	157.64	111.74	32.24	14.07	17.94	14.19	16.67	17.28	49.30

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes nine cases of unknown age and/or sex.

Map 26-1. Cumulative Incidence of Influenza by Public Health Unit of Residence: Ontario, 2011–12



PHU	Cases (n)	*Rates
ALG	43	36.92
BRN	26	18.35
CHK	12	11.06
DUR	111	17.39
ELG	14	15.36
EOH	57	28.33
GBO	53	32.31
HAL	183	34.76
HAM	269	49.43
HDN	26	23.58
HKP	73	40.67
HPE	52	32.16
HUR	30	49.59

PHU	Cases (n)	*Rates
KFL	43	21.71
LAM	12	9.16
LGL	17	10.04
MSL	108	23.29
NIA	139	31.12
NPS	64	50.41
NWR	8	9.73
OTT	146	15.88
OXF	32	29.42
PDH	47	61.01
PEE	547	39.34
PQP	30	34.64
PTC	29	20.74

PHU	Cases (n)	*Rates
REN	13	12.54
SMD	243	45.87
SUD	36	18.18
THB	14	8.92
TOR	1017	36.44
TSK	5	14.49
WAT	160	29.81
WDG	85	30.29
WEC	32	7.92
YRK	169	15.56
Ontario	**3945**	**29.21**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 27.

Invasive *Haemophilus influenzae*, type b

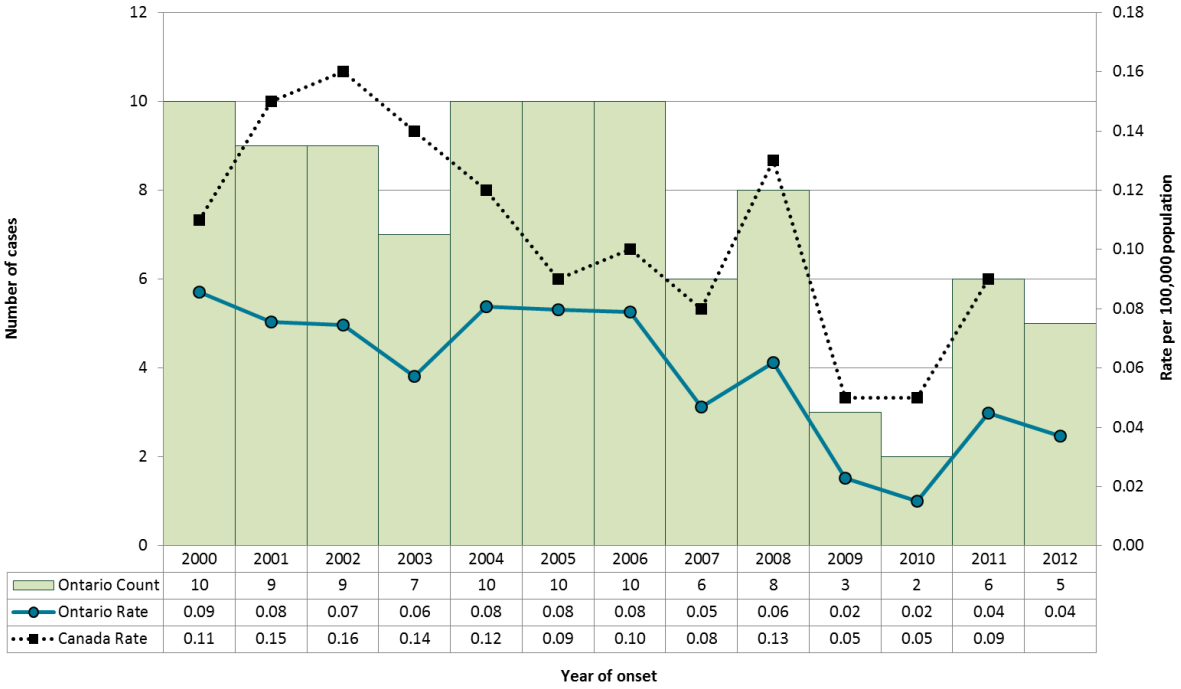
Haemophilus influenzae is a bacterium which can be differentiated into six serotypes (a-f) as well as non-typeable strains. While all invasive disease is reportable at the national level, only confirmed and probable cases of invasive *H. influenzae* type b (Hib) are reportable in Ontario. A polysaccharide Hib vaccine was introduced in 1987 followed by a more effective conjugate vaccine in 1988. As of 1992, a four-dose schedule has been recommended. Hib vaccine is administered to infants in combination with vaccines against diphtheria, tetanus, pertussis and polio. Hib-containing vaccine is routinely administered at 2, 4, and 6 months of age, with a booster at 18 months of age. Following the introduction of the infant Hib vaccination programs in Canada there has been a decline in disease in all age groups, including those not targeted by vaccination, in Ontario and the rest of the country.[53-55]

Due to the limitations of Hib reporting in iPHIS,[56] data for this analysis were obtained by linking and validating cases that were reported in iPHIS with laboratory data from the Public Health Ontario Laboratories (PHOL) between 2000 and 2012. In 2012, five confirmed Hib cases were reported, of which three were male. The annual incidence rate of invasive Hib disease in Ontario ranged between 0.02 (2010) and 0.09 cases (2000) per 100,000 persons per year and was lower than the Canadian rate for all years (Figure 27-1).

The median age of cases in 2012 was 2.0 years, ranging between three months and 47 years and the highest incidence occurred in infants less than one year of age; all cases were hospitalized. Figure 27-2 shows the age distribution of cases by immunization status. Immunization status could be determined for four of the five cases. Among these, one was unimmunized, one was partially immunized and not complete for age, while two received the appropriate number of doses for their age (complete-for-age). Of the latter cases, one was too young to have completed their primary series and was therefore not considered vaccine-preventable (CFA-not VP), and one case developed illness after completing their primary series which would be consistent with vaccine failure (CFA-VF). Between 2000 and 2012, higher rates of disease were observed in northern public health units (data not shown). This may be attributable to a greater density of Aboriginal populations, within which higher rates have been observed.[57] Public health unit-specific rates for 2012 are provided in Appendix 3.

Due to gaps in the reporting of Hib in iPHIS, incorporating laboratory data when conducting provincial level analyses is essential. While the quality of Hib data in iPHIS has improved, immunization status is frequently absent. This limits the ability to determine if cases were attributable to failure to vaccinate or the result of vaccine failure, as well as measuring vaccine effectiveness. Lastly, while the focus of this analysis was on invasive Hib disease, having all invasive *H. influenzae* reportable in Ontario would allow for more comprehensive assessment and align with national reporting guidelines.[58]

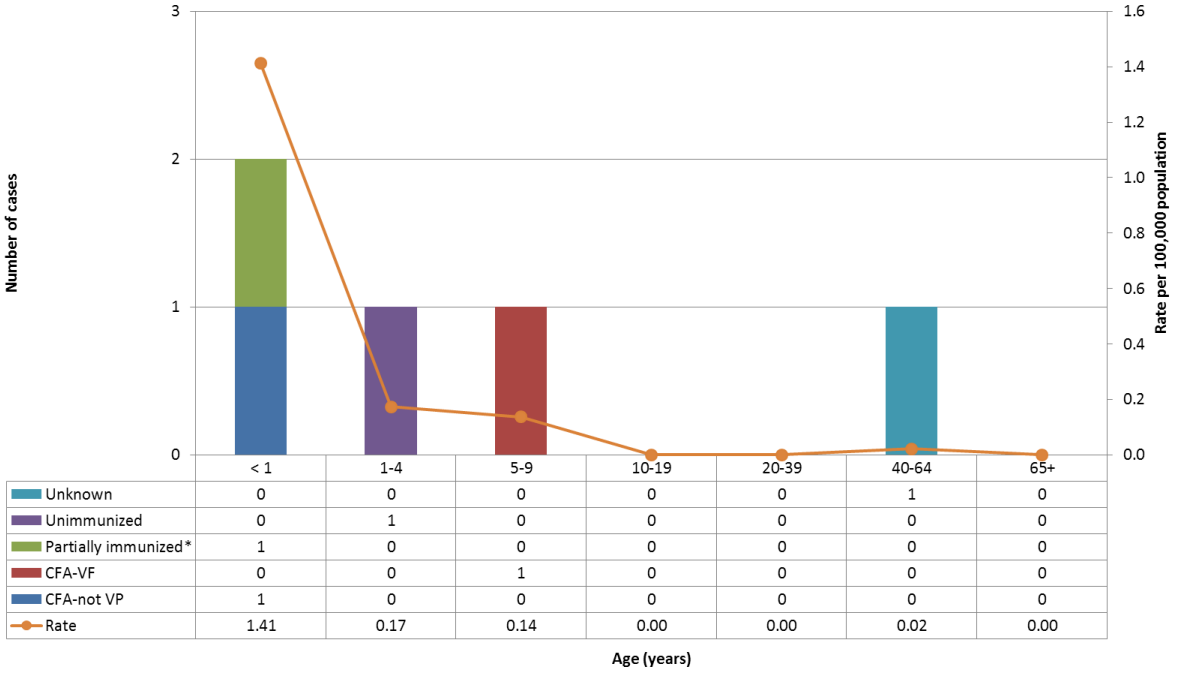
Figure 27-1. Incidence of Invasive *Haemophilus influenzae*, type b: Ontario and Canada, 2000–12



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	10	9	9	7	10	10	10	6	8	3	2	6	5
Ontario Rate	0.09	0.08	0.07	0.06	0.08	0.08	0.08	0.05	0.06	0.02	0.02	0.04	0.04
Canada Rate	0.11	0.15	0.16	0.14	0.12	0.09	0.10	0.08	0.13	0.05	0.05	0.09	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10] and Public Health Ontario Laboratories.
Ontario Population: Population Estimates [2000-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

Figure 27-2. Invasive *Haemophilus influenzae,* type b by Age and Immunization Status: Ontario, 2012



	< 1	1-4	5-9	10-19	20-39	40-64	65+
Unknown	0	0	0	0	0	1	0
Unimmunized	0	1	0	0	0	0	0
Partially immunized*	1	0	0	0	0	0	0
CFA-VF	0	0	1	0	0	0	0
CFA-not VP	1	0	0	0	0	0	0
Rate	1.41	0.17	0.14	0.00	0.00	0.02	0.00

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10] and Public Health Ontario Laboratories.
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
* Partially immunized indicates a case who was not complete-for-age.
CFA-not VP: complete-for-age but not vaccine-preventable as did not complete primary series yet; CFA-VF: complete-for-age and vaccine failure as completed primary series.

Chapter 28.

Lassa Fever

Lassa fever is not endemic to Ontario. As of 2012, no cases of Lassa fever have ever been reported in Ontario. The disease is not nationally notifiable and therefore no Canadian data are available.

Chapter 29.

Legionellosis

In 2012, 190 cases of legionellosis were reported in Ontario, corresponding to an incidence rate of 1.4 cases per 100,000 population (Figure 29-1). From 2003 to 2012, the incidence of legionellosis increased substantially, ranging from a low of 0.1 cases per 100,000 population in 2004 to a high of 1.4 cases per 100,000 population in 2012. The incidence rate in 2012 was more than 15 times higher than the rate in 2004. With the exception of 2004, the annual incidence rates of legionellosis in Ontario during this period were higher than the rest of Canada.

In 2012, males accounted for 71.6% (136/190) of all cases reported in Ontario (Figure 29-2). The incidence rate among males was 2.0 cases per 100,000 population, which was more than double the rate among females, which was 0.8 cases per 100,000 population. In general, the incidence of legionellosis increased with increasing age. No cases of legionellosis were reported among individuals less than 20 years of age in 2012, and 83.2% (158/190) of cases were reported among individuals 50 years of age and older. The highest incidence rates were reported among those over the age of 50 years; however, the incidence of legionellosis increased dramatically among men 70 years of age and older while decreasing among women in this age group.

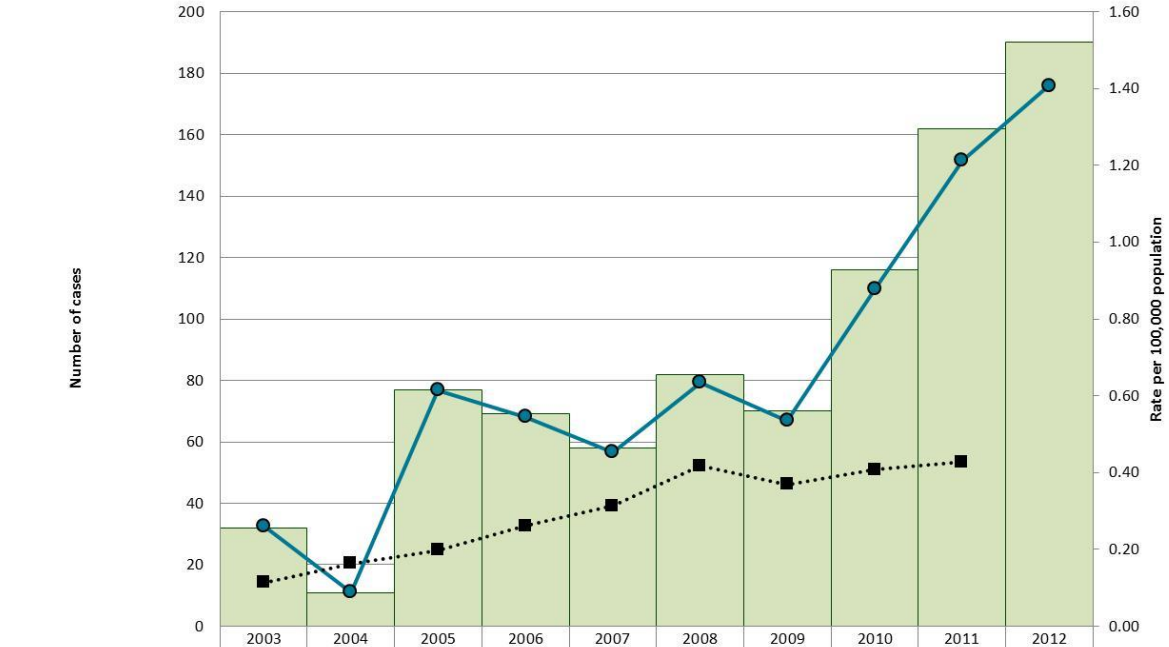
The incidence of legionellosis follows a seasonal pattern, with the majority of cases occurring in late summer and fall. For example, more than half (57.4%, 109/190) of all cases reported in 2012 were reported in August and September (Figure 29-3). However, the number of cases reported each month in 2012 consistently exceeded the corresponding monthly five-year (2007–11) average case count, with the exception of April, May, and October. The seasonal increase in August and September of 2012 was substantially higher than in previous years, with case counts that were 4.0 and 2.2 times higher, respectively, than the corresponding monthly five-year average. The number of specimens received and tested for *Legionella* at the Public Health Ontario Laboratories (PHOL) fluctuated by month, and the highest percent positivity (i.e., percentage of tests that were positive for *Legionella*) occurred in August (10.3%, 58/562) (Figure 29-4).

The incidence rates of legionellosis were highest in Peel Region, Eastern Ontario, and Waterloo Region public health units, with rates of 2.7, 2.5 and 2.4 cases per 100,000 population, respectively (Map 29-1). The majority of cases of legionellosis in Ontario are reported from public health units in and around the Golden Horseshoe Area.[59] In 2012, almost two-thirds of cases (61.1%, 116/190) in Ontario were reported from four public health units in the Greater Toronto Area, including Toronto, Peel Region, Durham Region, and Halton Region. Fourteen public health units did not report any cases of legionellosis in 2012.

In 2012, 74.2% (141/190) of legionellosis cases were hospitalized and 6.3% (12/190) of cases were fatal.

Legionella species are ubiquitous in the environment, which makes it challenging to identify and link potentially contaminated sources to cases of legionellosis. Since any aquatic medium has the potential to be a reservoir, it is difficult to implement preventative measures targeting the organism. The ongoing process to refine and improve case interviewing methods may lead to better identification of possible contaminated sources. In addition, under-reporting of cases may occur due to empiric treatment of pneumonia.

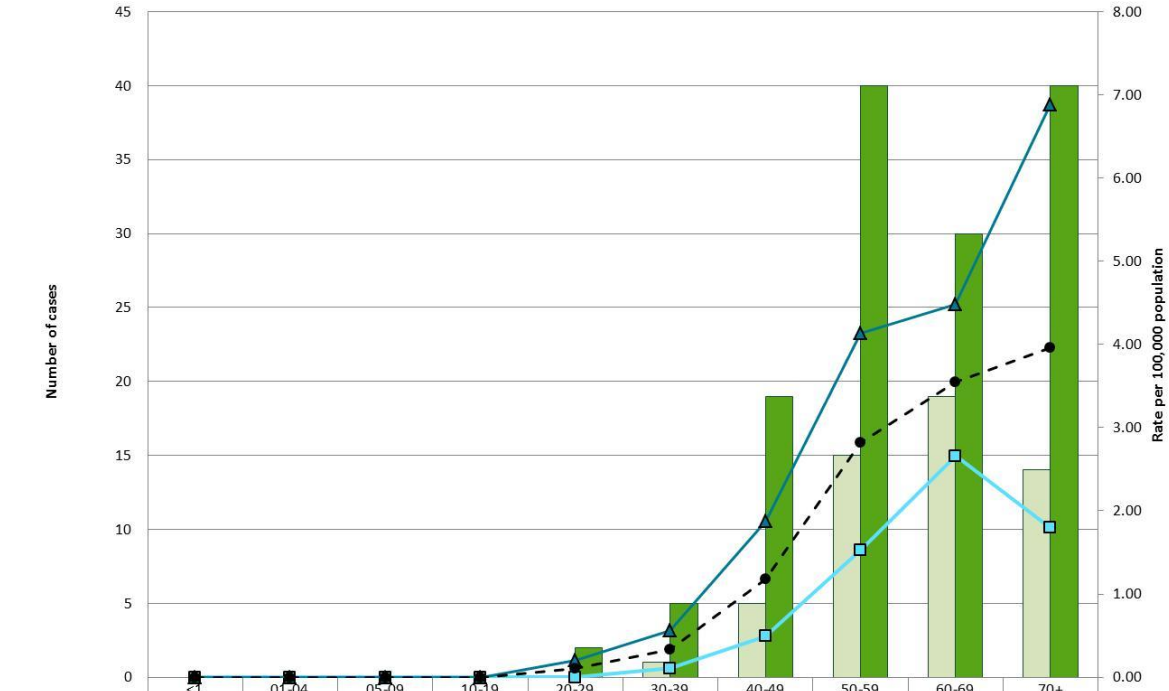
Figure 29-1. Incidence of Legionellosis: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	32	11	77	69	58	82	70	116	162	190
Ontario Rate	0.26	0.09	0.61	0.54	0.45	0.63	0.54	0.88	1.21	1.41
Canada (Excl. ON) Rate	0.11	0.16	0.20	0.26	0.31	0.42	0.37	0.41	0.43	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

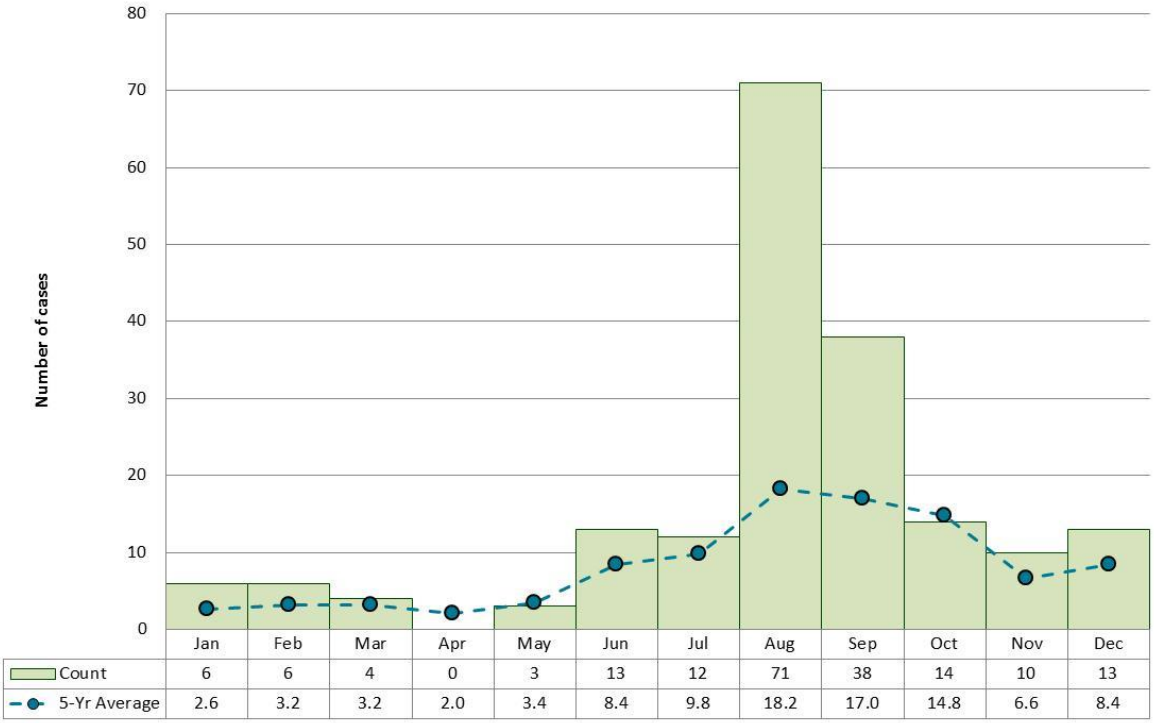
Figure 29-2. Incidence of Legionellosis by Age and Sex: Ontario, 2012



	<1	01-04	05-09	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	0	0	0	0	0	1	5	15	19	14
Male Count	0	0	0	0	2	5	19	40	30	40
Female Rate	0.00	0.00	0.00	0.00	0.00	0.11	0.49	1.53	2.66	1.79
Male Rate	0.00	0.00	0.00	0.00	0.21	0.56	1.87	4.13	4.48	6.88
Total Rate	0.00	0.00	0.00	0.00	0.10	0.33	1.18	2.82	3.54	3.96

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

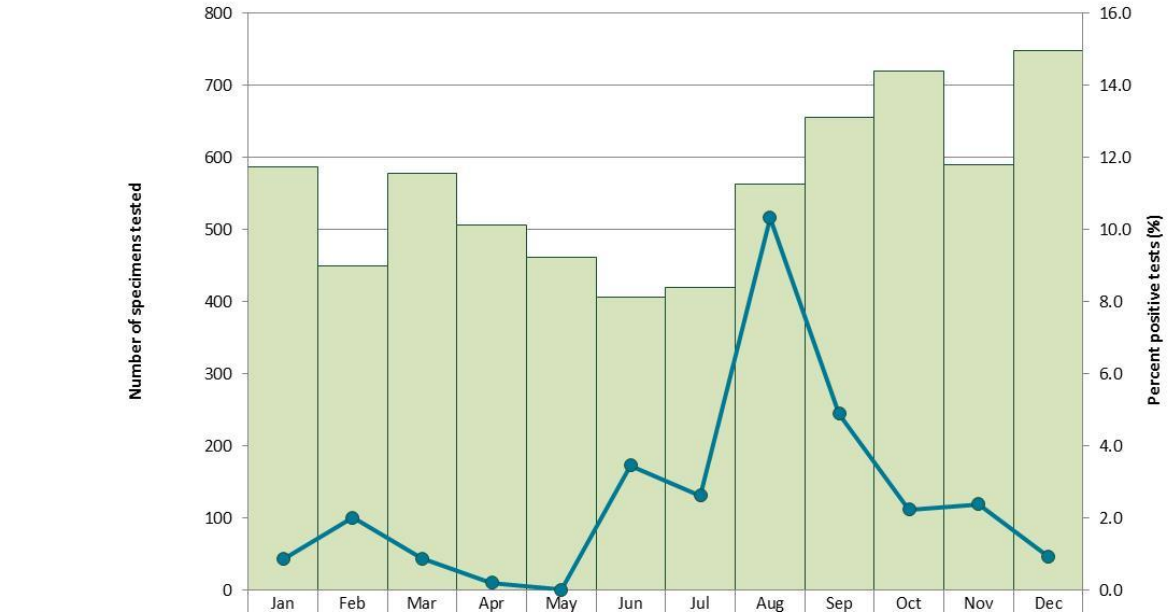
Figure 29-3. Number of Legionellosis Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	6	6	4	0	3	13	12	71	38	14	10	13
5-Yr Average	2.6	3.2	3.2	2.0	3.4	8.4	9.8	18.2	17.0	14.8	6.6	8.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

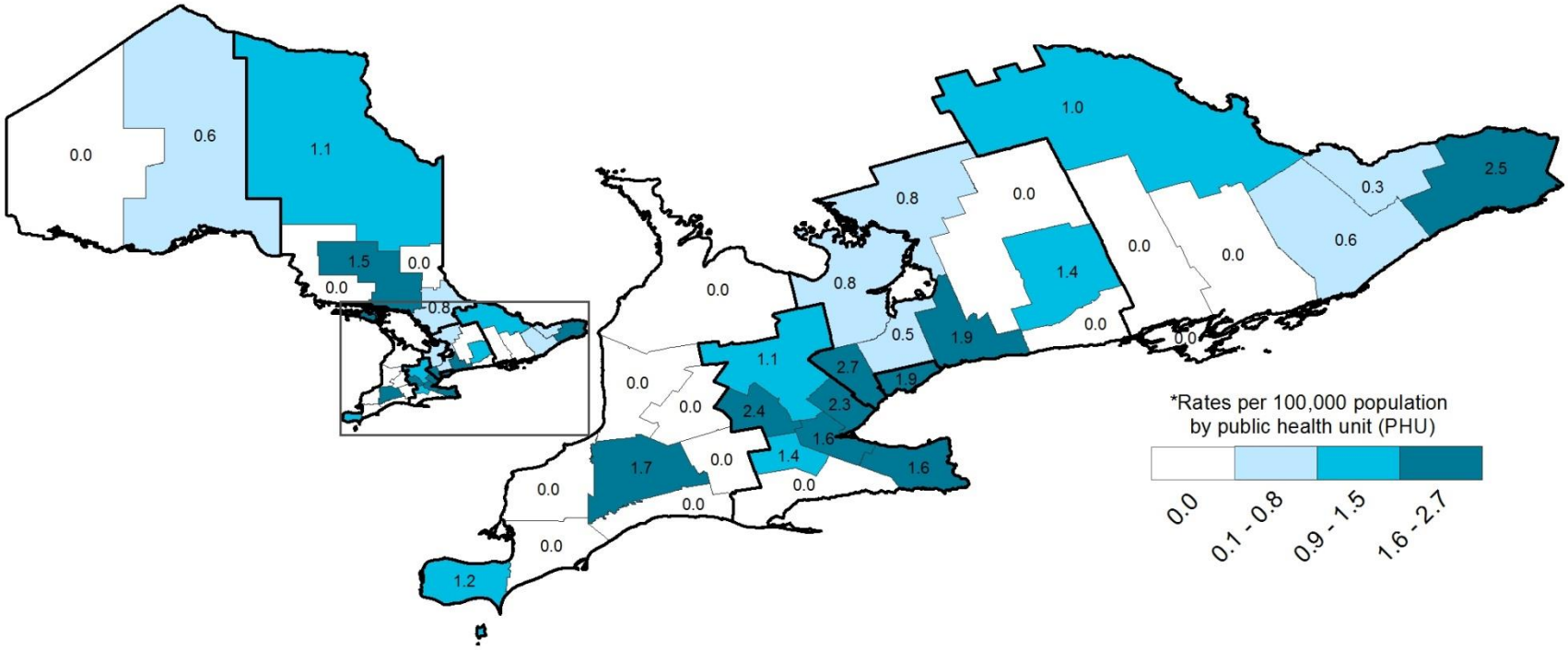
Figure 29-4. Number of Patients Tested and Percent Positivity for *Legionella* by Test Month: PHOL, 2012



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Specimens tested	586	449	578	506	461	406	420	562	655	719	589	748
Positive result	5	9	5	1	0	14	11	58	32	16	14	7
Percent positive specimens	0.9	2.0	0.9	0.2	0.0	3.4	2.6	10.3	4.9	2.2	2.4	0.9

Source: Public Health Ontario Laboratories (PHOL), Laboratory Information Management System, extracted [2014/01/16].
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.

Map 29-1. Incidence of Legionellosis by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.00
BRN	2	1.41
CHK	0	0.00
DUR	12	1.88
ELG	0	0.00
EOH	5	2.48
GBO	0	0.00
HAL	12	2.28
HAM	9	1.65
HDN	0	0.00
HKP	0	0.00
HPE	0	0.00
HUR	0	0.00

PHU	Cases (n)	*Rates
KFL	0	0.00
LAM	0	0.00
LGL	1	0.59
MSL	8	1.73
NIA	7	1.57
NPS	1	0.79
NWR	0	0.00
OTT	3	0.33
OXF	0	0.00
PDH	0	0.00
PEE	38	2.73
PQP	1	1.15
PTC	2	1.43

PHU	Cases (n)	*Rates
REN	1	0.96
SMD	4	0.76
SUD	3	1.51
THB	1	0.64
TOR	54	1.93
TSK	0	0.00
WAT	13	2.42
WDG	3	1.07
WEC	5	1.24
YRK	5	0.46
Ontario	**190**	**1.41**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 30.

Leprosy

Leprosy is a rare disease in Ontario. In 2012, two cases of leprosy were reported in the province, corresponding to an incidence rate of <0.2 cases per 1,000,000 population (Table 30-1). From 2003 to 2012, a total of 30 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, with five cases.

Among all cases reported from 2003 to 2012, 83.3% (25/30) were male, and 63.3% (19/30) were over the age of 40.

Table 30-1. Incidence of Leprosy: Ontario, 2003–12

Year	Ontario cases	Ontario rate (per 1,000,000 population)
2003	4	0.33
2004	4	0.32
2005	3	0.24
2006	2	0.16
2007	2	0.16
2008	5	0.39
2009	4	0.31
2010	1	0.08
2011	3	0.22
2012	2	0.15

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 31.

Listeriosis

In 2012, 43 cases of listeriosis were reported in Ontario, with an incidence rate of 0.3 cases per 100,000 population. Since 2003, the incidence rate of listeriosis has remained relatively stable with the exception of 2008 when a national outbreak occurred (Figure 31-1). Since 2008, provincial incidence rates of listeriosis remained above the national rates.

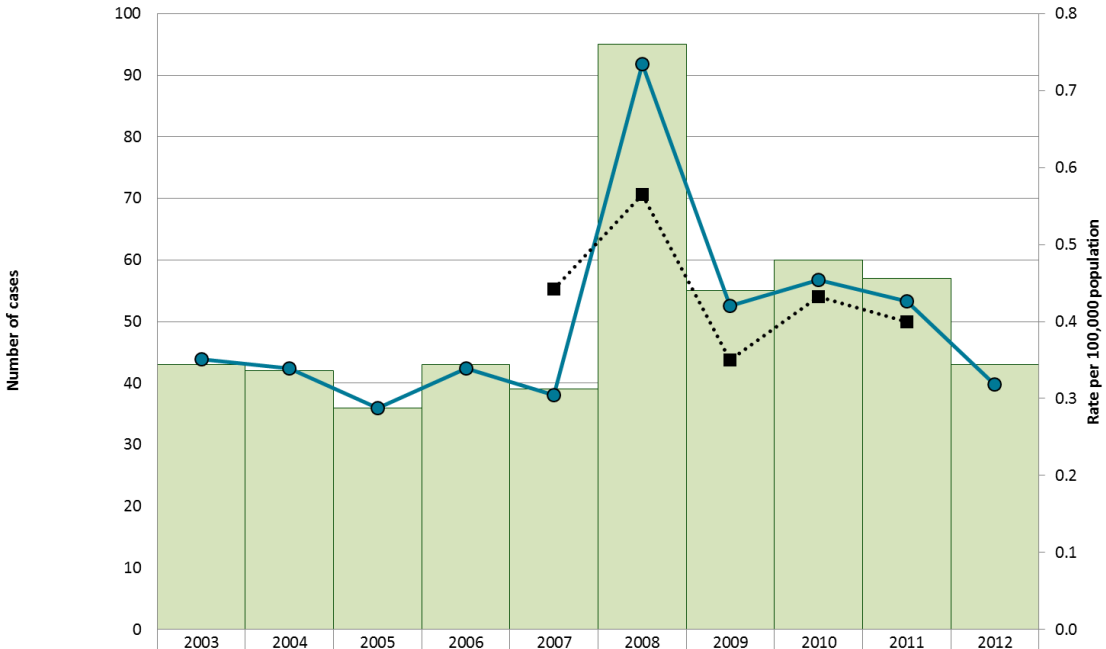
The incidence of listeriosis increased with age and was highest among adults 70 years of age and older at 1.2 cases per 100,000 population (Figure 31-2). Two cases of listeriosis were reported among children less than five years of age. Rates were higher for males 40 to 69 years of age, but were higher for females over 70 years of age. One case reported pregnancy, however, no additional information was provided.

In 2012, 69% (30/43 cases) of listeriosis cases were reported as hospitalized and one death was reported. However, a report from the Public Health Agency of Canada's National Enhanced Listeriosis Surveillance Program reported a fatal outcome for 17 to 20% of cases from 2011 to 2012 in Ontario.[60] Death outcomes are only captured at the time of the case investigation. The difference between the case fatality rates reported in iPHIS and those captured through the national surveillance program is due to a more comprehensive data entry process in the national program.

Seasonal increases in listeriosis are typically observed in warmer months.[26] However, in Ontario in 2012, the seasonal trend was not as pronounced as in previous years (Figure 31-3). Incidence rates for listeriosis by public health unit are shown in Map 31-1. However, due to low case counts in some jurisdictions rates should be interpreted with caution.

Additional information on listeriosis including exposure risks can be found in the Public Health Agency of Canada's 2012 Enhanced Listeriosis Technical Report and Public Health Ontario's Monthly Infectious Diseases Surveillance Report, February 2014 issue.[60,61]

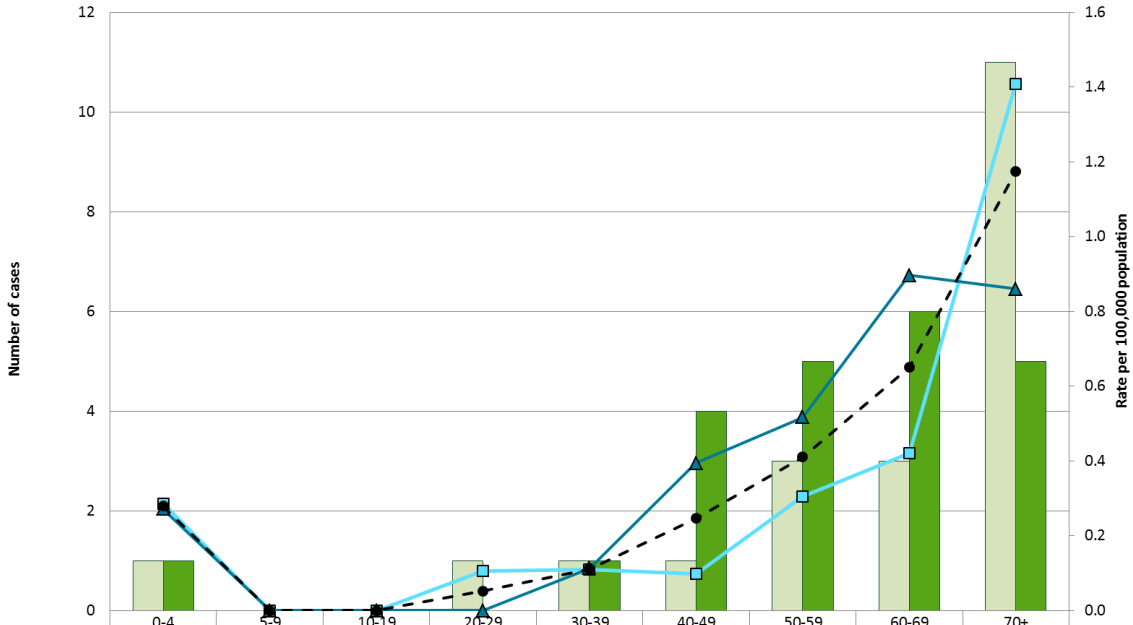
Figure 31-1. Incidence of Listeriosis: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	43	42	36	43	39	95	55	60	57	43
Ontario Rate	0.4	0.3	0.3	0.3	0.3	0.7	0.4	0.5	0.4	0.3
Canada (Excl. ON) Rate					0.4	0.6	0.3	0.4	0.4	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Listeriosis became nationally notifiable in 2007. Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

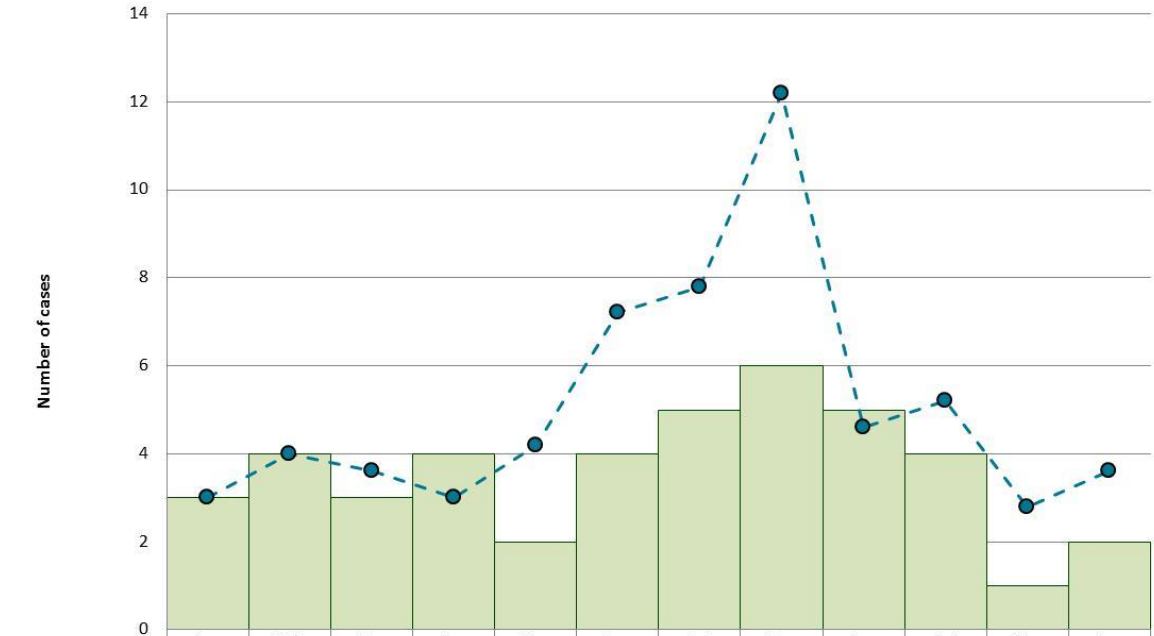
Figure 31-2. Incidence of Listeriosis by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	1	0	0	1	1	1	3	3	11
Male Count	1	0	0	0	1	4	5	6	5
Female Rate	0.3	0.0	0.0	0.1	0.1	0.1	0.3	0.4	1.4
Male Rate	0.3	0.0	0.0	0.0	0.1	0.4	0.5	0.9	0.9
Total Rate	0.3	0.0	0.0	0.1	0.1	0.2	0.4	0.7	1.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

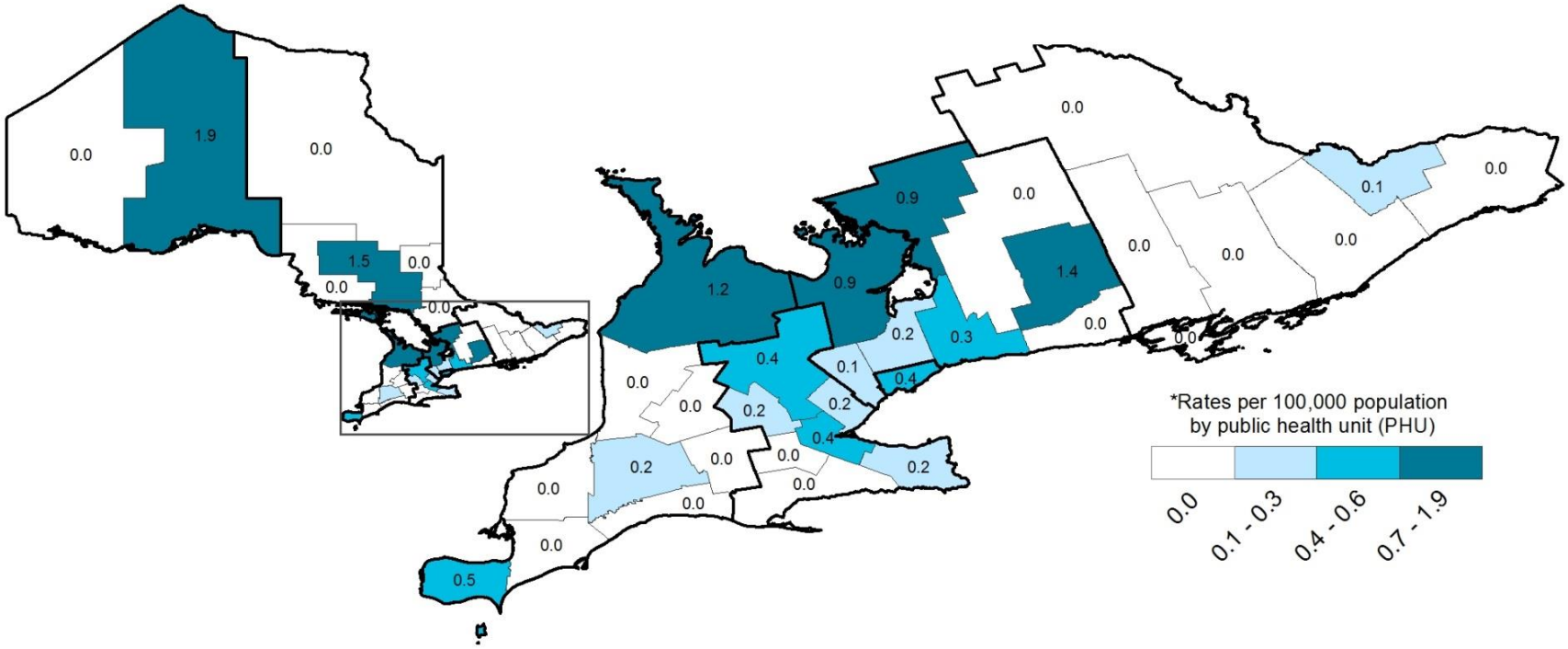
Figure 31-3. Number of Listeriosis Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	3	4	3	4	2	4	5	6	5	4	1	2
5-Yr Average	3.0	4.0	3.6	3.0	4.2	7.2	7.8	12.2	4.6	5.2	2.8	3.6

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 31-1. Incidence of Listeriosis by Public Health Unit of Residence: Ontario, 2012



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	0	0.0
GBO	2	1.2
HAL	1	0.2
HAM	2	0.4
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	1	0.2
NPS	0	0.0
NWR	0	0.0
OTT	1	0.1
OXF	0	0.0
PDH	0	0.0
PEE	2	0.1
PQP	0	0.0
PTC	2	1.4

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	5	0.9
SUD	3	1.5
THB	3	1.9
TOR	12	0.4
TSK	0	0.0
WAT	1	0.2
WDG	1	0.4
WEC	2	0.5
YRK	2	0.2
Ontario	**43**	**0.3**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 32.

Lyme Disease

Lyme disease is a tick-borne disease spread by the bite of an infected blacklegged tick, *Ixodes scapularis*. In 2012, there were a total of 185 probable and confirmed cases of Lyme disease reported in Ontario, with an incidence rate of 1.4 cases per 100,000 population (Figure 32-1). Since 2003, the provincial incidence rate of Lyme disease has been increasing. National incidence rates have also increased since 2009 although they have remained below provincial rates. The observed increase in provincial and national incidence rates may be due to a number of factors including new and expanding endemic disease transmission areas and increased public and physician awareness of the disease.

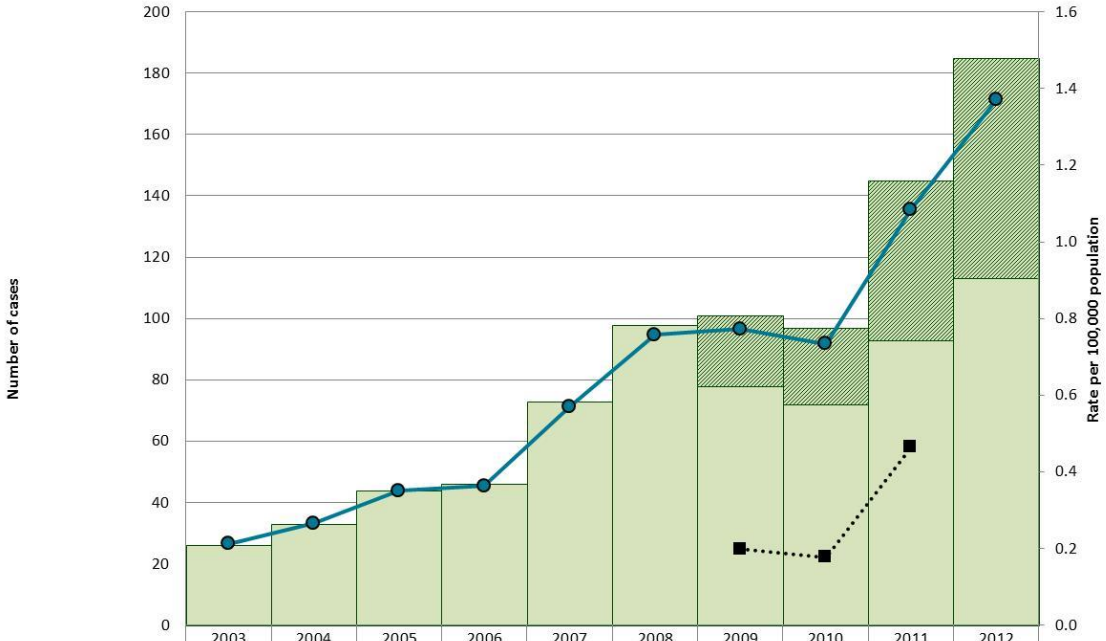
Although Lyme disease can be contracted at any age, the highest incidence rates in 2012 in Ontario were observed in young children and adults over 50 years of age (Figure 32-2). Individuals who spend significant amounts of time outdoors, such as campers, hikers, and hunters, are at greatest risk for Lyme disease due to the increased likelihood of exposure to infected ticks, especially in Lyme disease endemic areas. Hospitalization was reported for 2.2% (4/185) of cases.

The majority of Lyme disease cases in Ontario in 2012 were reported in the summer months, which corresponds with the nymphal stage of the blacklegged tick's life cycle (Figure 32-3). Due to their small size, an infected nymph is less likely to be noticed when attached, is thus more likely to feed for greater than 24 hours with resultant transmission of the Lyme disease bacteria. In Ontario, the areas of greatest risk for Lyme disease coincide with the areas with established populations of infected blacklegged ticks. In 2012, the highest incidence rates were reported in the Leeds, Grenville & Lanark District (17.7 cases per 100,000 population), Kingston, Frontenac and Lennox & Addington (8.1 cases per 100,000 population), and Eastern Ontario (8.0 cases per 100,000 population) public health units. (Map 32-1)

The observed variability in incidence rates by age and sex and public health unit should be interpreted with caution due to low case counts in some categories.

Additional information on Lyme disease can be found at September 2013 issue of Public Health Ontario's Monthly Infectious Diseases Surveillance Report, PHO's 2012 Vector-Borne Diseases summary report, and the PHOL Lyme disease testing Labstract.[62-64]

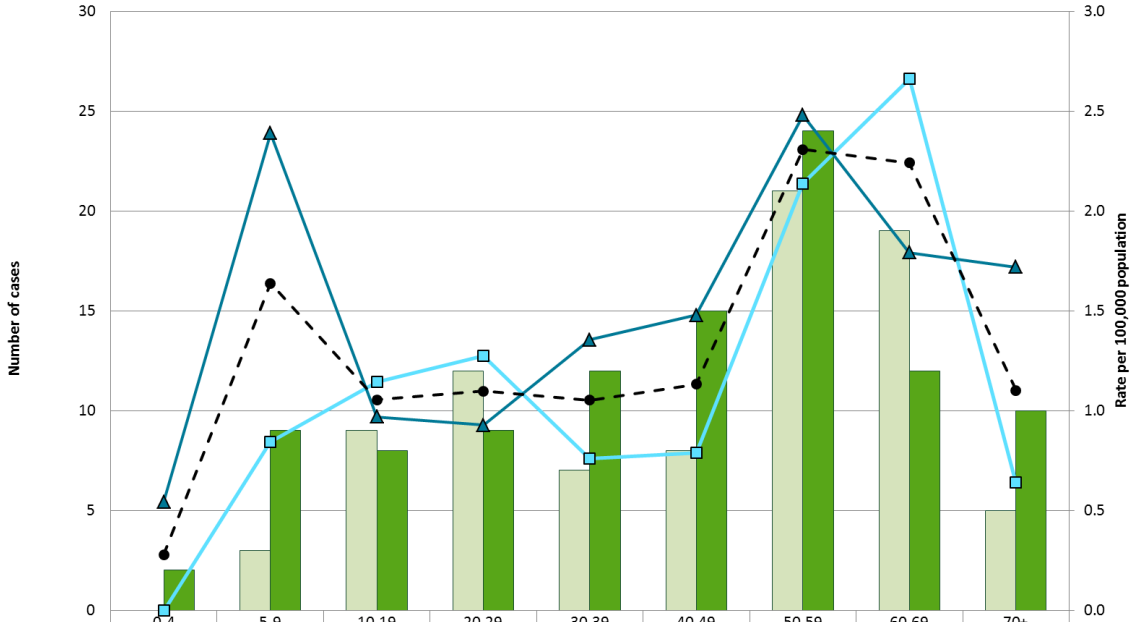
Figure 32-1. Incidence of Confirmed and Probable Lyme Disease: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count (Probable)							23	25	52	72
Ontario Count (Confirmed)	26	33	44	46	73	98	78	72	93	113
Ontario Rate	0.2	0.3	0.4	0.4	0.6	0.8	0.8	0.7	1.1	1.4
Canada (Excl. ON) Rate							0.2	0.2	0.5	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; Lyme disease became nationally notifiable in 2009 and national data were available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

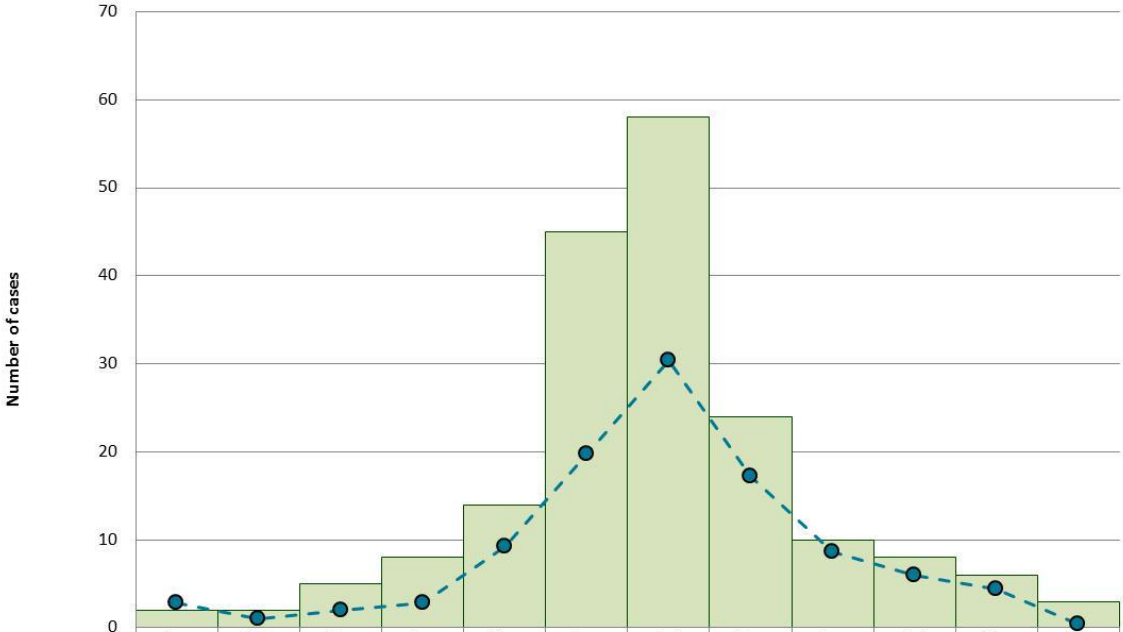
Figure 32-2. Incidence of Lyme Disease by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	0	3	9	12	7	8	21	19	5
Male Count	2	9	8	9	12	15	24	12	10
Female Rate	0.0	0.8	1.1	1.3	0.8	0.8	2.1	2.7	0.6
Male Rate	0.5	2.4	1.0	0.9	1.4	1.5	2.5	1.8	1.7
Total Rate	0.3	1.6	1.1	1.1	1.1	1.1	2.3	2.2	1.1

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

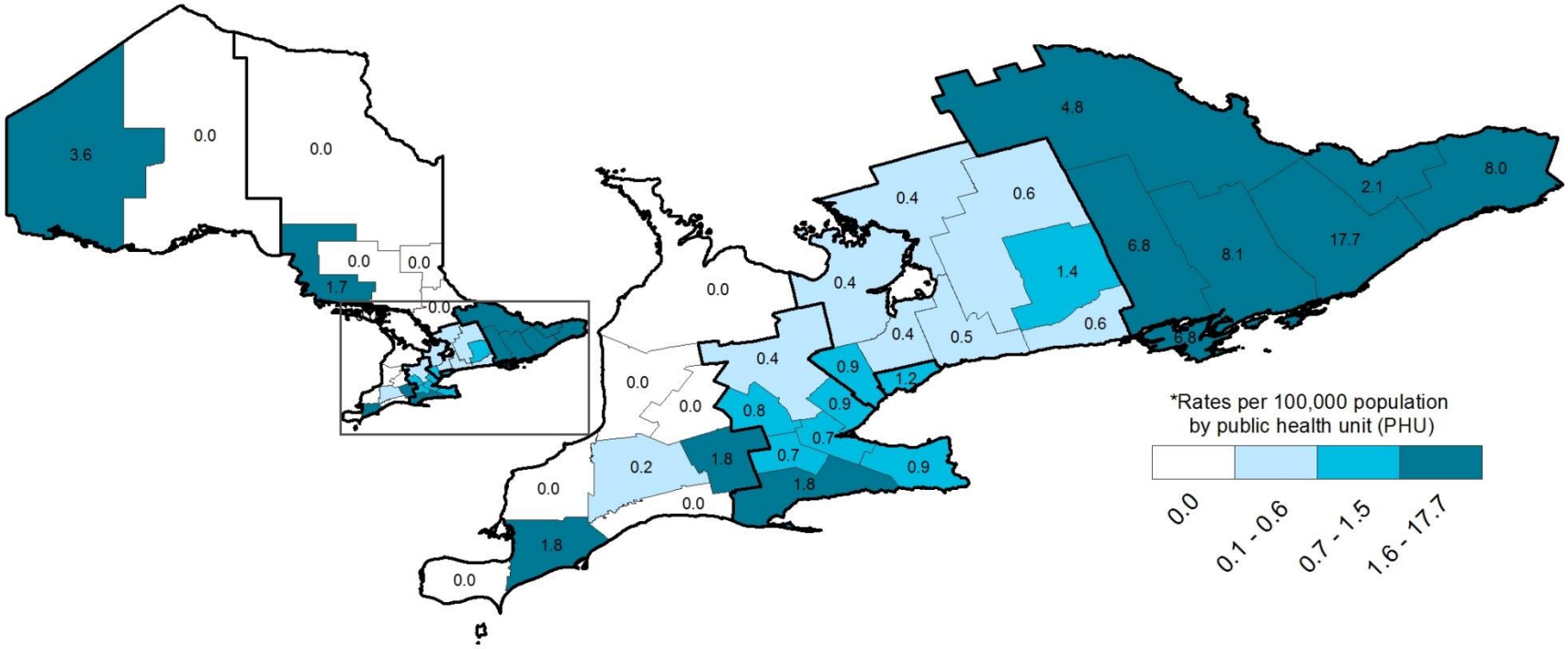
Figure 32-3. Number of Lyme Disease Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	2	2	5	8	14	45	58	24	10	8	6	3
5-Yr Average	2.8	1.0	2.0	2.8	9.2	19.8	30.4	17.2	8.6	6.0	4.4	0.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 32-1. Incidence of Lyme Disease by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	2	1.7
BRN	1	0.7
CHK	2	1.8
DUR	3	0.5
ELG	0	0.0
EOH	16	8.0
GBO	0	0.0
HAL	5	1.0
HAM	4	0.7
HDN	2	1.8
HKP	1	0.6
HPE	11	6.8
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	16	8.1
LAM	0	0.0
LGL	30	17.7
MSL	1	0.2
NIA	4	0.9
NPS	0	0.0
NWR	3	3.7
OTT	19	2.1
OXF	2	1.8
PDH	0	0.0
PEE	12	0.9
PQP	0	0.0
PTC	2	1.4

PHU	Cases (n)	*Rates
REN	5	4.8
SMD	2	0.4
SUD	0	0.0
THB	0	0.0
TOR	33	1.2
TSK	0	0.0
WAT	4	0.8
WDG	1	0.4
WEC	0	0.0
YRK	4	0.4
Ontario	**185**	**1.4**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

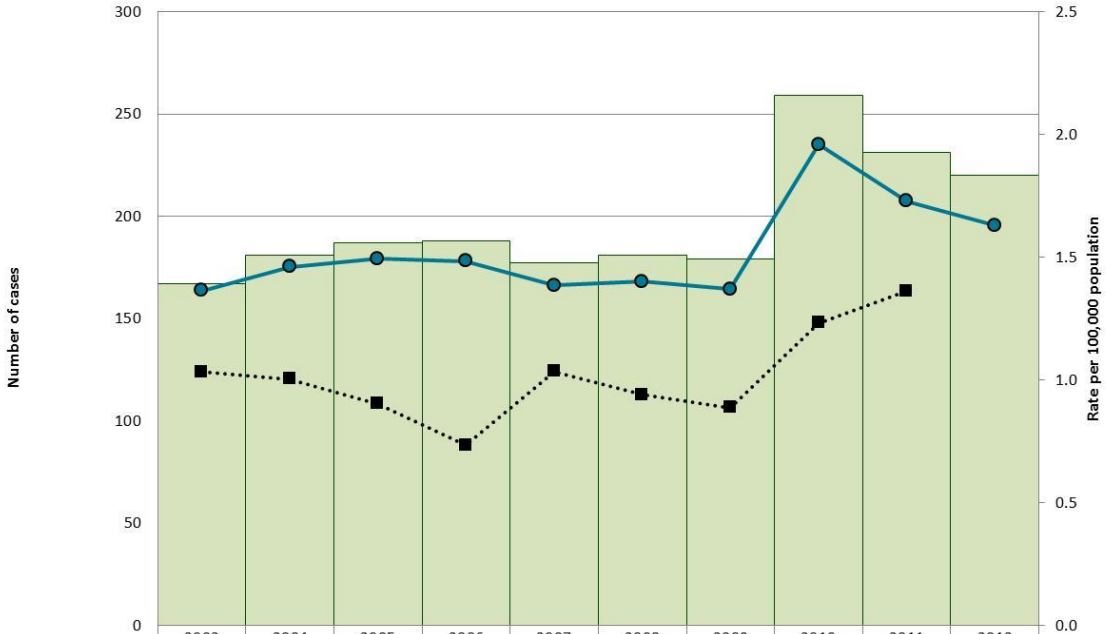
Chapter 33.

Malaria

Malaria is a mosquito-borne disease that is not endemic to North America. The majority of malaria cases reported in Ontario are acquired from travel to Africa and the Indian subcontinent. In 2012, there were 220 confirmed cases reported representing an incidence rate of 1.6 cases per 100,000 population (Figure 33-1). Of these cases, 90 were hospitalized and there was one death reported. The incidence rate in 2012 was higher than the incidence rates between 2003 and 2009 but lower than the incidence rates reported in 2010 and 2011. Since 2003, Ontario has consistently reported higher incidence rates than the rest of Canada. Additional information on the epidemiology of imported malaria in Ontario is described by Nelder *et al.*[65]

Ontario sex-specific malaria incidence rates were higher in males than in females with the highest incidence rates reported between 20 and 49 years (Figure 33-2). The majority of malaria cases were reported between May and September (Figure 33-3). Rates and counts of malaria cases reported in Ontario are presented in Map 33-1. Additional information on malaria, including a breakdown of malaria cases by *Plasmodium* parasite species, can be found in the April 2014 issue of Public Health Ontario's Monthly Infectious Diseases Surveillance Report.[66]

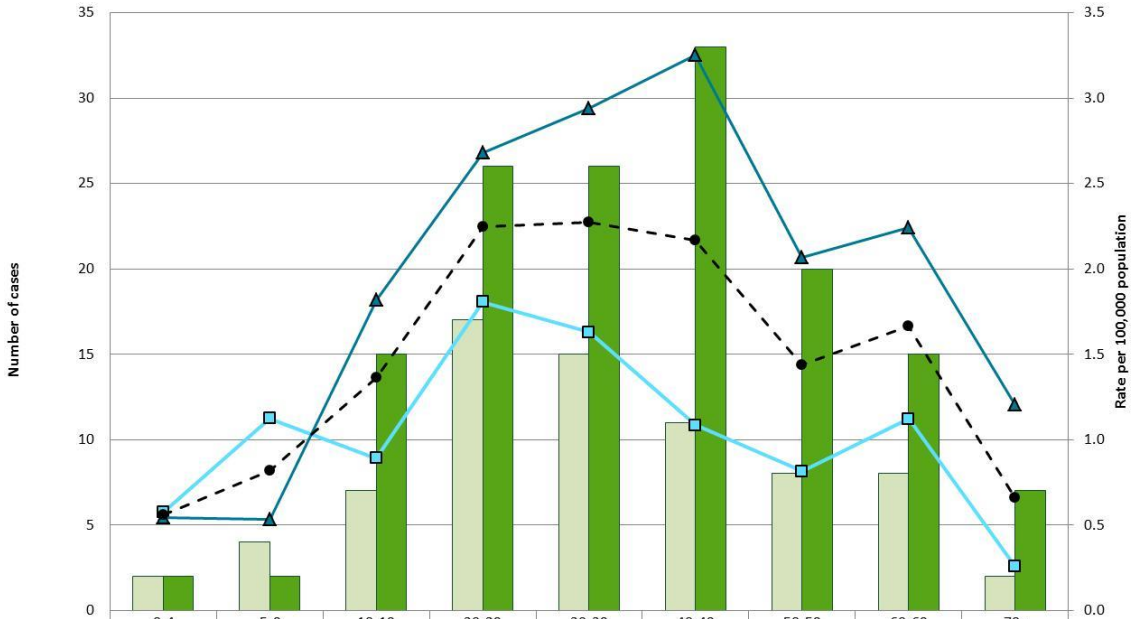
Figure 33-1. Incidence of Malaria: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	167	181	187	188	177	181	179	259	231	220
Ontario Rate	1.4	1.5	1.5	1.5	1.4	1.4	1.4	2.0	1.7	1.6
Canada (Excl. ON) Rate	1.0	1.0	0.9	0.7	1.0	0.9	0.9	1.2	1.4	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

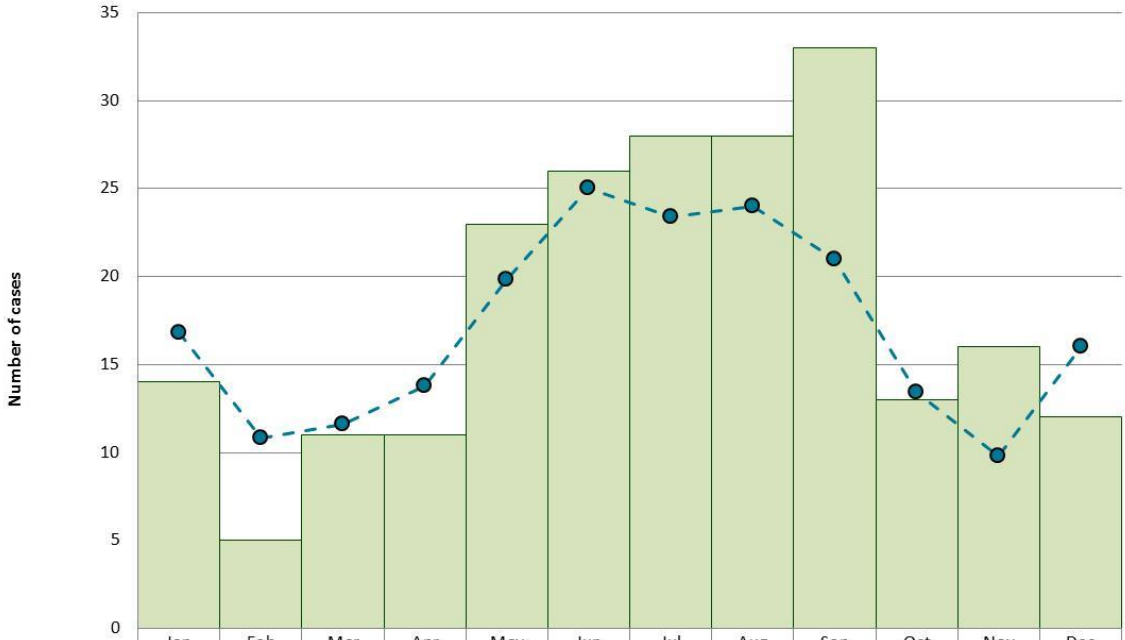
Figure 33-2. Incidence of Malaria by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	2	4	7	17	15	11	8	8	2
Male Count	2	2	15	26	26	33	20	15	7
Female Rate	0.6	1.1	0.9	1.8	1.6	1.1	0.8	1.1	0.3
Male Rate	0.5	0.5	1.8	2.7	2.9	3.3	2.1	2.2	1.2
Total Rate	0.6	0.8	1.4	2.2	2.3	2.2	1.4	1.7	0.7

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

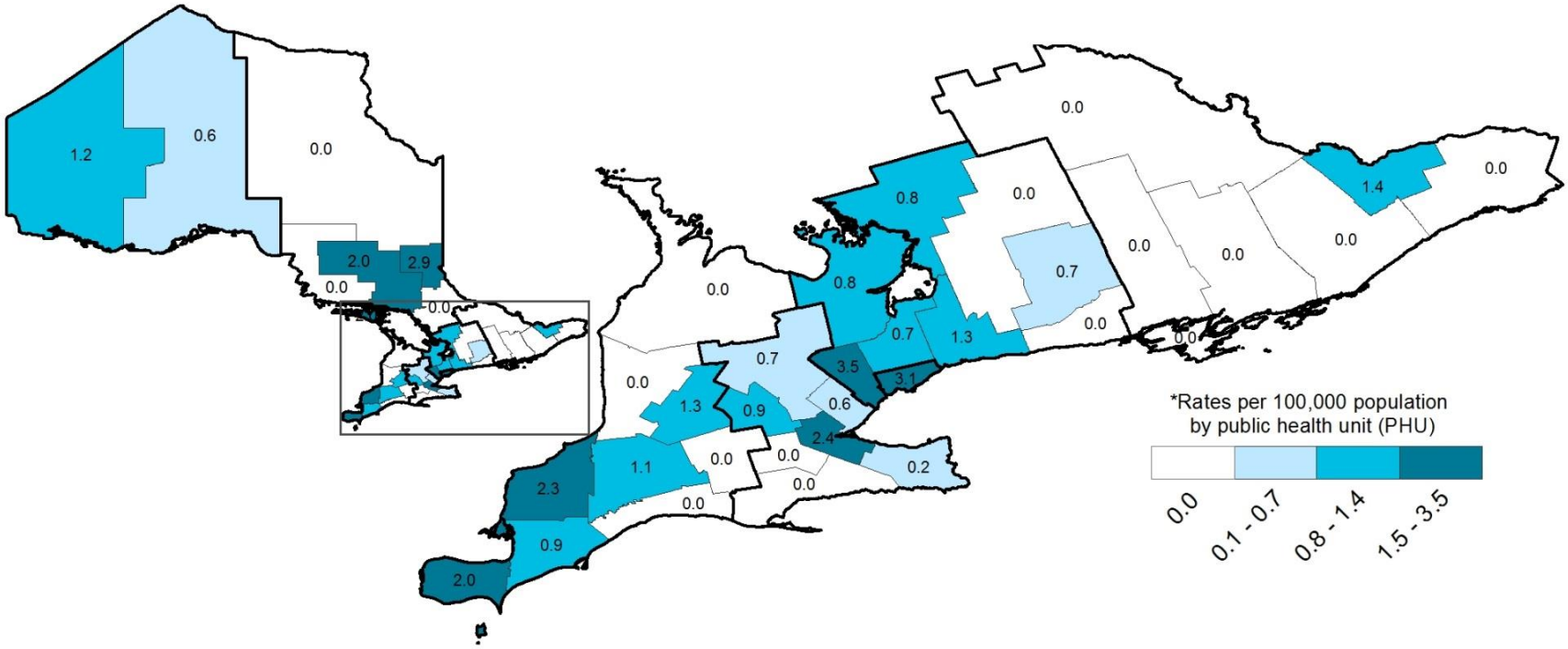
Figure 33-3. Number of Malaria Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	14	5	11	11	23	26	28	28	33	13	16	12
5-Yr Average	16.8	10.8	11.6	13.8	19.8	25.0	23.4	24.0	21.0	13.4	9.8	16.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 33-1. Incidence of Malaria by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	0	0.0
CHK	1	0.9
DUR	8	1.3
ELG	0	0.0
EOH	0	0.0
GBO	0	0.0
HAL	3	0.6
HAM	13	2.4
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	3	2.3
LGL	0	0.0
MSL	5	1.1
NIA	1	0.2
NPS	0	0.0
NWR	1	1.2
OTT	13	1.4
OXF	0	0.0
PDH	1	1.3
PEE	49	3.5
PQP	0	0.0
PTC	1	0.7

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	4	0.8
SUD	4	2.0
THB	1	0.6
TOR	88	3.2
TSK	1	2.9
WAT	5	0.9
WDG	2	0.7
WEC	8	2.0
YRK	8	0.7
Ontario	**220**	**1.6**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 34.

Measles

Indigenous measles has been eliminated from Canada; the last endemic case of measles was reported in 1997.[67] Under the guidance of the Pan American Health Organization (PAHO), countries of the Americas are currently documenting the elimination of measles.[68] 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 disease. In Canada, measles vaccine is only available in combination with mumps, rubella, and varicella vaccines (MMR and MMRV). 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 4 and 6 years of age.

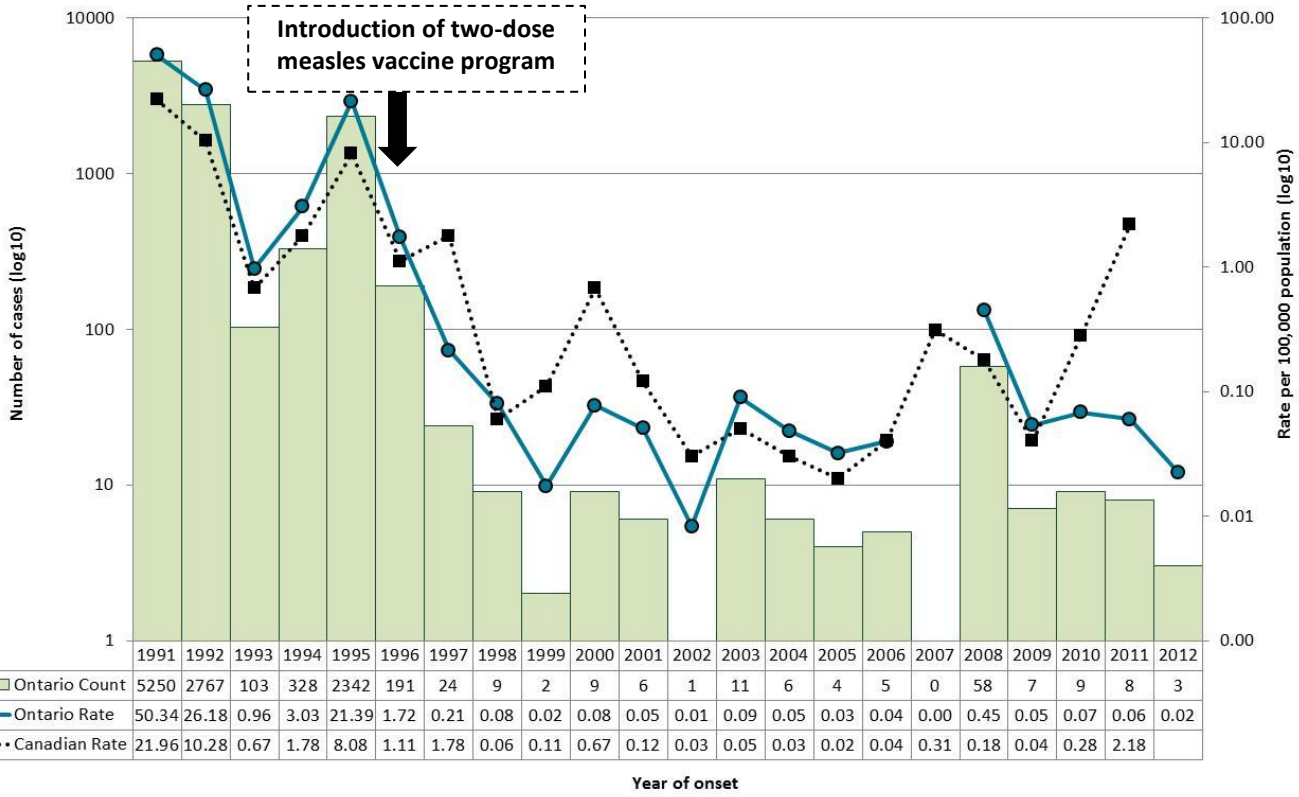
In 2012, three confirmed cases of measles were reported in Ontario (Figure 34-1). Two of the cases were associated with travel while the source of infection was unknown for the third case. Since 1991, the annual measles incidence ranged from 0 to 50.34 cases per 100,000 population. The decline in cases since 1996 is due in large part to the introduction of the two-dose measles immunization program. The large number of cases observed in 2008 was driven by an outbreak involving 54 cases with links to the Ontario Science Centre that was suspected to be travel-related. Other smaller outbreaks were associated with travel to the United States, Europe, and South East Asia. In Canada over the past decade, the annual incidence rate for measles was low, with the exception of 2007 and 2011 where distinct outbreaks were reported in Quebec.[69,70]

Due to the small number of measles cases reported in 2012, age- and sex- specific rates were derived using 2006–12 data (Figure 34-2). The highest incidence occurs among infants under one year. In 2012, two of the cases (an infant and toddler under five years of age) were hospitalized and subsequently discharged. The infant was too young to be vaccinated, while the toddler was unimmunized. The third case was an adolescent who had previously received one dose of measles-containing vaccine. Among 90 cases reported between 2006 and 2012, immunization status could only be determined for 53 (58.9%). Of these, 37 (69.8%) were unimmunized, ten (18.9%) had received one dose, and six (11.3%) had received two doses.

Figure 34-3 presents the importation status of measles cases in Ontario between 2006 and 2012. Of the 90 cases reported during this period, 30 (33.3%) were determined to be imported or import-related, although in the last three years, 19 of 20 cases (95%) had these classifications (Figure 34-3). To complement the determination of importation status, all measles specimens that are submitted for PCR testing at Public Health Ontario Laboratories are forwarded to the National Microbiology Laboratory for genotyping. The countries from which the 2012 measles cases were imported as well as the corresponding genotype (where available) are itemized in Table 34-1. Due to the spread of measles globally, genotypes are no longer uniquely linked to a specific country or region. According to data from the World Health Organization (WHO) Measles Nucleotide Surveillance,[71] measles B3 has been identified in various regions, including the Eastern Mediterranean WHO region, of which Pakistan and Afghanistan are member states. The annualized rate of measles by public health unit between 2006 and 2012 is shown in Map 34-1; 2012 rates are provided in Appendix 3.

To ensure Canada's elimination status is maintained, the assessment and documentation of travel and immunization histories for all suspected measles cases is essential. Efforts are currently underway within Ontario to address this to improve documentation and reporting.

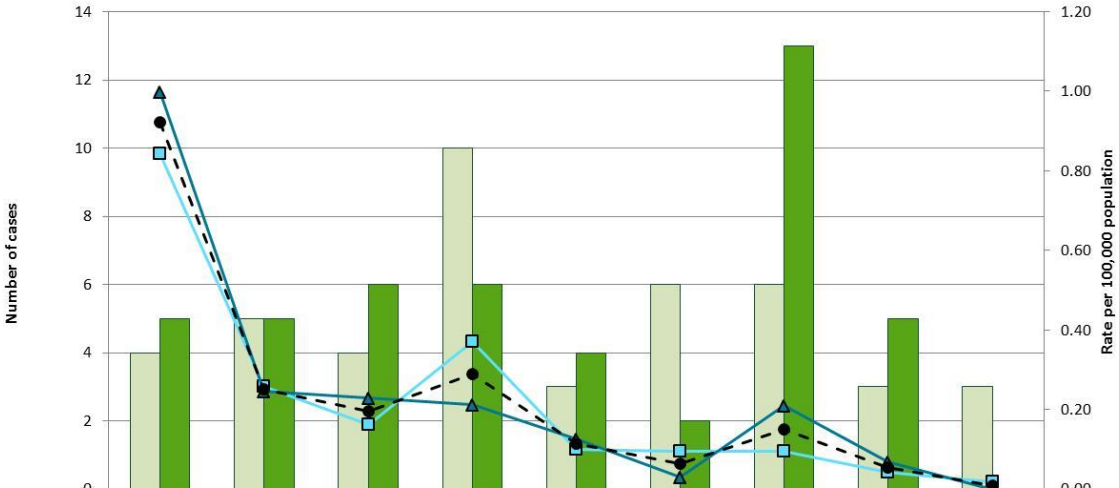
Figure 34-1. Incidence of Measles: Ontario and Canada, 1991–2012



	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	5250	2767	103	328	2342	191	24	9	2	9	6	1	11	6	4	5	0	58	7	9	8	3
Ontario Rate	50.34	26.18	0.96	3.03	21.39	1.72	0.21	0.08	0.02	0.08	0.05	0.01	0.09	0.05	0.03	0.04	0.00	0.45	0.05	0.07	0.06	0.02
Canadian Rate	21.96	10.28	0.67	1.78	8.08	1.11	1.78	0.06	0.11	0.67	0.12	0.03	0.05	0.03	0.02	0.04	0.31	0.18	0.04	0.28	2.18	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [1991-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: As indicated in the 'Ontario Count' row in the table above, one case was reported in 2002 and no cases were reported in 2007.

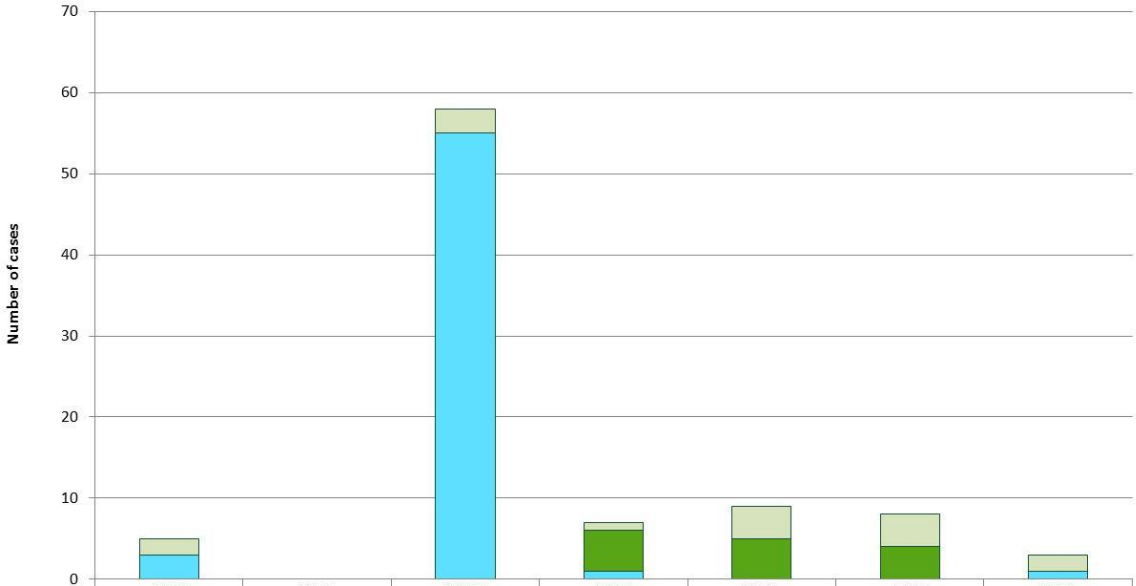
Figure 34-2. Incidence of Measles by Age and Sex: Ontario, 2006–12



	0-1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50+
Female Count	4	5	4	10	3	6	6	3	3
Male Count	5	5	6	6	4	2	13	5	0
Female Rate	0.84	0.26	0.16	0.37	0.10	0.10	0.09	0.04	0.02
Male Rate	1.00	0.25	0.23	0.21	0.13	0.03	0.21	0.07	0.00
Total Rate	0.92	0.25	0.20	0.29	0.11	0.06	0.15	0.05	0.01

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2006-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].

Figure 34-3. Incidence of Measles by Importation Status: Ontario, 2006–12



	2006	2007	2008	2009	2010	2011	2012
Imported	2	0	3	1	4	4	2
Import-related	0	0	0	5	5	4	0
Unknown	3	0	55	1	0	0	1

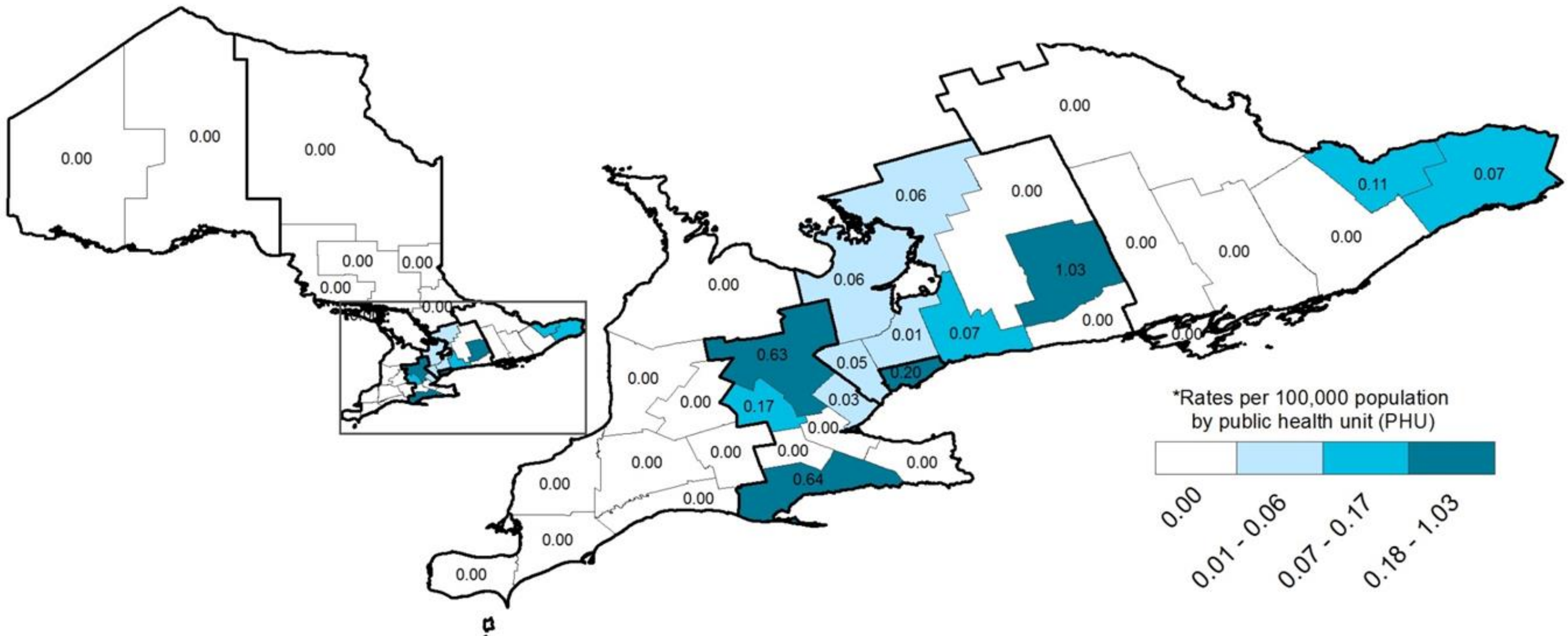
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].

Table 34-1. Genotype Distribution of Measles Cases: Ontario, 2012

Case ID	Country of Travel	Genotype
1	Pakistan	B3
2	Afghanistan	B3
3	Source unknown	Unknown

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].

Map 34-1. Incidence of Measles by Public Health Unit of Residence: Ontario, 2006–12



PHU	Cases (n)	*Annualized rates
ALG	0	0.00
BRN	0	0.00
CHK	0	0.00
DUR	3	0.07
ELG	0	0.00
EOH	1	0.07
GBO	0	0.00
HAL	1	0.03
HAM	0	0.00
HDN	5	0.64
HKP	0	0.00
HPE	0	0.00
HUR	0	0.00

PHU	Cases (n)	*Annualized rates
KFL	0	0.00
LAM	0	0.00
LGL	0	0.00
MSL	0	0.00
NIA	0	0.00
NPS	0	0.00
NWR	0	0.00
OTT	7	0.11
OXF	0	0.00
PDH	0	0.00
PEE	5	0.05
PQP	0	0.00
PTC	10	1.03

PHU	Cases (n)	*Annualized rates
REN	0	0.00
SMD	2	0.06
SUD	0	0.00
THB	0	0.00
TOR	37	0.20
TSK	0	0.00
WAT	6	0.17
WDG	12	0.63
WEC	0	0.00
YRK	1	0.01
Ontario	**90**	**0.01**

Ontario Counts: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2006-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].

Chapter 35.

Meningococcal Disease, Invasive

Meningococcal disease is caused by *Neisseria meningitidis*, a Gram-negative diplococcus which is divided into serogroups.[72] Almost all invasive meningococcal disease (IMD) globally is associated with serogroups A, B, C, Y, and W-135,[73] although serogroup A is an exceedingly rare cause of disease in Canada. IMD is an endemic but rare disease in Ontario. Since September 2004, a conjugated vaccine against serogroup C has been publicly funded for one-year-olds. This was followed by a school-based serogroup C program for grade seven students in January 2005, which was replaced with a quadrivalent conjugated vaccine against serogroups A, C, Y and W-135 in 2009.[31] As of December 2013, a new meningococcal B vaccine (Bexsero®) has been approved for use in Canada.

Unique IMD cases were identified using two data sources, the integrated Public Health Information System (iPHIS) and the Public Health Ontario Laboratories (PHOL). Confirmed and probable cases (starting in 2009) from iPHIS were linked to PHOL records using probabilistic record linkage from 2000 to 2010 and deterministic record linkage from 2011 to 2012.

In 2012, 35 IMD cases (32 confirmed and three probable) were identified in Ontario for a rate of 0.26 cases per 100,000 population (Figure 35-1). Disease incidence was highest among children less than one year of age, with a second smaller peak among adolescents aged 15–19 years (Figure 35-2). Overall, 22 (63%) of cases were female; they accounted for 42% (8/19) and 88% (14/16) among persons under 20 years of age and 20 years of age and older, respectively. No male cases were reported among persons over 44 years of age. Only 60% (21/35) of cases identified in 2012 had hospitalization data recorded, and, of these, all were hospitalized. Four cases died for a case fatality ratio of 11%; three were attributed to serogroup B and the remaining case had an unknown serogroup.

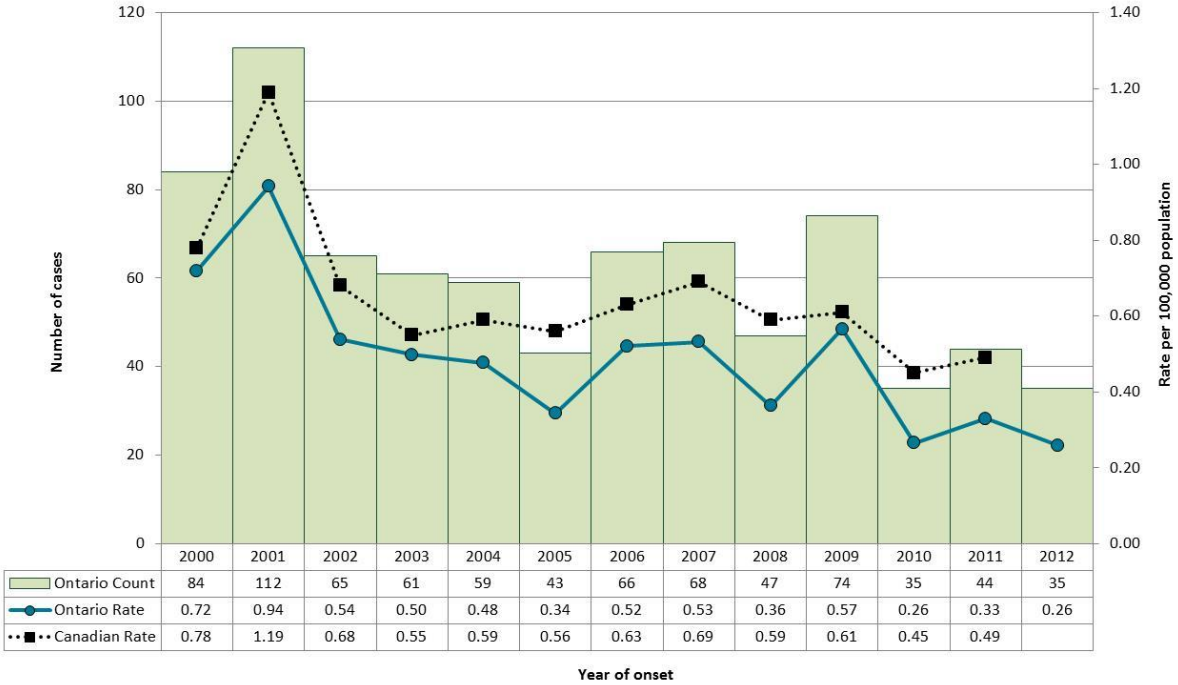
Between 2000 and 2012, 793 IMD cases were identified in Ontario. The incidence of IMD attributable to serogroup C has declined during this period (Figure 35-3). A decrease in incidence over time was also observed in two other vaccine-preventable serogroups (Y and W-135). Conversely, there has been no decline in serogroup B incidence and it has been the most frequently reported serogroup,[74] accounting for approximately 77% of IMD in the province in 2012.

Immunization status could only be assessed for 1.0% (4/393) of all cases with vaccine-preventable serogroups (A, C, W-135, and Y) reported between 2000 and 2012. There were four cases of serogroup Y that had received meningococcal C conjugate vaccine and were vaccine-preventable but were not yet age eligible for publicly funded quadrivalent meningococcal vaccine prior to illness.

A small number of public health units (19/36) reported IMD in 2012. Health unit-specific rates are provided in Appendix 3.

Documentation of the immunization status of every case of IMD is essential for assessing the impact of the toddler and adolescent programs on disease burden and changes in serogroup trends over time. Efforts to address improved documentation are currently underway.

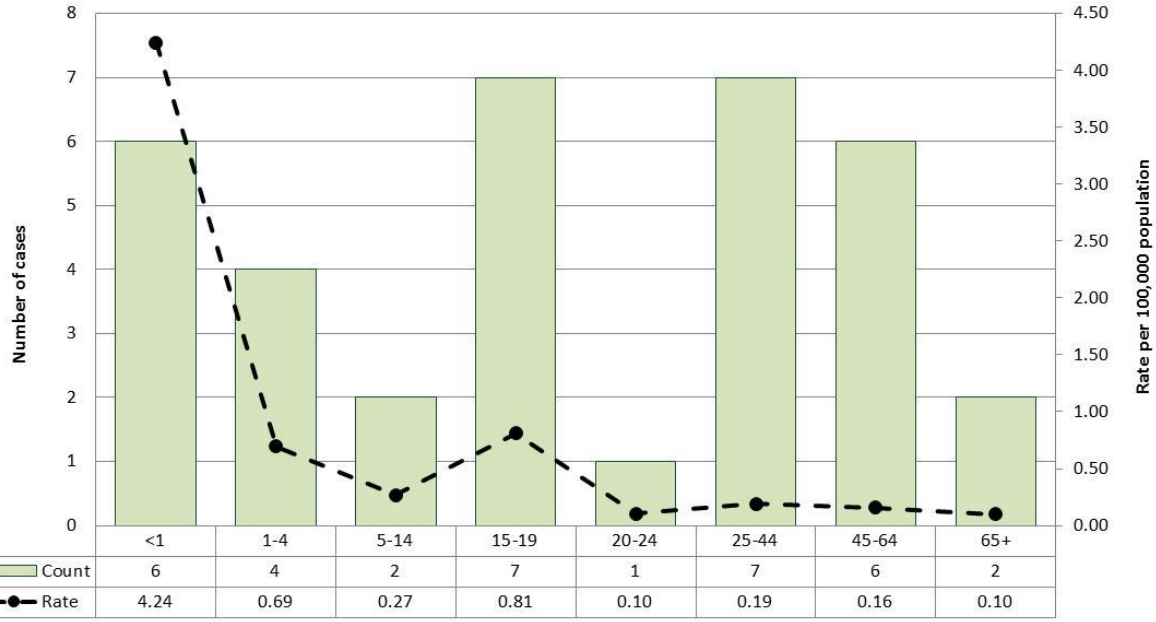
Figure 35-1. Incidence of Invasive Meningococcal Disease: Ontario and Canada, 2000–12



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	84	112	65	61	59	43	66	68	47	74	35	44	35
Ontario Rate	0.72	0.94	0.54	0.50	0.48	0.34	0.52	0.53	0.36	0.57	0.26	0.33	0.26
Canadian Rate	0.78	1.19	0.68	0.55	0.59	0.56	0.63	0.69	0.59	0.61	0.45	0.49	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10] and Public Health Ontario Laboratories (PHOL).
Ontario Population: Population Estimates [2000-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

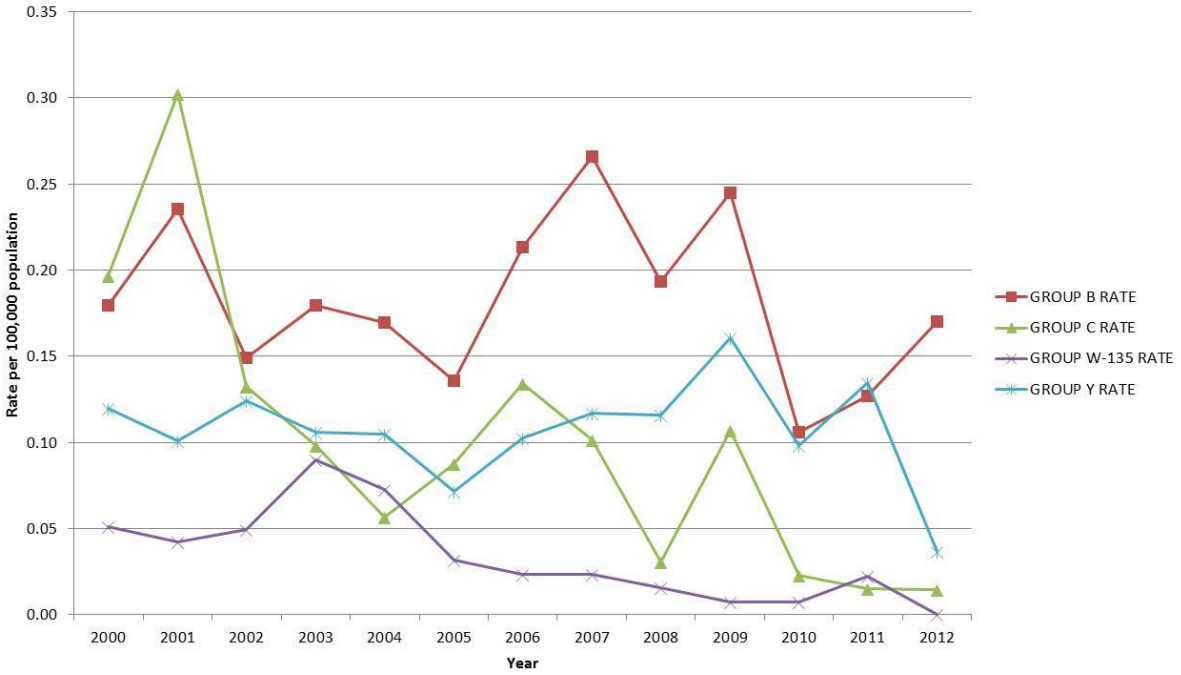
Figure 35-2. Incidence of Invasive Meningococcal Disease by Age: Ontario, 2012



	<1	1-4	5-14	15-19	20-24	25-44	45-64	65+
Count	6	4	2	7	1	7	6	2
Rate	4.24	0.69	0.27	0.81	0.10	0.19	0.16	0.10

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10] and Public Health Ontario Laboratories (PHOL).
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].

Figure 35-3. Incidence of Invasive Meningococcal Disease by Serogroup:* Ontario, 2000–12 (n=689)



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10] and Public Health Ontario Laboratories (PHOL).
Ontario Population: Population Estimates [2000-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
***Note:** Three serogroup A, one serogroup Z, 86 non-groupable, and 14 cases with unknown serogroups excluded.

Chapter 36.

Mumps

Vaccination with two doses of mumps-containing vaccine is the most effective method of preventing infection.[75,76] In Canada, the incidence of mumps declined following the introduction of the mumps vaccine in 1969, with further reductions following the introduction of a two-dose vaccination program.[75] In Canada, mumps vaccine is only available in combination with measles, rubella, and varicella vaccines (MMR and MMRV). A second dose of MMR vaccine 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 4 and 6 years of age.

In countries with high vaccination coverage such as Canada, sporadic cases of mumps occur throughout the year with peaks in incidence attributed to outbreaks. In general, people who have not had mumps infection or who have not been vaccinated with two doses of mumps-containing vaccine are susceptible to infection.[75] In Ontario, this includes people born between 1980 and approximately 1992 who received only one dose of mumps-containing vaccine and were less likely to be exposed to wild virus.[77]

In 2012, 26 confirmed and probable cases of mumps were reported in Ontario, representing a relatively low incidence of 0.19 cases per 100,000 population (Figure 36-1). Over the past decade, the annual mumps incidence has ranged between 0.08 and 2.60 cases per 100,000 population. Ontario has experienced several outbreaks in the past few years that have led to an increase in the number of cases. In 2007, 28 cases were attributed to the importation of mumps from outbreaks occurring in Nova Scotia and New Brunswick (which also accounted for a high Canadian incidence);[78] in 2008, there were 324 cases in an unimmunized community in Oxford County with links to concurrent mumps outbreaks in The Netherlands and British Columbia.[79] Between 2009 and June 2010, 167 cases resulted in a multi-health unit outbreak with links to concurrent outbreaks in Quebec and the United States;[77,80,81] and in 2011, 39 cases reported in nine Ontario public health units following confirmation of a positive case of mumps in a Toronto resident.

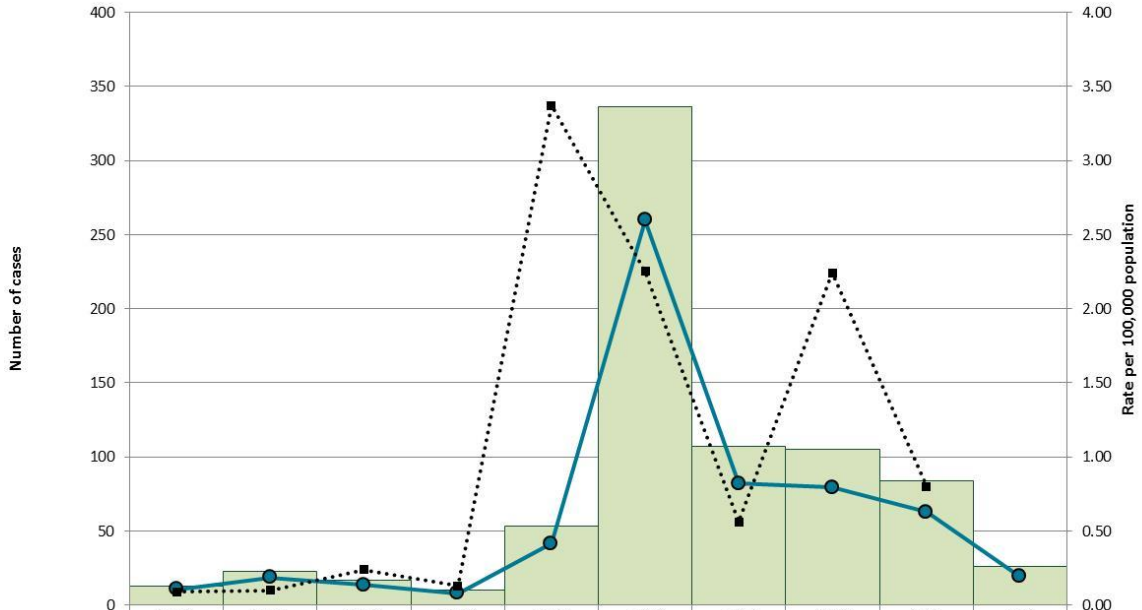
Males accounted for 61.5% of cases overall (16/26), and 87.5% of the cases were over 35 years of age. The annualized age and sex-specific incidence rates are presented in Figure 36-2. The highest age-specific rate was observed among adults 20 to 34 years of age (0.32 cases per 100,000), although there were differences in sex-specific rates by age. Persons born in the susceptible birth cohort from 1980 to 1992 (i.e., aged 20 to 32 years) accounted for 26.9% (seven cases) of mumps cases reported in 2012 but comprised 18.3% of the Ontario population during that year. No mumps cases were reported among infants less than one year of age, a group who are too young to receive MMR vaccine.

Hospitalizations were reported for two cases (7.7%), both of whom were male, between 30 and 45 years old; one case was unimmunized, while the status was unknown for the other case. No deaths were reported. Of the 26 cases reported in 2012, immunization status could be determined for 14 cases (53.8%); of these, four were unimmunized, five had received one dose, while another five had received two doses of mumps-containing vaccine. None of those who were unimmunized were infants, indicating that they were all eligible to have received mumps vaccine.

Genotype information was available for ten of the 26 cases reported in 2012 (Table 36-1). Of these, genotype G was most frequently isolated (70%), while unique isolates of genotypes F, H, and K were identified. In Canada, G is the most commonly isolated genotype. The incidence of mumps by public health unit in 2012 is shown in Map 36-1. Twenty-two public health units did not report any mumps cases in 2012.

As with many other vaccine-preventable diseases, immunization data are frequently absent or incompletely reported in iPHIS. This can limit the ability to determine if cases were attributable to failure to vaccinate or the result of vaccine failure, as well as limit the ability to estimate vaccine effectiveness.[77] Efforts are currently underway within Ontario to improve documentation and reporting.

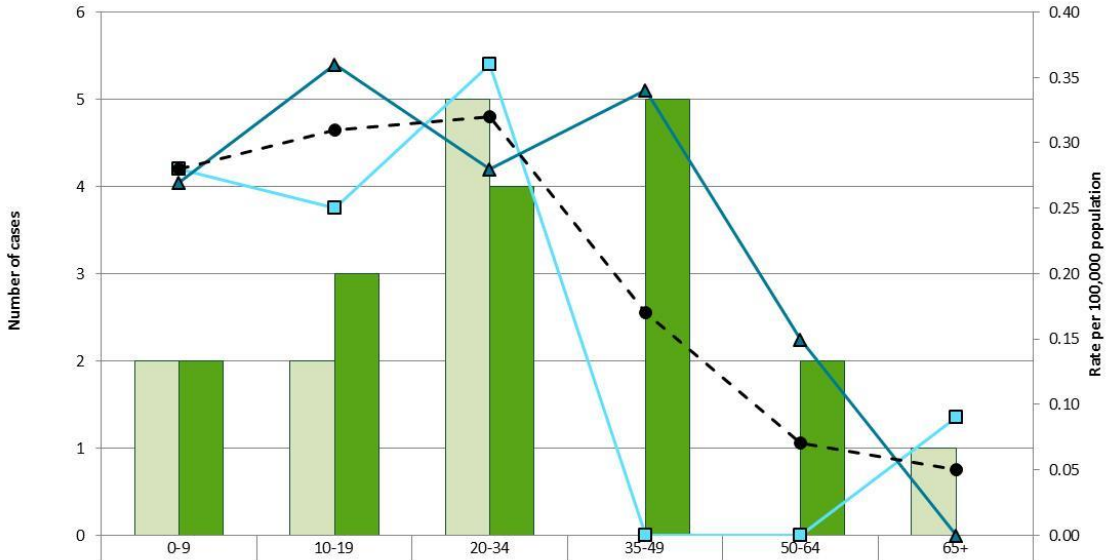
Figure 36-1. Incidence of Mumps: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	13	23	17	10	53	336	107	105	84	26
Ontario Rate	0.11	0.19	0.14	0.08	0.41	2.60	0.82	0.79	0.63	0.19
Canadian Rate	0.09	0.10	0.24	0.13	3.37	2.25	0.56	2.24	0.80	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

Figure 36-2. Incidence of Mumps by Age and Sex: Ontario, 2012



	0-9	10-19	20-34	35-49	50-64	65+
Female Count	2	2	5	0	0	1
Male Count	2	3	4	5	2	0
Female Rate	0.28	0.25	0.36	0.00	0.00	0.09
Male Rate	0.27	0.36	0.28	0.34	0.15	0.00
Total Rate	0.28	0.31	0.32	0.17	0.07	0.05

Age (years)

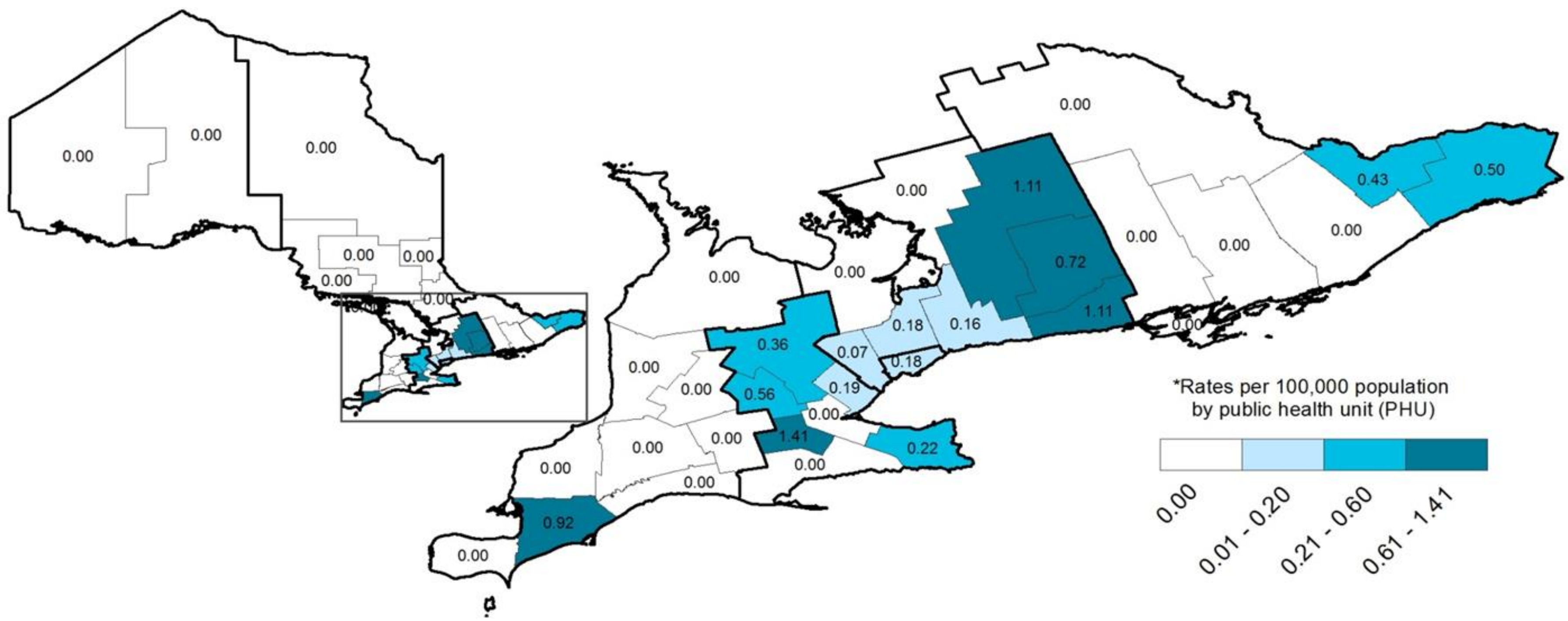
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].

Table 36-1. Genotype Distribution of Mumps Cases: Ontario, 2012

Genotype	N	%
F	1	10%
G	7	70%
H	1	10%
K	1	10%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database and Public Health Ontario Laboratories, extracted: [2013/12/10].
Note: Genotype information was known for 10/26 cases in 2012.

Map 36-1. Incidence of Mumps by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.00
BRN	2	1.41
CHK	1	0.92
DUR	1	0.16
ELG	0	0.00
EOH	1	0.50
GBO	0	0.00
HAL	1	0.19
HAM	0	0.00
HDN	0	0.00
HKP	2	1.11
HPE	0	0.00
HUR	0	0.00

PHU	Cases (n)	*Rates
KFL	0	0.00
LAM	0	0.00
LGL	0	0.00
MSL	0	0.00
NIA	1	0.22
NPS	0	0.00
NWR	0	0.00
OTT	4	0.43
OXF	0	0.00
PDH	0	0.00
PEE	1	0.07
PQP	0	0.00
PTC	1	0.72

PHU	Cases (n)	*Rates
REN	0	0.00
SMD	0	0.00
SUD	0	0.00
THB	0	0.00
TOR	5	0.18
TSK	0	0.00
WAT	3	0.56
WDG	1	0.36
WEC	0	0.00
YRK	2	0.18
Ontario	**26**	**0.19**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].

Chapter 37.

Ophthalmia Neonatorum

In 2012, four cases of ophthalmia neonatorum were reported in Ontario, corresponding to an incidence rate of 2.9 cases per 100,000 live births (Table 37-1). From 2003 to 2012, a total of 36 cases of ophthalmia neonatorum were reported, for an average of 3.6 cases per year over this period. The largest numbers of cases during this period were reported in 2004 and 2005, with six cases reported in each of those years.

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

Table 37-1. Incidence of Ophthalmia Neonatorum: Ontario, 2003–12

Year	Ontario cases	Ontario rate per 100,000 live births
2003	4	3.06
2004	6	4.54
2005	6	4.49
2006	3	2.22
2007	3	2.17
2008	3	2.14
2009	1	0.71
2010	5	3.59
2011	1	0.71
2012	4	2.86

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Live Births [2003-2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].
Note: Ophthalmia neonatorum is not a nationally notifiable disease.

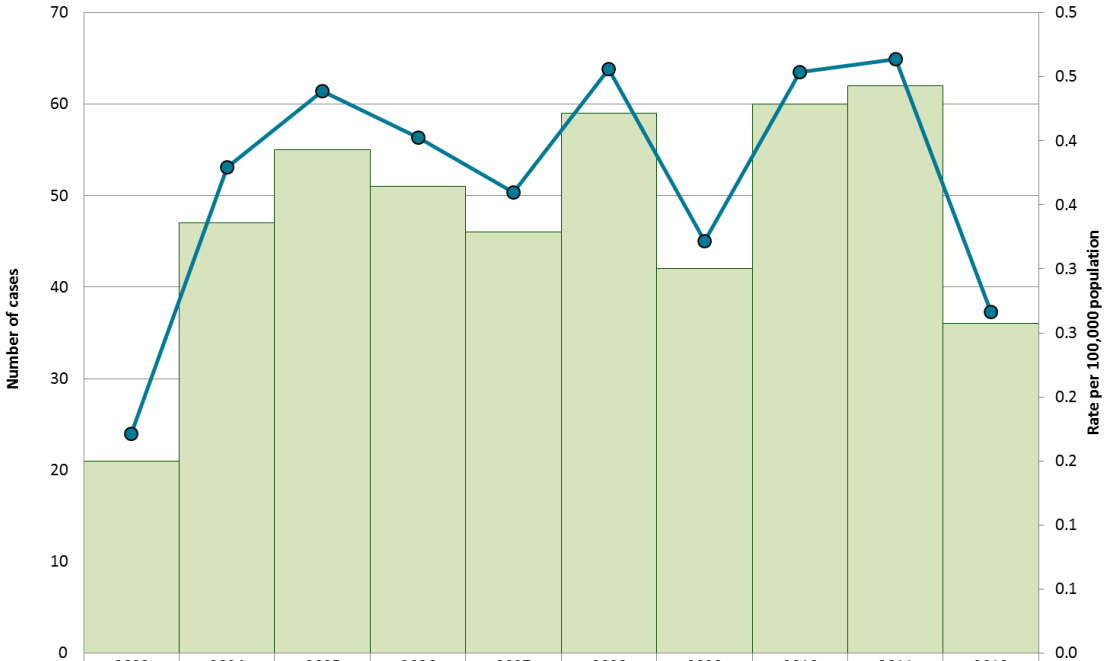
Chapter 38.

Paratyphoid Fever

Salmonella Paratyphi is the causative agent of paratyphoid fever and, along with *Salmonella Typhi*, is classified as typhoidal *Salmonella* (also known as enteric fever).[82] In 2012, 36 confirmed cases of paratyphoid fever were reported in Ontario, corresponding to an incidence rate of 0.3 cases per 100,000 population. The number of cases reported in 2012 was the lowest in nine years (Figure 38-1). National data for paratyphoid fever are not available, as it has not been distinguished from other types of salmonellosis at the national level since 2000. Hospitalization was reported for 13 paratyphoid fever cases and no deaths were reported.

In 2012, twice the number of male cases (24) compared to female cases (12) were reported provincially (Figure 38-2). Cases of paratyphoid fever by month do not show a clear seasonal trend, likely due to small case counts (Figure 38-3). Seasonal patterns have been reported elsewhere reflecting peak travel periods to endemic regions such as Indochina, South Asia, and endemic countries in other regions.[82] Peel Region (14 cases) and Toronto (11 cases) together accounted for 69% of paratyphoid fever cases in 2012 (Map 38-1). Provincial analyses of exposure information have indicated that the majority of travel-associated paratyphoid cases in Ontario report travel to India, Pakistan, and Bangladesh.[83] The basis for the higher number of male compared to female cases in 2012 is unknown, as the majority of cases for both groups are travel-associated. The observed variability in incidence rates by age, month, and public health unit should be interpreted with caution due to small case counts.

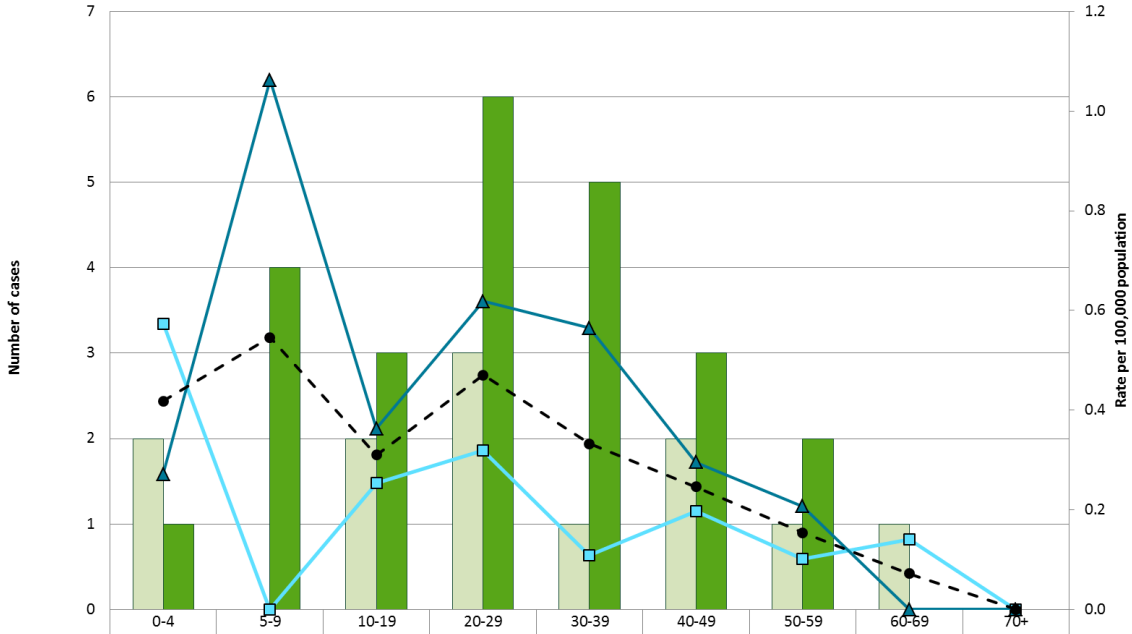
Figure 38-1. Incidence of Paratyphoid Fever: Ontario, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	21	47	55	51	46	59	42	60	62	36
Ontario Rate	0.2	0.4	0.4	0.4	0.4	0.5	0.3	0.5	0.5	0.3

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: National data for paratyphoid fever are not available as paratyphoid fever is reported as salmonellosis at the national level. Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

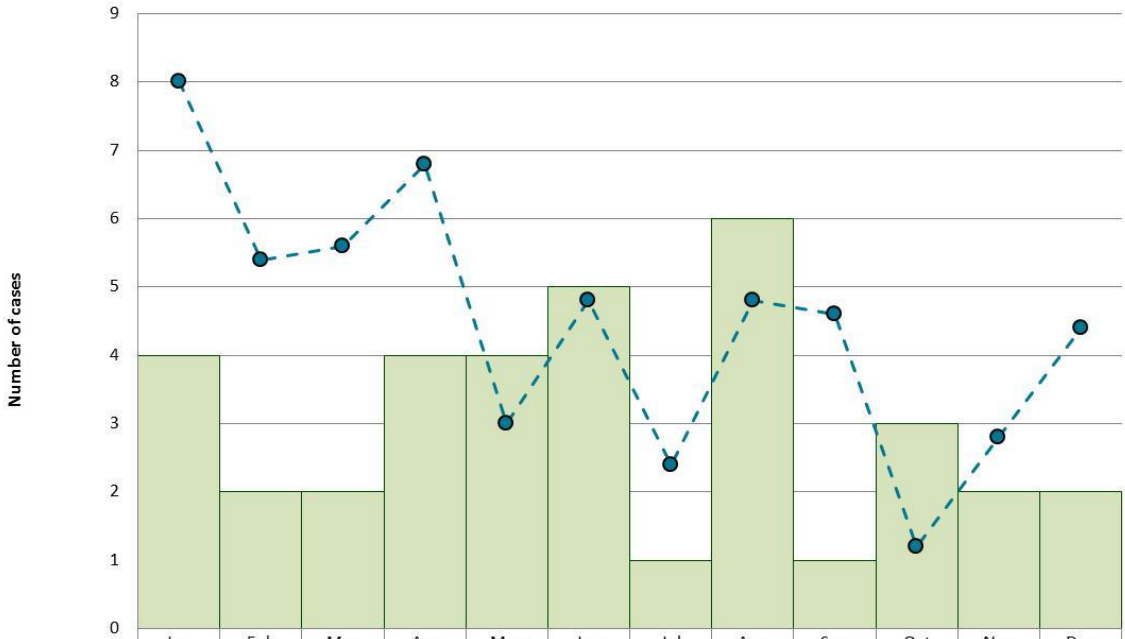
Figure 38-2. Incidence of Paratyphoid Fever by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	2	0	2	3	1	2	1	1	0
Male Count	1	4	3	6	5	3	2	0	0
Female Rate	0.6	0.0	0.3	0.3	0.1	0.2	0.1	0.1	0.0
Male Rate	0.3	1.1	0.4	0.6	0.6	0.3	0.2	0.0	0.0
Total Rate	0.4	0.5	0.3	0.5	0.3	0.2	0.2	0.1	0.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

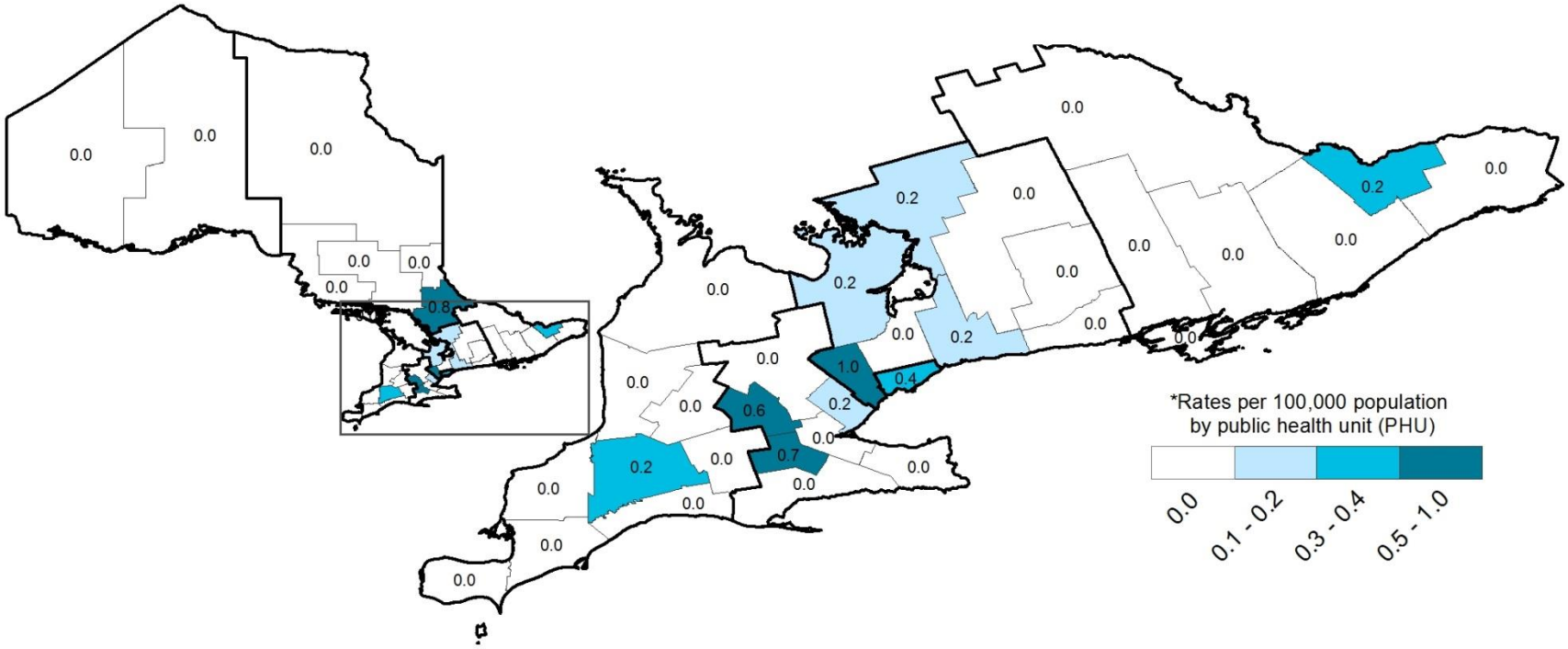
Figure 38-3. Number of Paratyphoid Fever Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	4	2	2	4	4	5	1	6	1	3	2	2
5-Yr Average	8.0	5.4	5.6	6.8	3.0	4.8	2.4	4.8	4.6	1.2	2.8	4.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 38-1. Incidence of Paratyphoid Fever by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0
BRN	1	0.7
CHK	0	0
DUR	1	0.2
ELG	0	0
EOH	0	0
GBO	0	0
HAL	1	0.2
HAM	0	0
HDN	0	0
HKP	0	0
HPE	0	0
HUR	0	0

PHU	Cases (n)	*Rates
KFL	0	0
LAM	0	0
LGL	0	0
MSL	1	0.2
NIA	0	0
NPS	1	0.8
NWR	0	0
OTT	2	0.2
OXF	0	0
PDH	0	0
PEE	14	1.0
PQP	0	0
PTC	0	0

PHU	Cases (n)	*Rates
REN	0	0
SMD	1	0.2
SUD	0	0
THB	0	0
TOR	11	0.4
TSK	0	0
WAT	3	0.6
WDG	0	0
WEC	0	0
YRK	0	0
Ontario	**36**	**0.3**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 39.

Pertussis

Like other vaccine-preventable diseases, susceptibility to pertussis is universal with vaccination being the primary method of prevention. Under the publicly funded immunization program in Ontario, an acellular pertussis vaccine is administered to young children in combination with vaccines against diphtheria, tetanus, *Haemophilus influenzae* type b and polio. This vaccine is administered at 2, 4, and 6 months of age, with a booster at 18 months. Additional booster doses of pertussis-containing vaccines are given at 4 to 6 years and 14 to 16 years.[31] In 2011, a single booster dose of pertussis-containing vaccine was introduced for adults over 18 and under 65 years of age who had not previously received an adolescent dose of the vaccine.

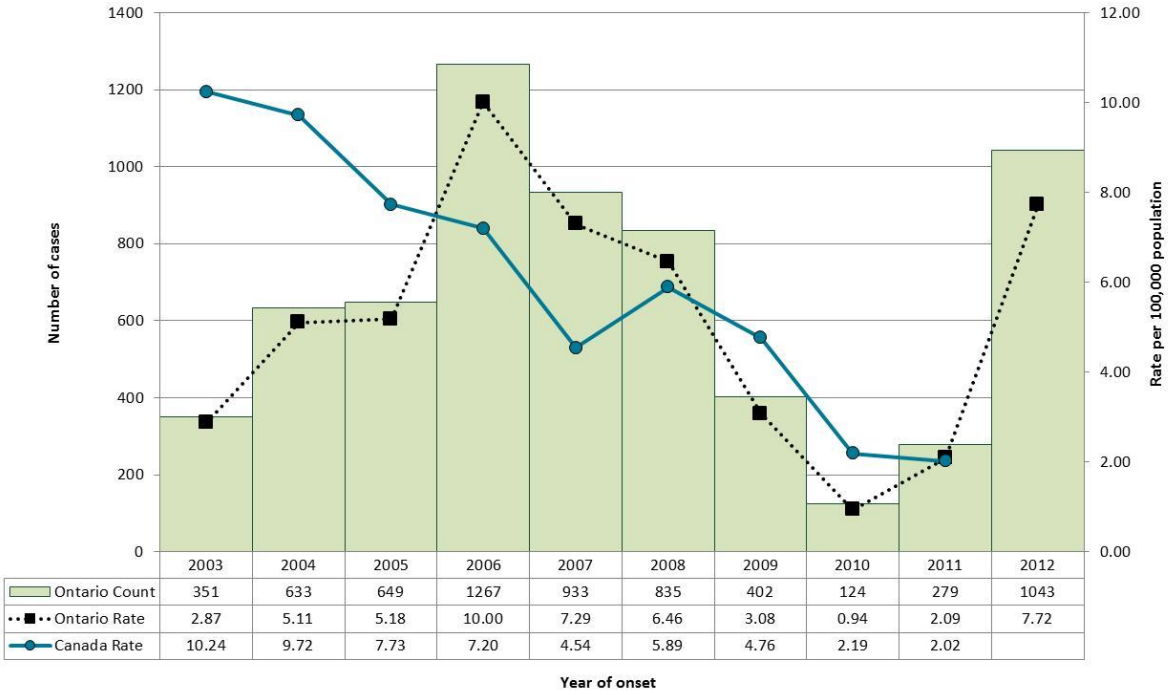
In 2012, 1,043 confirmed and probable cases of pertussis were reported in Ontario, representing an incidence of 7.72 cases per 100,000 population (Figure 39-1). Hospitalizations were reported for 58 cases (5.6%) and no deaths were reported. The number of cases in 2012 represented a 274% increase over the previous year, primarily due to a prolonged outbreak that began in an under-immunized religious community and spanned from November 2011 to April 2013; 36.4% of the 2012 cases were part of this outbreak.[84] Pertussis occurs in cycles with peaks in incidence occurring every three to five years.[85] The incidence of pertussis in Ontario over the ten-year period from 2003 to 2012 demonstrated this cyclical pattern with a notable peak in incidence from 2006 to 2008, and again in 2012. During this period of increased incidence, annual rates of pertussis ranged from 6.46 to 10.00 cases per 100,000 population. Changes related to the provincial immunization program, laboratory techniques (e.g., available diagnostic tests and interpretations), and disease reporting practices may have also had an impact on the incidence of pertussis. The annual incidence of pertussis in Ontario was substantially lower than the corresponding national rates for the period from 2002 to 2005, which coincided with a cyclical dip in cases in Ontario. On the other hand, national rates for pertussis were lower during Ontario's period of increased incidence from 2006 to 2008, illustrating that epidemic cycles are not necessarily synchronized across Canada. National data for 2012 were not available for comparison at the time of this analysis.

Approximately 57.1% of the cases occurring in 2012 were female, which is consistent with the observation that there is typically a female predominance of cases for pertussis.[86] The age- and sex-specific incidence rates for 2012 are presented in (Figure 39-2). The highest rates were observed among infants less than one year of age (100.38 cases per 100,000), followed by children 1 to 4 years old (30.71 cases per 100,000). Of the 1,043 cases reported in 2012, the number of doses of pertussis-containing vaccine that were received could be determined for 655 cases (62.8%), and of these almost half (319) were unimmunized (Table 39-1). Notably, the number of doses was unknown for 68.9% of cases 17 years or older, while only 4.5% had received all six doses. Among infants, 62.7% were unimmunized, while only 2.8% had completed their primary series (three doses). The expected number of doses for a given age group was highest among 7 to 16 year olds, where 42.6% of cases had received at least five doses.

There was variation in the distribution of 2012 pertussis cases by month (Figure 39-3). The higher number of cases observed in January and the summer months were driven by the aforementioned outbreak. The incidence of pertussis by public health unit in 2012 is shown in Map 39-1. Every public health unit in the province reported cases of pertussis in 2012. The seven public health units predominantly affected by the outbreak (Chatham-Kent, Elgin-St. Thomas, Haldimand-Norfolk, Oxford County, Perth District, Wellington-Dufferin-Guelph, and Windsor-Essex) demonstrated elevated rates of pertussis. However elevated rates were also observed in public health units that were not associated with the outbreak.

Active follow-up with public health units during the prolonged pertussis outbreak assisted in the determination of immunization status; whereas this was unknown for 24.2% of the 2012 cases associated with this outbreak, immunization status could not be determined for 44.6% of the remaining cases. The complete entry of immunization histories for all vaccine-preventable diseases remains a critical component of provincial reporting. Efforts to address improved documentation are currently underway.

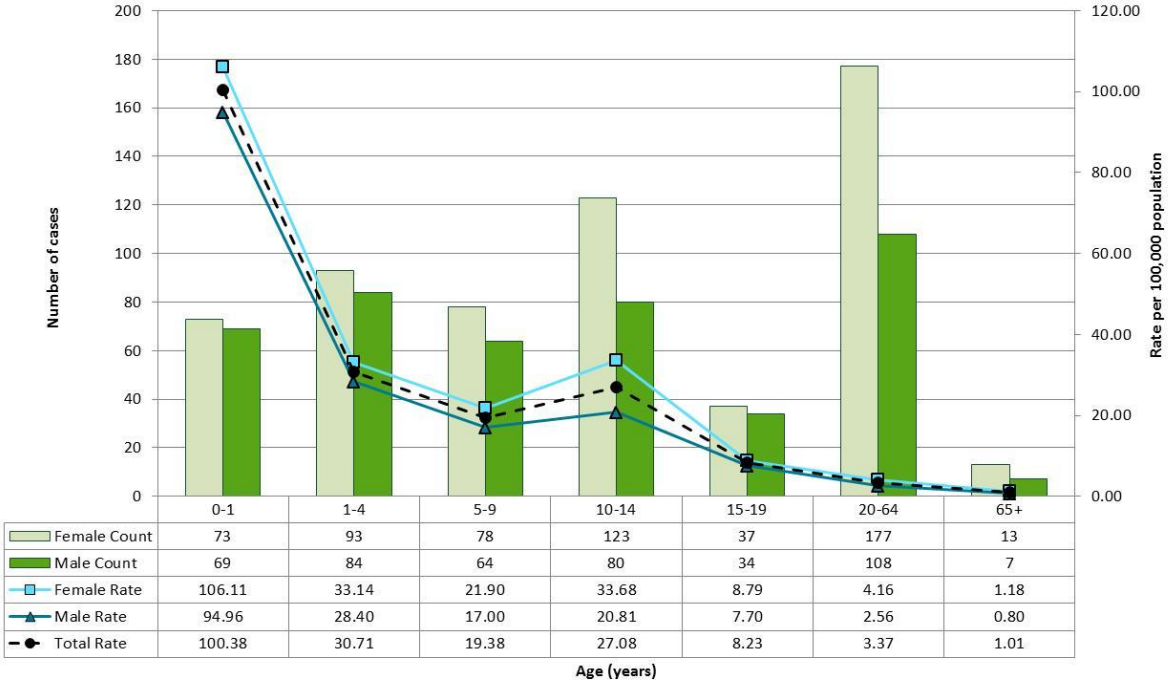
Figure 39-1. Incidence of Pertussis: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	351	633	649	1267	933	835	402	124	279	1043
Ontario Rate	2.87	5.11	5.18	10.00	7.29	6.46	3.08	0.94	2.09	7.72
Canada Rate	10.24	9.72	7.73	7.20	4.54	5.89	4.76	2.19	2.02	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

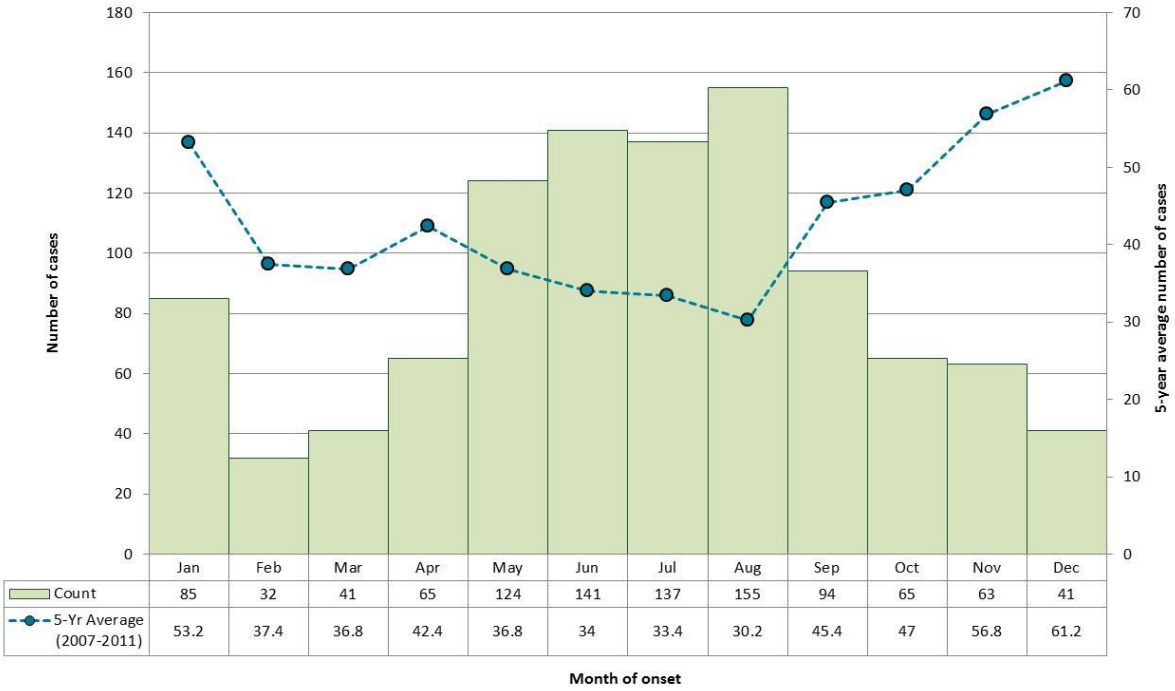
Figure 39-2. Incidence of Pertussis by Age and Sex: Ontario, 2012



	0-1	1-4	5-9	10-14	15-19	20-64	65+
Female Count	73	93	78	123	37	177	13
Male Count	69	84	64	80	34	108	7
Female Rate	106.11	33.14	21.90	33.68	8.79	4.16	1.18
Male Rate	94.96	28.40	17.00	20.81	7.70	2.56	0.80
Total Rate	100.38	30.71	19.38	27.08	8.23	3.37	1.01

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Note: Excludes three cases of unknown age.

Figure 39-3. Number of Pertussis Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	85	32	41	65	124	141	137	155	94	65	63	41
5-Yr Average (2007-2011)	53.2	37.4	36.8	42.4	36.8	34	33.4	30.2	45.4	47	56.8	61.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].

Table 39-1. Distribution of Pertussis Cases by Age and Number of Doses of Pertussis-Containing Vaccine Received: Ontario, 2012 (N=1040, excludes three cases for whom age was unknown)

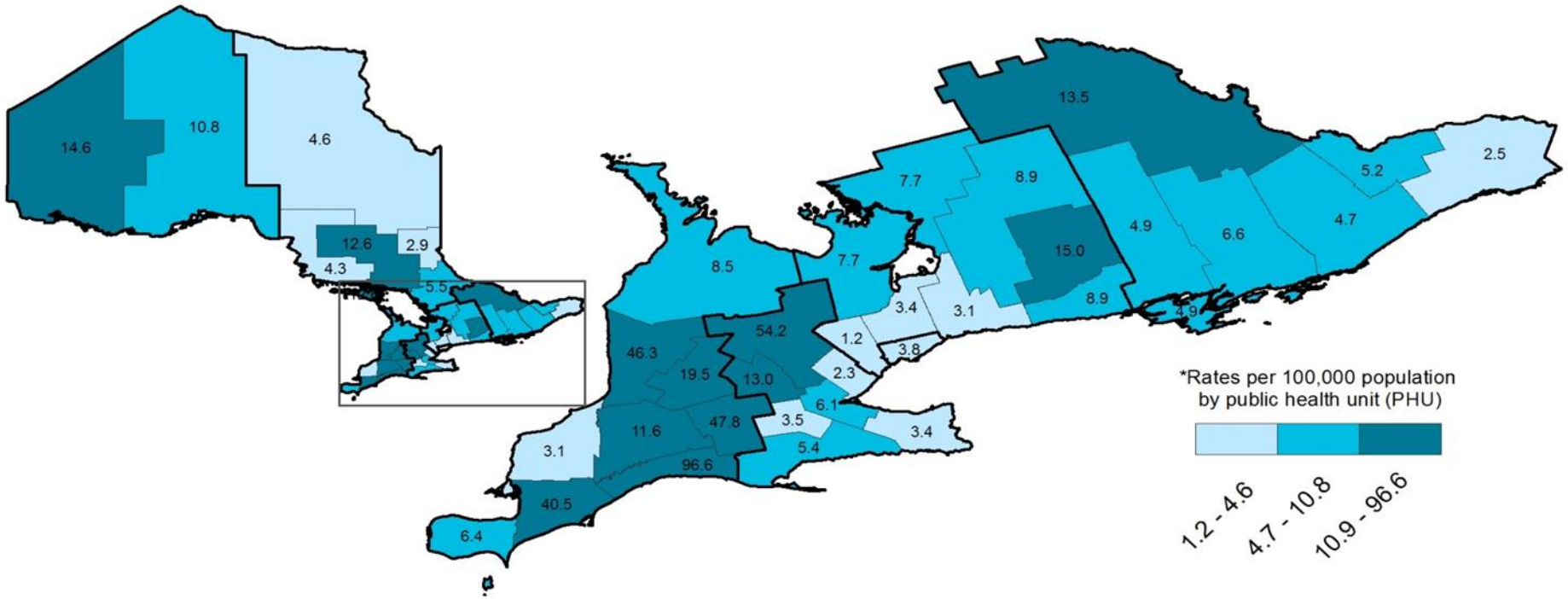
Age group	Number of doses* (% of cases within that age group **)							
	0 doses	1 dose	2 doses	3 doses	4 doses	5 doses	6 doses	Unknown
< 1 year	89 (62.7)	9 (6.3)	8 (5.6)	4 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)	32 (22.5)
1 – 6 years	109 (46.6)	7 (3.0)	6 (2.6)	16 (6.8)	29 (12.4)	13 (5.6)	0 (0.0)	54 (23.1)
7 – 16 years	72 (21.6)	9 (2.7)	1 (0.3)	3 (0.9)	35 (10.5)	132 (39.6)	10 (3.0)	71 (21.3)
>= 17 years	49 (14.8)	9 (2.7)	2 (0.6)	7 (2.1)	8 (2.4)	13 (3.9)	15 (4.5)	228 (68.9)

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].

* Only immunizations received at least 14 days prior to disease onset were considered.

** Percentages may not sum to zero within each age group due to rounding error.

Map 39-1. Incidence of Pertussis by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	5	4.29
BRN	5	3.53
CHK	44	40.54
DUR	20	3.13
ELG	88	96.56
EOH	5	2.48
GBO	14	8.54
HAL	12	2.28
HAM	33	6.06
HDN	6	5.44
HKP	16	8.91
HPE	8	4.95
HUR	28	46.28

PHU	Cases (n)	*Rates
KFL	13	6.56
LAM	4	3.05
LGL	8	4.73
MSL	54	11.65
NIA	15	3.36
NPS	7	5.51
NWR	12	14.59
OTT	48	5.22
OXF	52	47.80
PDH	15	19.47
PEE	17	1.22
PQP	4	4.62
PTC	21	15.02

PHU	Cases (n)	*Rates
REN	14	13.50
SMD	41	7.74
SUD	25	12.62
THB	17	10.83
TOR	106	3.80
TSK	1	2.90
WAT	70	13.04
WDG	152	54.16
WEC	26	6.44
YRK	37	3.41
Ontario	**1043**	**7.72**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].

Chapter 40.

Plague

There were no cases of plague reported in Ontario in 2012. In the last ten years, no cases have been reported in the province.

Chapter 41.

Pneumococcal Disease, Invasive

Invasive pneumococcal disease (IPD) is caused by the bacterium *Streptococcus pneumoniae*.[72] Currently, there are 92 serotypes recognized around the globe; however, the majority of disease is caused by a more limited number of serotypes.[87] In January 2005, a four-dose schedule of 7-valent pneumococcal conjugate vaccine (PCV7) was introduced in Ontario administered at 2, 4, and 6 months of age, with a booster at 12 months of age. This was replaced by a 10-valent pneumococcal conjugate vaccine (PCV10) in October 2009, using the same four-dose schedule as PCV7. In November 2010, PCV10 was replaced by a three-dose 13-valent pneumococcal conjugate vaccine (PCV13) program administered at 2 and 4 months of age, with a booster at 12 months of age. In 2011, a one-time catch-up dose of PCV13 for children with a completed PCV7 or PCV10 vaccine series was implemented for healthy children under three years of age and for children at higher risk of IPD under five years of age, including Aboriginal children and children attending group daycare.[31] A one dose 23-valent pneumococcal polysaccharide vaccine (PPV23) for adults 65 years and older and nursing home residents, regardless of age, has been in place since 1996.

In Ontario, only confirmed cases of IPD are reportable. Reported disease incidence has increased slightly in the province from 8.3 per 100,000 population in 2003, to 9.4 per 100,000 population in 2012 (Figure 41-1). Overall, national incidence of IPD followed a similar trend over the same time period. Crude estimates, not adjusted for changes in the population's age structure over time, are presented from both sources.

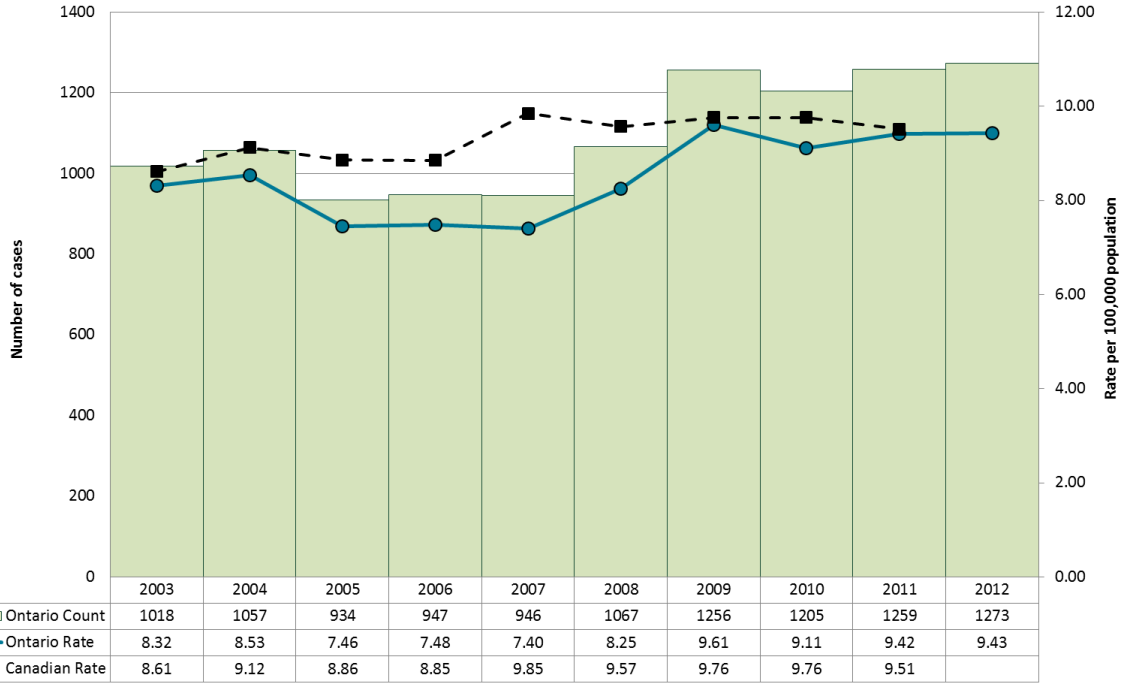
Very young children and older adults are at highest risk of disease (Figure 41-2). In 2012, the highest incidence of IPD was observed in adults aged 65 years and older, followed by adults aged 60–64 years and infants less than one year of age. Males were consistently at higher risk for IPD compared to females among adolescents and adults. Seasonality for IPD has been well documented;[72] in 2012, the lowest number of cases occurred in the summer months (Figure 41-3). Some evidence suggests that the increase in IPD incidence in winter is influenced by the influenza virus enhancing the risk of bacterial invasion in colonized individuals.[88] In 2012, hospitalization was reported for 885 cases (69.5%). There were 156 reported deaths, for a case fatality ratio of 12%. The incidence of IPD by public health unit is shown in Map 41-1; all jurisdictions experienced IPD cases in 2012, with rates ranging from 4.4 to 19.5 per 100,000 population. Among the 1,273 cases reported in 2012, immunization information was documented for 786 cases (61.7%). Of these, 607 cases (77.2%) were unimmunized, defined as zero doses or having date(s) of pneumococcal immunization that followed after date of disease onset. Among adults aged 65 years of age and older where immunization information was available, 252 (45.6%) were classified as unimmunized. In comparison, among those under five years of age, 27 (30.0%) were unimmunized. These estimates should be interpreted with caution given the extent of missing immunization information described above.

Serotype was known for 78.1% of cases (n=994) in 2012. Among children less than five years of age, a decrease in IPD incidence due to PCV7 serotypes (consisting of serotypes 4, 6B, 9V, 14, 18C, 19F, and 23F) was observed between 2007 and 2012; incidence due to PCV13 serotypes (consisting of PCV7 serotypes plus 1, 3, 5, 6A, 7F, and 19A) has declined since 2009, following an increase between 2007 and 2009 (Figure 41-4). Similar trends were observed among adults 65 years and older, suggesting a herd effect in other age groups not targeted for pneumococcal conjugate immunization Figure 41-4. A recent Ontario study also found that the use of pneumococcal conjugate vaccines in infants and young children may have an indirect beneficial effect on older adults, with reductions in the incidence of PCV7 and PCV13 vaccine-preventable serotypes following the

introduction of the publicly funded programs.[89] In contrast, IPD incidence due to serotypes unique to PPV23 demonstrated a consistent increase since 2007.

Data completeness, especially on immunization status and serotypes, is a critical component of provincial reporting of IPD. Efforts are underway to improve case-level documentation and data quality.

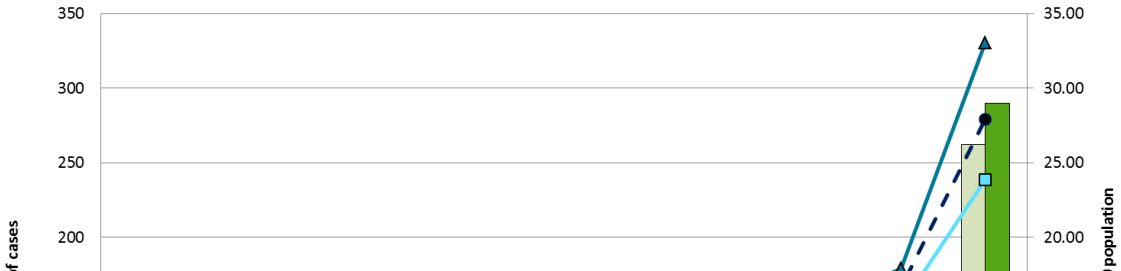
Figure 41-1. Incidence of Invasive Pneumococcal Disease: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	1018	1057	934	947	946	1067	1256	1205	1259	1273
Ontario Rate	8.32	8.53	7.46	7.48	7.40	8.25	9.61	9.11	9.42	9.43
Canadian Rate	8.61	9.12	8.86	8.85	9.85	9.57	9.76	9.76	9.51	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

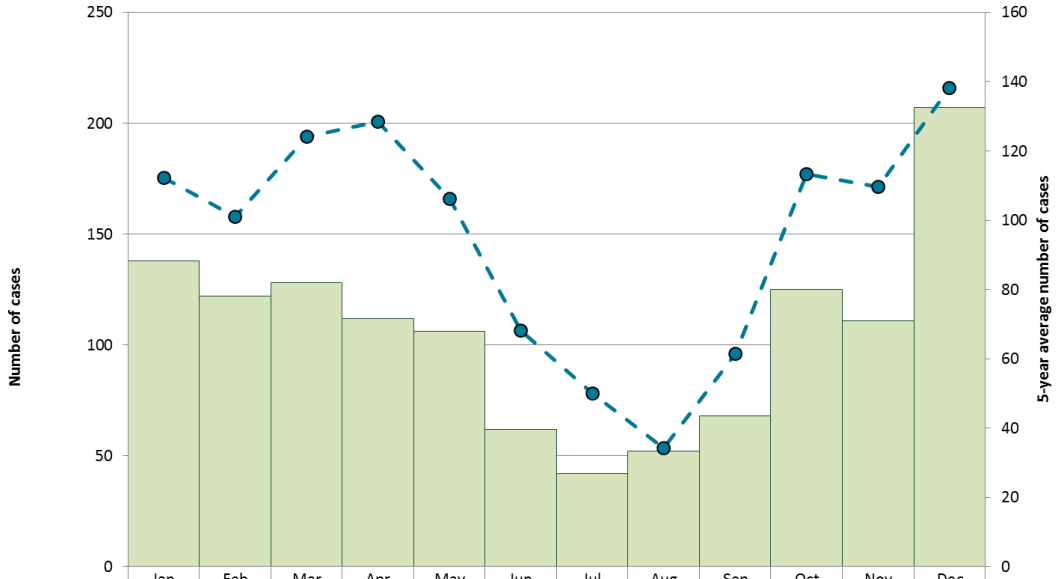
Figure 41-2. Incidence of Invasive Pneumococcal Disease by Age and Sex: Ontario, 2012



	<1	1-4	5-9	10-14	15-19	20-34	35-49	50-54	55-59	60-64	65+
Female Count	10	29	14	5	3	27	54	48	44	61	262
Male Count	9	42	18	4	7	46	109	55	68	67	290
Female Rate	14.54	10.34	3.93	1.37	0.71	1.92	3.73	9.41	9.53	15.41	23.85
Male Rate	12.39	14.20	4.78	1.04	1.59	3.25	7.49	10.53	15.28	17.93	33.06
Total Rate	13.43	12.32	4.37	1.20	1.16	2.59	5.60	9.97	12.35	16.63	27.94

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].

Figure 41-3. Number of Invasive Pneumococcal Disease Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11

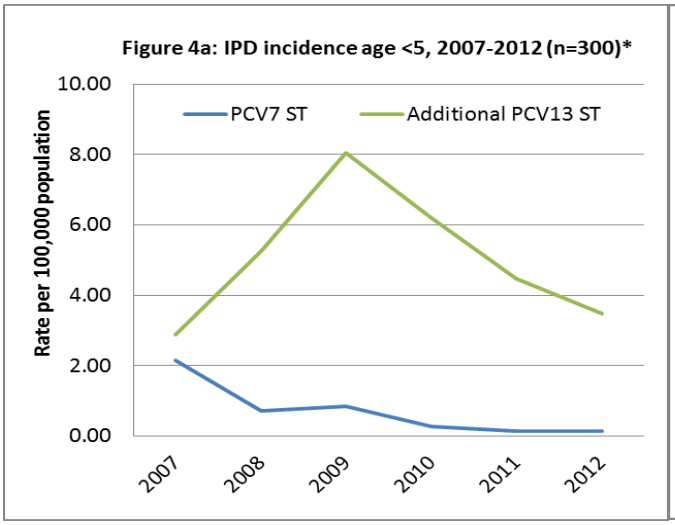


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012 Case Count	138	122	128	112	106	62	42	52	68	125	111	207
5-Yr Average (2007-2011)	112	101	124	128	106	68	50	34	61	113	110	138

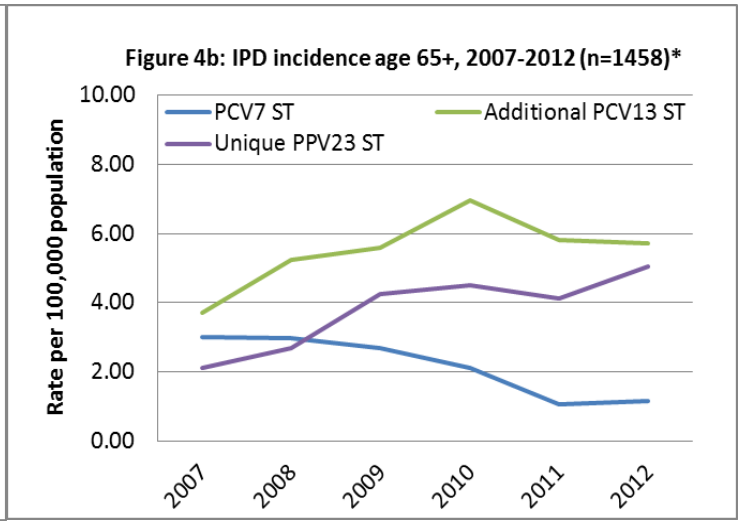
Month of Onset

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].

Figure 41-4. Invasive Pneumococcal Disease Incidence by Age Group and Vaccine Serotype (ST) Group: Ontario, 2007–12



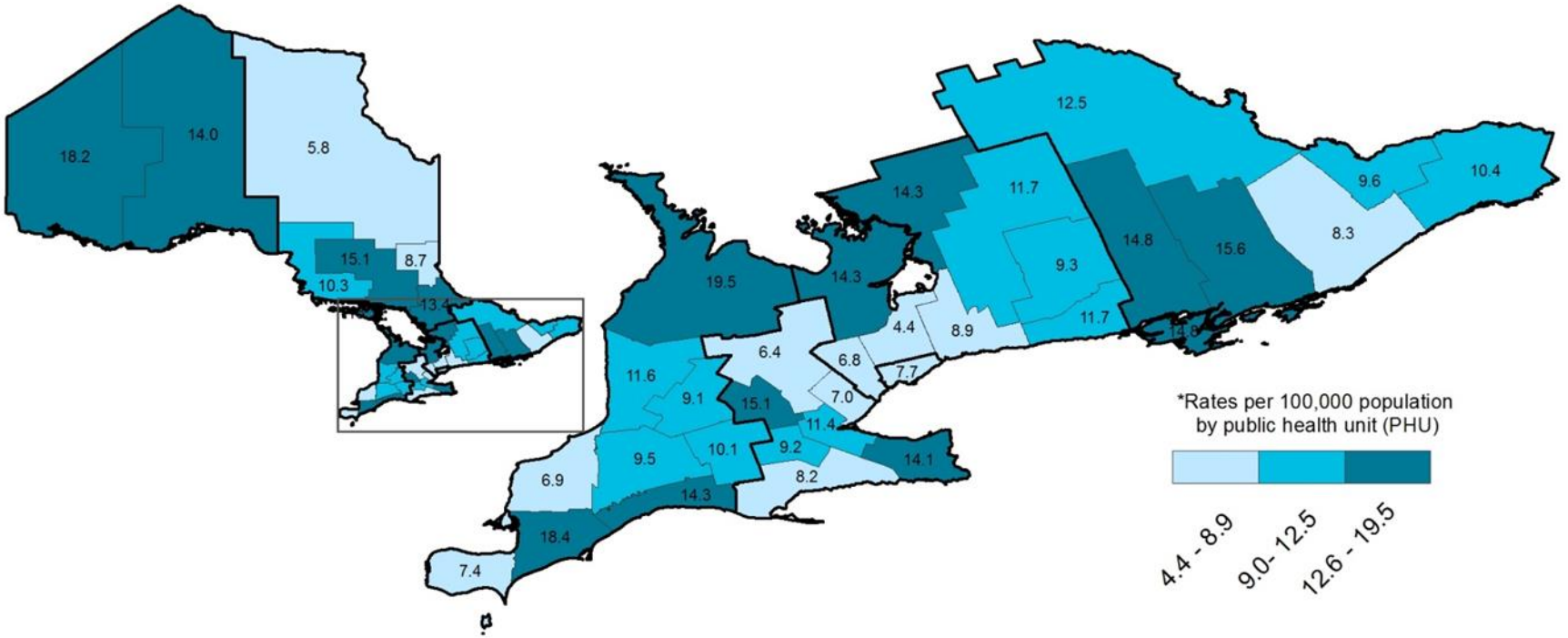
*NOTE: Additional PCV10 , PPV23 and non-vaccine-preventable serotypes not shown. Nongroupable/typeable and unspecified serotypes excluded.



*NOTE: Additional PCV10 , PPV23 and non-vaccine-preventable serotypes not shown. Nongroupable/typeable and unspecified serotypes excluded.

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2007-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].

Map 41-1. Incidence of Invasive Pneumococcal Disease by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	12	10.30
BRN	13	9.18
CHK	20	18.43
DUR	57	8.93
ELG	13	14.26
EOH	21	10.44
GBO	32	19.51
HAL	37	7.03
HAM	62	11.39
HDN	9	8.16
HKP	21	11.70
HPE	23	14.23
HUR	7	11.57

PHU	Cases (n)	*Rates
KFL	31	15.65
LAM	9	6.87
LGL	14	8.27
MSL	44	9.49
NIA	63	14.10
NPS	17	13.39
NWR	15	18.24
OTT	88	9.57
OXF	11	10.11
PDH	7	9.09
PEE	95	6.83
PQP	5	5.77
PTC	13	9.30

PHU	Cases (n)	*Rates
REN	13	12.54
SMD	76	14.35
SUD	30	15.15
THB	22	14.01
TOR	214	7.67
TSK	3	8.70
WAT	80	14.90
WDG	18	6.41
WEC	30	7.43
YRK	48	4.42
Ontario	**1273**	**9.43**

Ontario Counts: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].

Chapter 42.

Poliomyelitis (polio)

Although poliomyelitis (polio) remains endemic in only three countries of the world (Afghanistan, Pakistan, and Nigeria), cases of polio still continue to occur in other parts of the globe.[90] According to the *Global Polio Eradication Initiative*, cases were reported in Syria, Somalia, Cameroon, Ethiopia, and Kenya in 2013.[91] As a result of successful polio immunization programs, Canada was certified polio-free in 1994 by the World Health Organization.[90] However, there still remains a risk of importation of cases from countries where endemic transmission of polio still occurs.

Under the publicly funded immunization program in Ontario, inactivated polio vaccine (IPV) is administered to children in combination with vaccines against diphtheria, tetanus, pertussis and *Haemophilus influenzae* type b at 2, 4, 6, and 18 months of age.[31,90] A booster dose of IPV-containing vaccine is given at 4 to 6 years of age.[31] The vaccine provides 95% protection against infection after three doses and almost 100% protection after a booster dose.[90]

No cases of polio have been reported in Ontario since 1991.

Chapter 43.

Psittacosis/Ornithosis

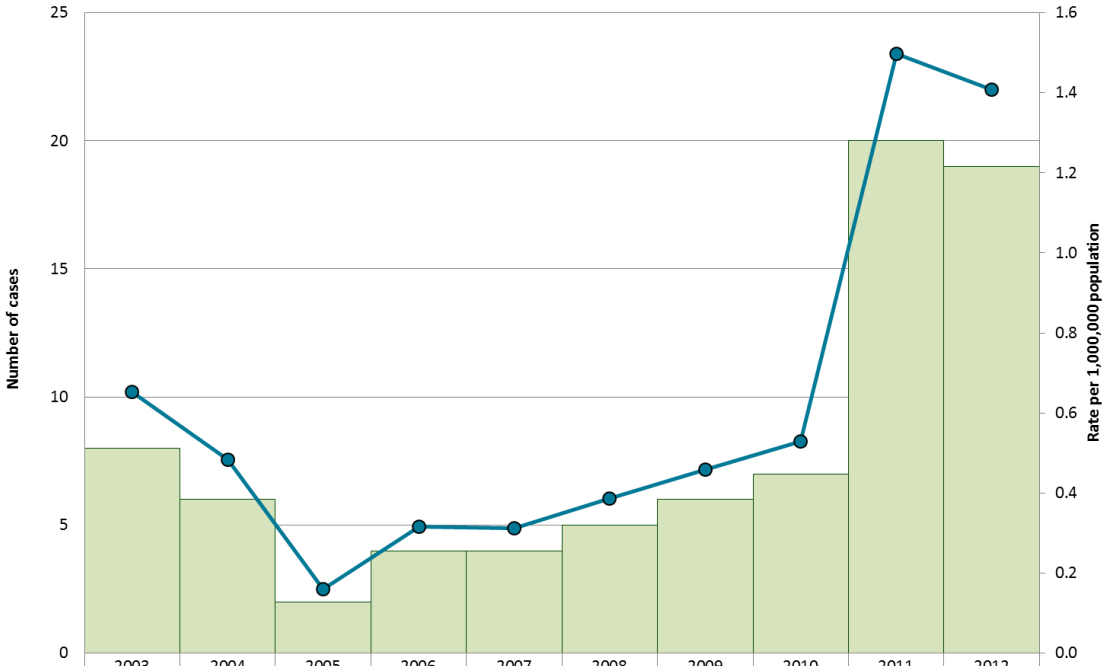
There were no cases of psittacosis/ornithosis reported in Ontario in 2012. In the last ten years, five confirmed cases have been reported in the province, with three cases occurring in 2003.

Chapter 44.

Q Fever

There were 19 confirmed cases of Q fever reported in Ontario in 2012. The number of confirmed cases more than tripled in 2011 and 2012 compared to the annual number of cases from 2003 to 2010 (Figure 44-1). An Ontario-wide Q fever study may have accounted, in part, for the increase in cases identified in 2011 and 2012. However, the possibility exists that cases prior to 2011 were under-reported or fewer cases were diagnosed. In 2012, no cases were reported under the age of 20 years; 74% (14/19) of cases were male (Figure 44-2). Thirty-seven per cent (7/19) of Q fever cases reported in 2012 were hospitalized and no fatal cases were reported. Cases were distributed across 14 public health units (Map 44-1). Additional information on Q fever can be found in the June 2012 issue of Public Health Ontario's Monthly Infectious Diseases Surveillance Report.[39]

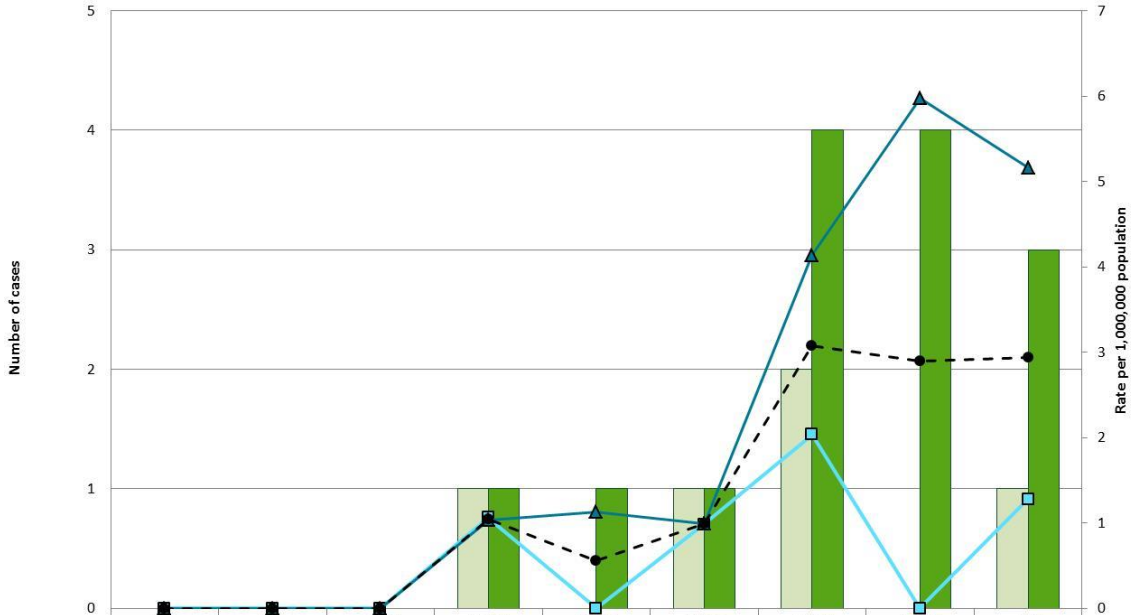
Figure 44-1. Incidence of Q Fever: Ontario, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	8	6	2	4	4	5	6	7	20	19
Ontario Rate	0.7	0.5	0.2	0.3	0.3	0.4	0.5	0.5	1.5	1.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Q fever is not nationally notifiable. Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

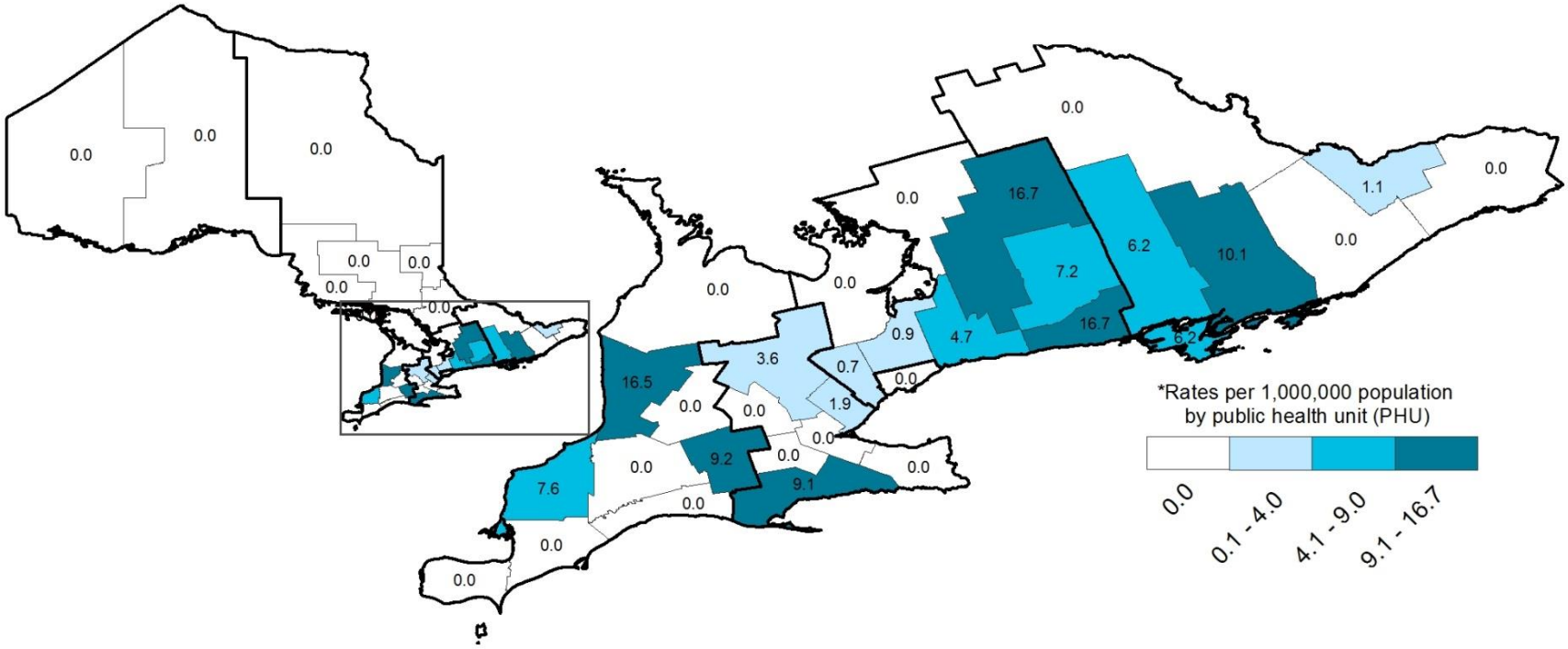
Figure 44-2. Incidence of Q Fever by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	0	0	0	1	0	1	2	0	1
Male Count	0	0	0	1	1	1	4	4	3
Female Rate	0	0	0	1.1	0	1.0	2.0	0	1.3
Male Rate	0	0	0	1.0	1.1	1.0	4.1	6.0	5.2
Total Rate	0	0	0	1.0	0.6	1.0	3.1	2.9	2.9

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Map 44-1. Incidence of Q Fever by Public Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0
BRN	0	0
CHK	0	0
DUR	3	4.7
ELG	0	0
EOH	0	0
GBO	0	0
HAL	1	1.9
HAM	0	0
HDN	1	9.1
HKP	3	16.7
HPE	1	6.2
HUR	1	16.5

PHU	Cases (n)	*Rates
KFL	2	10.1
LAM	1	7.6
LGL	0	0
MSL	0	0
NIA	0	0
NPS	0	0
NWR	0	0
OTT	1	1.1
OXF	1	9.2
PDH	0	0
PEE	1	0.7
PQP	0	0
PTC	1	7.2

PHU	Cases (n)	*Rates
REN	0	0
SMD	0	0
SUD	0	0
THB	0	0
TOR	0	0
TSK	0	0
WAT	0	0
WDG	1	3.6
WEC	0	0
YRK	1	0.9
Ontario	**19**	**1.4**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 45.

Rabies

One confirmed case of rabies was reported in Ontario in 2012. The case acquired their infection in the Caribbean and was hospitalized in Ontario prior to their death. No other cases have been reported provincially in the last ten years. Additional information on rabies can be found in the September 2012 issue of Public Health Ontario's Monthly Infectious Diseases Surveillance Report.[92]

Chapter 46.

Rubella and Congenital Rubella Syndrome

Similar to measles, indigenous rubella and congenital rubella syndrome (CRS) have been eliminated from Canada, with the last endemic cases occurring in 2005 and 2000, respectively.[67] Countries of the Americas are currently documenting the elimination of these diseases under the guidance of the Pan American Health Organization (PAHO).[68] As the disease remains endemic in other parts of the world, importation of cases continues to occur, and sporadic cases of CRS may occur as a result of prenatal infections acquired in endemic areas.

In Canada, screening is recommended for all pregnant women to determine susceptibility to rubella and to facilitate post-partum immunization of susceptible women.[93,94] Since 1970, a rubella-containing vaccine has been administered as part of the Ontario publicly funded immunization program. Presently, it is administered in combination with vaccines for mumps, measles, and varicella (MMR, MMRV). Per national guidelines, a single dose is required to be considered immunized against rubella.[93]

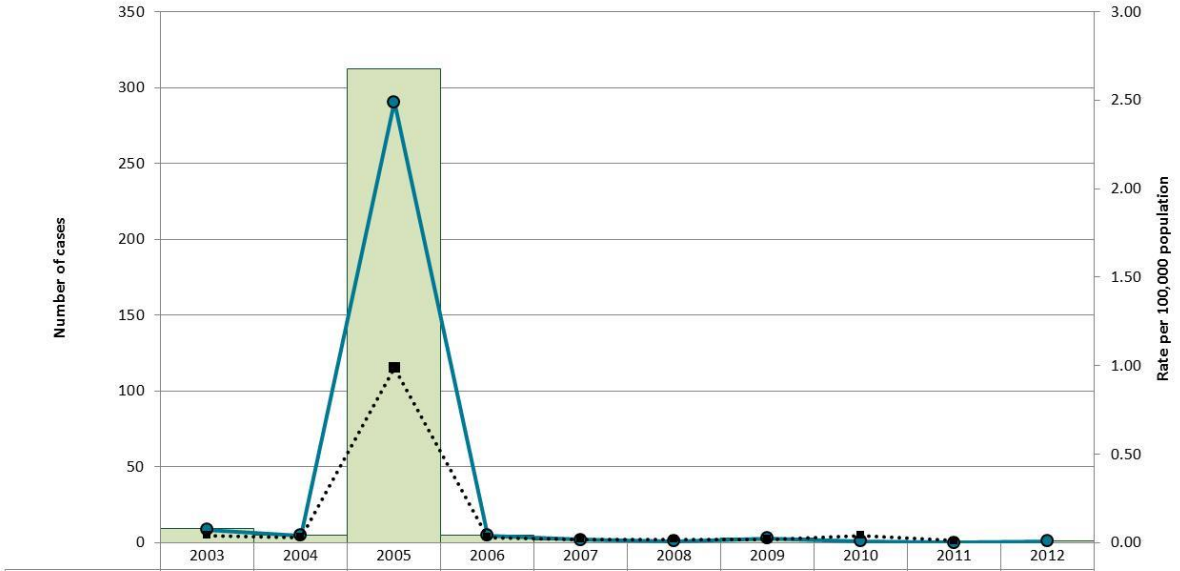
Only one confirmed case of rubella was reported in 2012 (Figure 46-1). This case was associated with travel to Russia and Belarus, and occurred in an adult male whose immunization status was unknown. No cases of CRS have been reported since 2009 (this case was determined to be an imported case since the mother travelled outside of Canada during her pregnancy). Over the past ten years, the annual incidence of rubella ranged between 0 and 2.49 cases per 100,000 population. In 2005, an outbreak of 309 cases of rubella occurred in southwestern Ontario following importation from the Netherlands. Cases in this outbreak were part of an under-vaccinated religious community opposed to immunization. Children between the ages of 5 and 14 years accounted for over 60% of cases, but no cases of CRS were reported in iPHIS. In Canada, the annual incidence rate for rubella and CRS was low, with the exception of 2005, owing to the outbreak in southwestern Ontario (Figure 46-2).

The annualized age-specific rate for rubella cases between 2006 and 2012 is shown in Figure 46-3. The highest rate of rubella was observed among 1- to 4-year olds (0.08 cases per 100,000 population). The annualized incidence rate was 0.01 and 0.02 cases per 100,000 population among females and males, respectively. Of the 13 rubella cases reported during this period, immunization status could only be determined for three cases (23.1%), none of whom were immunized.

Figure 46-4 presents the importation status of rubella cases in Ontario between 2006 and 2012. Of the 13 cases reported during this period, seven (53.8%) were determined to be imported or import-related; although, in the last three years both cases were imported. Genotype information was unknown for all rubella cases, while genotype 2B was isolated for the CRS case in 2009. Public health unit-specific rates for 2012 are provided in Appendix 3.

To ensure Canada's elimination status is maintained, the assessment and documentation of travel and immunization histories for all suspected rubella cases is essential. Efforts are currently underway within Ontario to address this to improve documentation and reporting.

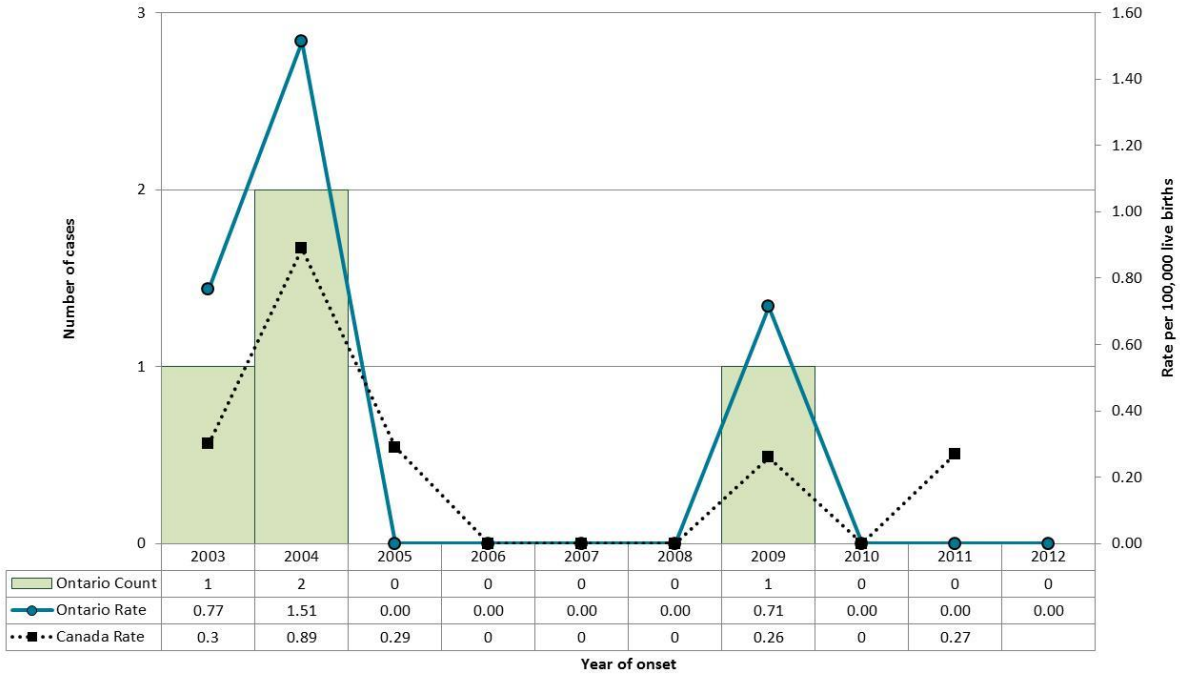
Figure 46-1. Incidence of Rubella: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	9	5	312	5	2	1	3	1	0	1
Ontario Rate	0.07	0.04	2.49	0.04	0.02	0.01	0.02	0.01	0.00	0.01
Canada Rate	0.04	0.03	0.99	0.03	0.02	0.02	0.02	0.04	0.01	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

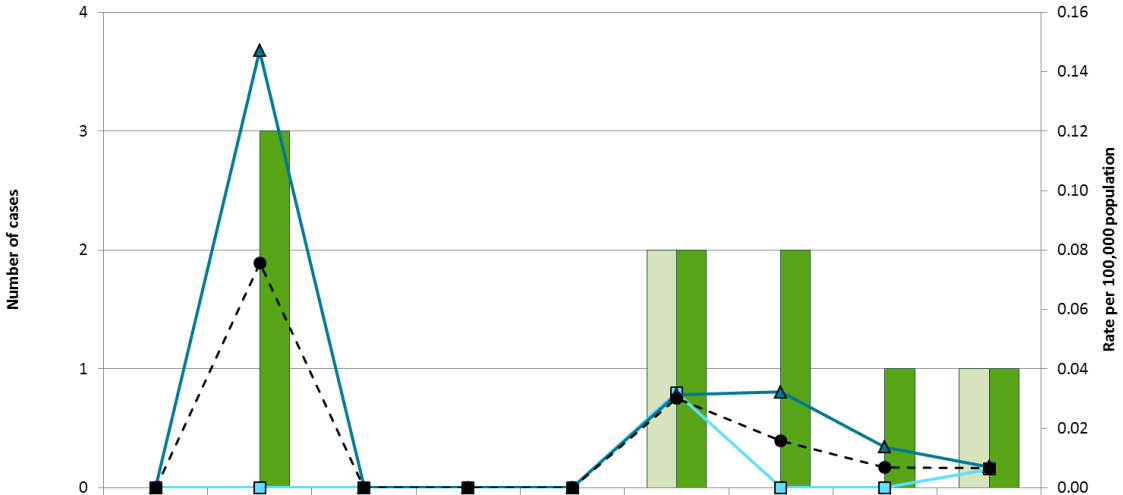
Figure 46-2. Incidence of Congenital Rubella Syndrome: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	1	2	0	0	0	0	1	0	0	0
Ontario Rate	0.77	1.51	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00
Canada Rate	0.3	0.89	0.29	0	0	0	0.26	0	0.27	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Live births [2003-2011], Ontario Ministry of Health and Long-Term Care, IntelliHEALTH Ontario, Date Extracted: [2014/01/03].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

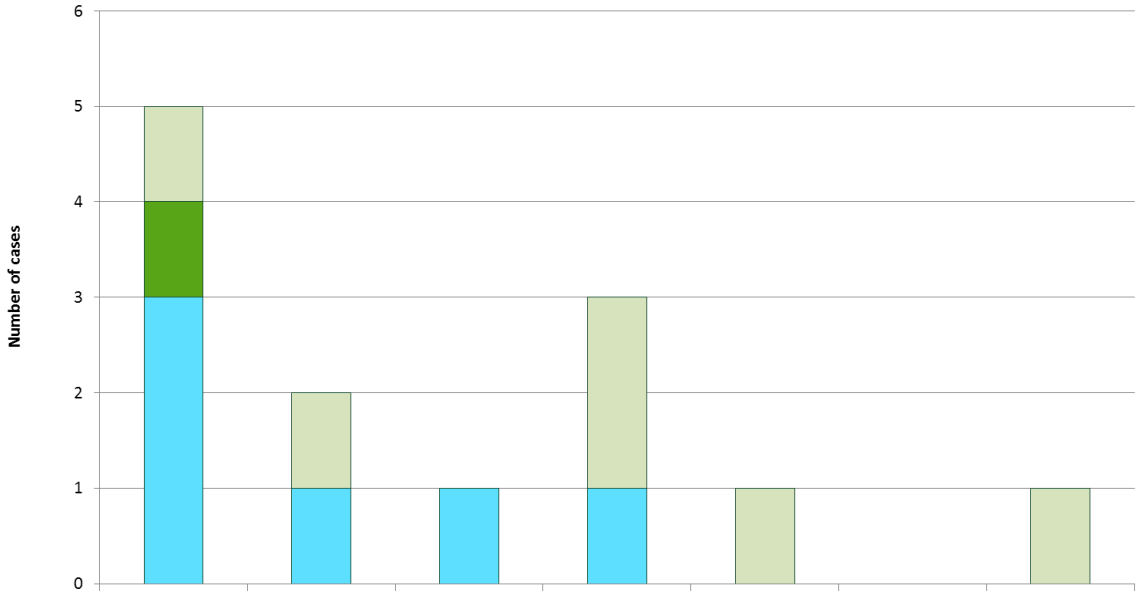
Figure 46-3. Incidence of Rubella by Age and Sex: Ontario, 2006–12



	0-1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50+
Female Count	0	0	0	0	0	2	0	0	1
Male Count	0	3	0	0	0	2	2	1	1
Female Rate	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.01
Male Rate	0.00	0.15	0.00	0.00	0.00	0.03	0.03	0.01	0.01
Total Rate	0.00	0.08	0.00	0.00	0.00	0.03	0.02	0.01	0.01

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [2006-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Excludes one case of unknown sex.

Figure 46-4. Incidence of Rubella by Importation Status: Ontario, 2006–12



	2006	2007	2008	2009	2010	2011	2012
Imported	1	1	0	2	1	0	1
Import-related	1	0	0	0	0	0	0
Unknown	3	1	1	1	0	0	0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].

Chapter 47.

Salmonellosis

Salmonellosis is the second most frequently reported enteric disease in Ontario. In 2012, there were 3,038 confirmed cases of salmonellosis, representing an incidence rate of 22.5 cases per 100,000 population. Rates in Ontario from 2008 to 2011 have been comparable to the rates in the rest of Canada (Figure 47-1). The top five *Salmonella* serotypes are presented in Table 47-1; *S*. Enteritidis (26.0%), *S*. Typhimurium (15.9%), and *S*. Heidelberg (15.2%) were the most common serotypes in 2012. It is expected that the serotype of some salmonellosis cases are misclassified or left as unspecified, resulting in under-reporting of certain *Salmonella* serotypes.

The highest incidence rates of salmonellosis in Ontario are observed in the 0–4 and 5–9 year age groups (Figure 47-2). Salmonellosis tends to follow a seasonal pattern, with increased incidence in the summer months due to increased frequency of outdoor activities, social gatherings with food, and warmer temperatures that promote pathogen growth (Figure 47-3).[26]

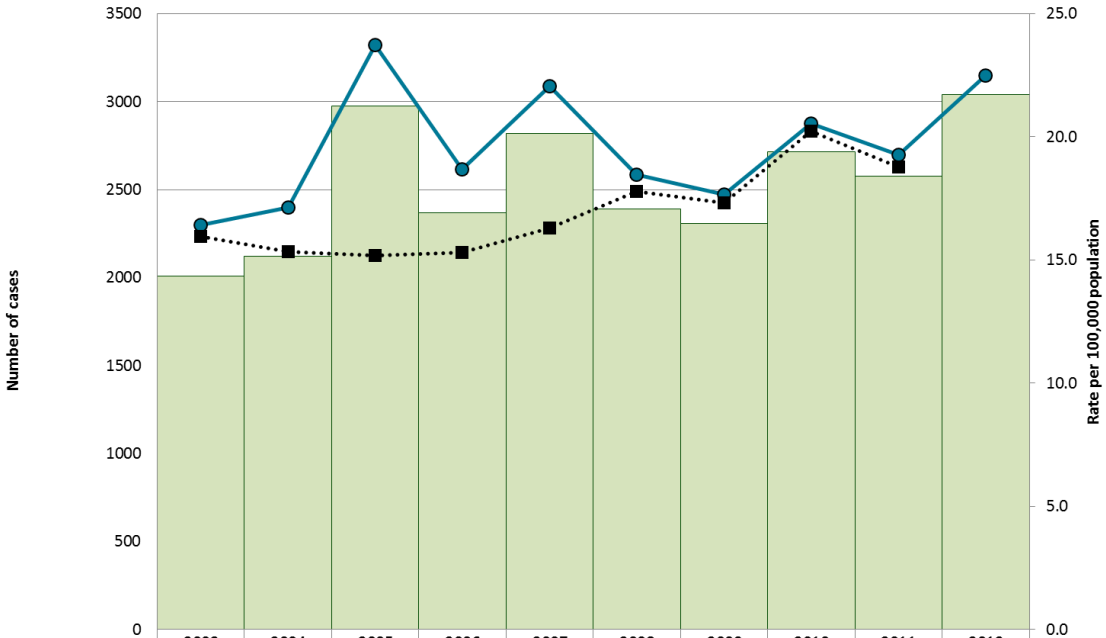
In 2012, the highest incidence rates of salmonellosis were reported by Grey Bruce (38.4 per 100,000 population) and Huron County (38.0 per 100,000 population). The geographic distribution of cases is displayed in Map 47-1. Among all salmonellosis cases in this year, 9.7% (295/3,038) were hospitalized and one death was reported.

There were several cluster and outbreak investigations involving various serotypes of *Salmonella* in 2012. Two separate provincial *S*. Heidelberg investigations occurred, one from January to March, and the other from September to November. Both provincial outbreaks led to the activation of an Ontario Outbreak Investigation Coordination Committee (ON-OICC) and included support from the Canadian Field Epidemiology Program. In both instances, the definitive source of the increase in reported cases was not identified, but chicken consumption was commonly reported by the cases interviewed.

In March 2012, an outbreak of *S*. Typhimurium implicated a school and daycare catering business in Ottawa that led to the recall of ground beef burger meat mix.[95] In addition, from April to August, there was an outbreak of *S*. Thompson affecting multiple provinces including Ontario that led to the activation of a national Outbreak Investigation Coordination Committee (OICC). Sixty cases in Ontario were reported; however, the source of the outbreak was not identified. A separate outbreak of both *S*. Thompson and *S.* Isangi was also investigated by one public health unit; the outbreak was likely the result of poor food handling.[96]

Additional information on salmonellosis can be found in the May 2012 issue of Public Health Ontario's Monthly Infectious Diseases Surveillance Report.[97]

Figure 47-1. Incidence of Salmonellosis: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	2009	2121	2974	2367	2821	2388	2306	2716	2577	3038
Ontario Rate	16.4	17.1	23.7	18.7	22.1	18.5	17.6	20.5	19.3	22.5
Canada (Excl. ON) Rate	15.9	15.3	15.2	15.3	16.3	17.8	17.3	20.2	18.8	

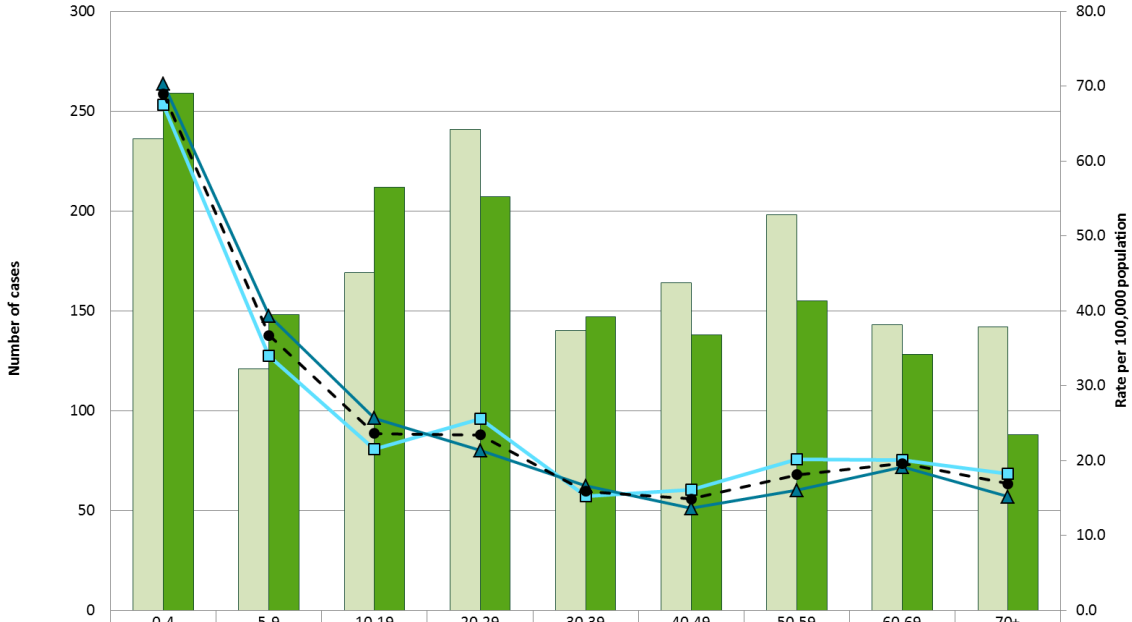
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: National data includes paratyphoid fever cases. Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

Table 47-1. Salmonellosis Cases by *Salmonella* Serotype: Ontario, 2012

***Salmonella* Serotypes**	**Cases**	
	Count	**Percent**
S. Enteritidis	789	26.0%
S. Typhimurium	484	15.9%
S. Heidelberg	461	15.2%
S. Thompson	163	5.4%
S. ssp. enterica 4,[5],12:i:–	111	3.7%
Other	938	30.9%
Unspecified serotype	92	3.0%
Total	**3038**	**100.0%**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/03/28].
Note: "Other" refers to the sum of other specified serotypes, each with frequencies <3%, as well as non-groupable/typable cases.

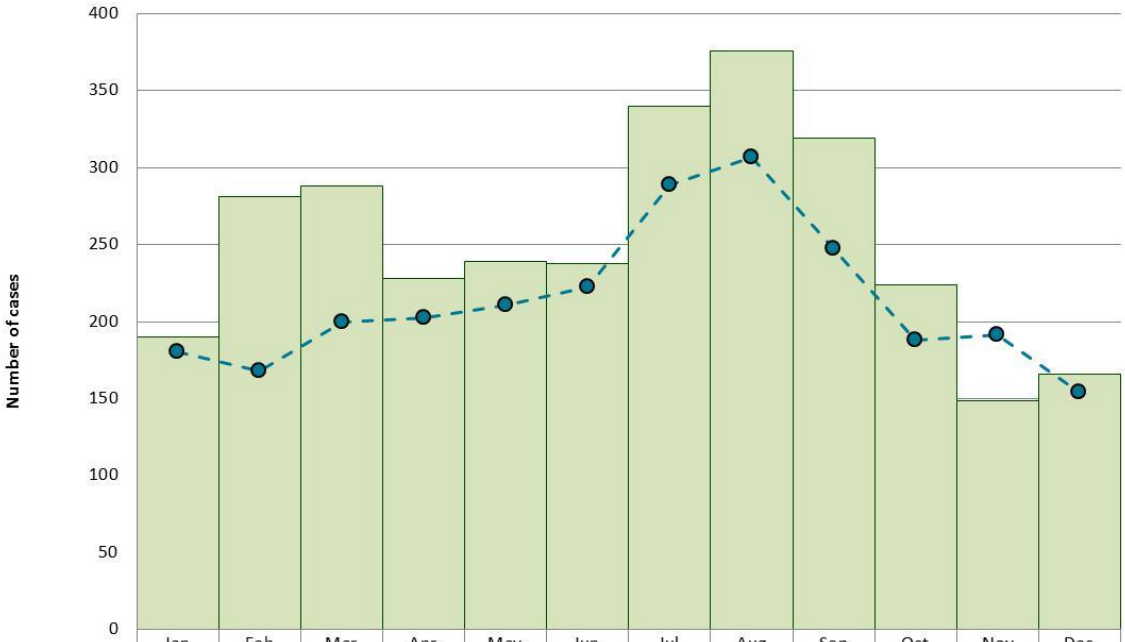
Figure 47-2. Incidence of Salmonellosis by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	236	121	169	241	140	164	198	143	142
Male Count	259	148	212	207	147	138	155	128	88
Female Rate	67.5	34.0	21.5	25.6	15.2	16.1	20.2	20.0	18.2
Male Rate	70.3	39.3	25.7	21.3	16.6	13.6	16.0	19.1	15.1
Total Rate	69.0	36.7	23.6	23.4	15.9	14.9	18.1	19.6	16.9

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes two cases of unknown age and/or sex. Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

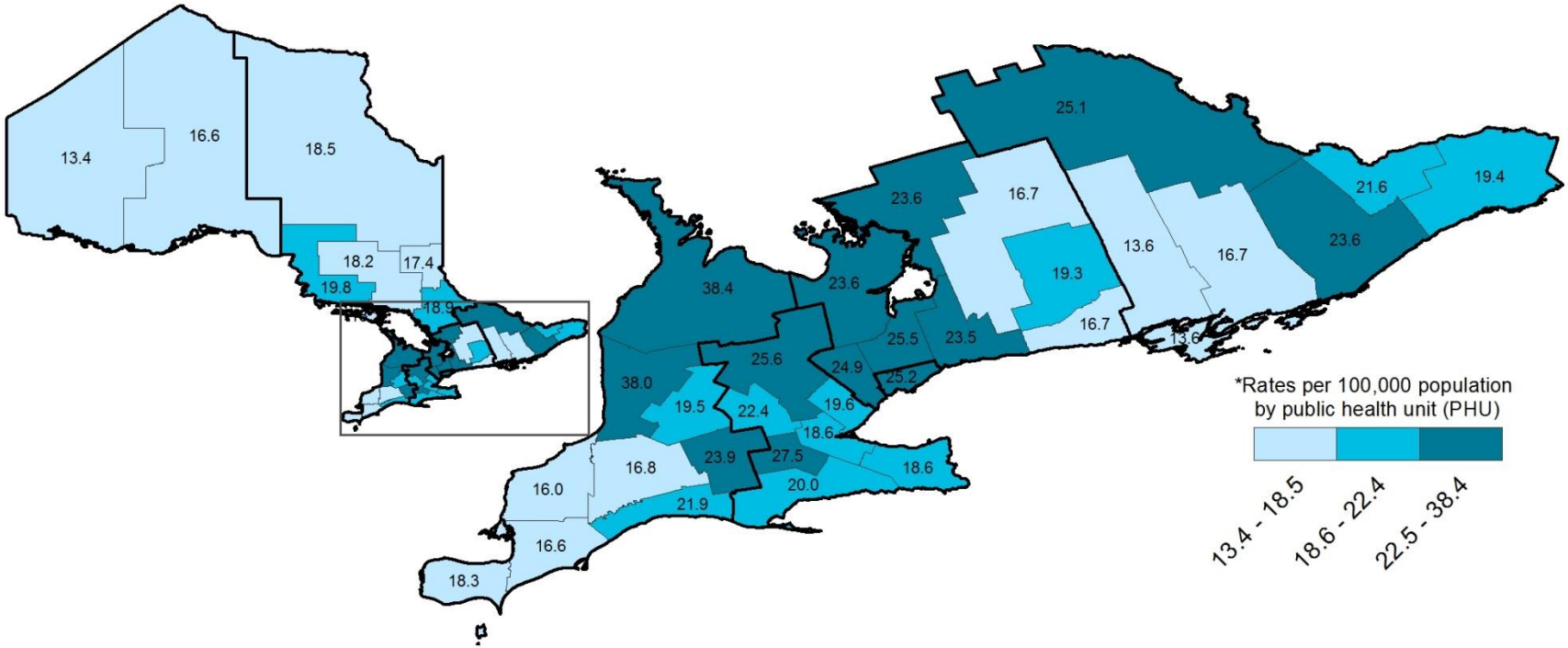
Figure 47-3. Number of Salmonellosis Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	190	281	288	228	239	238	340	376	319	224	149	166
5-Yr Average	180.6	167.8	199.6	202.6	210.8	222.8	289.0	307.0	247.4	188.2	191.8	154.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 47-1. Incidence of Salmonellosis by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	23	19.8
BRN	39	27.5
CHK	18	16.6
DUR	150	23.5
ELG	20	22.0
EOH	39	19.3
GBO	63	38.4
HAL	103	19.6
HAM	101	18.6
HDN	22	20.0
HKP	30	16.7
HPE	22	13.6
HUR	23	38.0

PHU	Cases (n)	*Rates
KFL	33	16.7
LAM	21	16.0
LGL	40	23.6
MSL	78	16.8
NIA	83	18.6
NPS	24	18.9
NWR	11	13.4
OTT	199	21.6
OXF	26	23.9
PDH	15	19.5
PEE	346	24.9
PQP	16	18.5
PTC	27	19.3

PHU	Cases (n)	*Rates
REN	26	25.1
SMD	125	23.6
SUD	36	18.2
THB	26	16.6
TOR	704	25.2
TSK	6	17.4
WAT	120	22.4
WDG	72	25.7
WEC	74	18.3
YRK	277	25.5
Ontario	**3038**	**22.5**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 48.

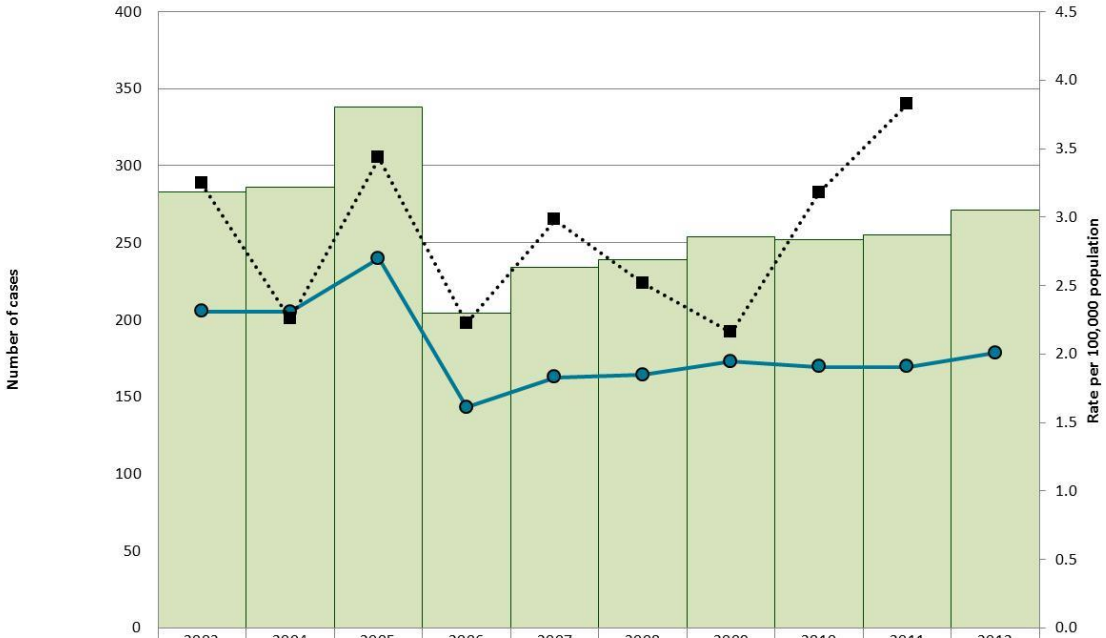
Shigellosis

In 2012, there were a total of 271 confirmed cases of shigellosis representing an incidence rate of 2.0 cases per 100,000 population (Figure 48-1). Of these cases, 8.5% (23/271) were hospitalized and no deaths were reported. Since 2003, Ontario incidence rates have been generally lower than the rates for the rest of Canada. The incidence rates were highest in children under the age of ten (Figure 48-2). Although individuals from all age groups are susceptible to shigellosis infection, the literature suggests that most cases occur among children under the age of ten.[98] Notably, adult males have higher rates than females, possibly associated with sexual transmission among men who have sex with men (MSM).[26,99]

Shigellosis cases are reported throughout the year (Figure 48-3). In 2012, incidence of shigellosis peaked in January and from July to September. The summer peak was attributed to transmission among an ethnic community, particularly in daycare settings. In addition, the peak observed in January is partially associated with travel-related clusters reporting travel to Mexico and the Caribbean.

The 2012 incidence rates by public health unit of residence are presented in Map 48-1. However, due to low case counts in some jurisdictions, rates should be interpreted with caution.

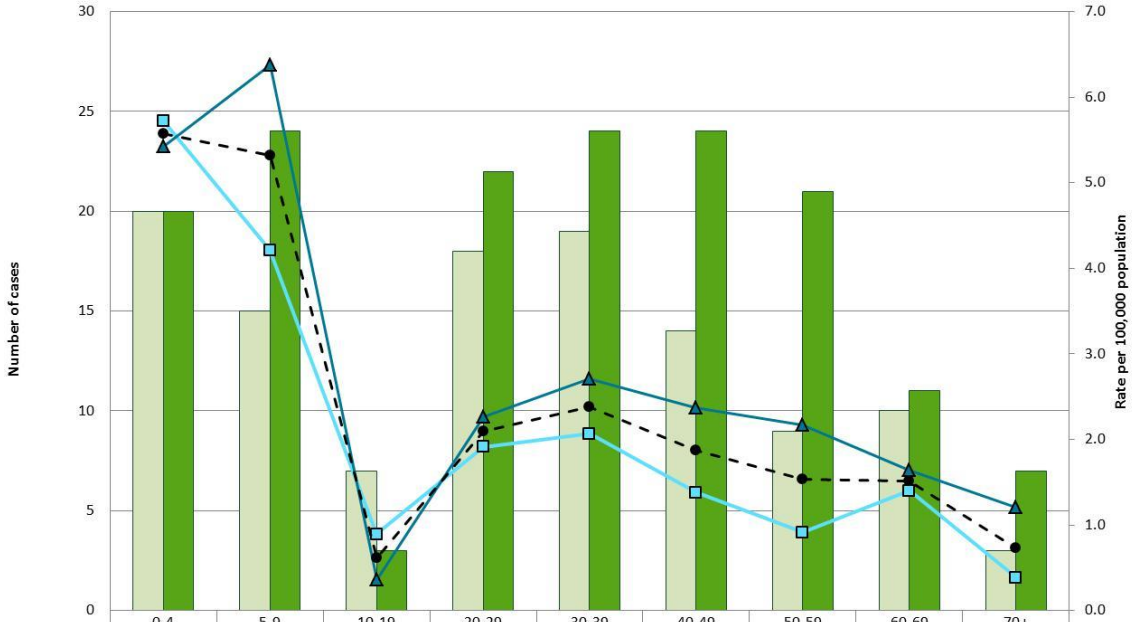
Figure 48-1. Incidence of Shigellosis: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	283	286	338	204	234	239	254	252	255	271
Ontario Rate	2.3	2.3	2.7	1.6	1.8	1.8	1.9	1.9	1.9	2.0
Canada (Excl. ON) Rate	3.2	2.3	3.4	2.2	3.0	2.5	2.2	3.2	3.8	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

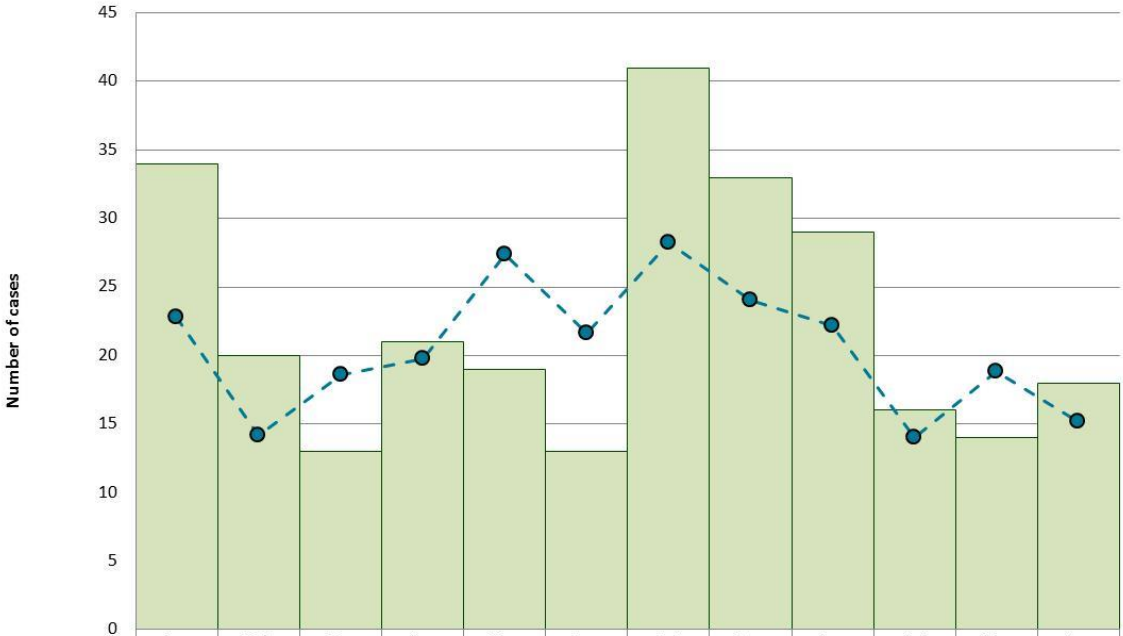
Figure 48-2. Incidence of Shigellosis by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	20	15	7	18	19	14	9	10	3
Male Count	20	24	3	22	24	24	21	11	7
Female Rate	5.7	4.2	0.9	1.9	2.1	1.4	0.9	1.4	0.4
Male Rate	5.4	6.4	0.4	2.3	2.7	2.4	2.2	1.6	1.2
Total Rate	5.6	5.3	0.6	2.1	2.4	1.9	1.5	1.5	0.7

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

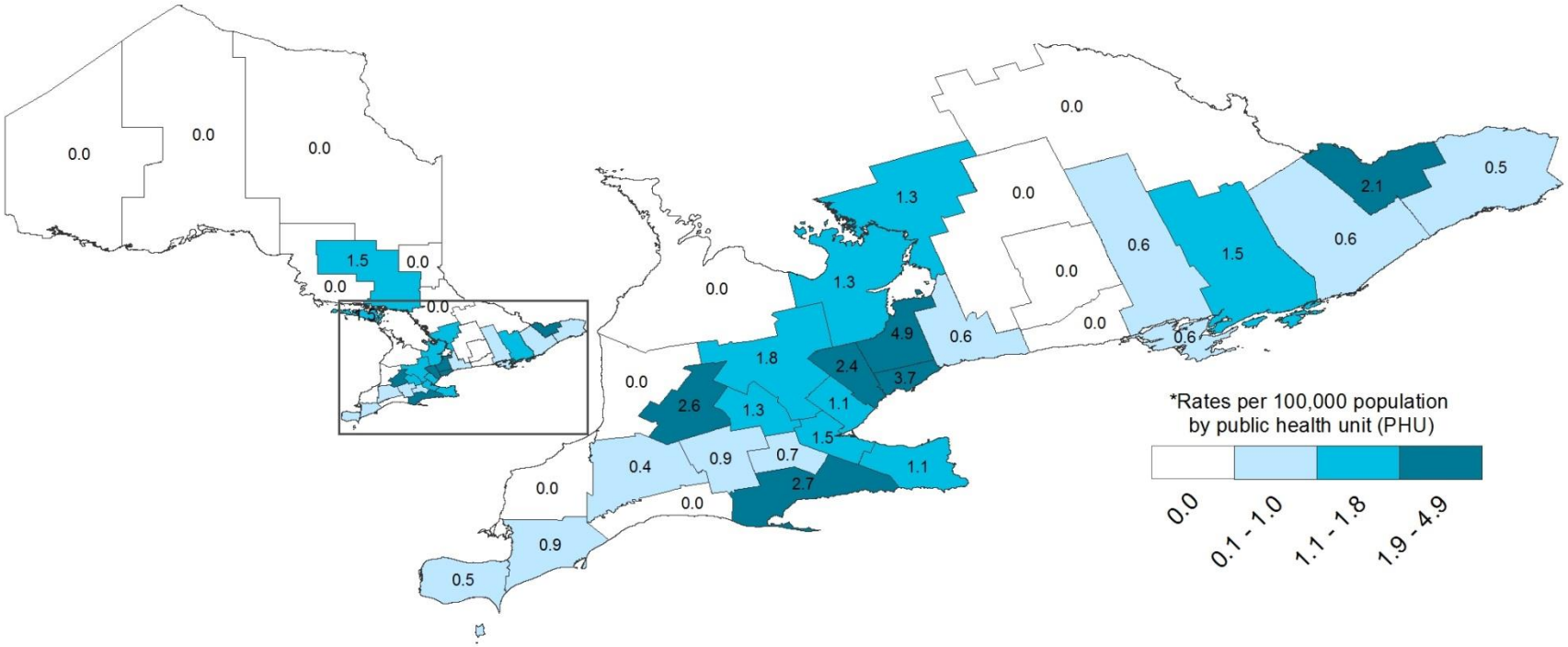
Figure 48-3. Number of Shigellosis Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	34	20	13	21	19	13	41	33	29	16	14	18
5-Yr Average	22.8	14.2	18.6	19.8	27.4	21.6	28.2	24.0	22.2	14.0	18.8	15.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 48-1. Incidence of Shigellosis by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0
BRN	1	0.7
CHK	1	0.9
DUR	4	0.6
ELG	0	0
EOH	1	0.5
GBO	0	0
HAL	6	1.1
HAM	8	1.5
HDN	3	2.7
HKP	0	0
HPE	1	0.6
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	3	1.5
LAM	0	0
LGL	1	0.6
MSL	2	0.4
NIA	5	1.1
NPS	0	0
NWR	0	0
OTT	19	2.1
OXF	1	0.9
PDH	2	2.6
PEE	33	2.4
PQP	0	0
PTC	0	0

PHU	Cases (n)	*Rates
REN	0	0
SMD	7	1.3
SUD	3	1.5
THB	0	0
TOR	103	3.7
TSK	0	0
WAT	7	1.3
WDG	5	1.8
WEC	2	0.5
YRK	53	4.9
Ontario	**271**	**2.0**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 49.

Smallpox

Smallpox is a highly contagious disease caused by the Variola virus, a member of the genus *Orthopoxvirus.*[100] Smallpox can be fatal in up to 30% of infected people and, currently, there is no cure for smallpox.[101] As a result of successful vaccination campaigns across the word, no naturally acquired cases of smallpox have been reported since 1977. Global eradication of smallpox was confirmed by the World Health Organization in 1980.[102]

There have been no confirmed cases of smallpox reported in Ontario since 1979.[103]

Chapter 50.

Syphilis, Infectious

In 2012, 818 cases of infectious syphilis cases were reported in Ontario, consisting of 260 cases (31.8%, 260/818) of primary syphilis, 311 cases (38.0%, 311/818) of secondary syphilis and 234 cases (28.6%, 234/818) of early latent syphilis, as well as 13 cases (1.6%, 13/818) of infectious neurosyphilis (Figure 50-1). This corresponds to an incidence rate for reported infectious syphilis of 6.1 cases per 100,000 population. In 2012, two cases of congenital syphilis were reported in Ontario, and an average of 1.1 congenital cases were reported per year from 2005 to 2012 (data not shown).

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 infection, which can result in misclassification.[104] In addition, syphilis staging may take up to several months, resulting in a lag in case reporting to public health units.

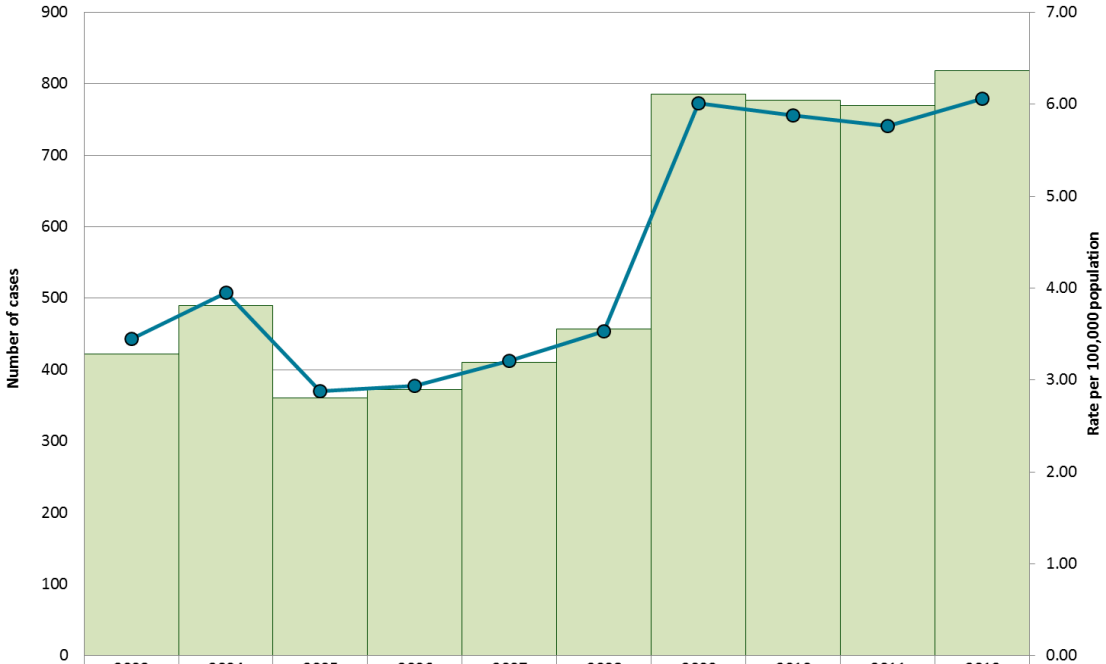
Prior to 2002, the reported incidence of infectious syphilis in Ontario was very low, with annual incidence rates less than 1.0 case per 100,000 population (data not shown). However, there have been two notable increases in the reported incidence of infectious syphilis in the past 12 years. From 2002 to 2004, the incidence of syphilis increased to a peak of 4.0 cases per 100,000 population. After a decline in 2005, the annual incidence of infectious syphilis increased gradually by an average of 7.1% each year from 2005 to 2008; the reported incidence then increased by 70.0%, from 3.5 cases per 100,000 population in 2008 to 6.0 cases per 100,000 population in 2009. Both of these increases were primarily attributable to cases of infectious syphilis among men who have sex with men (MSM).[105-107] Since 2009, the reported incidence of infectious syphilis in Ontario has remained relatively stable at these higher rates. The annual incidence rates for Ontario are not directly comparable to rates for the rest of Canada as the latter includes cases of infectious, non-infectious and unspecified syphilis.

In 2012, the reported incidence of infectious syphilis was 30 times higher among males (11.9 cases per 100,000 population) than females (0.4 cases per 100,000 population), with males accounting for 96.7% (791/818) of all cases reported in Ontario. Among males, incidence rates increased steadily with increasing age, peaked in the 40–49 year age group at 26.4 cases per 100,000 population, and then declined dramatically among males 50 years of age and older (Figure 50-2). The incidence of infectious syphilis among females was highest among those in the 20–24 year age group.

In 2012, cases of infectious syphilis were reported in 28 of Ontario's public health units (Map 50-1). The highest incidence rates were reported in Toronto, Hamilton, and Middlesex-London public health units, with rates of 19.4, 5.7, and 5.4 cases per 100,000 population, respectively.

HIV co-infection is common among infectious syphilis cases.[108] Among cases of infectious syphilis diagnosed in 2012, 39.7% (325/818) were co-infected with HIV; these cases were either diagnosed with HIV prior to or within one year of their syphilis diagnosis.

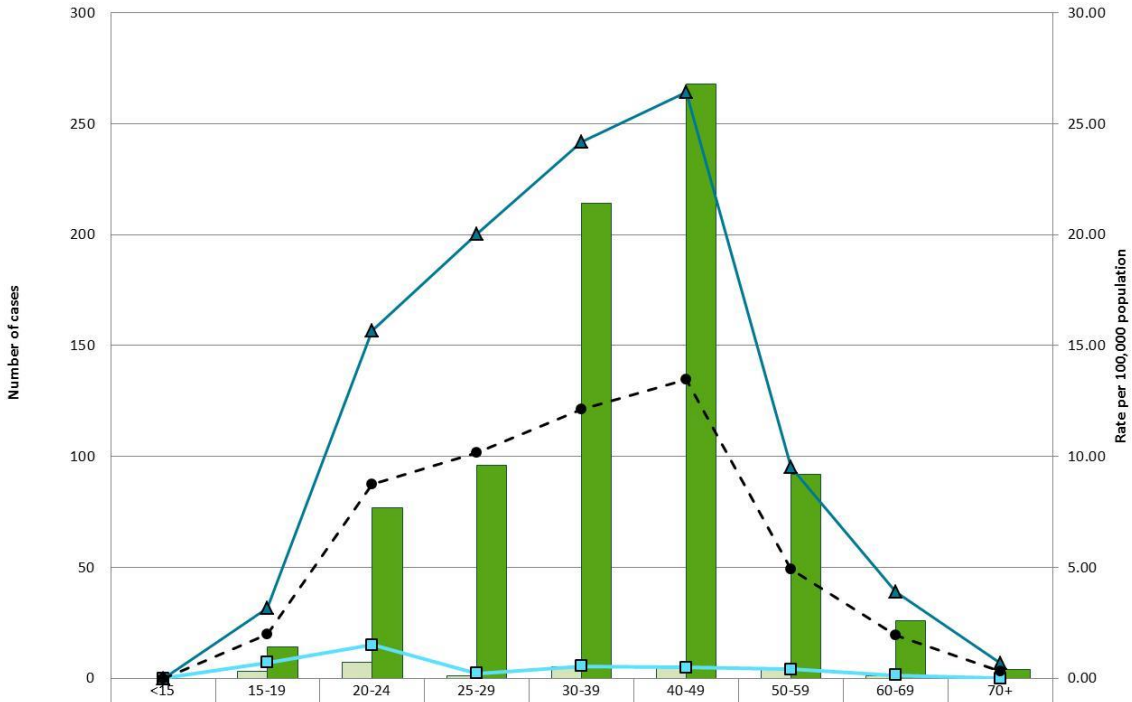
Figure 50-1. Incidence of Syphilis, Infectious: Ontario, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	422	490	361	372	411	457	785	777	770	818
Ontario Rate	3.45	3.95	2.88	2.94	3.21	3.53	6.01	5.88	5.76	6.06

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: National data excluded as it does not distinguish between infectious and non-infectious syphilis.

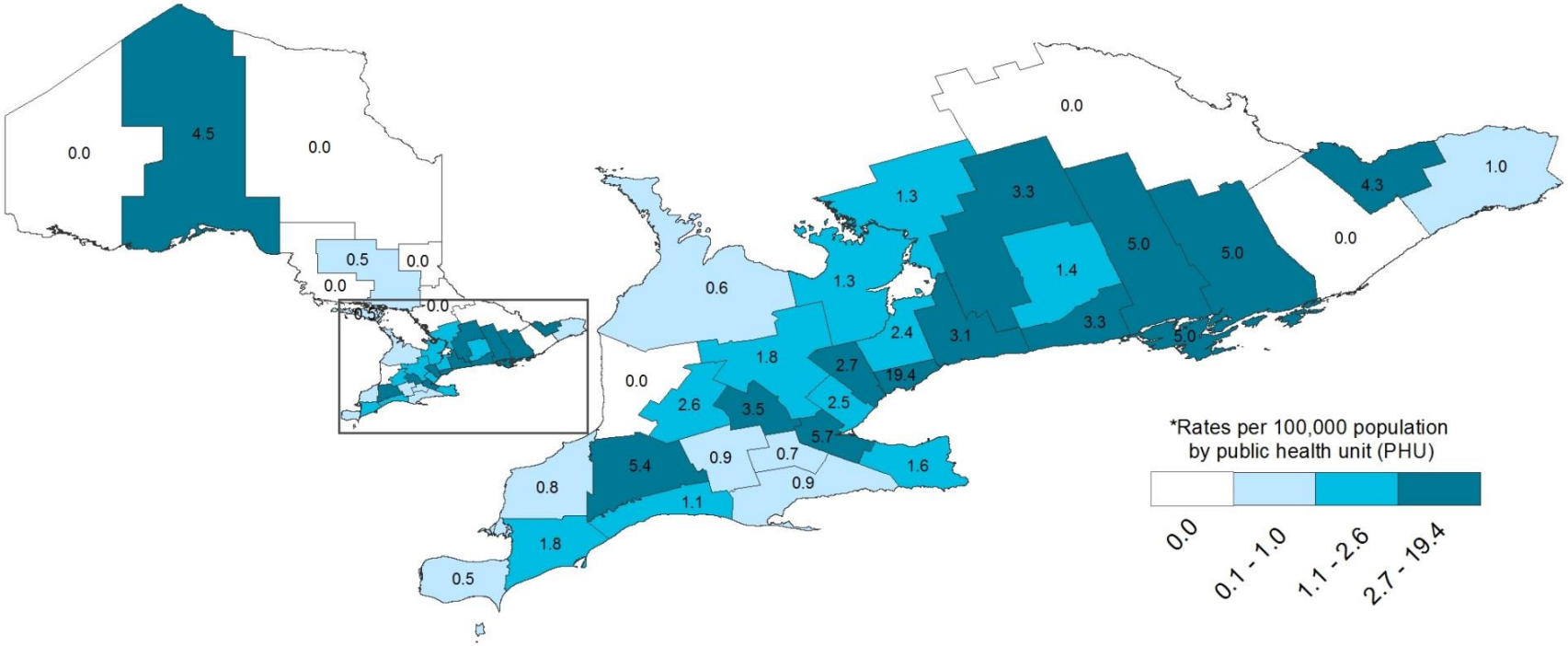
Figure 50-2. Incidence of Syphilis, Infectious by Age and Sex: Ontario, 2012



	<15	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+
Female Count	0	3	7	1	5	5	4	1	0
Male Count	0	14	77	96	214	268	92	26	4
Female Rate	0.00	0.71	1.49	0.21	0.54	0.49	0.41	0.14	0.00
Male Rate	0.00	3.17	15.67	20.03	24.18	26.43	9.51	3.88	0.69
Total Rate	0.00	1.97	8.75	10.18	12.13	13.45	4.92	1.95	0.29

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Excludes one case of unknown age and/or sex.

Map 50-1. Incidence of Syphilis, Infectious by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.00
BRN	1	0.71
CHK	2	1.84
DUR	20	3.13
ELG	1	1.10
EOH	2	0.99
GBO	1	0.61
HAL	13	2.47
HAM	31	5.70
HDN	1	0.91
HKP	6	3.34
HPE	8	4.95
HUR	0	0.00

PHU	Cases (n)	*Rates
KFL	10	5.05
LAM	1	0.76
LGL	0	0.00
MSL	25	5.39
NIA	7	1.57
NPS	0	0.00
NWR	0	0.00
OTT	40	4.35
OXF	1	0.92
PDH	2	2.60
PEE	37	2.66
PQP	0	0.00
PTC	2	1.43

PHU	Cases (n)	*Rates
REN	0	0.00
SMD	7	1.32
SUD	1	0.50
THB	7	4.46
TOR	540	19.35
TSK	0	0.00
WAT	19	3.54
WDG	5	1.78
WEC	2	0.50
YRK	26	2.39
Ontario	**818**	**6.06**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 51.

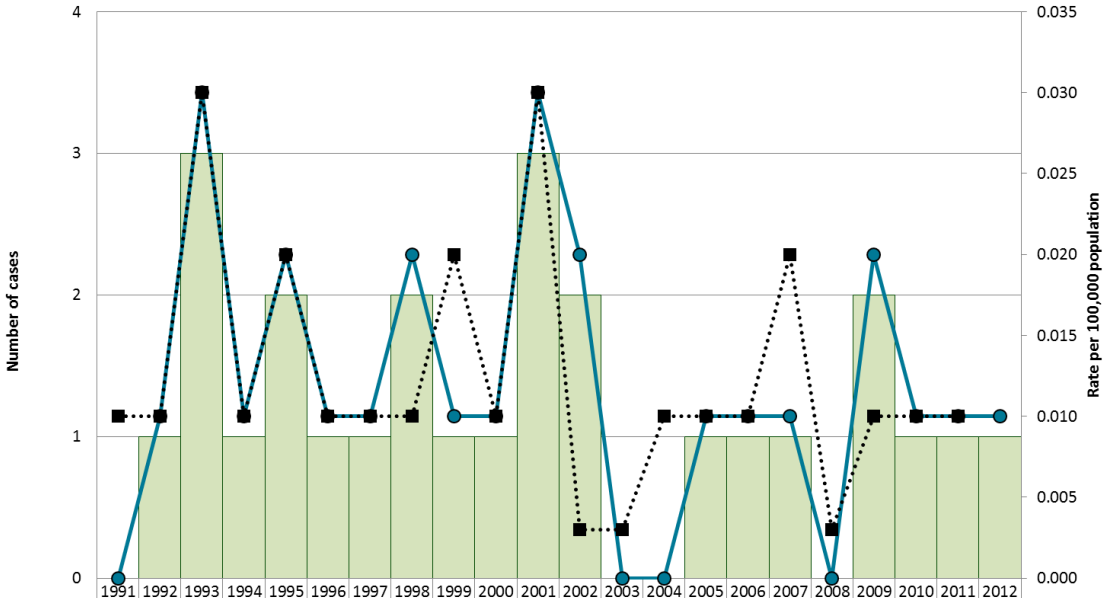
Tetanus

Tetanus (lockjaw) is a disease caused by a neurotoxin produced by the *Clostridium tetani* bacterium.[109] *C. tetani* spores are widely distributed in soil and tetanus occurs throughout the world, however it is rare in Canada.[110] The incidence and mortality of tetanus in Canada rapidly declined after the introduction of tetanus toxoid in 1940.[111] 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 2, 4, 6, and 18 months of age.[31,110] Subsequently, booster doses of tetanus toxoid-containing vaccines are administered at 4 to 6 years and 14 to 16 years of age.[31,110] A booster dose is recommended for adults every ten years for continued protection.[110]

Tetanus is rare in Ontario; only one confirmed case of tetanus was reported in 2012 (Figure 51-1). This case occurred in an adult with unknown immunization status. Between 1991 and 2012, the annual incidence of tetanus in Ontario ranged between 0.00 and 0.03 cases per 100,000 population, with one to three cases occurring in years when confirmed cases were reported. Annual incidence for Ontario was comparable to national figures over the past 20 years.

Documentation of immunization histories are frequently absent or incomplete for cases reported in iPHIS. Because the assessment of immunization status is essential for vaccine-preventable-disease cases, the lack of complete immunization histories is a major limitation in data quality.

Figure 51-1. Incidence of Tetanus: Ontario and Canada, 1991–2012



	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	0	1	3	1	2	1	1	2	1	1	3	2	0	0	1	1	1	0	2	1	1	1
Ontario Rate	0.00	0.01	0.03	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.03	0.02	0.00	0.00	0.01	0.01	0.01	0.00	0.02	0.01	0.01	0.01
Canadian Rate	0.01	0.01	0.03	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.03	0.003	0.003	0.01	0.01	0.01	0.02	0.003	0.01	0.01	0.01	

Ontario Counts: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/10].
Ontario Population: Population Estimates [1991-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

Chapter 52.

Transmissible Spongiform Encephalopathy

In 2012, four prion diseases in Ontario were reportable under the category of transmissible spongiform encephalopathy: Creutzfeldt-Jakob Disease (CJD), including sporadic, familial, iatrogenic, and variant types; Gerstmann-Sträussler-Scheinker Syndrome (GSS); Fatal Familial Insomnia (FFI); and Kuru. 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. Information about CJD cases is not consistently shared with local public health units and, as a result, these cases are not entered in iPHIS.

From 2008 to 2012, the CJDSS was notified of 85 deaths in Ontario due to CJD: 79 were classified as sporadic, three as familial, and one as variant. This count was slightly higher than the 76 CJD deaths reported to the CJDSS from 2003 to 2007. Deaths reported through the CJDSS were attributed to “definite” and “probable” cases of CJD according to national case definitions.[112] The CJD case counts available from the CJDSS are more than twice as high as the 30 CJD cases reported in iPHIS for the same time period.

GSS, FFI and Kuru were removed from Ontario’s Reportable Disease List in December 2013.

Chapter 53.

Trichinosis

There were two confirmed cases of trichinosis reported in Ontario in 2012. Trichinosis is not an endemic disease in the province. In the last ten years, four confirmed cases have been reported.

Chapter 54.

Tuberculosis

In 2012, a total of 615 active tuberculosis (TB) cases were reported in Ontario, corresponding to an incidence rate of 4.6 cases per 100,000 population (Figure 54-1). From 2003 to 2012, the annual incidence rate of reported active TB cases in Ontario decreased by an average of 1.9% each year. Over this same time period, incidence rates of active TB in Ontario were higher than in the rest of Canada, with the exception of the years 2008 and 2009.

The reported incidence of active TB was higher for males than females in 2012, at 5.0 and 4.1 cases per 100,000 population, respectively; males accounted for 54.5% (335/615) of cases. Cases ranged in age from less than 1 year to 99 years, with a median age of 44 years. The highest age-specific incidence rates of active TB were reported among adults between 20 and 49 years of age, as well as older adults 70 years of age and over (Figure 54-2). In this older age group, the reported incidence rate among males (14.1 cases per 100,000 population) was more than double the rate among females (6.0 cases per 100,000 population).

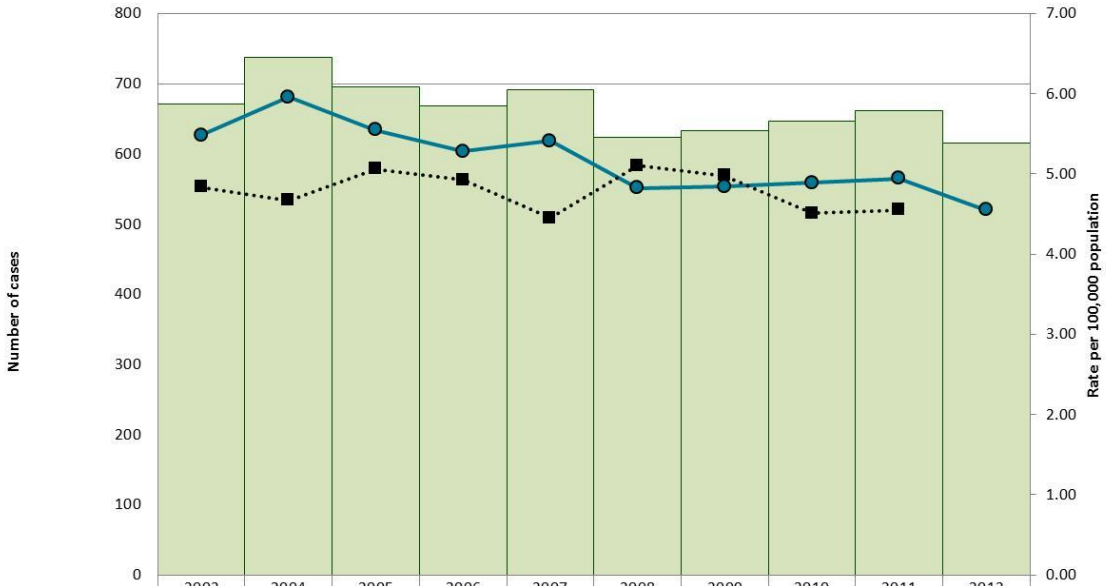
Individuals born outside of Canada accounted for the largest proportion of active TB cases reported in Ontario in 2012 (88.6%, 545/615 cases) (Table 54-1). The top five countries of birth among TB cases reported from 2007 to 2012 were India (17.7%, 684/3872), the Philippines (13.3%, 514/3872), China (9.3%, 360/3872), Vietnam (5.5%, 214/3872), and Pakistan (4.3%, 166/3872). These countries are among the 27 high multidrug-resistant TB (MDR-TB) burden countries identified by the World Health Organization.[113] Although the incidence of MDR-TB and extensively drug-resistant TB (XDR-TB) is relatively uncommon at present in Ontario,[114] rates may increase with continued immigration from high MDR-TB burden countries, as well as reactivation of latent TB infection among those who emigrated earlier from such countries.

In 2012, the highest incidence rates of active TB were reported in Toronto, Peel Region, and York Region public health units, with 10.5, 8.9, and 4.9 cases per 100,000 population, respectively (Map 54-1). These public health units have large urban centres in Ontario that tend to attract new immigrants[115] and have established communities of residents originating from countries with a high prevalence of TB. Therefore, the increased burden of active TB in these public health units may be due to the relatively higher proportion of immigrants, particularly those that arrive from high incidence TB countries.

In 2012, 5.0% (31/615) of active TB cases were reported as fatal (data not shown). While a number of TB cases are co-infected with HIV, the true extent of such cases is under-reported and unknown.

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 who are disproportionately affected by TB.[116] 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 off-reserve may not be identified as being First Nations in iPHIS due to incomplete origin information.

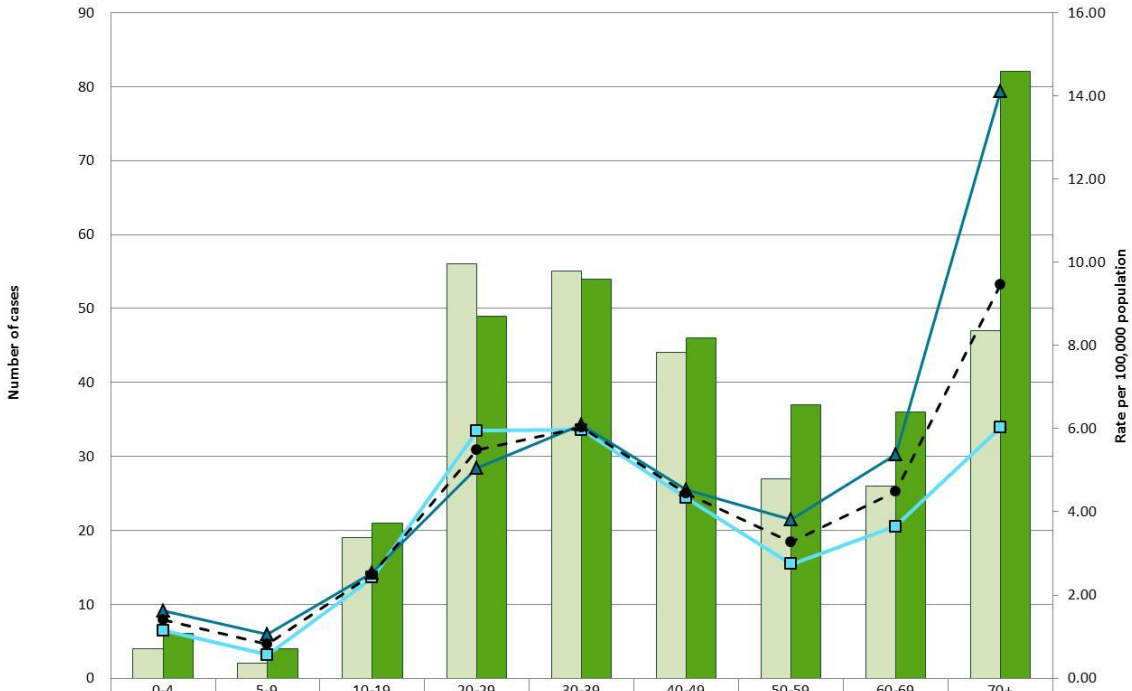
Figure 54-1. Incidence of Tuberculosis: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	671	738	695	669	692	624	633	647	661	615
Ontario Rate	5.48	5.96	5.55	5.28	5.41	4.83	4.84	4.89	4.95	4.55
Canada (Excl. ON) Rate	4.84	4.67	5.06	4.93	4.45	5.11	4.98	4.51	4.55	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.

Figure 54-2. Incidence of Tuberculosis by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	4	2	19	56	55	44	27	26	47
Male Count	6	4	21	49	54	46	37	36	82
Female Rate	1.14	0.56	2.42	5.95	5.97	4.33	2.75	3.64	6.02
Male Rate	1.63	1.06	2.54	5.05	6.10	4.54	3.82	5.38	14.11
Total Rate	1.39	0.82	2.48	5.49	6.04	4.43	3.28	4.48	9.47

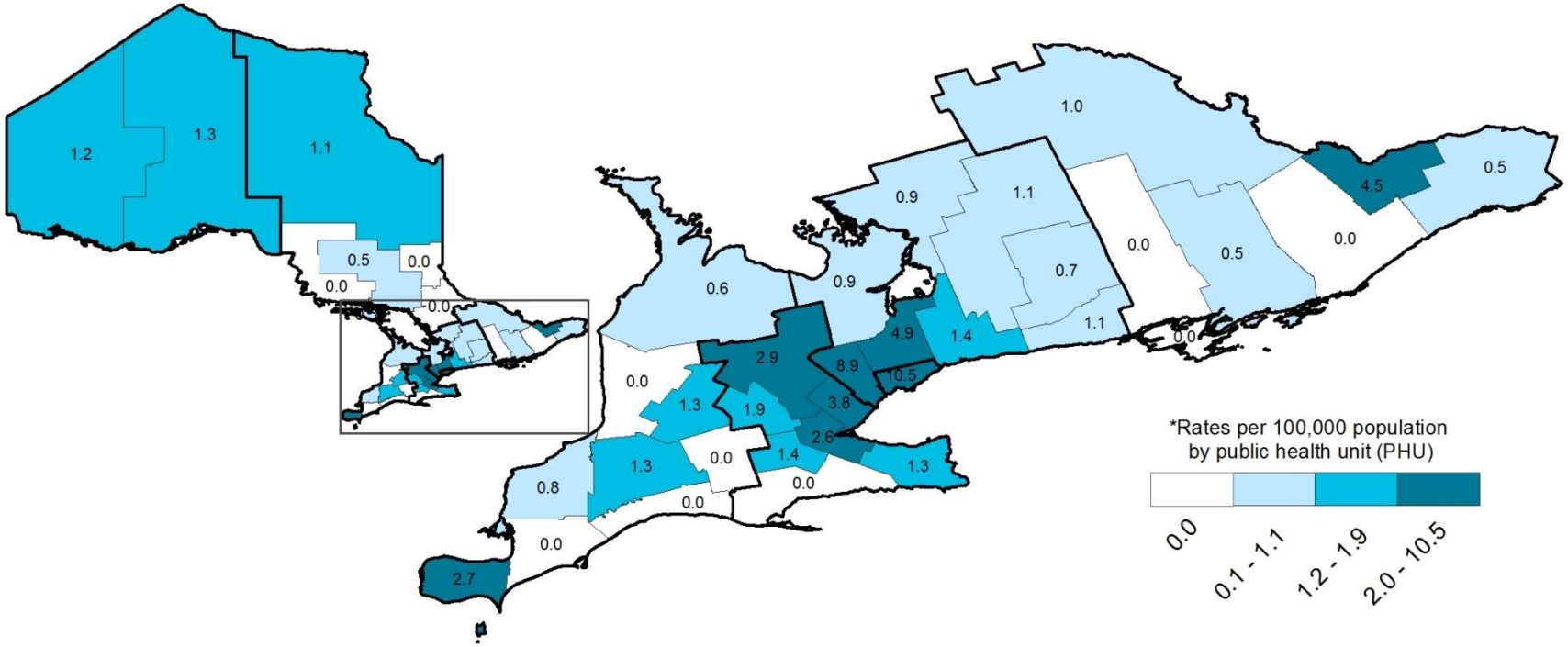
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Table 54-1. Tuberculosis Cases by Country of Birth: Ontario, 2007–12

Country of Birth	Diagnosis Year						Total
	2007	2008	2009	2010	2011	2012	
Born Outside Canada							
India	110	106	122	114	119	113	684
Philippines	70	88	88	81	90	97	514
China	73	60	57	57	56	57	360
Vietnam	34	37	28	42	38	35	214
Pakistan	38	27	17	26	25	33	166
Sri Lanka	29	22	12	21	24	18	126
Somalia	20	26	20	18	19	17	120
Hong Kong	19	14	13	17	13	12	88
Ethiopia	12	10	15	12	12	18	79
Bangladesh	15	8	11	14	7	14	69
Other	189	150	163	173	178	130	983
Unknown[*]	0	4	1	0	4	1	10
Total born outside Canada	***609***	***552***	***547***	***575***	***585***	***545***	***3413***
Born in Canada							
Inuit	1	2	1	1	4	2	11
Non-Aboriginal	48	53	71	52	58	57	339
Registered/Status Indian[†]*, Other Aboriginal*	13	7	10	5	7	4	46
Total born in Canada	***62***	***62***	***82***	***58***	***69***	***63***	***396***
Origin unknown/missing	**21**	**10**	**4**	**14**	**7**	**7**	**63**
TOTAL	**692**	**624**	**633**	**647**	**661**	**615**	**3872**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/05].
Notes: [*] Unknown: 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'.

Map 54-1. Incidence of Tuberculosis by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.00
BRN	2	1.41
CHK	0	0.00
DUR	9	1.41
ELG	0	0.00
EOH	1	0.50
GBO	1	0.61
HAL	20	3.80
HAM	14	2.57
HDN	0	0.00
HKP	2	1.11
HPE	0	0.00
HUR	0	0.00

PHU	Cases (n)	*Rates
KFL	1	0.50
LAM	1	0.76
LGL	0	0.00
MSL	6	1.29
NIA	6	1.34
NPS	0	0.00
NWR	1	1.22
OTT	41	4.46
OXF	0	0.00
PDH	1	1.30
PEE	124	8.92
PQP	1	1.15
PTC	1	0.72

PHU	Cases (n)	*Rates
REN	1	0.96
SMD	5	0.94
SUD	1	0.50
THB	2	1.27
TOR	292	10.46
TSK	0	0.00
WAT	10	1.86
WDG	8	2.85
WEC	11	2.72
YRK	53	4.88
Ontario	**615**	**4.55**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 55.

Tularemia

There was one confirmed case of tularemia reported in Ontario in 2012. Tularemia is a rare disease in the province. In the last ten years, eight cases have been reported in the province with five cases occurring from 2003 through 2005.

Chapter 56.

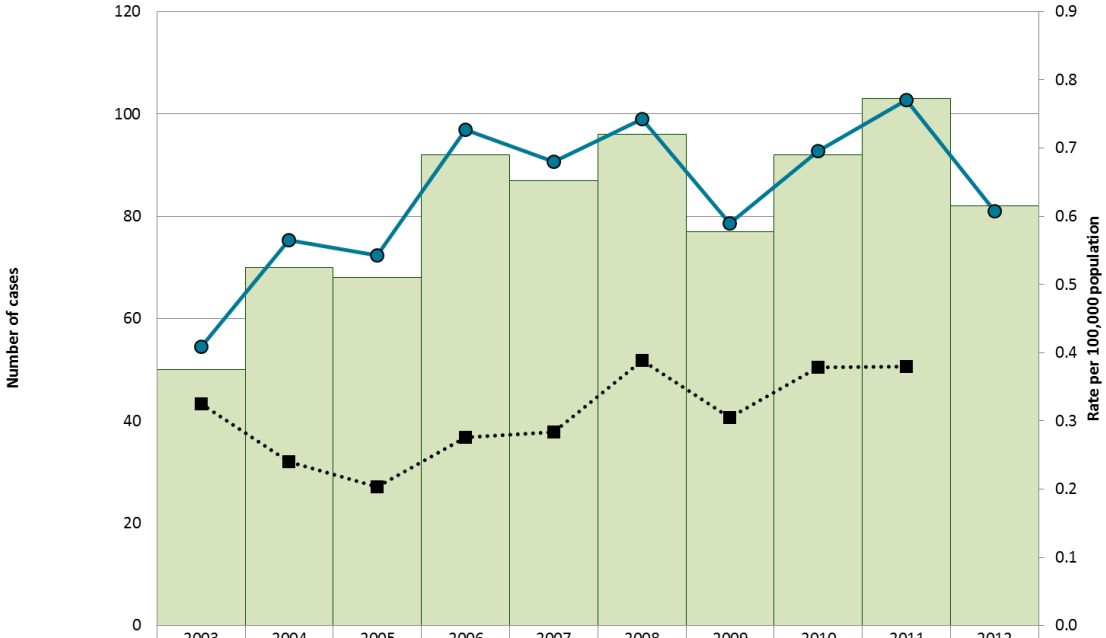
Typhoid Fever

Salmonella Typhi is the causative agent of typhoid fever (also known as enteric fever).[117] In 2012, 82 confirmed cases of typhoid fever were reported in Ontario, corresponding to an incidence rate of 0.6 cases per 100,000 population. Since 2003, the provincial incidence rate of typhoid fever has increased and is comparably higher than rest of Canada (Figure 56-1).

In 2012, incidence rate of typhoid fever was highest among younger age groups. More cases were reported among females than males; however, the reason for this is unknown. Due to low case counts in some age- and gender-specific strata, rates should be interpreted with caution (Figure 56-2). Hospitalization was reported for 37.8% (31/82) of cases. No deaths were reported.

Increases in disease due to typhoid fever are known to occur during peak travel periods;[117] however, a seasonal trend was not observed in Ontario in 2012 (Figure 56-3). Peel Region and Toronto reported the highest number of cases, with 45 cases reported in Peel Region and 22 cases reported in Toronto (Map 56-1). All other public health units reported fewer than five cases. In Ontario and elsewhere, over 80% of typhoid fever cases report travel to typhoid-endemic regions such as Indochina and South Asia during the incubation period for their infection.[83] The most common reasons for travel to typhoid-endemic countries in reported cases were to visit friends and relatives.[118] Additional information on typhoid fever is available in the February 2013 issue of Public Health Ontario's Monthly Infectious Diseases Surveillance Report.[83]

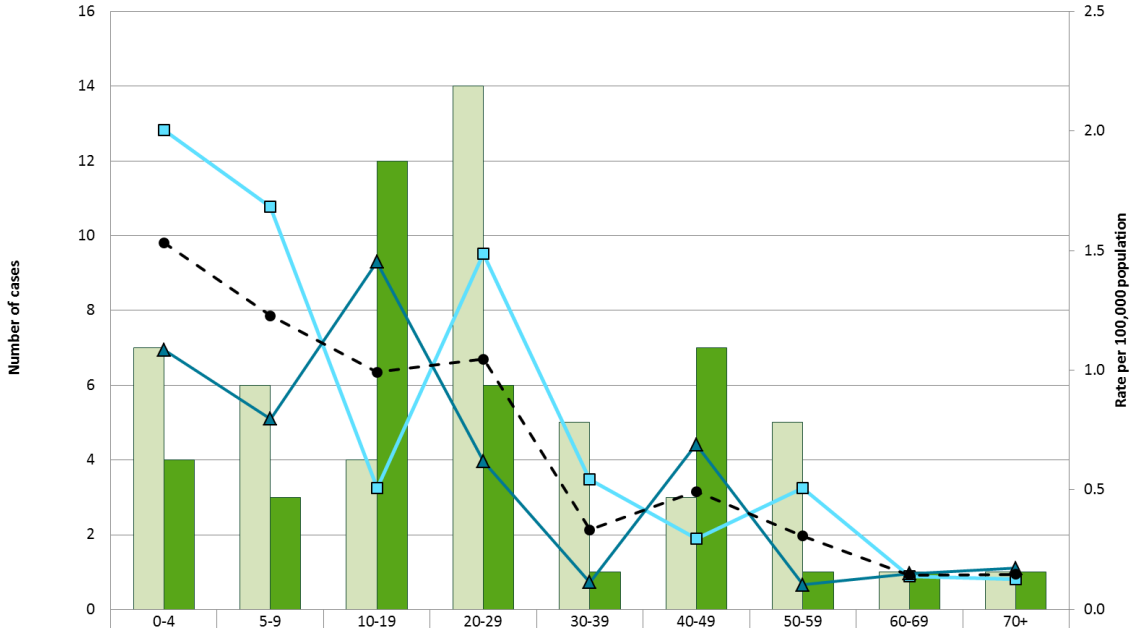
Figure 56-1. Incidence of Typhoid Fever: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	50	70	68	92	87	96	77	92	103	82
Ontario Rate	0.4	0.6	0.5	0.7	0.7	0.7	0.6	0.7	0.8	0.6
Canada (Excl. ON) Rate	0.3	0.2	0.2	0.3	0.3	0.4	0.3	0.4	0.4	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

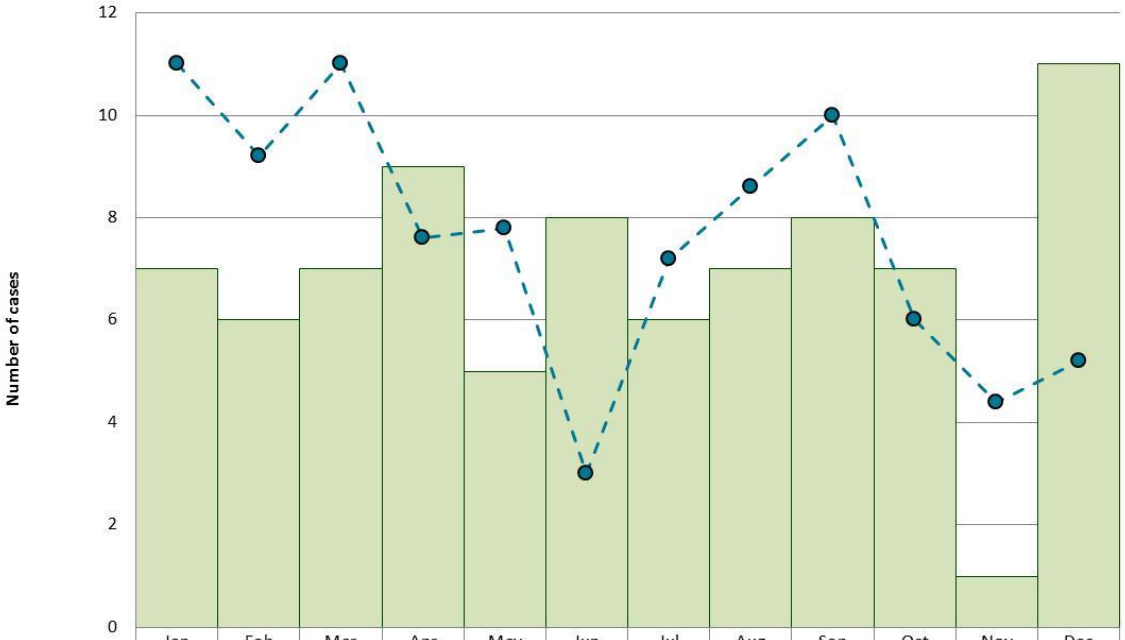
Figure 56-2. Incidence of Typhoid Fever by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	7	6	4	14	5	3	5	1	1
Male Count	4	3	12	6	1	7	1	1	1
Female Rate	2.0	1.7	0.5	1.5	0.5	0.3	0.5	0.1	0.1
Male Rate	1.1	0.8	1.5	0.6	0.1	0.7	0.1	0.1	0.2
Total Rate	1.5	1.2	1.0	1.0	0.3	0.5	0.3	0.1	0.1

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

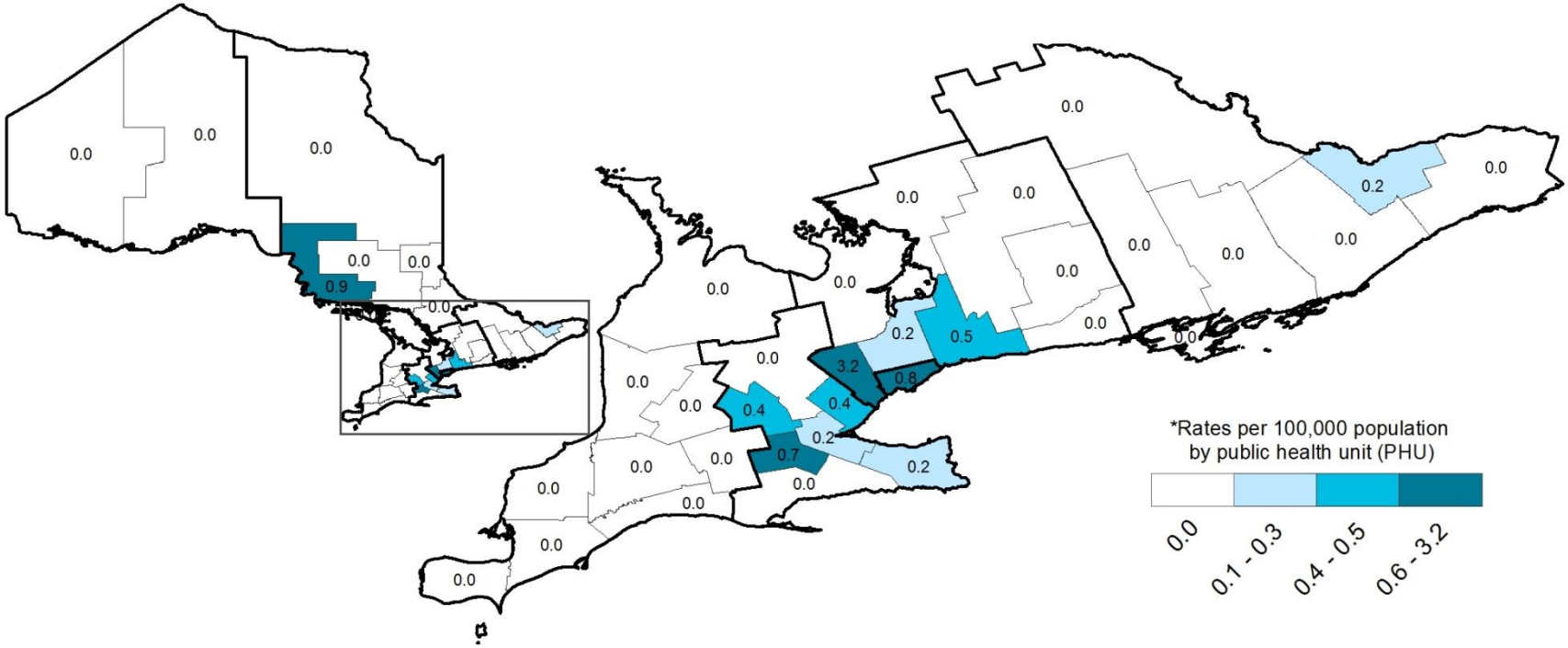
Figure 56-3. Number of Typhoid Fever Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	7	6	7	9	5	8	6	7	8	7	1	11
5-Yr Average	11.0	9.2	11.0	7.6	7.8	3.0	7.2	8.6	10.0	6.0	4.4	5.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 56-1. Incidence of Typhoid Fever by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	1	0.9
BRN	1	0.7
CHK	0	0
DUR	3	0.5
ELG	0	0
EOH	0	0
GBO	0	0
HAL	2	0.4
HAM	1	0.2
HDN	0	0
HKP	0	0
HPE	0	0
HUR	0	0

PHU	Cases (n)	*Rates
KFL	0	0
LAM	0	0
LGL	0	0
MSL	0	0
NIA	1	0.2
NPS	0	0
NWR	0	0
OTT	2	0.2
OXF	0	0
PDH	0	0
PEE	45	3.2
PQP	0	0
PTC	0	0

PHU	Cases (n)	*Rates
REN	0	0
SMD	0	0
SUD	0	0
THB	0	0
TOR	22	0.8
TSK	0	0
WAT	2	0.4
WDG	0	0
WEC	0	0
YRK	2	0.2
Ontario	**82**	**0.6**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 57.

Varicella (Chickenpox)

Varicella, commonly known as chickenpox, is a primary infection caused by the varicella-zoster virus. A vaccine against varicella was authorized for use in Canada in December 1998.[119] In September 2004, a publicly funded program was introduced in Ontario for children at 15 months of age without a history of chickenpox. A two-dose varicella program was introduced in August 2011, with the first dose recommended at 15 months of age and the second dose at 4 to 6 years of age given in combination with measles, mumps, and rubella (MMRV) vaccine.[31] All children born on or after January 1, 2000, were also eligible to receive a second dose of publicly funded varicella vaccine.[31]

In Ontario, cases of varicella are reported provincially via iPHIS, both individually and in aggregate numbers.[120] Herpes zoster is not a reportable disease in Ontario although it is caused by the same virus as varicella. Laboratory-confirmed cases, hospitalized cases, and cases with complications including death are reported as individual cases in iPHIS.[121] In addition, all public health units are requested to report monthly aggregate counts of varicella broken down by predefined age groups. Aggregate counts represent the total number of cases occurring in a public health unit jurisdiction in a specific age group and by month. They do not contain individual case details, 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.[122] Public health units receive reports of cases from health care providers, schools, child care facilities, and parents, which establish the data used for provincial reporting of aggregate varicella counts. Aggregate counts are requested from the public health units regardless of whether any cases were observed in a given month. This chapter only presents varicella data that was reported provincially as aggregate cases. Counts from 2005 and 2006 were excluded due to data incompleteness, as aggregate reporting of varicella in iPHIS began in late 2006.

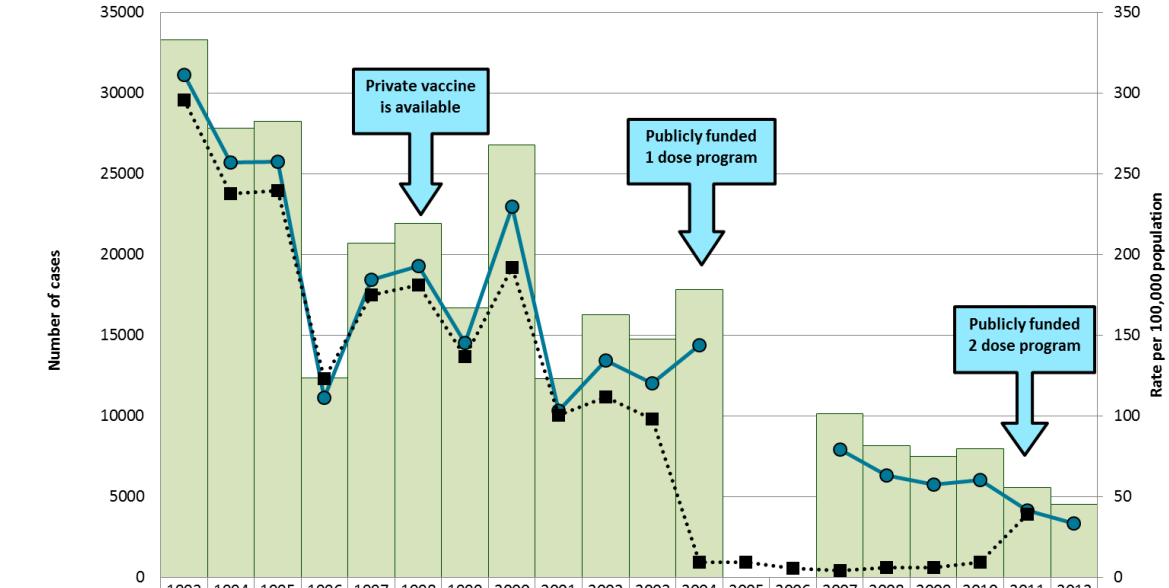
Varicella continues to be endemic in Ontario. There were 4,535 aggregate cases reported in 2012. The incidence of varicella declined from 311.4 cases per 100,000 population in 1993 to 33.6 cases per 100,000 population in 2012 (Figure 57-1). The annual reported incidence of varicella in Ontario was higher than the Canadian incidence in all years except 1996. However, it should be noted that the Canadian rate does not include counts from all provinces and territories (see notes for Figure 57-1).

In 2012, the highest incidence of varicella was observed in the 5–9 year age group with 2,264 cases (309.0 cases per 100,000 population), accounting for 49.9% of total cases that occurred in that year. The 10–14 year age group was associated with the second highest incidence, followed closely by the 1–4 year age group (Figure 57-2). 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; however, this could be due to reporting bias. The public health unit-specific incidence rates ranged widely from 0.0 to 193.4 cases per 100,000 population in 2012 (Map 57-1). It is unclear as to whether the absence of cases observed in four public health units reflects a true absence of disease in those regions or a lack of reporting. Based on the five-year average, the number of varicella cases peaked in May and declined over the summer months with lowest counts in July and August (Figure 57-3). Cases in 2012 had a similar distribution.

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 not known, 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).

Despite the challenges associated with aggregate reporting, this data still provide valuable information regarding the epidemiology of varicella in Ontario and are useful for monitoring trends over time. The decrease in varicella incidence in the province since the introduction of the vaccination program suggests that the vaccine has had a positive impact on reducing disease incidence.[123]

Figure 57-1. Annual Incidence of Varicella (Chickenpox): Ontario and Canada, 1993–2012

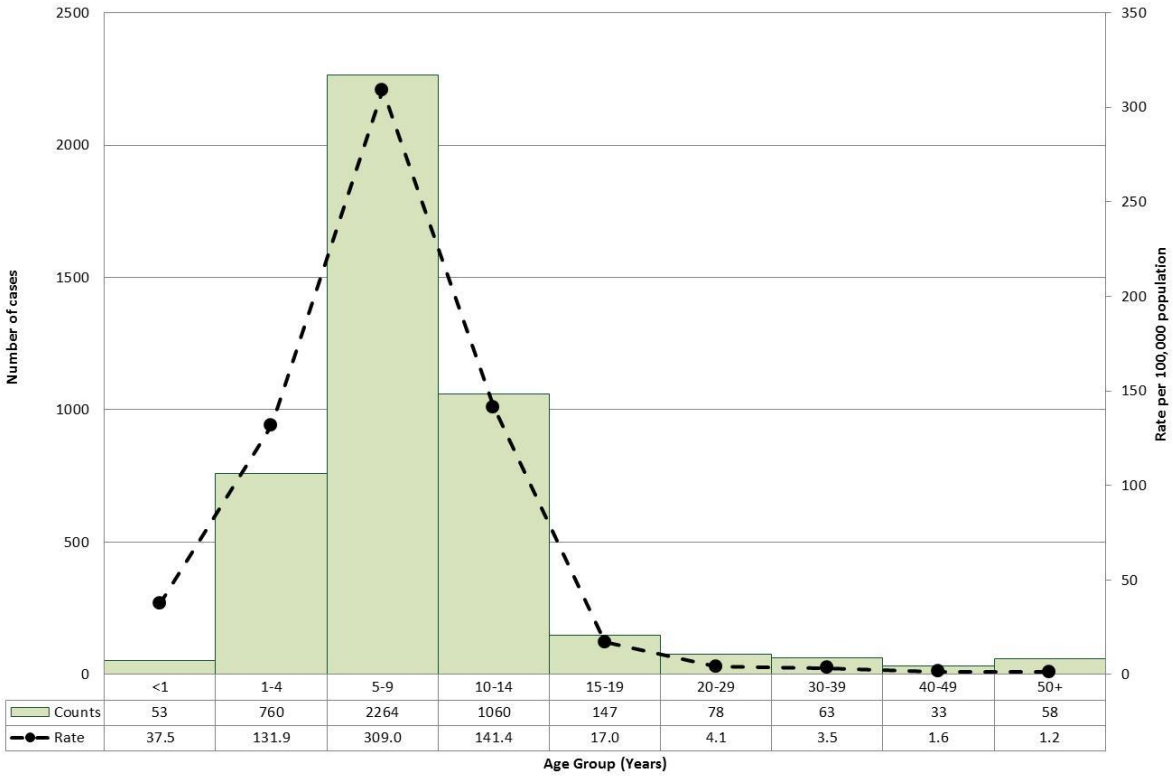


	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	33289	27826	28229	12351	20695	21950	16700	26812	12319	16274	14743	17819			10161	8165	7524	7980	5549	4535
Ontario Rate	311.4	257.0	257.4	111.4	184.3	193.1	145.2	229.5	103.6	134.6	120.4	143.8			79.4	63.1	57.6	60.3	41.5	33.6
Canadian Rate	296.0	238.0	239.6	123.1	174.9	180.9	137.0	192.2	100.7	111.9	98.3	9.6	9.6	5.6	4.4	6.0	6.0	9.5	39.1	

Ontario Cases (1993-2004): MOHLTC, Ontario Public Health Portal, extracted [2012/05/24].
Ontario Cases (2007-2012): MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/17].
Ontario Population: Population Estimates [1993-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Aggregate counts for 2005 are not available. Aggregate counts for 2006 are incomplete as the reporting began in late 2006.
Note: Some provinces and territories did not report on varicella in certain years. The population of these provinces and territories have been removed for Canadian rate calculation. Provinces and territories that did not report on varicella include:

a. 1991-1992: Manitoba, Ontario and Quebec
b. 1993-1995: British Columbia, Manitoba and Quebec
c. 1996-1997: British Columbia, Manitoba, Quebec and Saskatchewan
d. 1998-2000: British Columbia, Manitoba and Quebec
e. 2001-2008: British Columbia, Manitoba, Quebec and Saskatchewan
f. 2009-2010: British Columbia, Manitoba, Nova Scotia, Quebec, Saskatchewan, and Yukon Territories
g. 2011: British Columbia, Manitoba, Nova Scotia, Ontario, Quebec, Saskatchewan, and Yukon Territories

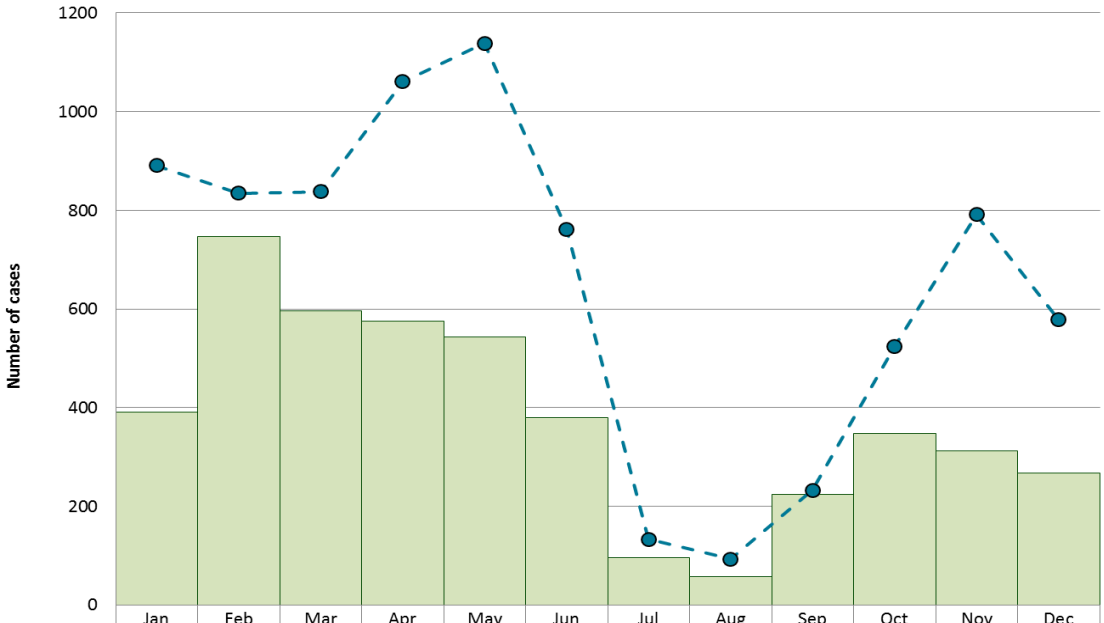
Figure 57-2. Annual Incidence of Varicella (Chickenpox) by Age: Ontario, 2012



	<1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50+
Counts	53	760	2264	1060	147	78	63	33	58
Rate	37.5	131.9	309.0	141.4	17.0	4.1	3.5	1.6	1.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/17].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].
Note: Excludes 19 cases of unknown age.

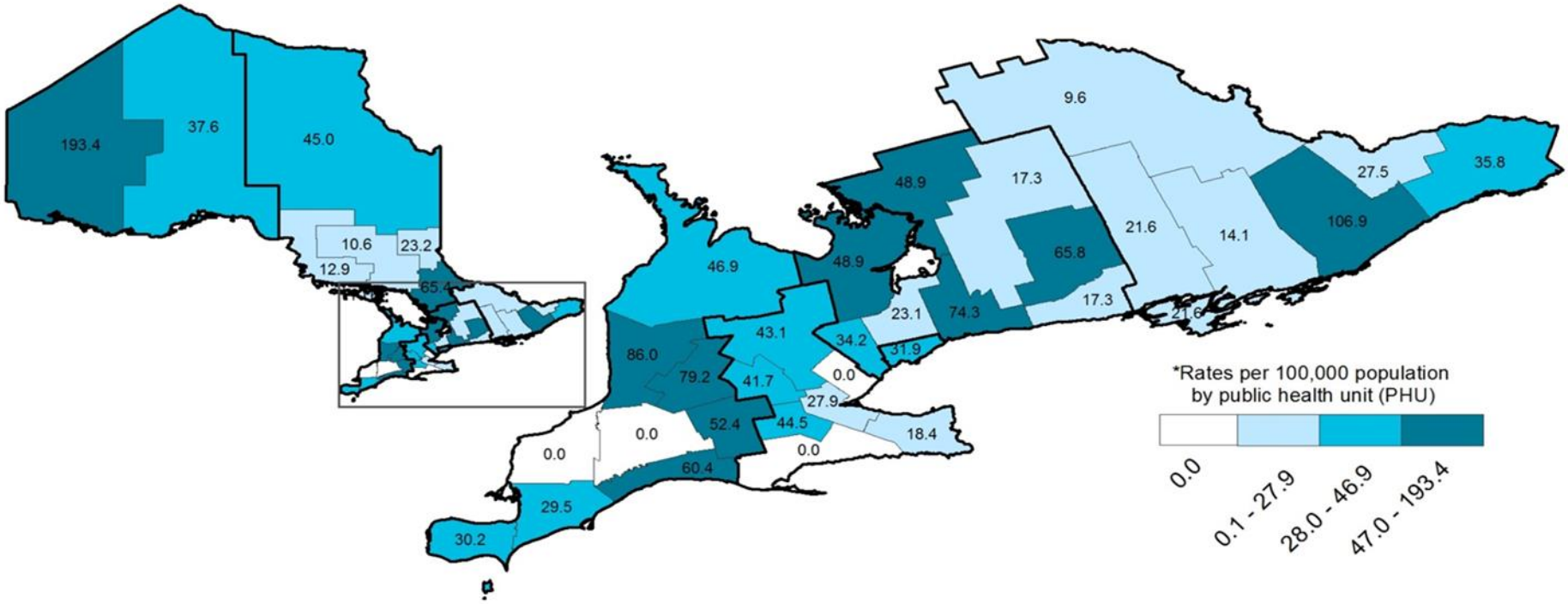
Figure 57-3. Number of Varicella (Chickenpox) Cases in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012 Count	391	747	596	575	543	380	96	57	224	347	312	267
5-Yr Average (2007-2011)	891	835	838	1061	1138	761	133	93	233	524	791	578

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/17].

Map 57-1. Incidence of Varicella (Chickenpox) by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	15	12.9
BRN	63	44.5
CHK	32	29.5
DUR	474	74.3
ELG	55	60.4
EOH	72	35.8
GBO	77	46.9
HAL	0	0.0
HAM	152	27.9
HDN	0	0.0
HKP	31	17.3
HPE	35	21.6
HUR	52	86.0

PHU	Cases (n)	*Rates
KFL	28	14.1
LAM	0	0.0
LGL	181	106.9
MSL	0	0.0
NIA	82	18.4
NPS	83	65.4
NWR	159	193.4
OTT	253	27.5
OXF	57	52.4
PDH	61	79.2
PEE	476	34.2
PQP	39	45.0
PTC	92	65.8

PHU	Cases (n)	*Rates
REN	10	9.6
SMD	259	48.9
SUD	21	10.6
THB	59	37.6
TOR	891	31.9
TSK	8	23.2
WAT	224	41.7
WDG	121	43.1
WEC	122	30.2
YRK	251	23.1
Ontario	**4535**	**33.6**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/12/17].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/16].

Chapter 58.

Verotoxin-producing *E. coli* infection indicator conditions, including Hemolytic Uremic Syndrome

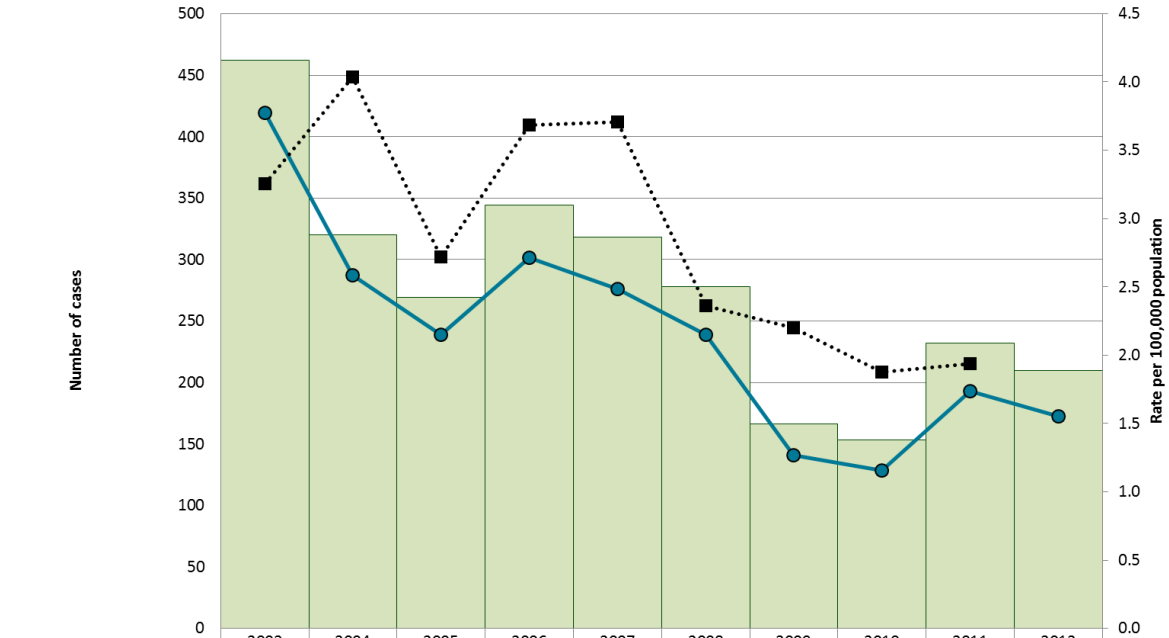
In 2012, 210 confirmed cases of verotoxin-producing *E. coli* infections (VTEC) were reported in Ontario, representing an incidence rate of 1.6 cases per 100,000 population. The majority of VTEC cases reported (78.6%, 165/210 cases) were due to the O157:H7 serotype. Since 2003, the provincial incidence rate for VTEC has declined. With the exception of 2003, the provincial incidence rate has remained below the national rate, although national data for 2012 was not available at the time of writing (Figure 58-1).

In Ontario in 2012, the age-specific incidence rates for VTEC infections were highest among children under the age of five and then decreased with increasing age (Figure 58-2). The health care-seeking behaviour of parents, as well as the challenges of maintaining good hygiene practices for young children, may account for the higher incidence among the younger age groups. A consistent trend by sex was not observed. Hospitalization was reported for 24.8% (52/210 cases) of VTEC cases, and death was reported for two cases. Three cases reported hemolytic uremic syndrome (HUS).

A seasonal increase in VTEC is typically observed in Ontario in the warmer months. In 2012, the number of cases increased in July and August (Figure 58-3). However, numbers of cases by month may also be affected when clusters or outbreaks occur as described below. The highest incidence rate by public health unit for VTEC in 2012 was reported in Perth District at 11.7 cases per 100,000 population which resulted from nine reported cases, three of which were linked to a local outbreak at a daycare facility (Map 58-1). The observed variability in incidence rates by age, sex, and public health unit should be interpreted with caution due to low case counts in some strata, which may be exacerbated by small denominators.

In 2012, there were several cluster and outbreak investigations involving VTEC. In March, cases distributed across two provinces, including one case reported in Ontario, were linked to a national investigation involving recalled ground beef. In November, Ontario participated in a second national investigation involving four provinces. However, no Ontario cases were linked to the November outbreak. In December, another national cluster involving cases distributed across two provinces, including five cases in Ontario, was investigated. Outbreak cases were linked to a specific brand of frozen hamburgers. It is believed that thick, frozen hamburgers, such as those involved in this outbreak, may pose additional risk of VTEC as compared to other burgers, as consumers may not allow enough preparation time to thaw and cook the product thoroughly. Additional information on VTEC in Ontario is available in the July 2013 issue of Public Health Ontario's Monthly Infectious Diseases Surveillance Report.[124]

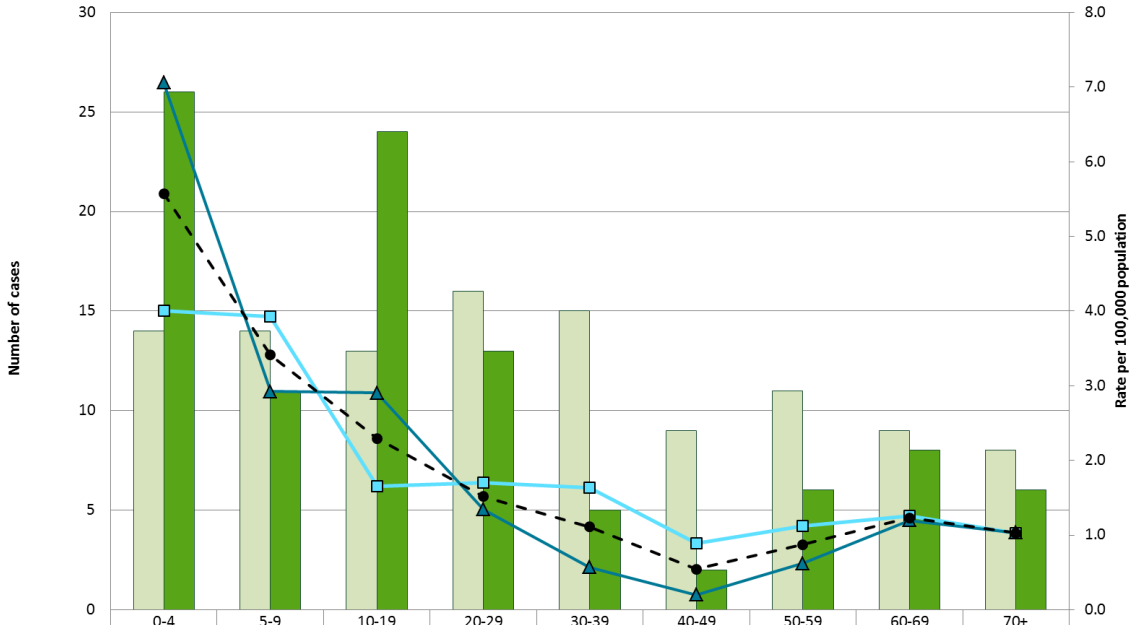
Figure 58-1. Incidence of VTEC: Ontario and Canada, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	462	320	269	344	318	278	166	153	232	210
Ontario Rate	3.8	2.6	2.1	2.7	2.5	2.1	1.3	1.2	1.7	1.6
Canada (Excl. ON) Rate	3.3	4.0	2.7	3.7	3.7	2.4	2.2	1.9	1.9	

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2013/12/16]; national data available up to 2011.
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

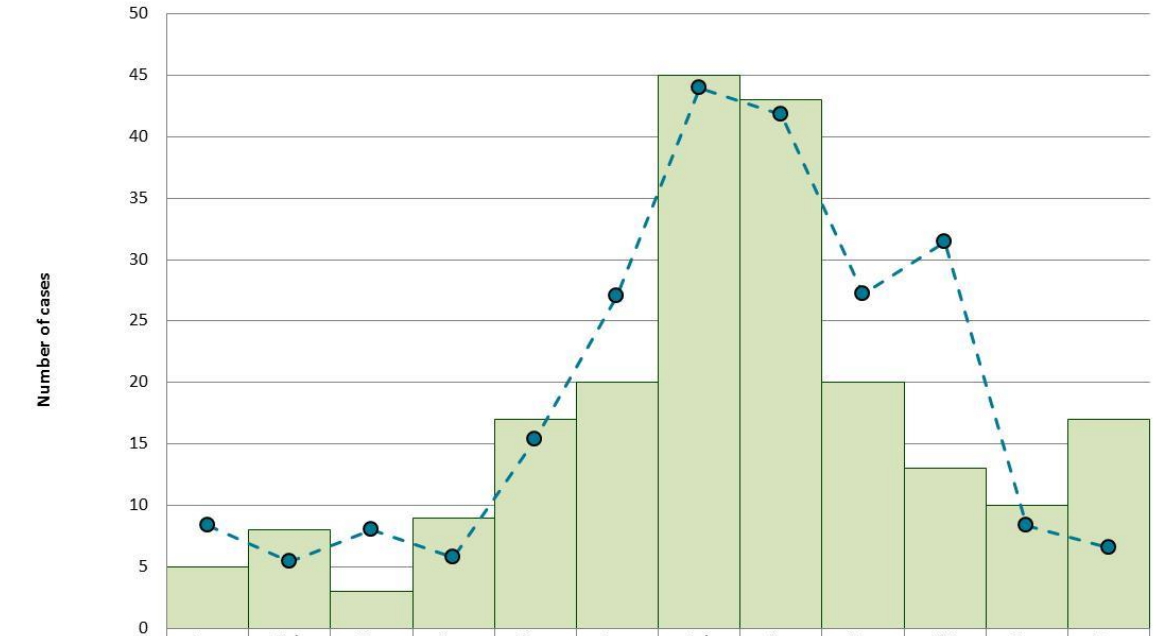
Figure 58-2. Incidence of VTEC by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	14	14	13	16	15	9	11	9	8
Male Count	26	11	24	13	5	2	6	8	6
Female Rate	4.0	3.9	1.7	1.7	1.6	0.9	1.1	1.3	1.0
Male Rate	7.1	2.9	2.9	1.3	0.6	0.2	0.6	1.2	1.0
Total Rate	5.6	3.4	2.3	1.5	1.1	0.5	0.9	1.2	1.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

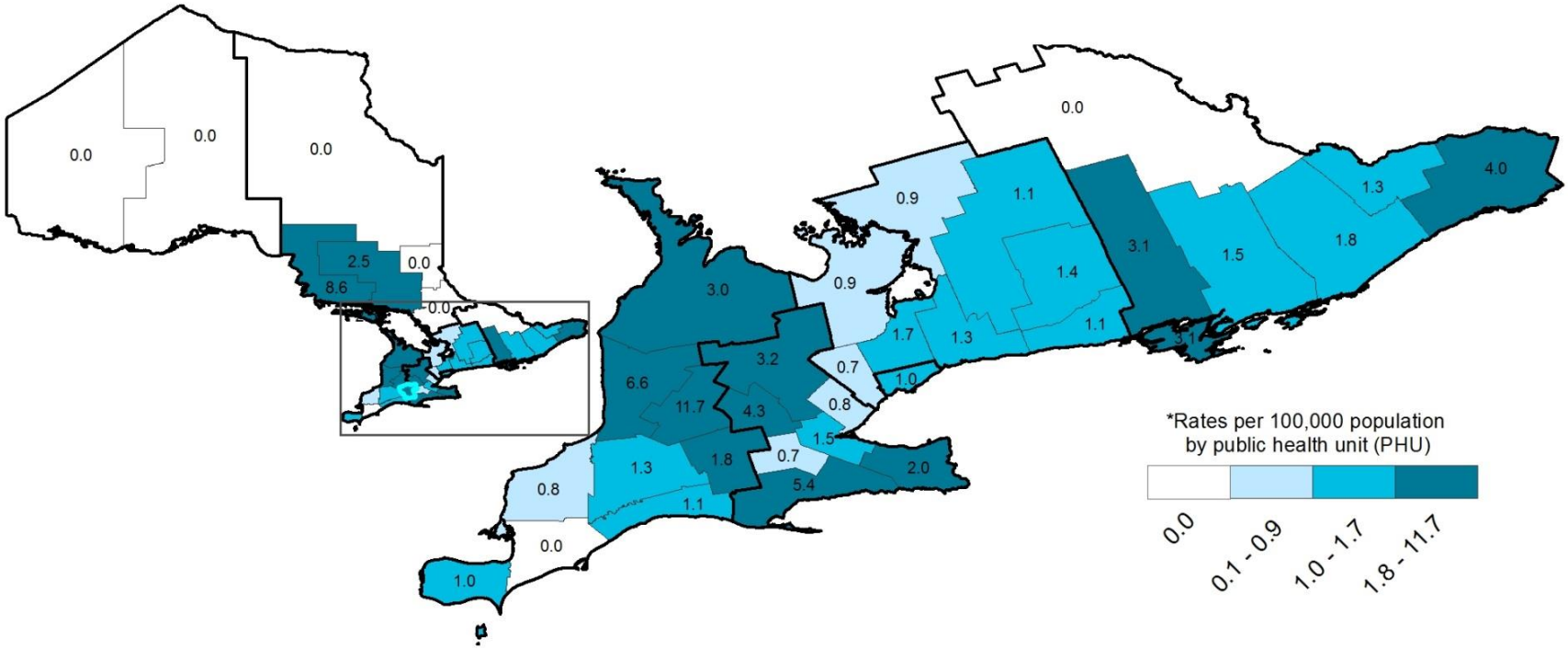
Figure 58-3. Number of VTEC Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	5	8	3	9	17	20	45	43	20	13	10	17
5-Yr Average	8.4	5.4	8.0	5.8	15.4	27.0	44.0	41.8	27.2	31.4	8.4	6.6

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 58-1. Incidence of VTEC by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	10	8.6
BRN	1	0.7
CHK	0	0.0
DUR	8	1.3
ELG	1	1.1
EOH	8	4.0
GBO	5	3.1
HAL	4	0.8
HAM	8	1.5
HDN	6	5.4
HKP	2	1.1
HPE	5	3.1
HUR	4	6.6

PHU	Cases (n)	*Rates
KFL	3	1.5
LAM	1	0.8
LGL	3	1.8
MSL	6	1.3
NIA	9	2.0
NPS	0	0.0
NWR	0	0.0
OTT	12	1.3
OXF	2	1.8
PDH	9	11.7
PEE	10	0.7
PQP	0	0.0
PTC	2	1.4

PHU	Cases (n)	*Rates
REN	0	0.0
SMD	5	0.9
SUD	5	2.5
THB	0	0.0
TOR	27	1.0
TSK	0	0.0
WAT	23	4.3
WDG	9	3.2
WEC	4	1.0
YRK	18	1.7
Ontario	**210**	**1.6**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 59.

West Nile Virus Illness

West Nile Virus (WNV) is a mosquito-borne disease primarily transmitted to humans by mosquitoes. In Ontario, the main mosquito vector species for WNV transmission is *Culex pipiens/restuans*. In 2012, there were 271 probable and confirmed cases of WNV illness reported in Ontario, representing the highest number of cases reported since 2003 (Figure 59-1). The incidence rate in 2012 was 2.0 cases per 100,000 population. In 2012, 31.7% (86/271) of WNV cases were hospitalized and death was reported in 2.2% (6/271) of cases.

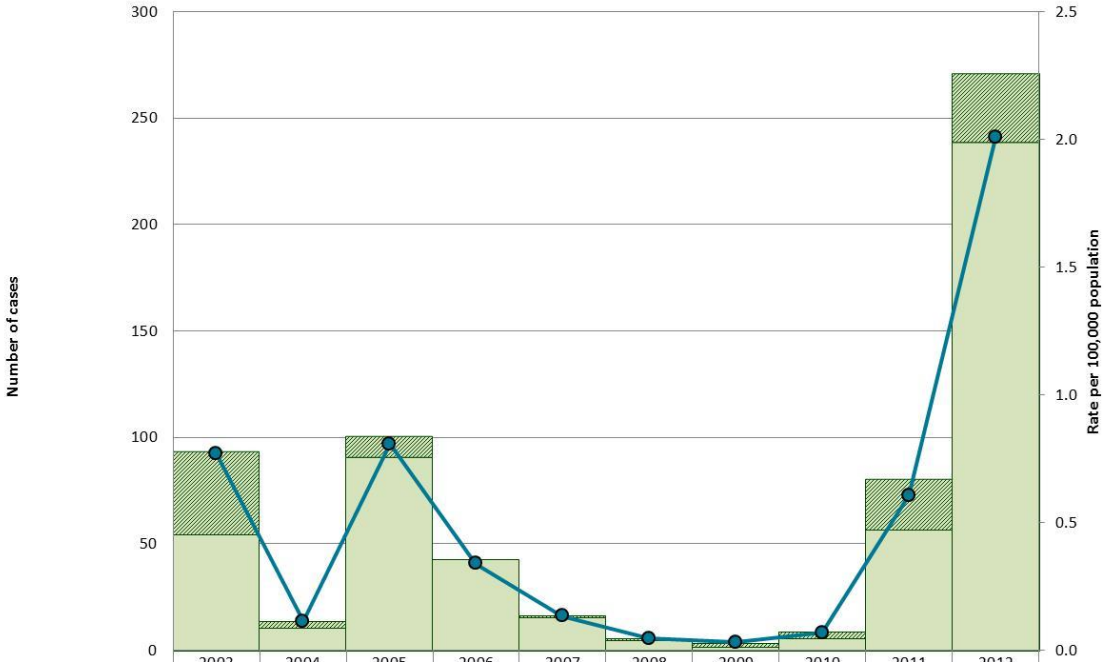
The majority of WNV human cases are asymptomatic.[125] Cases are primarily observed in the elderly and the highest incidence rates in 2012 were reported in those 50 years and older (Figure 59-2).

WNV cases in Ontario were predominantly reported during the warmer months from July to September, with August having the highest reported totals (Figure 59-3). As WNV is transmitted by mosquitoes and their lifecycle is heavily influenced by weather, year-to-year fluctuations in reported cases are expected. The year 2009 had one of the lowest levels of human and mosquito numbers and according to Environment Canada, was one of the coolest summers on record; while 2012 was one of the warmest[126] and it was the year with the second largest number of positive mosquito pools and human cases in Ontario.

C. pipiens/restuans is an urban-dwelling mosquito with a preference for catch basins during early stages of development. For this reason, the majority of human WNV cases are reported in urban settings (Map 59-1).

Additional information on WNV can be found in the December 2012 issue of Public Health Ontario's Monthly Infectious Diseases Surveillance Report, the weekly WNV Surveillance Reports, and the 2012 Vector-Borne Diseases Summary Report.[127,128,62]

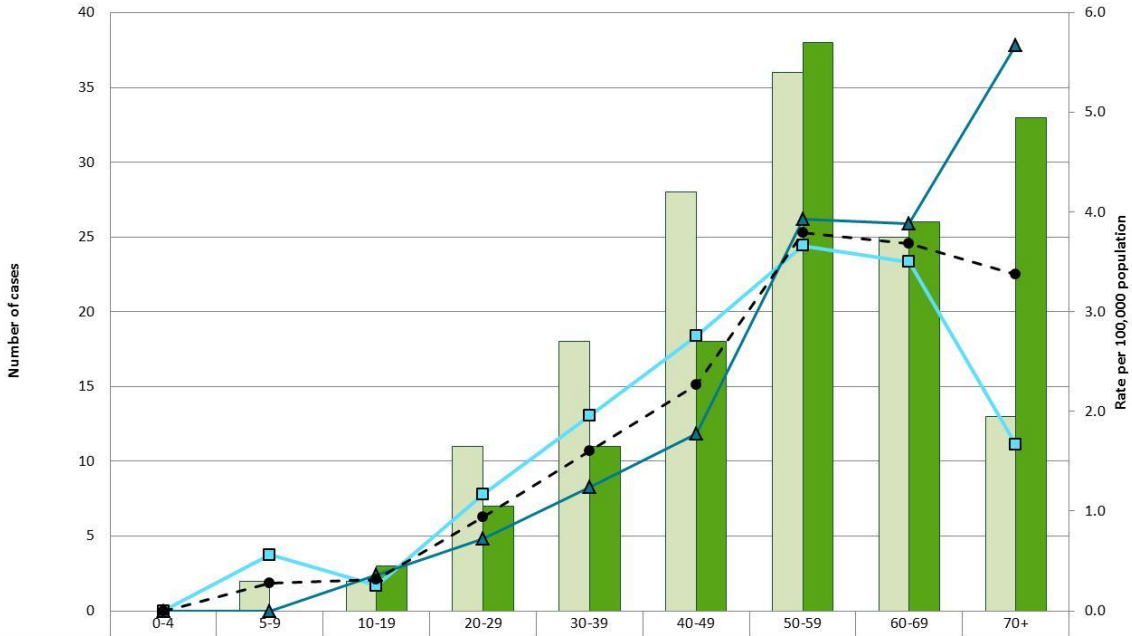
Figure 59-1. Incidence of Confirmed and Probable West Nile Virus Illness: Ontario, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count (Probable)	39	3	10	0	1	1	2	3	24	32
Ontario Count (Confirmed)	55	11	91	43	16	5	2	6	57	239
Ontario Rate	0.8	0.1	0.8	0.3	0.1	0.0	0.0	0.1	0.6	2.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: National incidence rates for WNV are not available. Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

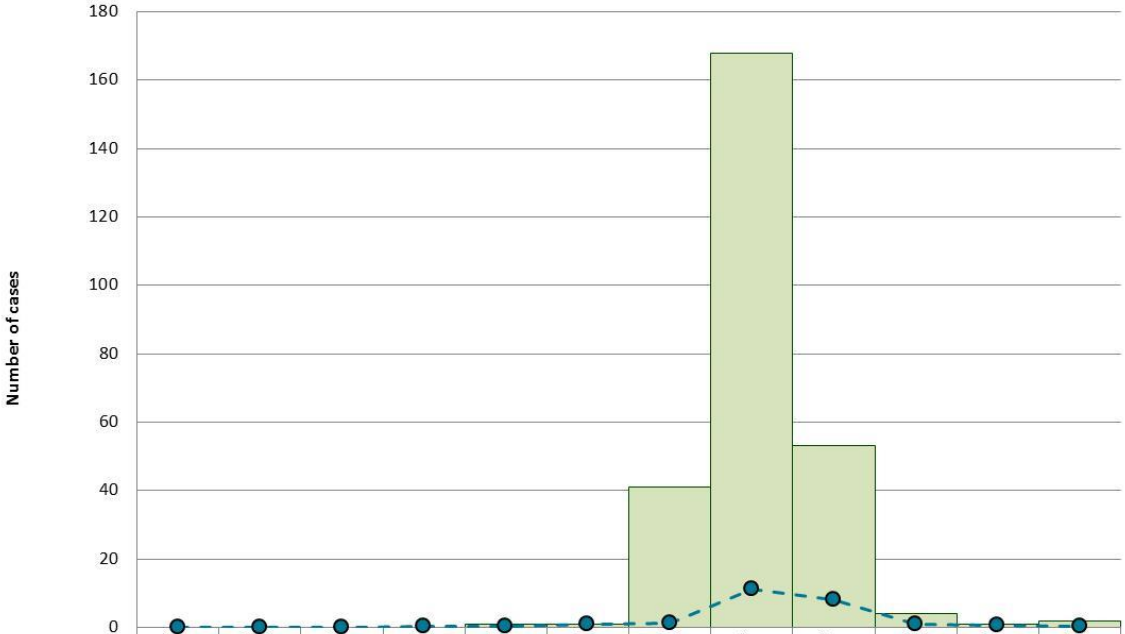
Figure 59-2. Incidence of Confirmed and Probable West Nile Virus Illness by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	0	2	2	11	18	28	36	25	13
Male Count	0	0	3	7	11	18	38	26	33
Female Rate	0.0	0.6	0.3	1.2	2.0	2.8	3.7	3.5	1.7
Male Rate	0.0	0.0	0.4	0.7	1.2	1.8	3.9	3.9	5.7
Total Rate	0.0	0.3	0.3	0.9	1.6	2.3	3.8	3.7	3.4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

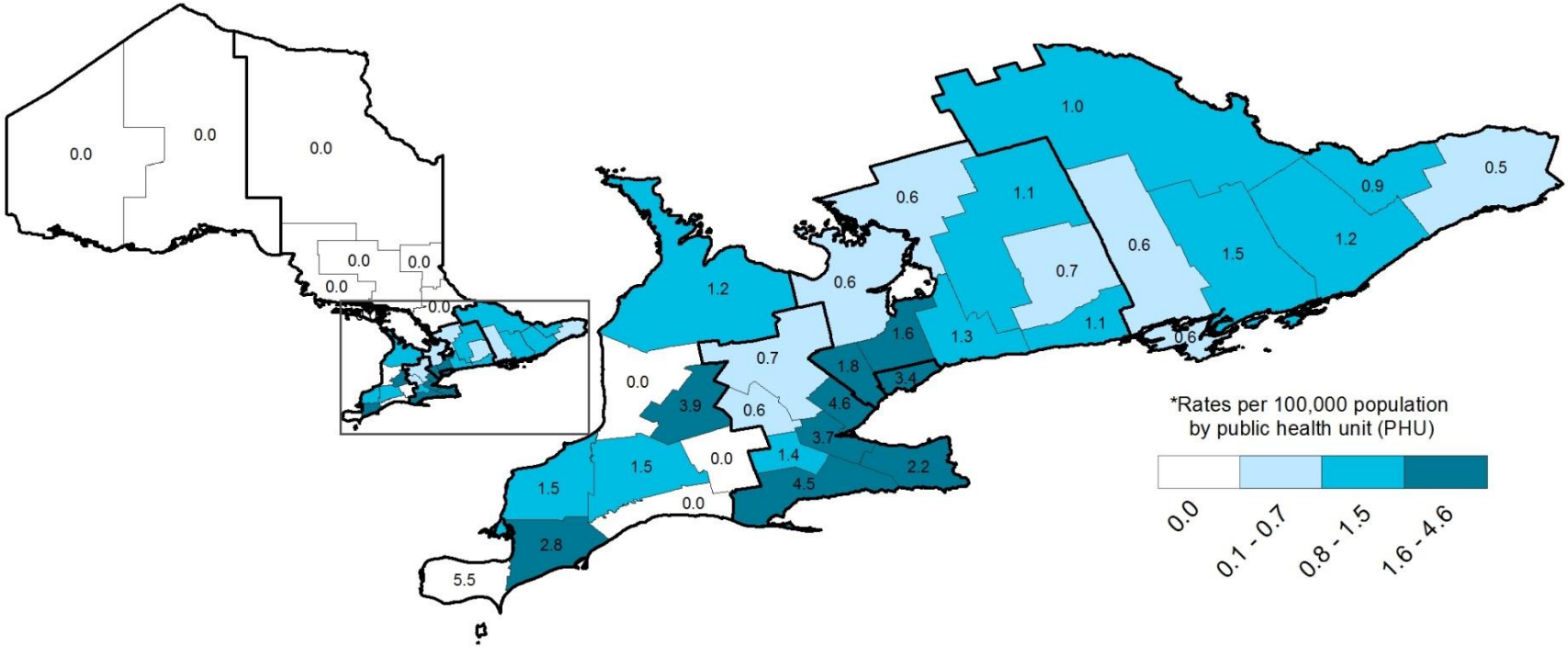
Figure 59-3. Number of Confirmed and Probable West Nile Virus Illness Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	0	0	0	0	1	1	41	168	53	4	1	2
5-Yr Average	0.0	0.0	0.0	0.2	0.2	0.8	1.2	11.2	8.0	1.0	0.6	0.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 59-1. Incidence of Confirmed and Probable West Nile Virus Illness by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	0	0.0
BRN	2	1.4
CHK	3	2.8
DUR	8	1.3
ELG	0	0.0
EOH	1	0.5
GBO	2	1.2
HAL	24	4.6
HAM	20	3.7
HDN	5	4.5
HKP	2	1.1
HPE	1	0.6
HUR	0	0.0

PHU	Cases (n)	*Rates
KFL	3	1.5
LAM	2	1.5
LGL	2	1.2
MSL	7	1.5
NIA	10	2.2
NPS	0	0.0
NWR	0	0.0
OTT	8	0.9
OXF	0	0.0
PDH	3	3.9
PEE	25	1.8
PQP	0	0.0
PTC	1	0.7

PHU	Cases (n)	*Rates
REN	1	1.0
SMD	3	0.6
SUD	0	0.0
THB	0	0.0
TOR	94	3.4
TSK	0	0.0
WAT	3	0.6
WDG	2	0.7
WEC	22	5.4
YRK	17	1.6
Ontario	**271**	**2.0**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

Chapter 60.

Yellow Fever

Yellow fever is a travel-related mosquito-borne disease. From 2003 to 2011, there were no reported cases of yellow fever in Ontario. In 2012, there were two confirmed cases reported in Ontario, both cases were travel-related; one was associated with travel to South America while the other was associated with travel to Africa.

Chapter 61.

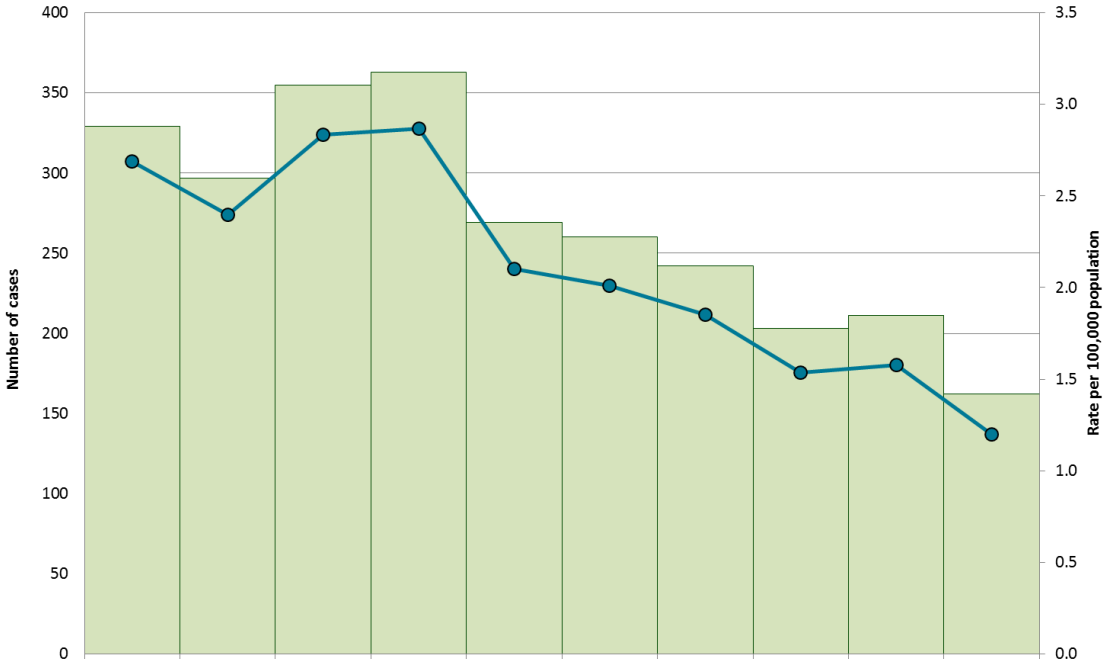
Yersiniosis

In 2012, 162 confirmed cases of yersiniosis were reported in Ontario, which corresponds to an incidence rate of 1.2 cases per 100,000 population. Since 2006, the provincial incidence rate has declined; however, the reason for the decline is not known (Figure 61-1). Yersiniosis is not nationally notifiable.

The age-specific incidence rate of yersiniosis was highest among children 0 to 4 years of age (Figure 61-2). In 2012, 6% (10/162) of cases were hospitalized and one death was reported.

Although a seasonal increase for yersiniosis tends to occur during the winter season in temperate climate regions,[129] a seasonal trend was not observed in Ontario in 2012 (Figure 61-3). Incidence rates for yersiniosis by public health unit are shown in Map 61-1. However, due to low case counts in some jurisdictions, rates should be interpreted with caution.

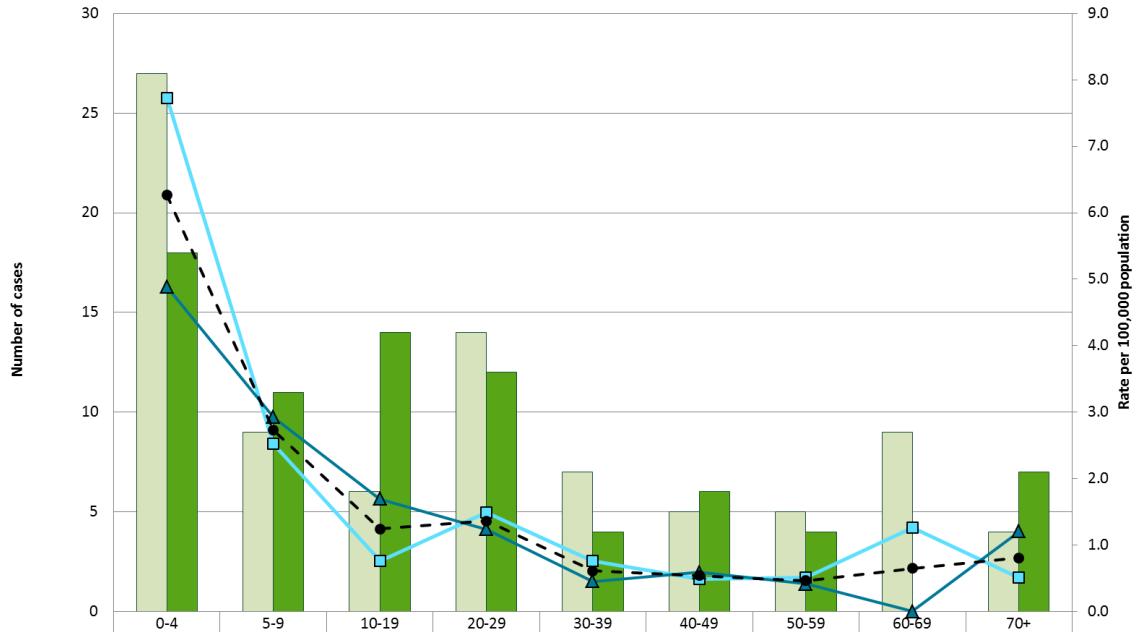
Figure 61-1. Incidence of Yersiniosis: Ontario, 2003–12



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ontario Count	329	297	355	363	269	260	242	203	211	162
Ontario Rate	2.7	2.4	2.8	2.9	2.1	2.0	1.9	1.5	1.6	1.2

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Yersiniosis is not a nationally notifiable disease. Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

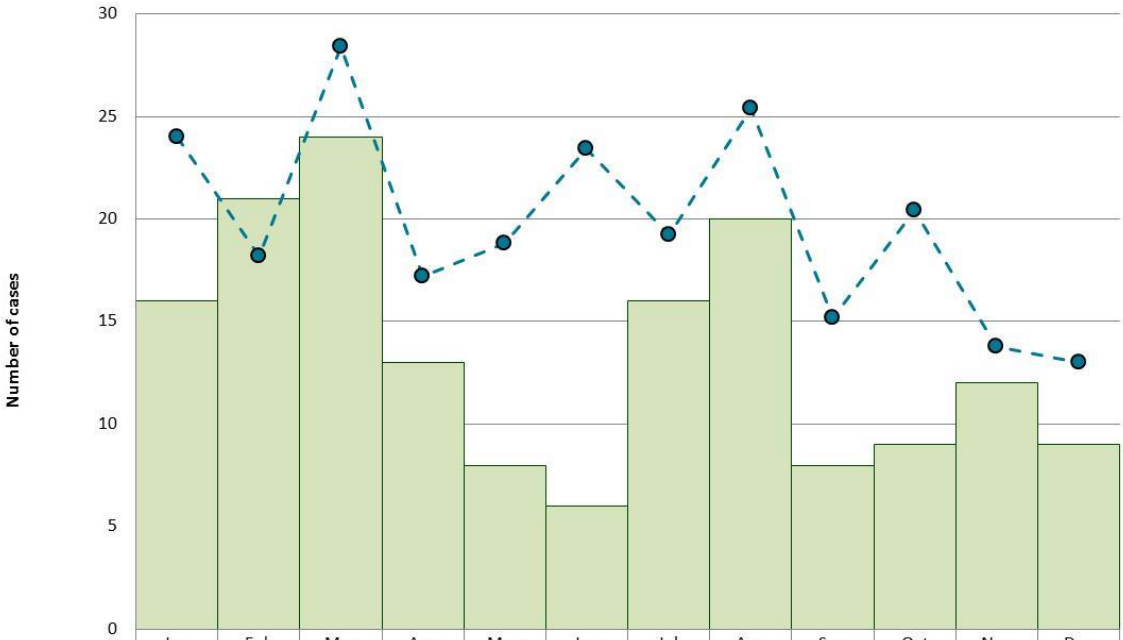
Figure 61-2. Incidence of Yersiniosis by Age and Sex: Ontario, 2012



	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Female Count	27	9	6	14	7	5	5	9	4
Male Count	18	11	14	12	4	6	4	0	7
Female Rate	7.7	2.5	0.8	1.5	0.8	0.5	0.5	1.3	0.5
Male Rate	4.9	2.9	1.7	1.2	0.5	0.6	0.4	0.0	1.2
Total Rate	6.3	2.7	1.2	1.4	0.6	0.5	0.5	0.7	0.8

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Note: Discrepancies in the rates graphed and presented in the data table for this figure may occur due to rounding.

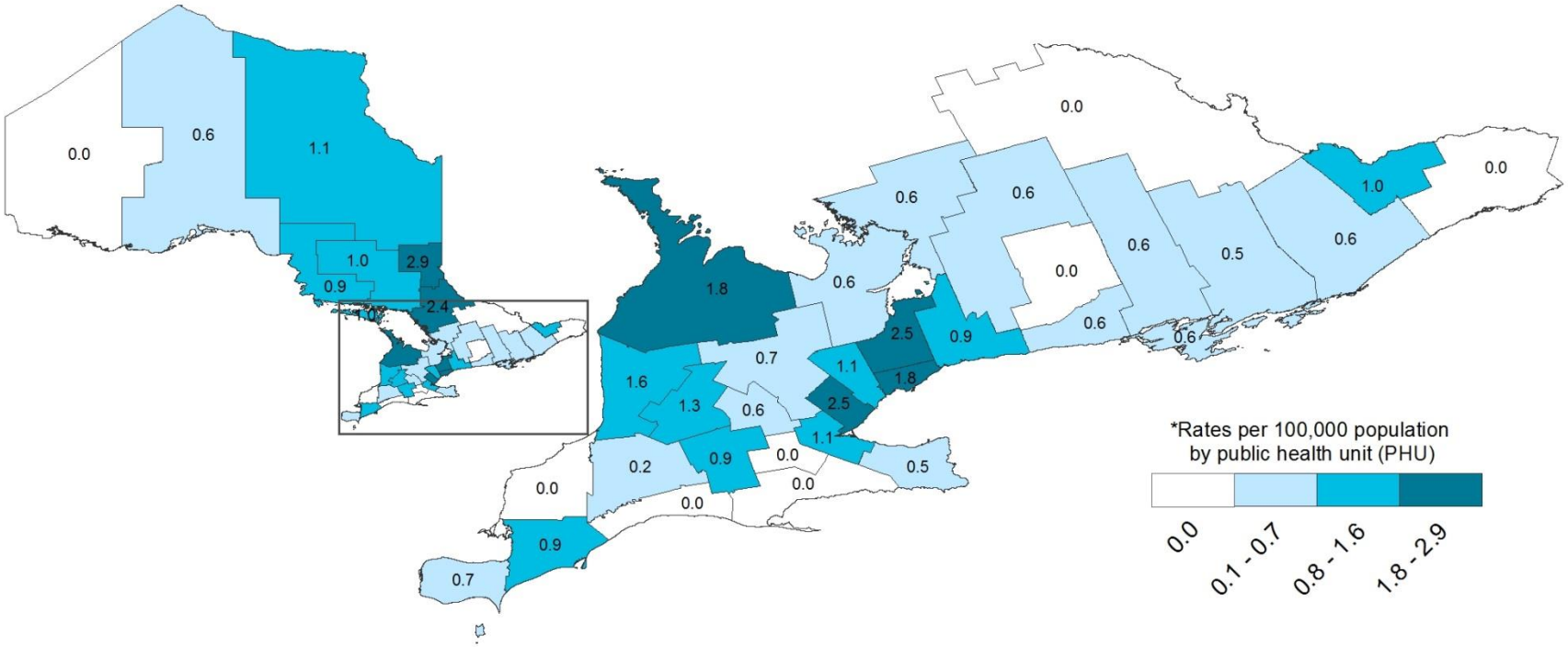
Figure 61-3. Number of Yersiniosis Cases by Month in Ontario in 2012 and Average Number of Cases, 2007–11



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Count	16	21	24	13	8	6	16	20	8	9	12	9
5-Yr Average	24.0	18.2	28.4	17.2	18.8	23.4	19.2	25.4	15.2	20.4	13.8	13.0

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].

Map 61-1. Incidence of Yersiniosis by Public Health Unit of Residence: Ontario, 2012



PHU	Cases (n)	*Rates
ALG	1	0.9
BRN	0	0.0
CHK	1	0.9
DUR	6	0.9
ELG	0	0.0
EOH	0	0.0
GBO	3	1.8
HAL	13	2.5
HAM	6	1.1
HDN	0	0.0
HKP	1	0.6
HPE	1	0.6
HUR	1	1.7

PHU	Cases (n)	*Rates
KFL	1	0.5
LAM	0	0.0
LGL	1	0.6
MSL	1	0.2
NIA	2	0.5
NPS	3	2.4
NWR	0	0.0
OTT	9	1.0
OXF	1	0.9
PDH	1	1.3
PEE	16	1.2
PQP	1	1.2
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	51	1.8
TSK	1	2.9
WAT	3	0.6
WDG	2	0.7
WEC	3	0.7
YRK	27	2.5
Ontario	**162**	**1.2**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/11/13].
Ontario Population: Population Estimates [2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].

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Appendices

Appendix 1

Technical notes

Data Sources

Ontario reportable disease data

The main source for reportable diseases data (case counts and calculated incidence rates) 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 by the end of that year.

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. Public Health Ontario (PHO) is aware of cases and related data elements reported by the local public health units in accordance with the HPPA, Ontario Regulation 569, the Ontario Public Health Standards, and the Infectious Diseases Protocol. Laboratory confirmation of reportable disease cases 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.

The iPHIS data used in this report were extracted between November 13, 2013, and December 19, 2014. The exception is for historical counts of influenza. For the 2004–05 to 2007–08 seasons, data were extracted from iPHIS on February 12, 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 represent a combination of aggregate and case level data for all influenza types, and were extracted on September 3, 2009, September 9, 2010, and August 10, 2011.

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), linked iPHIS and Public Health Ontario Laboratories (PHOL) data identified additional confirmed cases of disease and helped to rule out cases that were incorrectly classified. Final case counts for Hib following this data linkage process were reconciled in iPHIS and extracted for the period 2000 to 2012. For IMD, the final case count for 2012 was derived by deterministic record linkage of iPHIS data to laboratory records. Because of some degree of under-reporting of cases 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.

- For influenza and legionellosis, PHOL percent positivity data were extracted from the Laboratory Information Management System (LIMS) on January 15, 2014. For chlamydia and gonorrhea, percent positivity data were downloaded from STI Online on January 30, 2014, based on data extracted from LIMS on December 31, 2013.

- For varicella, in addition to the 2006–11 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 healthcare services in Ontario. Population and live birth counts for Ontario, originally sourced from Statistics Canada, were obtained from IntelliHEALTH for this report. Unless otherwise specified, population and live birth data for Ontario were extracted by PHO from IntelliHEALTH on September 26, 2013, and November 29, 2013, respectively. These data, stratified by age, sex, and health unit, were used as denominators to calculate overall, age-, sex- and geographic-specific crude incidence rates, where applicable.

National comparator data

Comparator incidence rates for Canada are provided in the report whenever available. These data were obtained directly from the Public Health Agency of Canada (PHAC) on December 16, 2013. In this report, comparator incidence rates for Canada excluding Ontario are used for the years 2003 to 2011, in trend over time graphs for most diseases. For the following vaccine-preventable diseases, national rates (including Ontario) are used for comparison: measles, rubella, congenital rubella syndrome, Hib, mumps, pertussis, IMD, invasive pneumococcal disease (IPD), varicella, and tetanus.

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).

Incidence rates for Canada presented in this report may differ from reports published by PHAC. Where such discrepancies exist, incidence rates published in 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 2012. The most recent 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 2012.

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 Ontario Ministry of Health and Long-Term Care (MOHLTC) surveillance case definitions used at the time the case was identified and public health units 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 the 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 illness.

Following case definition changes in 2009, cases that previously met the confirmed case definition are now required to be reported as probable for some diseases.

- For Lyme disease, mumps, and pertussis, the impact of this change was substantial, such that probable cases after 2009 constituted a significant proportion of total case counts. As a result, probable case counts are included in total counts in order to ensure valid comparisons over time for these diseases.
- Probable cases 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 are included in total counts to ensure valid comparisons over time for amebiasis.

- Probable cases are now 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.

WNV illness is relatively new in Ontario. When the disease first became reportable, both confirmed and probable cases were enumerated in order to better understand the burden of the disease in the province. This method of enumerating cases has continued over time and is also consistent with the national process wherein no distinction is made between confirmed and probable case counts.

For measles, probable cases are excluded from the historical temporal trend despite being reportable at the provincial level, since measles has been eliminated from Canada and strict criteria are required to identify cases; no probable cases were reported in 2012.

For hepatitis B, confirmed acute cases are captured with the classification of "CONFIRMED" in iPHIS. Analyses on confirmed chronic hepatitis B cases are also provided in this report; these cases are reported with the "CARRIER" classification.

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 total number of reported cases of a disease in a calendar year and within a select group or sub-group that were reported as confirmed and/or probable as applicable.

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 (primary, secondary, early latent, and infectious neurosyphilis) 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 2011–12 influenza season started on September 1, 2011, and ended on August 31, 2012.

Varicella

For varicella, cases are reported provincially as both individual and aggregate cases. This report only presents varicella data that are reported provincially as aggregate cases. As aggregate cases do not contain individual case details, immunization status, deaths, and hospitalizations associated with varicella are not presented. Aggregate counts for 2005 are not available because aggregate data were not collected until September in that year, and these data were not entered in iPHIS and also is not available to public health units on the eHealth Ontario Portal. Reporting was also incomplete in 2006 as the reporting of aggregate varicella cases as part of the Outbreak Summary Functionality in iPHIS began in late 2006.

Aggregate varicella cases are included in the analysis only if they met the following conditions, as outlined in the "Entering Monthly Chickenpox Counts" section of the Final Outbreak Summary User Guide v5 (2008-01-04):

1. Only those counts that have the Outbreak Classification field entered as "CONFIRMED" are included.
2. Only those counts that have the Role field entered as "OTHER" are included.

For those varicella outbreaks that have a missing Reported Date field, the Outbreak Name field is used to update the missing date field to minimize the loss of cases due to incomplete data.

Clostridium difficile infection (CDI) outbreaks and cases

On September 1, 2008, *Clostridium difficile* infection (CDI) outbreaks in public hospitals in Ontario and outbreak-associated cases became reportable in Ontario in accordance with the HPPA. CDI outbreaks in long-term care homes are also reportable to the local Medical Officer of Health, as institutional outbreaks of gastroenteritis. Based on information provided by hospitals and long-term care homes, the data presented on CDI outbreaks and cases in this report were obtained from iPHIS and analyzed as follows:

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

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 "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 per 100,000 population).

$$\frac{\text{Number of cases in specified time period and population}}{\text{Total number of people in that population}} \times 100{,}000$$

Overall: Number of all new cases over a specified time period divided by the Ontario population for that time period, multiplied by 100,000.

Group-specific: Number of new cases in a sub-group (e.g., age group, sex, or health unit) over a specified time period divided by the Ontario population for that sub-group for that time period, multiplied by 100,000.

Neonatal: Number of new congenital or neonatal cases of a disease (cases occurring up to 28 days old) over 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 within a defined 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 of acquisition. 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.

Average annual percentage change

For selected diseases—AIDS, HIV, chlamydia, gonorrhea, hepatitis B, hepatitis C, invasive group A streptococcal disease (iGAS), syphilis, and tuberculosis—the average annual percentage change is calculated by subtracting the case count in year t+1 from the case count in year t, dividing by the case count in year t, multiplying by 100, and taking the average of these calculations for each consecutive pairs of years in the date range (i.e., 2003–12). For example, if the case count in year 2003 is 20, the case count in year 2004 is 30, and the case count in year 2005 is 45, then the percentage change from 2003 to 2004 is (30-20)/20×100=50%, and from 2004 to 2005 is (45-25)/25×100=80%. From 2003 to 2005, the average annual change is calculated as (50+80)/2=65%. If the result is positive, then the average annual change reflects an increase; if the result is negative, then the change reflects a decrease.

Health unit distribution

Unless otherwise specified, this measure refers to the number of new cases reported by each public health unit in 2012 (or a multi-year time period, where indicated). Crude incidence rates are also provided for each public health unit, and are calculated as per the group-specific incidence rate formula described above.

Orientation of case counts by public health unit 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. 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.

To compare relative distributions, incidence rates by health unit are presented in maps that use tertiles to group rates into categories for mapping. If a health unit had no cases for a disease, a fourth category of zero incidence is included in the applicable maps.

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, the vaccination program, and in some cases, the birth cohort(s) and implementation year of Ontario publicly funded immunization schedules.

Monthly incidence

For selected diseases, the number of cases that occurred during each month in 2012 is compared to monthly averages for the previous five years (2007 to 2011). For influenza, the five-year monthly averages for comparison include only the non-pandemic seasons from 2004–2005 to 2010–2011. 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, a multi-year time period (2009 to 2012) presenting the number of outbreaks occurring each month is provided, instead of number of cases that occurred during each month.

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 no administration dates and risk factors were entered, the case is determined to have an unknown immunization status. The number of valid doses takes into consideration the appropriate interval between the most recent dose and onset of illness, and age at immunization, which varied 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 to health units.

Case fatality ratio

This measure 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 fatal if the reportable disease was recorded as an underlying or contributing cause of death. For vaccine-preventable diseases, due to data quality issues, all cases with a date of death reported are counted as a fatal case.

For CDI cases, any outbreak-linked confirmed case that was reported with an outcome of fatal, or that had a date of death entered, are counted as a fatal case; however, deaths reported are all-cause related and may or may not be attributable to CDI directly.

Subtype/Serotype/Serogroup/Genotype

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.

Analysis Software

Data analysis and presentation for this report were completed using IBM SPSS Statistics 22, SAS version 9.3, and Microsoft Excel 2010 with the PowerPivot add-in. 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, 2012. Unless otherwise specified, historical data cover the period from 2003 to 2011. 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:

1. Symptom onset date
2. Specimen collection date
3. Lab test date (date laboratory testing was performed)
4. Reported date (date the case was reported to the health unit).

During data extraction, the earliest date available at each stage in the hierarchy was selected as the episode date for each case. For example, if an onset date had been 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).

Three reportable diseases are not classified by time based on the episode date. 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 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 2012, with the following exclusions:

1. Cases who were not residents of Ontario at the time of diagnosis
2. Cases reported with a Disposition Status of "ENTERED IN ERROR," "DOES NOT MEET DEFINITION," "DUPLICATE-DO NOT USE", or any variation on these values

3. Events reported as adverse events following immunization (AEFIs) and related data, which are published in a separate report
4. Cases reported as encephalitis, meningitis, or food poisoning
5. Institutional outbreaks of gastroenteritis (where the aetiologic agent was not CDI) and respiratory illness
6. Severe acute respiratory syndrome (SARS).

Appendix 2 provides a list of all reportable diseases in Ontario for 2012, 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 an instance of re-infection, as opposed to relapse, were assessed by local health units before entry into iPHIS based on several factors, including 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 particular disease to the total provincial count for that year; for example, this may occur for individuals with chlamydia, gonorrhea, or salmonellosis. Co-infections with more than one infectious agent at the same time (e.g., *Mycobacterium tuberculosis* complex and HIV) or with different strains of an infectious agent (e.g., *Salmonella* Typhimurium and *Salmonella* Hadar) are reported as separate episodes of the resulting infections.

Exposure determination – Vaccine-preventable diseases

For measles, rubella, and congenital rubella syndrome, 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 congenital rubella syndrome. An imported case of measles or rubella is a case 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 the Pan American Health Organization (PAHO)[68] to reference travel outside Canada rather than the Americas, and to be consistent with the incubation periods specified in the Infectious Diseases Protocol, Appendix A (Measles, April 2014; Rubella, January 2013). An import-related case is one that resulted from transmission by an imported case (i.e., epidemiologically linked). For congenital rubella syndrome, 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).

Data Limitations

Accuracy of data

Public Health Ontario provides public health units with preliminary case counts for the previous year in February or March for review and cleaning. These data are subsequently re-extracted in 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
- Differences in data extraction dates.

Where such variability exists, data provided in other versions 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., average annual case count, total case count over ten years, annualized incidence rates based on a multi-year period).

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. As a result, case counts only represent known cases reported to public health units 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.[130,131] However, under-reporting has not been assessed for all reportable diseases 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 health units)

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 deaths occur shortly after symptom onset, or before case investigations are 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 deaths 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
4. Merging data from multiple data sets or fields to create more complete data.

Cases may also not be diagnosed or reported to public health units, or may be reported but not entered into iPHIS. While these processes result in under-reporting, they are not accounted for in the analyses completed for this report.

Appendix 2

Reportable diseases and reportable classifications: Ontario, 2012

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)	✓	×	×
Adverse events following immunization (AEFIs)[2]	✓	×	×
Amebiasis[1]	✓	✓	×
Anthrax	✓	✓	✓
Botulism	✓	✓	✓
Brucellosis	✓	✓	×
Campylobacter enteritis	✓	✓	×
Chancroid	✓	✓	×
Chickenpox (Varicella)	✓	×	×
Chlamydia trachomatis infections	✓	×	×
Cholera	✓	✓	×
Clostridium difficile Infection (CDI) Outbreaks in Public Hospitals	✓	×	×
Cryptosporidiosis	✓	✓	×
Cyclosporiasis	✓	✓	×
Cytomegalovirus 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, except asymptomatic cases	✓	✓	×
Gonorrhea, all types	✓	×	×
Group A Streptococcal disease, invasive	✓	✓	×
Group B Streptococcal disease, neonatal	✓	✓	×
Haemophilus influenzae b disease, invasive	✓	✓	×
Hantavirus pulmonary syndrome	✓	×	×
Hemorrhagic fevers, including: • Ebola virus disease • Marburg virus disease • Other viral causes	✓	✓	✓
Hepatitis A	✓	✓	×

Reportable Disease	Reportable Case Classifications		
	Confirmed	Probable	Suspect
Hepatitis B[5]	✓	×	×
Hepatitis C	✓	×	×
Hepatitis D (Delta hepatitis)[3]	✓	×	×
Herpes, neonatal[3]	✓	×	×
Influenza	✓	×	×
Lassa fever	✓	✓	✓
Legionellosis	✓	✓	×
Leprosy	✓	✓	×
Listeriosis	✓	✓	×
Lyme disease[1]	✓	✓	×
Malaria	✓	✓	×
Measles	✓	✓	×
Meningitis, acute[2] • Bacterial • Viral • Other	✓	✓	×
Meningococcal disease, invasive	✓	✓	×
Mumps[1]	✓	✓	×
Ophthalmia neonatorum	✓	✓	×
Paratyphoid fever	✓	✓	×
Pertussis (whooping cough)[1]	✓	✓	×
Plague	✓	✓	×
Pneumococcal disease, invasive	✓	×	×
Poliomyelitis, acute	✓	✓	×
Psittacosis/Ornithosis	✓	✓	×
Q-fever	✓	✓	×
Rabies	✓	✓	×
Respiratory infection outbreaks in institutions[2]	N/A	N/A	N/A
Rubella	✓	✓	×
Rubella, congenital syndrome	✓	×	×
Salmonellosis	✓	✓	×
Severe acute respiratory syndrome (SARS)[2]	✓	✓	×
Shigellosis	✓	✓	×
Smallpox	✓	✓	✓
Syphilis, infectious	✓	×	×
Tetanus	✓	×	×
Transmissible spongiform encephalopathy, including: • Creutzfeldt-Jakob disease, all types • Gerstmann-Sträussler-Scheinker syndrome[3] • Fatal Familial Insomnia[3] • Kuru[3]	✓	✓	✓
Trichinosis	✓	✓	×
Tuberculosis	✓	×	✓

Reportable Disease	Reportable Case Classifications		
	Confirmed	Probable	Suspect
Tularemia	✓	✓	×
Typhoid fever	✓	✓	×
Verotoxin-producing *E. coli* infection indicator conditions, including Haemolytic Uremic Syndrome	✓	✓	×
West Nile Virus illness[1]	✓	✓	×
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: Only CDI outbreaks in long-term care homes are included in this report.

5: Chronic Case (Carrier) classification added in 2012.

Appendix 3

Data Tables

Table A: Count and crude rate of reportable diseases: Ontario, 2003–12

Reportable Disease[1,7,8]	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	Count (Rate)[2]									
Acquired Immunodeficiency Syndrome (AIDS)	203 (1.66)	210 (1.69)	213 (1.7)	158 (1.25)	163 (1.27)	176 (1.36)	122 (0.93)	110 (0.83)	108 (0.81)	68 (0.5)
Amebiasis[1]	772 (6.31)	683 (5.51)	782 (6.24)	640 (5.05)	816 (6.38)	7.61 (5.88)	820 (6.27)	806 (6.1)	763 (5.71)	807 (5.98)
Anthrax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Botulism	1 (0.01)	2 (0.02)	1 (0.01)	5 (0.04)	6 (0.05)	2 (0.02)	4 (0.03)	1 (0.01)	2 (0.01)	5 (0.04)
Brucellosis	4 (0.03)	3 (0.02)	6 (0.05)	2 (0.02)	5 (0.04)	5 (0.04)	4 (0.03)	2 (0.02)	1 (0.01)	9 (0.07)
Campylobacter enteritis	4146 (33.87)	4003 (32.31)	3824 (30.52)	3871 (30.56)	3886 (30.38)	3800 (29.38)	3238 (24.78)	3356 (25.38)	3508 (26.25)	3898 (28.86)
Chancroid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Chlamydia	19479 (159.11)	20807 (167.93)	21885 (174.68)	22409 (176.93)	23298 (182.14)	26213 (202.69)	28822 (220.54)	33496 (253.3)	36414 (272.43)	36549 (270.62)
Cholera	2 (0.02)	0 (0)	1 (0.01)	1 (0.01)	1 (0.01)	3 (0.02)	1 (0.01)	0 (0)	0 (0)	0 (0)
Cryptosporidiosis	277 (2.26)	306 (2.47)	267 (2.13)	401 (3.17)	406 (3.17)	337 (2.61)	305 (2.33)	339 (2.56)	301 (2.25)	297 (2.2)
Cyclosporiasis	39 (0.32)	95 (0.77)	132 (1.05)	92 (0.73)	95 (0.74)	103 (0.8)	142 (1.09)	167 (1.26)	105 (0.79)	79 (0.58)
Cytomegalovirus Infection, Congenital[2]	8 (6.13)	7 (5.29)	7 (5.24)	8 (5.91)	6 (4.34)	3 (2.14)	9 (6.43)	5 (3.59)	11 (7.86)	3 (2.14)
Diphtheria	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Giardiasis	1643 (13.42)	1598 (12.9)	1644 (13.12)	1545 (12.2)	1615 (12.63)	1615 (12.49)	1508 (11.54)	1414 (10.69)	1294 (9.68)	1341 (9.93)
Gonorrhea	3362 (27.46)	3514 (28.36)	3322 (26.52)	3844 (30.35)	3963 (30.98)	3865 (29.89)	3549 (27.16)	3964 (29.98)	4205 (31.46)	4097 (30.33)
Group A Streptococcal Disease, Invasive (iGAS)	409 (3.34)	288 (2.32)	386 (3.08)	468 (3.7)	505 (3.95)	518 (4.01)	469 (3.59)	562 (4.25)	668 (5)	606 (4.49)
Group B Streptococcal Disease, Neonatal[2]	64 (49)	55 (41.6)	52 (38.96)	55 (40.65)	46 (33.3)	59 (41.99)	50 (35.7)	52 (37.36)	56 (40.04)	56 (40.04)
Hantavirus Pulmonary Syndrome	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hemorrhagic Fevers	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Reportable Disease[1,7,8]	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	Count (Rate)[2]									
Hepatitis A	143 (1.17)	184 (1.48)	150 (1.2)	206 (1.63)	120 (0.94)	115 (0.89)	121 (0.93)	137 (1.04)	105 (0.79)	124 (0.92)
Hepatitis B (Acute)	168 (1.37)	169 (1.36)	152 (1.21)	169 (1.33)	163 (1.27)	139 (1.07)	133 (1.02)	111 (0.84)	122 (0.91)	104 (0.77)
Hepatitis B (Chronic)[6]	--	--	--	--	--	--	--	--	--	2240 (16.59)
Hepatitis C	5300 (43.29)	5240 (42.29)	4566 (36.44)	4025 (31.78)	4639 (36.27)	4729 (36.57)	4607 (35.25)	4526 (34.23)	4188 (31.33)	4172 (30.89)
Hepatitis D	2 (0.02)	1 (0.01)	8 (0.06)	5 (0.04)	3 (0.02)	5 (0.04)	2 (0.02)	1 (0.01)	4 (0.03)	4 (0.03)
Herpes, Neonatal[2]	2 (1.53)	11 (8.32)	5 (3.75)	5 (3.7)	3 (2.17)	8 (5.69)	6 (4.28)	9 (6.47)	8 (5.72)	5 (3.57)
Human Immunodeficiency Virus (HIV)	943 (7.7)	1000 (8.07)	939 (7.49)	1017 (8.03)	995 (7.78)	946 (7.31)	857 (6.56)	844 (6.38)	866 (6.48)	781 (5.78)
Influenza[5]	981 (8.01)	5387 (43.48)	5796 (46.26)	2500 (19.74)	2938 (22.97)	5157 (39.88)	8181 (62.6)	7606 (57.52)	6046 (45.23)	3945 (29.21)
Invasive *Haemophilus influenzae*, type b[3]	7 (0.06)	10 (0.08)	10 (0.08)	10 (0.08)	6 (0.05)	8 (0.06)	3 (0.02)	2 (0.02)	6 (0.04)	5 (0.04)
Lassa Fever	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Legionellosis	32 (0.26)	11 (0.09)	77 (0.61)	69 (0.54)	58 (0.45)	82 (0.63)	70 (0.54)	116 (0.88)	162 (1.21)	190 (1.41)
Leprosy	4 (0.03)	4 (0.03)	3 (0.02)	2 (0.02)	2 (0.02)	5 (0.04)	4 (0.03)	1 (0.01)	3 (0.02)	2 (0.01)
Listeriosis	43 (0.35)	42 (0.34)	36 (0.29)	43 (0.34)	39 (0.3)	95 (0.73)	55 (0.42)	60 (0.45)	57 (0.43)	43 (0.32)
Lyme Disease	26 (0.21)	33 (0.27)	44 (0.35)	46 (0.36)	73 (0.57)	98 (0.76)	101 (0.77)	97 (0.73)	145 (1.08)	185 (1.37)
Malaria	167 (1.36)	181 (1.46)	187 (1.49)	188 (1.48)	177 (1.38)	181 (1.4)	179 (1.37)	259 (1.96)	231 (1.73)	220 (1.63)
Measles	11 (0.09)	6 (0.05)	4 (0.03)	5 (0.04)	0 (0)	58 (0.45)	7 (0.05)	9 (0.07)	8 (0.06)	3 (0.02)
Meningococcal disease, invasive[1,3]	61 (0.5)	59 (0.48)	43 (0.34)	66 (0.52)	68 (0.53)	47 (0.36)	74 (0.57)	35 (0.26)	44 (0.33)	35 (0.26)
Mumps[1]	13 (0.11)	23 (0.19)	17 (0.14)	10 (0.08)	53 (0.41)	336 (2.6)	107 (0.82)	105 (0.79)	84 (0.63)	26 (0.19)
Ophthalmia Neonatorum[2]	4 (3.06)	6 (4.54)	6 (4.49)	3 (2.22)	3 (2.17)	3 (2.14)	1 (0.71)	5 (3.59)	1 (0.71)	4 (2.86)
Paratyphoid Fever	21 (0.17)	47 (0.38)	55 (0.44)	51 (0.4)	46 (0.36)	59 (0.46)	42 (0.32)	60 (0.45)	62 (0.46)	36 (0.27)
Pertussis[1]	351 (2.87)	633 (5.11)	649 (5.18)	1267 (10)	933 (7.29)	835 (6.46)	402 (3.08)	124 (0.94)	279 (2.09)	1043 (7.72)
Plague	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pneumococcal Disease, Invasive	1018 (8.32)	1058 (8.54)	937 (7.48)	952 (7.52)	949 (7.42)	1070 (8.27)	1260 (9.64)	1209 (9.14)	1263 (9.45)	1275 (9.44)
Poliomyelitis (polio)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Psittacosis/Ornithosis	3 (0.02)	1 (0.01)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.01)	0 (0)

Reportable Disease[1,7,8]	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	Count (Rate)[2]									
Q-Fever	8 (0.07)	6 (0.05)	2 (0.02)	4 (0.03)	4 (0.03)	5 (0.04)	6 (0.05)	7 (0.05)	20 (0.15)	19 (0.14)
Rabies	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.01)
Rubella	9 (0.07)	5 (0.04)	312 (2.49)	5 (0.04)	2 (0.02)	1 (0.01)	3 (0.02)	1 (0.01)	0 (0)	1 (0.01)
Salmonellosis	2009 (16.41)	2121 (17.12)	2974 (23.74)	2367 (18.69)	2821 (22.05)	2388 (18.47)	2306 (17.65)	2716 (20.54)	2577 (19.28)	3038 (22.49)
Shigellosis	283 (2.31)	286 (2.31)	338 (2.7)	204 (1.61)	234 (1.83)	239 (1.85)	254 (1.94)	252 (1.91)	255 (1.91)	271 (2.01)
Smallpox	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Syphilis, Infectious	422 (3.45)	490 (3.95)	361 (2.88)	372 (2.94)	411 (3.21)	457 (3.53)	785 (6.01)	777 (5.88)	770 (5.76)	818 (6.06)
Tetanus	0 (0)	0 (0)	1 (0.01)	1 (0.01)	1 (0.01)	0 (0)	2 (0.02)	1 (0.01)	1 (0.01)	1 (0.01)
Trichinosis	0 (0)	1 (0.01)	1 (0.01)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.01)
Tuberculosis	671 (5.48)	738 (5.96)	695 (5.55)	669 (5.28)	692 (5.41)	624 (4.83)	633 (4.84)	647 (4.89)	661 (4.95)	615 (4.55)
Tularemia	2 (0.02)	2 (0.02)	1 (0.01)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.02)	0 (0)	1 (0.01)
Typhoid Fever	50 (0.41)	70 (0.56)	68 (0.54)	92 (0.73)	87 (0.68)	96 (0.74)	77 (0.59)	92 (0.7)	103 (0.77)	82 (0.61)
Varicella (Chickenpox)[4]	14743 (120.43)	17819 (143.81)	--	--	10161 (79.44)	8165 (63.14)	7524 (57.57)	7980 (60.35)	5549 (41.51)	4535 (33.58)
Verotoxin-producing *E. coli* infection indicator conditions, including Hemolytic Uremic Syndrome	462 (3.77)	320 (2.58)	269 (2.15)	344 (2.72)	318 (2.49)	278 (2.15)	166 (1.27)	153 (1.16)	232 (1.74)	210 (1.55)
West Nile Virus illness[1]	94 (0.77)	14 (0.11)	101 (0.81)	43 (0.34)	17 (0.13)	6 (0.05)	4 (0.03)	9 (0.07)	81 (0.61)	271 (2.01)
Yellow Fever	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.01)
Yersiniosis	329 (2.69)	297 (2.4)	355 (2.83)	363 (2.87)	269 (2.1)	260 (2.01)	242 (1.85)	203 (1.54)	211 (1.58)	162 (1.2)

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted between [2013/11/13] and [2014/02/28].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Ontario Population: Live Births [2003-2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].

1. Includes only confirmed cases with the following exceptions: both probable and confirmed cases as for amebiasis, Lyme disease, mumps, pertussis, invasive meningococcal disease (IMD), and West Nile Virus illness.
2. Crude rates are per 100,000 population with the following exceptions: crude rates are per 100,000 live births for group B streptococcal disease, neonatal herpes, ophthalmia neonatorum, and congenital cytomegalovirus.
3. Public Health Ontario Laboratories data was used to supplement iPHIS data to increase data quality and completeness of case ascertainment for invasive *Haemophilus influenzae* type B disease (Hib) and IMD.
4. Varicella data is presented as aggregate counts. Aggregate counts for 2005 are not available and are not presented. Reporting was incomplete for the year 2006 and is not presented. RDIS data was downloaded from the eHealth Ontario portal to provide counts 2003 and 2004 Ontario varicella case counts.
5. Influenza data are reported by seasons. 2003=2002/2003, 2004=2003/2004 etc. The 2008/2009 and 2009/2010 seasons include pandemic H1N1 influenza cases that were reported in aggregate.
6. 2012 was the first year chronic hepatitis B cases are included in provincial disease surveillance.
7. Data for Transmissible Spongiform Encephalopathy is not included in the table above.
8. Further details about the data are specified in the Technical notes.

Table B1: Count and crude rate of disease by public health unit of residence: Ontario, 2012

Reportable Disease[1,7,8]	ALG	BRN	CHK	DUR	ELG	EOH	GBO	HAL
	Count (Rate)[2]							
Acquired Immunodeficiency Syndrome (AIDS)	0 (0)	2 (1.41)	0 (0)	1 (0.16)	2 (2.19)	1 (0.5)	1 (0.61)	4 (0.76)
Amebiasis[1]	0 (0)	2 (1.41)	0 (0)	13 (2.04)	2 (2.19)	8 (3.98)	0 (0)	12 (2.28)
Anthrax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Botulism	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.19)
Brucellosis	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.1)	0 (0)	0 (0)	0 (0)
Campylobacter enteritis	25 (21.46)	25 (17.65)	26 (23.96)	184 (28.83)	22 (24.14)	70 (34.79)	61 (37.19)	156 (29.63)
Chancroid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Chlamydia	364 (312.49)	470 (331.74)	296 (272.74)	1714 (268.56)	203 (222.75)	337 (167.47)	314 (191.44)	762 (144.75)
Cholera	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cryptosporidiosis	0 (0)	2 (1.41)	2 (1.84)	9 (1.41)	6 (6.58)	10 (4.97)	15 (9.15)	4 (0.76)
Cyclosporiasis	0 (0)	0 (0)	0 (0)	5 (0.78)	0 (0)	0 (0)	0 (0)	3 (0.57)
Cytomegalovirus Infection, Congenital[2]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (17.29)
Diphtheria	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Giardiasis	11 (9.44)	3 (2.12)	9 (8.29)	55 (8.62)	3 (3.29)	25 (12.42)	26 (15.85)	49 (9.31)
Gonorrhea	20 (17.2)	45 (31.8)	9 (8.3)	157 (24.6)	3 (3.3)	11 (5.5)	4 (2.4)	68 (12.9)
Group A Streptococcal Disease, Invasive (iGAS)	8 (6.87)	11 (7.76)	9 (8.29)	15 (2.35)	1 (1.1)	7 (3.48)	11 (6.71)	17 (3.23)
Group B Streptococcal Disease, Neonatal[2]	0 (0)	1 (64.23)	0 (0)	1 (18.57)	1 (81.43)	1 (15.18)	1 (52.22)	1 (93.28)
Hantavirus Pulmonary Syndrome	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hemorrhagic Fevers	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hepatitis A	0 (0)	0 (0)	1 (0.92)	4 (0.63)	1 (1.1)	0 (0)	1 (0.61)	2 (0.38)
Hepatitis B (Acute)	0 (0)	4 (2.82)	1 (0.92)	1 (0.16)	1 (1.1)	0 (0)	1 (0.61)	4 (0.76)
Hepatitis B (Chronic)[6]	1 (0.86)	5 (3.53)	2 (1.84)	34 (5.33)	1 (1.1)	3 (1.49)	0 (0)	45 (8.55)
Hepatitis C	68 (58.38)	60 (42.35)	47 (43.31)	166 (26.01)	19 (20.85)	57 (28.33)	21 (12.8)	97 (18.43)
Hepatitis D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Herpes, Neonatal[2]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (65.06)	1 (17.29)
Human Immunodeficiency Virus (HIV)	2 (1.72)	2 (1.41)	0 (0)	10 (1.57)	2 (2.19)	3 (1.49)	1 (0.61)	11 (2.09)
Influenza[5]	43 (36.92)	26 (18.35)	12 (11.06)	111 (17.39)	14 (15.36)	57 (28.33)	53 (32.31)	183 (34.76)
Invasive *Haemophilus influenzae*, type b[3]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lassa Fever	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Legionellosis	0 (0)	2 (1.41)	0 (0)	12 (1.88)	0 (0)	5 (2.48)	0 (0)	12 (2.28)
Leprosy	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Listeriosis	0 (0)	0 (0)	0 (0)	2 (0.31)	0 (0)	0 (0)	2 (1.22)	1 (0.19)
Lyme Disease	2 (1.72)	1 (0.71)	2 (1.84)	3 (0.47)	0 (0)	16 (7.95)	0 (0)	5 (0.95)
Malaria	0 (0)	0 (0)	1 (0.92)	8 (1.25)	0 (0)	0 (0)	0 (0)	3 (0.57)

Reportable Disease[1,7,8]	ALG	BRN	CHK	DUR	ELG	EOH	GBO	HAL
	Count (Rate)[2]							
Measles	0 (0)	0 (0)	0 (0)	1 (0.16)	0 (0)	0 (0)	0 (0)	0 (0)
Meningococcal disease, invasive[1,3]	1 (0.9)	0 (0)	0 (0)	3 (0.5)	0 (0)	1 (0.5)	2 (1.2)	1 (0.2)
Mumps[1]	0 (0)	2 (1.41)	1 (0.92)	1 (0.16)	0 (0)	1 (0.5)	0 (0)	1 (0.19)
Ophthalmia Neonatorum[2]	0 (0)	1 (64.23)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paratyphoid Fever	0 (0)	1 (0.71)	0 (0)	1 (0.16)	0 (0)	0 (0)	0 (0)	1 (0.19)
Pertussis[1]	5 (4.29)	5 (3.53)	44 (40.54)	20 (3.13)	88 (96.56)	5 (2.48)	14 (8.54)	12 (2.28)
Plague	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pneumococcal Disease, Invasive	12 (10.3)	13 (9.18)	20 (18.43)	57 (8.93)	13 (14.26)	21 (10.44)	32 (19.51)	37 (7.03)
Poliomyelitis (polio)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Psittacosis/Ornithosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Q-Fever	0 (0)	0 (0)	0 (0)	3 (0.47)	0 (0)	0 (0)	0 (0)	1 (0.19)
Rabies	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rubella	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Salmonellosis	23 (19.75)	39 (27.53)	18 (16.59)	150 (23.5)	20 (21.95)	39 (19.38)	63 (38.41)	103 (19.57)
Shigellosis	0 (0)	1 (0.71)	1 (0.92)	4 (0.63)	0 (0)	1 (0.5)	0 (0)	6 (1.14)
Smallpox	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Syphilis, Infectious	0 (0)	1 (0.71)	2 (1.84)	20 (3.13)	1 (1.1)	2 (0.99)	1 (0.61)	13 (2.47)
Tetanus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trichinosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.61)	0 (0)
Tuberculosis	0 (0)	2 (1.41)	0 (0)	9 (1.41)	0 (0)	1 (0.5)	1 (0.61)	20 (3.8)
Tularemia	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Typhoid Fever	1 (0.86)	1 (0.71)	0 (0)	3 (0.47)	0 (0)	0 (0)	0 (0)	2 (0.38)
Varicella (Chickenpox)[4]	15 (12.88)	63 (44.47)	32 (29.49)	474 (74.27)	55 (60.35)	72 (35.78)	77 (46.94)	0 (0)
Verotoxin-producing *E. coli* infection indicator conditions, including Hemolytic Uremic Syndrome	10 (8.59)	1 (0.71)	0 (0)	8 (1.25)	1 (1.1)	8 (3.98)	5 (3.05)	4 (0.76)
West Nile Virus illness[1]	0 (0)	2 (1.41)	3 (2.76)	8 (1.25)	0 (0)	1 (0.5)	2 (1.22)	24 (4.56)
Yellow Fever	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Yersiniosis	1 (0.86)	0 (0)	1 (0.92)	6 (0.94)	0 (0)	0 (0)	3 (1.83)	13 (2.47)

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted between [2013/11/13] and [2014/02/28].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Ontario Population: Live Births [2003-2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].

1. Includes only confirmed cases with the following exceptions: both probable and confirmed cases as for amebiasis, Lyme disease, mumps, pertussis, invasive meningococcal disease (IMD), and West Nile Virus illness.
2. Crude rates are per 100,000 population with the following exceptions: crude rates are per 100,000 live births for group B streptococcal disease, neonatal herpes, ophthalmia neonatorum, and congenital cytomegalovirus.
3. Public Health Ontario Laboratories data was used to supplement iPHIS data to increase data quality and completeness of case ascertainment for invasive *Haemophilus influenzae* type B disease (Hib) and IMD.
4. Varicella data is presented as aggregate counts. Aggregate counts for 2005 are not available and are not presented. Reporting was incomplete for the year 2006 and is not presented. RDIS data was downloaded from the eHealth Ontario portal to provide counts 2003 and 2004 Ontario varicella case counts.
5. Influenza data are reported by seasons. 2003=2002/2003, 2004=2003/2004 etc. The 2008/2009 and 2009/2010 seasons include pandemic H1N1 influenza cases that were reported in aggregate.
6. 2012 was the first year chronic hepatitis B cases are included in provincial disease surveillance.
7. Data for Transmissible Spongiform Encephalopathy is not included in the table above.
8. Further details about the data are specified in the Technical notes.

Table B2: Count and crude rate of disease by public health unit of residence: Ontario, 2012

Reportable Disease[1,7]	HAM	HDN	HKP	HPE	HUR	KFL	LAM	LGL
	Count (Rate)[2]							
Acquired Immunodeficiency Syndrome (AIDS)	2 (0.37)	0 (0)	0 (0)	1 (0.62)	0 (0)	2 (1.01)	0 (0)	0 (0)
Amebiasis[1]	21 (3.86)	1 (0.91)	2 (1.11)	1 (0.62)	1 (1.65)	6 (3.03)	0 (0)	3 (1.77)
Anthrax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Botulism	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Brucellosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Campylobacter enteritis	110 (20.21)	40 (36.28)	58 (32.31)	24 (14.84)	44 (72.73)	46 (23.22)	20 (15.27)	30 (17.72)
Chancroid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Chlamydia	1623 (298.23)	209 (189.58)	245 (136.49)	514 (317.93)	72 (119.02)	740 (373.57)	288 (219.83)	252 (148.85)
Cholera	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cryptosporidiosis	3 (0.55)	9 (8.16)	4 (2.23)	4 (2.47)	14 (23.14)	7 (3.53)	3 (2.29)	11 (6.5)
Cyclosporiasis	1 (0.18)	0 (0)	0 (0)	1 (0.62)	0 (0)	2 (1.01)	0 (0)	0 (0)
Cytomegalovirus Infection, Congenital[2]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diphtheria	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Giardiasis	44 (8.09)	7 (6.35)	14 (7.8)	13 (8.04)	2 (3.31)	16 (8.08)	3 (2.29)	15 (8.86)
Gonorrhea	160 (29.4)	20 (18.1)	12 (6.7)	5 (3.1)	0 (0)	26 (13.1)	8 (6.1)	9 (5.3)
Group A Streptococcal Disease, Invasive (iGAS)	34 (6.25)	3 (2.72)	3 (1.67)	10 (6.19)	2 (3.31)	12 (6.06)	9 (6.87)	8 (4.73)
Group B Streptococcal Disease, Neonatal[2]	5 (325.31)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hantavirus Pulmonary Syndrome	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hemorrhagic Fevers	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hepatitis A	2 (0.37)	0 (0)	2 (1.11)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.59)
Hepatitis B (Acute)	3 (0.55)	0 (0)	5 (2.79)	2 (1.24)	0 (0)	16 (8.08)	2 (1.53)	2 (1.18)
Hepatitis B (Chronic)[6]	49 (9)	0 (0)	3 (1.67)	2 (1.24)	0 (0)	5 (2.52)	1 (0.76)	0 (0)
Hepatitis C	200 (36.75)	35 (31.75)	73 (40.67)	53 (32.78)	8 (13.22)	144 (72.69)	75 (57.25)	73 (43.12)
Hepatitis D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Herpes, Neonatal[2]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Human Immunodeficiency Virus (HIV)	17 (3.12)	1 (0.91)	0 (0)	2 (1.24)	0 (0)	7 (3.53)	0 (0)	1 (0.59)
Influenza[5]	269 (49.43)	26 (23.58)	73 (40.67)	52 (32.16)	30 (49.59)	43 (21.71)	12 (9.16)	17 (10.04)
Invasive *Haemophilus influenzae*, type b[3]	0 (0)	0 (0)	0 (0)	1 (0.62)	0 (0)	0 (0)	0 (0)	0 (0)
Lassa Fever	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Legionellosis	9 (1.65)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.59)
Leprosy	1 (0.18)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Listeriosis	2 (0.37)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lyme Disease	4 (0.74)	2 (1.81)	1 (0.56)	11 (6.8)	0 (0)	16 (8.08)	0 (0)	30 (17.72)
Malaria	13 (2.39)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (2.29)	0 (0)

Reportable Disease[1,7]	HAM	HDN	HKP	HPE	HUR	KFL	LAM	LGL
	Count (Rate)[2]							
Measles	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Meningococcal disease, invasive[1,3]	0 (0)	0 (0)	0 (0)	1 (0.6)	0 (0)	4 (2)	1 (0.8)	0 (0)
Mumps[1]	0 (0)	0 (0)	2 (1.11)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Ophthalmia Neonatorum[2]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paratyphoid Fever	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pertussis[1]	33 (6.06)	6 (5.44)	16 (8.91)	8 (4.95)	28 (46.28)	13 (6.56)	4 (3.05)	8 (4.73)
Plague	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pneumococcal Disease, Invasive	62 (11.39)	9 (8.16)	21 (11.7)	24 (14.84)	7 (11.57)	31 (15.65)	9 (6.87)	14 (8.27)
Poliomyelitis (polio)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Psittacosis/Ornithosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Q-Fever	0 (0)	1 (0.91)	3 (1.67)	1 (0.62)	1 (1.65)	2 (1.01)	1 (0.76)	0 (0)
Rabies	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rubella	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Salmonellosis	101 (18.56)	22 (19.96)	30 (16.71)	22 (13.61)	23 (38.02)	33 (16.66)	21 (16.03)	40 (23.63)
Shigellosis	8 (1.47)	3 (2.72)	0 (0)	1 (0.62)	0 (0)	3 (1.51)	0 (0)	1 (0.59)
Smallpox	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Syphilis, Infectious	31 (5.7)	1 (0.91)	6 (3.34)	8 (4.95)	0 (0)	10 (5.05)	1 (0.76)	0 (0)
Tetanus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trichinosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tuberculosis	14 (2.57)	0 (0)	2 (1.11)	0 (0)	0 (0)	1 (0.5)	1 (0.76)	0 (0)
Tularemia	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Typhoid Fever	1 (0.18)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Varicella (Chickenpox)[4]	152 (27.93)	0 (0)	31 (17.27)	35 (21.65)	52 (85.96)	28 (14.14)	0 (0)	181 (106.91)
Verotoxin-producing *E. coli* infection indicator conditions, including Hemolytic Uremic Syndrome	8 (1.47)	6 (5.44)	2 (1.11)	5 (3.09)	4 (6.61)	3 (1.51)	1 (0.76)	3 (1.77)
West Nile Virus illness[1]	20 (3.68)	5 (4.54)	2 (1.11)	1 (0.62)	0 (0)	3 (1.51)	2 (1.53)	2 (1.18)
Yellow Fever	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Yersiniosis	6 (1.1)	0 (0)	1 (0.56)	1 (0.62)	1 (1.65)	1 (0.5)	0 (0)	1 (0.59)

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted between [2013/11/13] and [2014/02/28].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Ontario Population: Live Births [2003-2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].

1. Includes only confirmed cases with the following exceptions: both probable and confirmed cases as for amebiasis, Lyme disease, mumps, pertussis, invasive meningococcal disease (IMD), and West Nile Virus illness.
2. Crude rates are per 100,000 population with the following exceptions: crude rates are per 100,000 live births for group B streptococcal disease, neonatal herpes, ophthalmia neonatorum, and congenital cytomegalovirus.
3. Public Health Ontario Laboratories data was used to supplement iPHIS data to increase data quality and completeness of case ascertainment for invasive *Haemophilus influenzae* type B disease (Hib) and IMD.
4. Varicella data is presented as aggregate counts. Aggregate counts for 2005 are not available and are not presented. Reporting was incomplete for the year 2006 and is not presented. RDIS data was downloaded from the eHealth Ontario portal to provide counts 2003 and 2004 Ontario varicella case counts.
5. Influenza data are reported by seasons. 2003=2002/2003, 2004=2003/2004 etc. The 2008/2009 and 2009/2010 seasons include pandemic H1N1 influenza cases that were reported in aggregate.
6. 2012 was the first year chronic hepatitis B cases are included in provincial disease surveillance.
7. Data for Transmissible Spongiform Encephalopathy is not included in the table above.
8. Further details about the data are specified in the Technical notes.

Table B3: Count and crude rate of disease by public health unit of residence: Ontario, 2012

Reportable Disease[1,7,8]	MSL	NIA	NPS	NWR	OTT	OXF	PDH	PEE
	Count (Rate)[2]							
Acquired Immunodeficiency Syndrome (AIDS)	1 (0.22)	0 (0)	0 (0)	1 (1.22)	5 (0.54)	0 (0)	0 (0)	5 (0.36)
Amebiasis[1]	11 (2.37)	12 (2.69)	0 (0)	0 (0)	64 (6.96)	0 (0)	2 (2.6)	114 (8.2)
Anthrax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Botulism	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.22)
Brucellosis	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.11)	0 (0)	0 (0)	2 (0.14)
Campylobacter enteritis	135 (29.11)	147 (32.91)	21 (16.54)	15 (18.24)	234 (25.45)	29 (26.66)	45 (58.42)	365 (26.25)
Chancroid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Chlamydia	1567 (337.93)	1153 (258.13)	372 (292.98)	624 (758.84)	2532 (275.33)	196 (180.17)	127 (164.87)	3411 (245.3)
Cholera	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cryptosporidiosis	5 (1.08)	3 (0.67)	3 (2.36)	5 (6.08)	31 (3.37)	10 (9.19)	8 (10.39)	16 (1.15)
Cyclosporiasis	2 (0.43)	2 (0.45)	0 (0)	0 (0)	17 (1.85)	0 (0)	0 (0)	6 (0.43)
Cytomegalovirus Infection, Congenital[2]	1 (21.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diphtheria	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Giardiasis	23 (4.96)	68 (15.22)	14 (11.03)	7 (8.51)	88 (9.57)	10 (9.19)	4 (5.19)	136 (9.78)
Gonorrhea	106 (22.9)	118 (26.4)	10 (7.9)	72 (87.6)	238 (25.9)	7 (6.4)	4 (5.2)	416 (29.9)
Group A Streptococcal Disease, Invasive (iGAS)	35 (7.55)	14 (3.13)	14 (11.03)	24 (29.19)	33 (3.59)	6 (5.52)	9 (11.68)	38 (2.73)
Group B Streptococcal Disease, Neonatal[2]	1 (21.3)	2 (50.63)	0 (0)	0 (0)	7 (70.97)	0 (0)	0 (0)	5 (604.59)
Hantavirus Pulmonary Syndrome	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hemorrhagic Fevers	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hepatitis A	8 (1.73)	0 (0)	0 (0)	0 (0)	14 (1.52)	0 (0)	0 (0)	21 (1.51)
Hepatitis B (Acute)	1 (0.22)	3 (0.67)	2 (1.58)	0 (0)	2 (0.22)	0 (0)	0 (0)	5 (0.36)
Hepatitis B (Chronic)[6]	26 (5.61)	13 (2.91)	1 (0.79)	0 (0)	147 (15.98)	2 (1.84)	0 (0)	237 (17.04)
Hepatitis C	264 (56.93)	197 (44.1)	73 (57.49)	31 (37.7)	241 (26.21)	42 (38.61)	11 (14.28)	284 (20.42)
Hepatitis D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Herpes, Neonatal[2]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Human Immunodeficiency Virus (HIV)	29 (6.25)	12 (2.69)	1 (0.79)	1 (1.22)	57 (6.2)	1 (0.92)	1 (1.3)	46 (3.31)
Influenza[5]	108 (23.29)	139 (31.12)	64 (50.41)	8 (9.73)	146 (15.88)	32 (29.42)	47 (61.01)	547 (39.34)
Invasive *Haemophilus influenzae*, type b[3]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lassa Fever	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Legionellosis	8 (1.73)	7 (1.57)	1 (0.79)	0 (0)	3 (0.33)	0 (0)	0 (0)	38 (2.73)
Leprosy	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.07)
Listeriosis	1 (0.22)	1 (0.22)	0 (0)	0 (0)	1 (0.11)	0 (0)	0 (0)	2 (0.14)
Lyme Disease	1 (0.22)	4 (0.9)	0 (0)	3 (3.65)	19 (2.07)	2 (1.84)	0 (0)	12 (0.86)
Malaria	5 (1.08)	1 (0.22)	0 (0)	1 (1.22)	13 (1.41)	0 (0)	1 (1.3)	49 (3.52)

Reportable Disease[1,7,8]	MSL	NIA	NPS	NWR	OTT	OXF	PDH	PEE
	Count (Rate)[2]							
Measles	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.07)
Meningococcal disease, invasive[1,3]	2 (0.4)	0 (0)	1 (0.8)	0 (0)	1 (0.1)	1 (0.9)	0 (0)	2 (0.1)
Mumps[1]	0 (0)	1 (0.22)	0 (0)	0 (0)	4 (0.43)	0 (0)	0 (0)	1 (0.07)
Ophthalmia Neonatorum[2]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (6.32)
Paratyphoid Fever	1 (0.22)	0 (0)	1 (0.79)	0 (0)	2 (0.22)	0 (0)	0 (0)	14 (1.01)
Pertussis[1]	54 (11.65)	15 (3.36)	7 (5.51)	12 (14.59)	48 (5.22)	52 (47.8)	15 (19.47)	17 (1.22)
Plague	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pneumococcal Disease, Invasive	44 (9.49)	63 (14.1)	17 (13.39)	15 (18.24)	88 (9.57)	11 (10.11)	7 (9.09)	95 (6.83)
Poliomyelitis (polio)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Psittacosis/Ornithosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Q-Fever	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.11)	1 (0.92)	0 (0)	1 (0.07)
Rabies	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rubella	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.07)
Salmonellosis	78 (16.82)	83 (18.58)	24 (18.9)	11 (13.38)	199 (21.64)	26 (23.9)	15 (19.47)	346 (24.88)
Shigellosis	2 (0.43)	5 (1.12)	0 (0)	0 (0)	19 (2.07)	1 (0.92)	2 (2.6)	33 (2.37)
Smallpox	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Syphilis, Infectious	25 (5.39)	7 (1.57)	0 (0)	0 (0)	40 (4.35)	1 (0.92)	2 (2.6)	37 (2.66)
Tetanus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trichinosis	0 (0)	0 (0)	1 (0.79)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tuberculosis	6 (1.29)	6 (1.34)	0 (0)	1 (1.22)	41 (4.46)	0 (0)	1 (1.3)	124 (8.92)
Tularemia	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.92)	0 (0)	0 (0)
Typhoid Fever	0 (0)	1 (0.22)	0 (0)	0 (0)	2 (0.22)	0 (0)	0 (0)	45 (3.24)
Varicella (Chickenpox)[4]	0 (0)	82 (18.36)	83 (65.37)	159 (193.36)	253 (27.51)	57 (52.4)	61 (79.19)	476 (34.23)
Verotoxin-producing *E. coli* infection indicator conditions, including Hemolytic Uremic Syndrome	6 (1.29)	9 (2.01)	0 (0)	0 (0)	12 (1.3)	2 (1.84)	9 (11.68)	10 (0.72)
West Nile Virus illness[1]	7 (1.51)	10 (2.24)	0 (0)	0 (0)	8 (0.87)	0 (0)	3 (3.89)	25 (1.8)
Yellow Fever	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.11)	0 (0)	0 (0)	0 (0)
Yersiniosis	1 (0.22)	2 (0.45)	3 (2.36)	0 (0)	9 (0.98)	1 (0.92)	1 (1.3)	16 (1.15)

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted between [2013/11/13] and [2014/02/28].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Ontario Population: Live Births [2003-2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].

1. Includes only confirmed cases with the following exceptions: both probable and confirmed cases as for amebiasis, Lyme disease, mumps, pertussis, invasive meningococcal disease (IMD), and West Nile Virus illness.
2. Crude rates are per 100,000 population with the following exceptions: crude rates are per 100,000 live births for group B streptococcal disease, neonatal herpes, ophthalmia neonatorum, and congenital cytomegalovirus.
3. Public Health Ontario Laboratories data was used to supplement iPHIS data to increase data quality and completeness of case ascertainment for invasive *Haemophilus influenzae* type B disease (Hib) and IMD.
4. Varicella data is presented as aggregate counts. Aggregate counts for 2005 are not available and are not presented. Reporting was incomplete for the year 2006 and is not presented. RDIS data was downloaded from the eHealth Ontario portal to provide counts 2003 and 2004 Ontario varicella case counts.
5. Influenza data are reported by seasons. 2003=2002/2003, 2004=2003/2004 etc. The 2008/2009 and 2009/2010 seasons include pandemic H1N1 influenza cases that were reported in aggregate.
6. 2012 was the first year chronic hepatitis B cases are included in provincial disease surveillance.
7. Data for Transmissible Spongiform Encephalopathy is not included in the table above.
8. Further details about the data are specified in the Technical notes.

Table B4: Count and crude rate of disease by public health unit of residence: Ontario, 2012

Reportable Disease[1,7,8]	PQP	PTC	REN	SMD	SUD	THB	TOR	TSK
	Count (Rate)[2]							
Acquired Immunodeficiency Syndrome (AIDS)	0 (0)	0 (0)	0 (0)	1 (0.19)	2 (1.01)	0 (0)	27 (0.97)	0 (0)
Amebiasis[1]	0 (0)	4 (2.86)	5 (4.82)	6 (1.13)	5 (2.52)	0 (0)	413 (14.8)	0 (0)
Anthrax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Botulism	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Brucellosis	0 (0)	0 (0)	0 (0)	1 (0.19)	0 (0)	0 (0)	3 (0.11)	0 (0)
Campylobacter enteritis	13 (15.01)	30 (21.46)	15 (14.47)	114 (21.52)	30 (15.15)	47 (29.93)	947 (33.93)	6 (17.39)
Chancroid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Chlamydia	411 (474.55)	392 (280.39)	250 (241.15)	1286 (242.76)	626 (316.1)	708 (450.92)	9779 (350.36)	88 (255.06)
Cholera	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cryptosporidiosis	2 (2.31)	4 (2.86)	2 (1.93)	4 (0.76)	5 (2.52)	4 (2.55)	42 (1.5)	2 (5.8)
Cyclosporiasis	0 (0)	1 (0.72)	0 (0)	6 (1.13)	1 (0.5)	0 (0)	21 (0.75)	0 (0)
Cytomegalovirus Infection, Congenital[2]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diphtheria	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Giardiasis	3 (3.46)	11 (7.87)	7 (6.75)	49 (9.25)	9 (4.54)	11 (7.01)	399 (14.3)	2 (5.8)
Gonorrhea	30 (34.6)	25 (17.9)	7 (6.8)	58 (10.9)	26 (13.1)	65 (41.4)	1940 (69.5)	3 (8.7)
Group A Streptococcal Disease, Invasive (iGAS)	7 (8.08)	15 (10.73)	0 (0)	19 (3.59)	13 (6.56)	38 (24.2)	106 (3.8)	2 (5.8)
Group B Streptococcal Disease, Neonatal[2]	0 (0)	1 (102.04)	0 (0)	1 (93.98)	4 (83.04)	2 (106.61)	16 (1034.26)	0 (0)
Hantavirus Pulmonary Syndrome	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hemorrhagic Fevers	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hepatitis A	0 (0)	0 (0)	1 (0.96)	6 (1.13)	0 (0)	0 (0)	41 (1.47)	0 (0)
Hepatitis B (Acute)	0 (0)	1 (0.72)	1 (0.96)	5 (0.94)	1 (0.5)	8 (5.1)	9 (0.32)	0 (0)
Hepatitis B (Chronic)[6]	0 (0)	1 (0.72)	1 (0.96)	17 (3.21)	6 (3.03)	4 (2.55)	1150 (41.2)	0 (0)
Hepatitis C	26 (30.02)	53 (37.91)	23 (22.19)	153 (28.88)	100 (50.49)	154 (98.08)	817 (29.27)	19 (55.07)
Hepatitis D	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (0.14)	0 (0)
Herpes, Neonatal[2]	0 (0)	0 (0)	1 (93.98)	1 (20.76)	0 (0)	0 (0)	0 (0)	0 (0)
Human Immunodeficiency Virus (HIV)	0 (0)	4 (2.86)	2 (1.93)	4 (0.76)	16 (8.08)	0 (0)	495 (17.73)	0 (0)
Influenza[5]	30 (34.64)	29 (20.74)	13 (12.54)	243 (45.87)	36 (18.18)	14 (8.92)	1017 (36.44)	5 (14.49)
Invasive *Haemophilus influenzae*, type b[3]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.64)	1 (0.04)	0 (0)
Lassa Fever	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Legionellosis	1 (1.15)	2 (1.43)	1 (0.96)	4 (0.76)	3 (1.51)	1 (0.64)	54 (1.93)	0 (0)
Leprosy	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Listeriosis	0 (0)	2 (1.43)	0 (0)	5 (0.94)	3 (1.51)	3 (1.91)	12 (0.43)	0 (0)
Lyme Disease	0 (0)	2 (1.43)	5 (4.82)	2 (0.38)	0 (0)	0 (0)	33 (1.18)	0 (0)
Malaria	0 (0)	1 (0.72)	0 (0)	4 (0.76)	4 (2.02)	1 (0.64)	88 (3.15)	1 (2.9)

Reportable Disease[1,7,8]	PQP	PTC	REN	SMD	SUD	THB	TOR	TSK
	Count (Rate)[2]							
Measles	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.04)	0 (0)
Meningococcal disease, invasive[1,3]	1 (1.2)	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	5 (0.2)	0 (0)
Mumps[1]	0 (0)	1 (0.72)	0 (0)	0 (0)	0 (0)	0 (0)	5 (0.18)	0 (0)
Ophthalmia Neonatorum[2]	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (6.55)	0 (0)
Paratyphoid Fever	0 (0)	0 (0)	0 (0)	1 (0.19)	0 (0)	0 (0)	11 (0.39)	0 (0)
Pertussis[1]	4 (4.62)	21 (15.02)	14 (13.5)	41 (7.74)	25 (12.62)	17 (10.83)	106 (3.8)	1 (2.9)
Plague	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pneumococcal Disease, Invasive	5 (5.77)	13 (9.3)	13 (12.54)	76 (14.35)	30 (15.15)	22 (14.01)	214 (7.67)	3 (8.7)
Poliomyelitis (polio)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Psittacosis/Ornithosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Q-Fever	0 (0)	1 (0.72)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rabies	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.04)	0 (0)
Rubella	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Salmonellosis	16 (18.47)	27 (19.31)	26 (25.08)	125 (23.6)	36 (18.18)	26 (16.56)	704 (25.22)	6 (17.39)
Shigellosis	0 (0)	0 (0)	0 (0)	7 (1.32)	3 (1.51)	0 (0)	103 (3.69)	0 (0)
Smallpox	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Syphilis, Infectious	0 (0)	2 (1.43)	0 (0)	7 (1.32)	1 (0.5)	7 (4.46)	540 (19.35)	0 (0)
Tetanus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.04)	0 (0)
Trichinosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tuberculosis	1 (1.15)	1 (0.72)	1 (0.96)	5 (0.94)	1 (0.5)	2 (1.27)	292 (10.46)	0 (0)
Tularemia	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Typhoid Fever	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	22 (0.79)	0 (0)
Varicella (Chickenpox)[4]	39 (45.03)	92 (65.81)	10 (9.65)	259 (48.89)	21 (10.6)	59 (37.58)	891 (31.92)	8 (23.19)
Verotoxin-producing *E. coli* infection indicator conditions, including Hemolytic Uremic Syndrome	0 (0)	2 (1.43)	0 (0)	5 (0.94)	5 (2.52)	0 (0)	27 (0.97)	0 (0)
West Nile Virus illness[1]	0 (0)	1 (0.72)	1 (0.96)	3 (0.57)	0 (0)	0 (0)	94 (3.37)	0 (0)
Yellow Fever	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.04)	0 (0)
Yersiniosis	1 (1.15)	0 (0)	0 (0)	3 (0.57)	2 (1.01)	1 (0.64)	51 (1.83)	1 (2.9)

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted between [2013/11/13] and [2014/02/28].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Ontario Population: Live Births [2003-2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].

1. Includes only confirmed cases with the following exceptions: both probable and confirmed cases as for amebiasis, Lyme disease, mumps, pertussis, invasive meningococcal disease (IMD), and West Nile Virus illness.
2. Crude rates are per 100,000 population with the following exceptions: crude rates are per 100,000 live births for group B streptococcal disease, neonatal herpes, ophthalmia neonatorum, and congenital cytomegalovirus.
3. Public Health Ontario Laboratories data was used to supplement iPHIS data to increase data quality and completeness of case ascertainment for invasive *Haemophilus influenzae* type B disease (Hib) and IMD.
4. Varicella data is presented as aggregate counts. Aggregate counts for 2005 are not available and are not presented. Reporting was incomplete for the year 2006 and is not presented. RDIS data was downloaded from the eHealth Ontario portal to provide counts 2003 and 2004 Ontario varicella case counts.
5. Influenza data are reported by seasons. 2003=2002/2003, 2004=2003/2004 etc. The 2008/2009 and 2009/2010 seasons include pandemic H1N1 influenza cases that were reported in aggregate.
6. 2012 was the first year chronic hepatitis B cases are included in provincial disease surveillance.
7. Data for Transmissible Spongiform Encephalopathy is not included in the table above.
8. Further details about the data are specified in the Technical notes.

Table B5: Count and crude rate of disease by public health unit of residence: Ontario, 2012

Reportable Disease[1,7,8]	WAT	WDG	WEC	YRK
	Count (Rate)[2]			
Acquired Immunodeficiency Syndrome (AIDS)	1 (0.19)	3 (1.07)	1 (0.25)	5 (0.46)
Amebiasis[1]	35 (6.52)	10 (3.56)	13 (3.22)	41 (3.77)
Anthrax	0 (0)	0 (0)	0 (0)	0 (0)
Botulism	0 (0)	0 (0)	1 (0.25)	0 (0)
Brucellosis	1 (0.19)	0 (0)	0 (0)	0 (0)
Campylobacter enteritis	147 (27.38)	125 (44.54)	133 (32.92)	359 (33.05)
Chancroid	0 (0)	0 (0)	0 (0)	0 (0)
Chlamydia	1209 (225.23)	555 (197.75)	959 (237.4)	1901 (175.02)
Cholera	0 (0)	0 (0)	0 (0)	0 (0)
Cryptosporidiosis	13 (2.42)	17 (6.06)	3 (0.74)	15 (1.38)
Cyclosporiasis	3 (0.56)	2 (0.71)	1 (0.25)	5 (0.46)
Cytomegalovirus Infection, Congenital[2]	0 (0)	0 (0)	0 (0)	1 (8.92)
Diphtheria	0 (0)	0 (0)	0 (0)	0 (0)
Giardiasis	62 (11.55)	27 (9.62)	32 (7.92)	84 (7.73)
Gonorrhea	88 (16.4)	35 (12.5)	91 (22.5)	201 (18.5)
Group A Streptococcal Disease, Invasive (iGAS)	27 (5.03)	11 (3.92)	11 (2.72)	24 (2.21)
Group B Streptococcal Disease, Neonatal[2]	0 (0)	1 (32.95)	0 (0)	5 (44.6)
Hantavirus Pulmonary Syndrome	0 (0)	0 (0)	0 (0)	0 (0)
Hemorrhagic Fevers	0 (0)	0 (0)	0 (0)	0 (0)
Hepatitis A	7 (1.3)	0 (0)	0 (0)	12 (1.1)
Hepatitis B (Acute)	1 (0.19)	11 (3.92)	2 (0.5)	10 (0.92)
Hepatitis B (Chronic)[6]	53 (9.87)	7 (2.49)	30 (7.43)	394 (36.27)
Hepatitis C	115 (21.42)	55 (19.6)	135 (33.42)	183 (16.85)
Hepatitis D	0 (0)	0 (0)	0 (0)	0 (0)
Herpes, Neonatal[2]	0 (0)	0 (0)	1 (25.5)	0 (0)
Human Immunodeficiency Virus (HIV)	10 (1.86)	4 (1.43)	21 (5.2)	18 (1.66)
Influenza[5]	160 (29.81)	85 (30.29)	32 (7.92)	169 (15.56)
Invasive *Haemophilus influenzae*, type b[3]	1 (0.19)	0 (0)	0 (0)	1 (0.09)
Lassa Fever	0 (0)	0 (0)	0 (0)	0 (0)
Legionellosis	13 (2.42)	3 (1.07)	5 (1.24)	5 (0.46)
Leprosy	0 (0)	0 (0)	0 (0)	0 (0)
Listeriosis	1 (0.19)	1 (0.36)	2 (0.5)	2 (0.18)
Lyme Disease	4 (0.75)	1 (0.36)	0 (0)	4 (0.37)
Malaria	5 (0.93)	2 (0.71)	8 (1.98)	8 (0.74)

Reportable Disease[1,7,8]	WAT	WDG	WEC	YRK
	Count (Rate)[2]			
Measles	0 (0)	0 (0)	0 (0)	0 (0)
Meningococcal disease, invasive[1,3]	0 (0)	2 (0.7)	1 (0.2)	4 (0.4)
Mumps[1]	3 (0.56)	1 (0.36)	0 (0)	2 (0.18)
Ophthalmia Neonatorum[2]	0 (0)	0 (0)	0 (0)	0 (0)
Paratyphoid Fever	3 (0.56)	0 (0)	0 (0)	0 (0)
Pertussis[1]	70 (13.04)	152 (54.16)	26 (6.44)	37 (3.41)
Plague	0 (0)	0 (0)	0 (0)	0 (0)
Pneumococcal Disease, Invasive	81 (15.09)	18 (6.41)	30 (7.43)	48 (4.42)
Poliomyelitis (polio)	0 (0)	0 (0)	0 (0)	0 (0)
Psittacosis/Ornithosis	0 (0)	0 (0)	0 (0)	0 (0)
Q-Fever	0 (0)	1 (0.36)	0 (0)	1 (0.09)
Rabies	0 (0)	0 (0)	0 (0)	0 (0)
Rubella	0 (0)	0 (0)	0 (0)	0 (0)
Salmonellosis	120 (22.35)	72 (25.65)	74 (18.32)	277 (25.5)
Shigellosis	7 (1.3)	5 (1.78)	2 (0.5)	53 (4.88)
Smallpox	0 (0)	0 (0)	0 (0)	0 (0)
Syphilis, Infectious	19 (3.54)	5 (1.78)	2 (0.5)	26 (2.39)
Tetanus	0 (0)	0 (0)	0 (0)	0 (0)
Trichinosis	0 (0)	0 (0)	0 (0)	0 (0)
Tuberculosis	10 (1.86)	8 (2.85)	11 (2.72)	53 (4.88)
Tularemia	0 (0)	0 (0)	0 (0)	0 (0)
Typhoid Fever	2 (0.37)	0 (0)	0 (0)	2 (0.18)
Varicella (Chickenpox)[4]	224 (41.73)	121 (43.11)	122 (30.2)	251 (23.11)
Verotoxin-producing *E. coli* infection indicator conditions, including Hemolytic Uremic Syndrome	23 (4.28)	9 (3.21)	4 (0.99)	18 (1.66)
West Nile Virus illness[1]	3 (0.56)	2 (0.71)	22 (5.45)	17 (1.57)
Yellow Fever	0 (0)	0 (0)	0 (0)	0 (0)
Yersiniosis	3 (0.56)	2 (0.71)	3 (0.74)	27 (2.49)

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted between [2013/11/13] and [2014/02/28].
Ontario Population: Population Estimates [2003-2012], MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/26].
Ontario Population: Live Births [2003-2011], MOHLTC, IntelliHEALTH Ontario, extracted [2013/11/29].

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2. Crude rates are per 100,000 population with the following exceptions: crude rates are per 100,000 live births for group B streptococcal disease, neonatal herpes, ophthalmia neonatorum, and congenital cytomegalovirus.
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Table C1: Number of *Clostridium difficile* Infection (CDI) outbreaks and cases by health unit and year: Ontario, 2009-2012

PHU	2009	2010	2011	2012
	Outbreak (Cases)			
ALG	0 (0)	1 (4)	0 (0)	0 (0)
BRN	0 (0)	0 (0)	0 (0)	0 (0)
CHK	0 (0)	0 (0)	0 (0)	0 (0)
DUR	1 (8)	0 (0)	2 (4)	5 (66)
ELG	1 (4)	0 (0)	0 (0)	0 (0)
EOH	0 (0)	0 (0)	0 (0)	0 (0)
GBO	1 (18)	0 (0)	1 (7)	0 (0)
HAL	0 (0)	0 (0)	0 (0)	0 (0)
HAM	1 (21)	5 (92)	3 (11)	5 (30)
HDN	0 (0)	0 (0)	0 (0)	1 (5)
HKP	2 (15)	0 (0)	0 (0)	1 (5)
HPE	0 (0)	0 (0)	1 (3)	0 (0)
HUR	0 (0)	0 (0)	0 (0)	0 (0)
KFL	2 (48)	2 (147)	3 (99)	0 (0)
LAM	0 (0)	0 (0)	1 (24)	0 (0)
LGL	0 (0)	0 (0)	0 (0)	0 (0)
MSL	4 (35)	4 (52)	3 (23)	3 (18)
NIA	0 (0)	1 (4)	8 (129)	0 (0)
NPS	0 (0)	0 (0)	0 (0)	0 (0)
NWR	0 (0)	0 (0)	0 (0)	0 (0)
OTT	0 (0)	1 (6)	4 (25)	3 (25)
OXF	0 (0)	1 (3)	0 (0)	1 (3)
PDH	0 (0)	0 (0)	0 (0)	0 (0)
PEE	1 (107)	1 (7)	2 (15)	5 (62)
PQP	1 (14)	0 (0)	1 (2)	0 (0)
PTC	1 (6)	1 (8)	1 (4)	0 (0)
REN	0 (0)	1 (9)	1 (9)	1 (3)
SMD	0 (0)	3 (71)	0 (0)	2 (37)
SUD	0 (0)	1 (9)	0 (0)	2 (23)
THB	0 (0)	0 (0)	1 (6)	0 (0)
TOR	2 (12)	5 (149)	5 (46)	3 (38)
TSK	0 (0)	0 (0)	0 (0)	0 (0)
WAT	0 (0)	0 (0)	2 (6)	2 (11)
WDG	0 (0)	1 (4)	2 (28)	1 (3)
WEC	0 (0)	1 (9)	1 (27)	0 (0)
YRK	1 (9)	1 (6)	2 (21)	1 (17)
Total	**18 (297)**	**30 (580)**	**44 (489)**	**36 (346)**

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2014/04/16].

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