

Reportable Disease Trends in Ontario

2011

Technical Report
January 2014

Public Health Ontario

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Reportable Disease Trends in Ontario 2011

Contributing Authors

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December 2013

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About this Report

Reportable Disease Trends in Ontario, 2011 is a publication of Public Health Ontario (PHO). It is the first annual reportable disease surveillance report produced by Public Health Ontario (PHO) since the transfer of related functions from the Ministry of Health and Long-Term Care (MOHLTC) to PHO in July 2011. Similar annual reports up to 2009 were produced by the MOHLTC. Like its predecessor, the 2011 report is an important component of the provincial infectious diseases surveillance system, serving as an outlet for the dissemination of information on reportable disease trends in Ontario. The report provides a descriptive analysis of ten year trends in reportable diseases in Ontario and identifies diseases or disease-specific areas where public health responses may be required to anticipate and counter emerging trends. The epidemiological analyses will be a key resource for setting priorities for health practitioners and researchers involved in the planning, implementation and evaluation of public health policy and practice in Ontario.

The scope of the report is limited to diseases designated as reportable under the [Ontario Health Protection and Promotion Act, R.S.O. 1990, c. H.7](#) with a focus on data reported in 2011. The core of the report is a brief epidemiological analysis of these diseases, complete with interpretations of trends and contextual data. The report relies primarily on data extracted from the integrated Public Health Information System (iPHIS), except where otherwise noted. Comparative data at the national level are also provided where available. Recommendations to improve the quality of reportable disease surveillance information in Ontario are not a focus and will be addressed in future reports.

The data in this report are presented in five main sections that align with either a specific mode of disease transmission or a recognized measure of prevention:

Section 1: Enteric and Zoonotic Diseases
Section 2: Respiratory Diseases and Diseases Transmitted through Direct Contact

Section 3: Sexually Transmitted and Blood-borne Infections

Section 4: Vaccine-Preventable Diseases

Section 5: Vector-borne Diseases

Section 6: Other Reportable Diseases

Within these sections, individual reportable diseases are presented as chapters with detailed analyses where sufficient data as reported in 2011 are available to enable meaningful analyses. The ten year trend is presented for all diseases in order to assess the relative burden (number of reported cases and incidence rate) of reportable diseases in Ontario. Each disease chapter is presented alphabetically and is comprised of a brief description of the disease, and highlights for the ten year period from 2002 to 2011. Canadian incidence rates for the period from 2002 to 2008 are also presented for comparison where available. Summary tables, maps and figures for 2011 are presented for diseases where sufficient data were reported. These tables, maps and figures summarize the following data:

- Distribution of reported cases per month for select diseases (seasonality),
- Age and sex-specific counts and incidence rates,
- Disease incidence by etiologic agent, serotypes or serogroups where applicable
- Geographic distribution of reported cases,
- Frequency distribution of risk factors, risk settings and exposure sources, where applicable, and
- Other indicators of burden such as hospitalization and case fatality ratios, where applicable.

The report also comes with several quick reference data tables and detailed Technical Notes found in the Appendices. The Technical Notes outline the data sources and methods used, as well as some limitations and cautions for interpretation.

The 2011 report can be found online on PHO's website at www.publichealthontario.ca/en/Pages/default.aspx

Glossary of terms

AIDS - Acquired Immunodeficiency Syndrome

CFR - case fatality ratio

CJD - Creutzfeldt-Jakob disease

CMV - cytomegalovirus

CRS - congenital rubella syndrome

HAART - Highly Active Anti-retroviral Therapy

HBsAg - hepatitis B virus surface antigen

HBV - hepatitis B virus

HCV - hepatitis C virus

Hib - *haemophilus influenzae* type B

HIV - Human Immunodeficiency Virus

HPPA - *Health Protection and Promotion Act*

HPS - Hantavirus Pulmonary Syndrome

HSV - herpes simplex virus

HUS - hemolytic uremic syndrome

IDU - injection drug use

iGAS - invasive group A streptococcal disease

IMD - invasive meningococcal disease

IPD - invasive pneumococcal disease

iPHIS - integrated Public Health Information System

IPV - inactivated polio vaccine

MMR - mumps, measles, rubella (vaccine)

MMRV - mumps, measles, rubella, varicella (vaccine)

MOHLTC - Ministry of Health and Long-Term care

MSM - men who have sex with men

NF - necrotizing fasciitis

PHAC - Public Health Agency of Canada

PHO - Public Health Ontario

PHU - public health units

RDIS - Reportable Diseases Information System

SARS - Severe Acute Respiratory Syndrome

STBBIs - sexually transmitted and blood-borne infections

STI - sexually transmitted infections

STSS - streptococcal toxic shock syndrome

TB - tuberculosis

TSEs - transmissible spongiform encephalopathies

VPDs - vaccine-preventable diseases

VTEC - verotoxin-producing *E. coli*

WNV - West Nile virus

Section 1

Enterics and zoonotic diseases

Overview

Enteric and zoonotic diseases accounted for 15% of all reported cases of reportable diseases in Ontario in 2011. The top three enteric illnesses in 2011 were campylobacteriosis, salmonellosis and giardiasis. Incidence rates for most enteric diseases declined during the period from 2002 to 2011, with the declines occurring primarily among enteric diseases that are considered endemic in Ontario (e.g. salmonellosis, *E. coli* and listeriosis). Non-endemic diseases, such as typhoid fever, paratyphoid fever and cyclosporiasis were largely associated with international travel and generally increased over the period.

Although enteric disease trends can be affected by outbreaks, the impact of outbreaks on overall incidence in 2011 was minimal, ranging from less than one percent of cases for most enteric diseases to approximately 15-20% of cases for shigellosis, *E. coli* and cyclosporiasis.

In this report, diseases exclusively transmitted from animal to person are referred to as zoonotic. For most of these diseases, zero to one case was reported in Ontario in 2011. In contrast, there was a notable increase in the incidence of Q fever compared to previous years owing to increased awareness and testing for the disease among a group of highly susceptible Ontarians taking part in a provincial study of Q fever.

Several quick reference data tables on the enteric and zoonotic diseases covered in this report are included in Appendix 4.

Amebiasis

- **Amebiasis is the fourth most commonly reported enteric disease in Ontario.**
- **Since 2009, males have accounted for a disproportionate share of amebiasis cases with higher annual incidence rates in almost every age group.**
- **Out of province travel and water-borne exposures were the most commonly reported risk factors among amebiasis cases reported in Ontario in 2011.**

Amebiasis is a common enteric disease caused by the ubiquitous parasite *Entamoeba histolytica*.¹ Humans are the only reservoir for *E. histolytica* and transmission is usually foodborne or water-borne via the fecal-oral route or sexually via the oral-anal route.¹⁻³

Only 10-20% of persons develop symptoms of amebiasis after infection with *E. histolytica*.¹ Symptoms commonly appear two to four weeks after exposure but can occur as early as a few days to several months after exposure.¹ In most cases, symptoms include mild abdominal discomfort with bloody or mucoid diarrhea that alternates with constipation. In severe cases, amebic dysentery occurs and is characterized by fever, chills and bloody or mucoid diarrhea.¹

Although susceptibility to amebiasis is universal, it is mostly a disease of young adults with infections rarely occurring in children under the age of five years. The risk of amebiasis is higher among travelers to tropical regions with poor sanitary conditions, among persons who live in institutions with poor sanitation, and among men who have sex with men. Amebiasis can be prevented through proper hand washing with soap and running water after toileting or changing diapers, by abstaining from sexual practices that permit fecal-oral transmission, and by consuming only bottled water or water that has been adequately treated while traveling in areas with poor sanitary conditions.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Amebiasis was the fourth most commonly reported enteric disease in Ontario in 2011, accounting for eight percent of all enteric and zoonotic diseases reported in that year. In 2011, a total of 744 confirmed and probable cases were reported, representing an incidence rate of 5.56 cases per 100,000 population (Figure 1-1).

Between 2002 and 2011, annual incidence rates of amebiasis fluctuated, ranging from a low of 5.05 cases per 100,000 population in 2006 to a high of 6.83 cases per 100,000 population in 2002 (Figure 1-1). Compared to 2008, the number of reported cases of amebiasis remained elevated in 2009 and 2010 but has since dropped to its lowest level since 2006. The implementation of new provincial case definitions in early 2009 did not contribute significantly to this initial increase in incidence in 2009 and 2010. In the period prior to the case definition change (2002 to 2008), the cumulative incidence rate of amebiasis was 6.01 cases per 100,000 population compared to 5.99 cases per 100,000 in the three years since the change (2009 to 2011). A more detailed discussion on the impact of the case definition change is provided in the Technical Notes in Appendix 1.

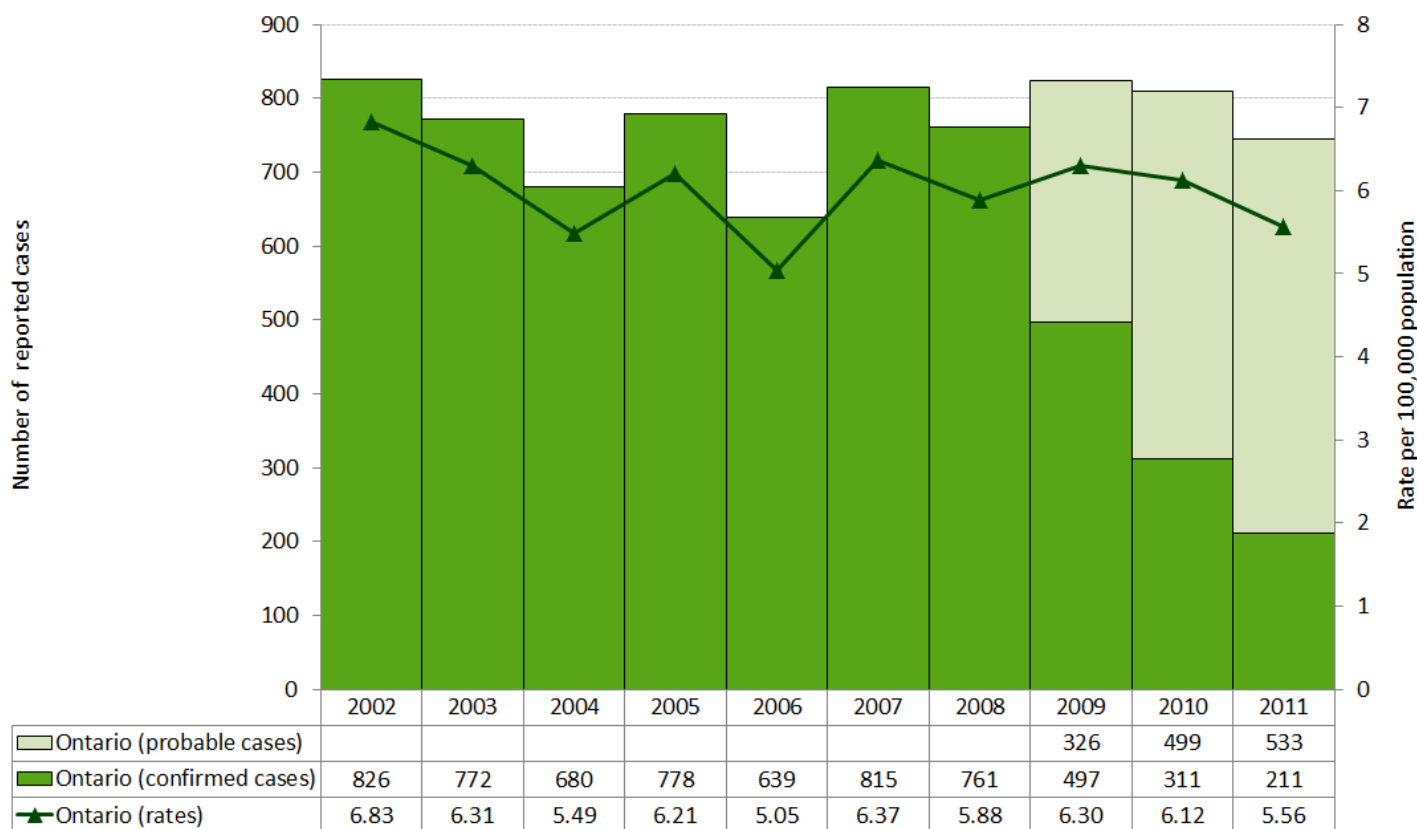
Amebiasis is not nationally notifiable, thus a comparison between Ontario incidence rates and Canadian rates is not provided.

AGE AND SEX DISTRIBUTION

Amebiasis cases reported in 2011 ranged in age from one to 92 years, with a median age of 41 years. Males accounted for a disproportionately larger share of cases with 522 cases or 70% of cases reported in 2011 (Table 1-1, Figure 1-2). Overall sex-specific incidence rates for amebiasis in 2011 were also higher for males compared to females in all age groups except the 10-19 year age group. For males, rates were highest in the 30-39 and 40-49 age groups at 12.05 and 14.15 cases per 100,000 population, respectively. For females, incidence rates were highest in the 20-29 and 30-39 age groups at 4.85 and 6.46 cases per 100,000 population, respectively.

From 2009 to 2011, males accounted for 70 to 72% of amebiasis cases reported in Ontario. This trend of higher incidence rates of amebiasis among males, particularly those aged 30 to 49 years, may be reflective of same-sex contact, which is an emerging risk factor for enteric diseases such as amebiasis.^{2,3}

Figure 1-1. Incidence of Amebiasis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]; probable cases included as of 2009.

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Amebiasis is not nationally notifiable.

Table 1-1. Incidence of Amebiasis by Age and Sex: Ontario, 2011

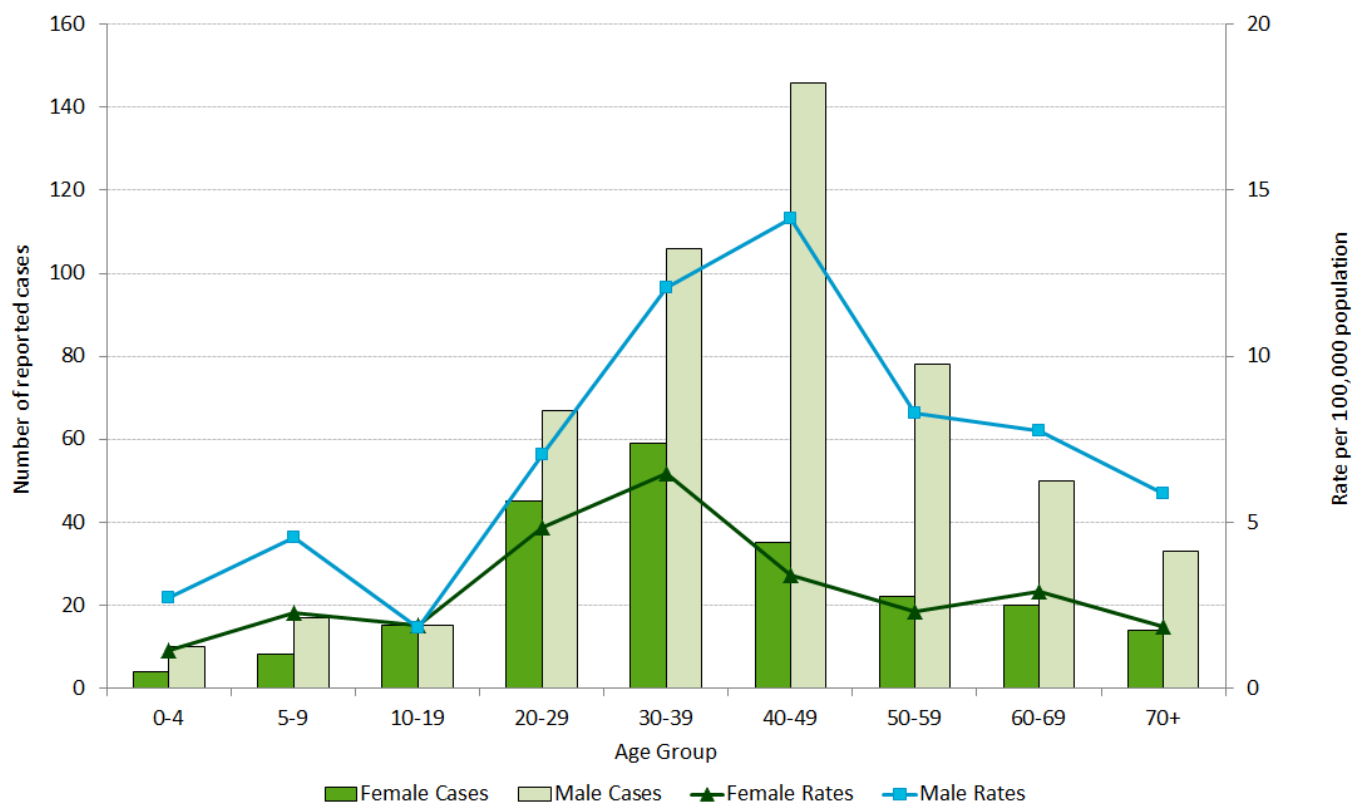
Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	4	1.14	10	2.70	14	1.94
5-9	8	2.26	17	4.54	25	3.43
10-19	15	1.88	15	1.80	30	1.84
20-29	45	4.85	67	7.03	112	5.96
30-39	59	6.46	106	12.05	165	9.20
40-49	35	3.40	146	14.15	181	8.78
50-59	22	2.30	78	8.29	100	5.27
60-69	20	2.91	50	7.75	70	5.25
70+	14	1.84	33	5.87	47	3.55
Total	222	3.27	522	7.92	744	5.56

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Includes both confirmed and probable cases.

Figure 1-2. Incidence of Amebiasis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Includes both confirmed and probable cases.

HOSPITALIZATIONS AND DEATHS

In 2011, two percent (16/744) of amebiasis cases were hospitalized. No fatalities were reported among the cases.

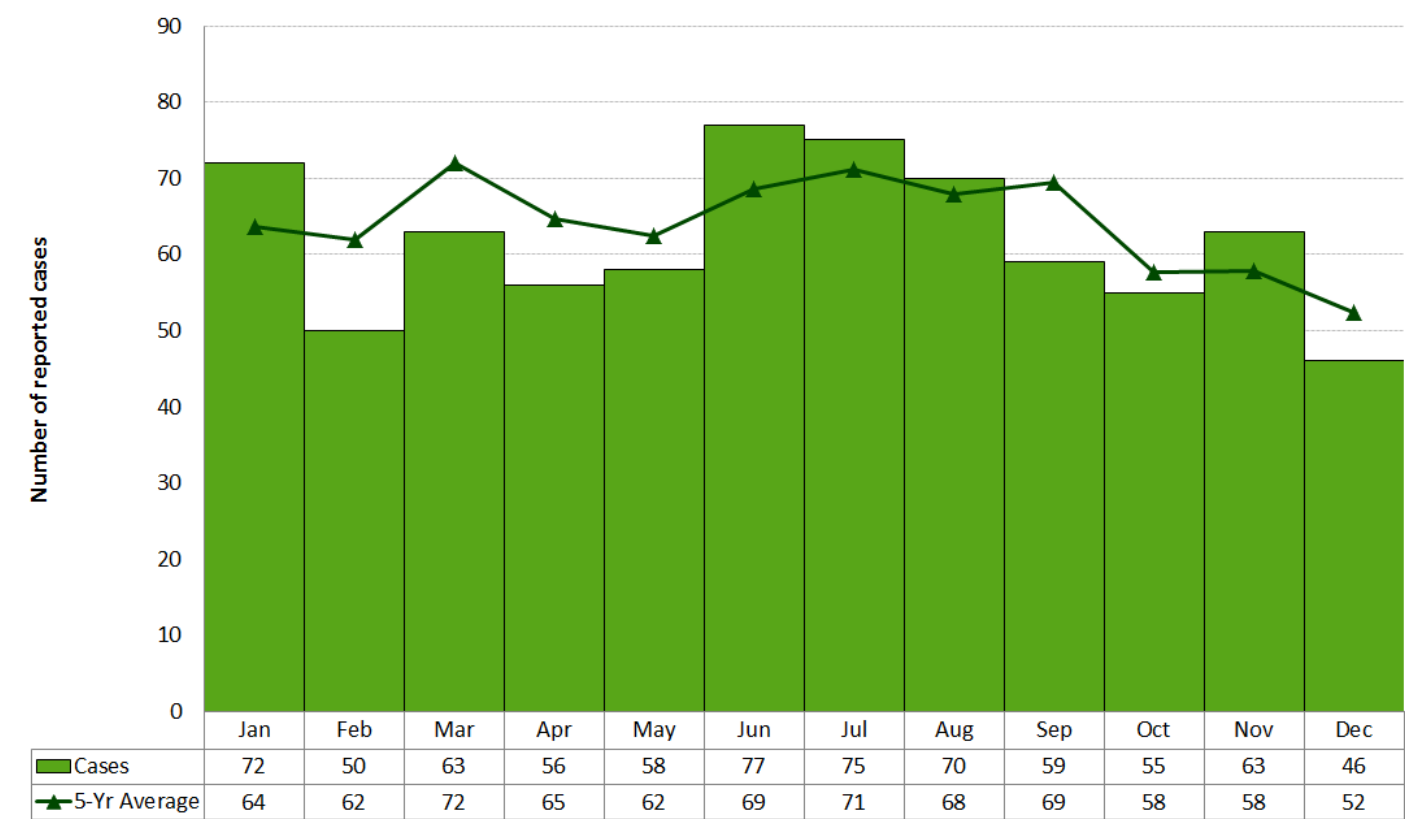
MONTHLY DISTRIBUTION

Amebiasis occurs throughout the year with no clear seasonal pattern. In 2011, the highest number of cases was reported in January (72), June (77) and July (75), (Figure 1-3). A low of 46 cases was reported in December.

GEOGRAPHIC DISTRIBUTION

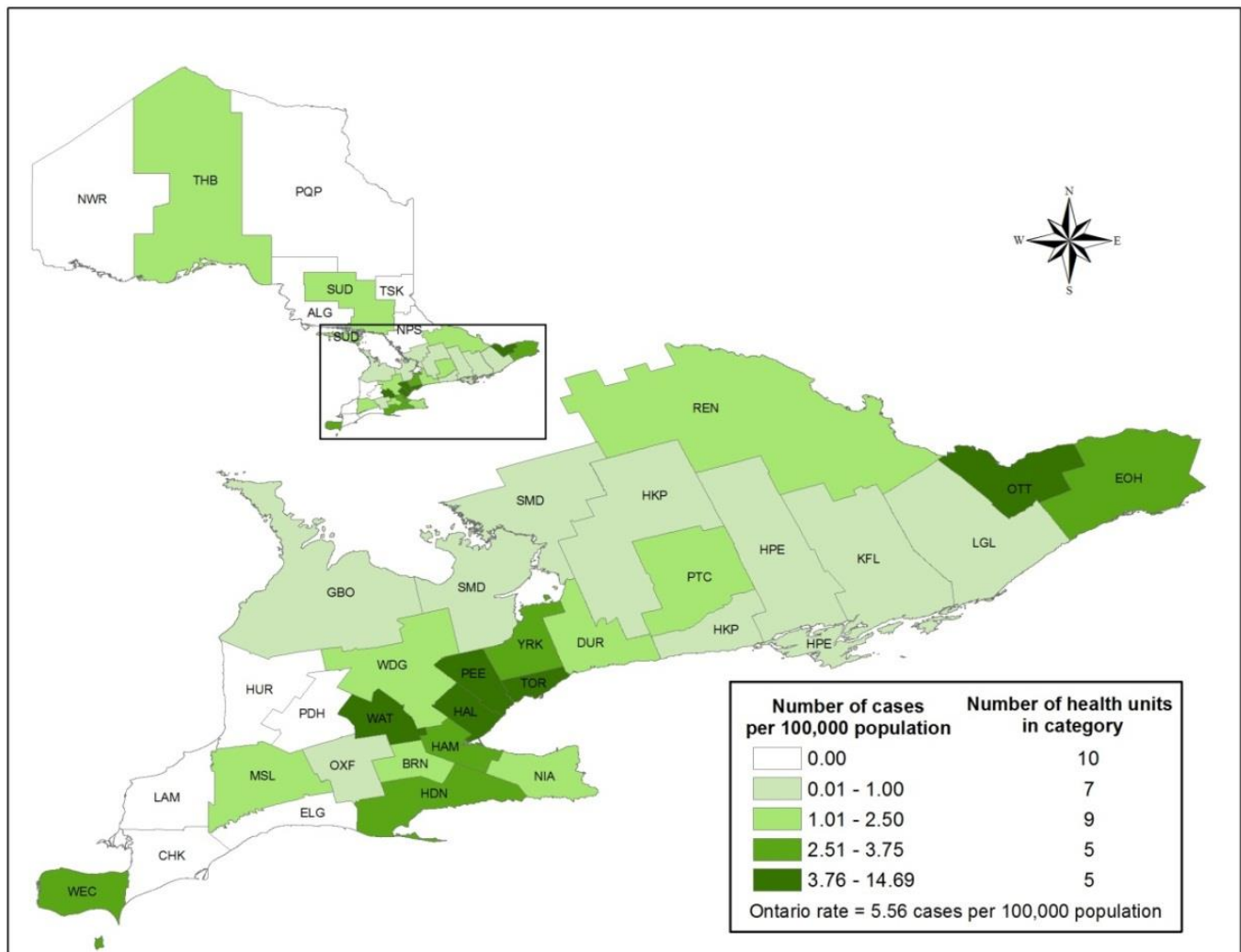
Toronto accounted for 54% of amebiasis cases reported in Ontario in 2011, which also corresponded to the highest incidence rate of amebiasis (14.69 cases per 100,000 population). Peel Region reported the second highest incidence rate with 8.42 cases per 100,000 population. Ten health units, all in southwest and northern Ontario, reported no cases of amebiasis in 2011 (Map 1-1, Table 1-2).

Figure 1-3. Number of Amebiasis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].
Note: Includes both confirmed and probable cases.

Map 1-1. Incidence of Amebiasis by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition. Includes both confirmed and probable cases.

Table 1-2. Incidence of Amebiasis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	2	1.42	0.3%	1.1%
Chatham-Kent	0	0.00	0.0%	0.8%
Durham Region	14	2.22	1.9%	4.7%
Eastern Ontario	6	2.98	0.8%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	1	0.61	0.1%	1.2%
Haldimand-Norfolk	4	3.61	0.5%	0.8%
Haliburton, Kawartha, Pine Ridge District	1	0.56	0.1%	1.3%
Halton Region	21	4.05	2.8%	3.9%
Hamilton, City of	19	3.52	2.6%	4.0%
Hastings & Prince Edward Counties	1	0.61	0.1%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	1	0.51	0.1%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	1	0.59	0.1%	1.3%
Middlesex-London	10	2.17	1.3%	3.4%
Niagara Region	7	1.57	0.9%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	0	0.00	0.0%	0.6%
Ottawa, City of	45	4.95	6.0%	6.8%
Oxford County	1	0.92	0.1%	0.8%
Peel Region	115	8.42	15.5%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	2	1.42	0.3%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	2	1.94	0.3%	0.8%
Simcoe Muskoka District	3	0.57	0.4%	3.9%
Sudbury & District	2	1.01	0.3%	1.5%
Thunder Bay District	2	1.28	0.3%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	403	14.69	54.2%	20.5%
Waterloo Region	21	3.96	2.8%	4.0%
Wellington-Dufferin-Guelph	6	2.15	0.8%	2.1%
Windsor-Essex County	15	3.72	2.0%	3.0%
York Region	39	3.65	5.2%	8.0%
Ontario	744	5.56	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition. Includes both confirmed and probable cases.

REPORTED RISK FACTORS

Just under half (49%, 362/744) of amebiasis cases reported at least one risk factor in 2011 (Table 1-3). The most commonly reported risk factors were travel or living outside of the province at 63% (226/362), followed by consumption of potentially contaminated water or recreational water contact at 32% (115/362), and consumption of raw unwashed fruits and vegetables at 25% (89/362). Cases reporting anal-oral contact (53/362) were predominantly male (98%) and ranged in age from 19 to 78 years with a median age of 40 years.

Table 1-3. Reported Risk Factors for Amebiasis Cases: Ontario, 2011 (n=362)

Risk Factors	Cases	
	Number	Percent
Travel or lived outside of province	227	62.7%
Consumption/ingestion of potentially contaminated water or recreational water contact	115	31.8%
Consumption of raw unwashed fruits/vegetables	89	24.6%
Anal-oral contact	53	14.6%
Close contact with case	17	4.7%
Consumption of other potentially contaminated food and dairy	17	4.7%
Poor hand hygiene	13	3.6%
Other	24	6.6%
Unknown	53	14.6%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/6/13].

Note: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to the sum of risk factors reported as "Other, specify" and risk factors with frequency <2%. "Unknown" refers to risk factors reported solely as "Unknown". Includes both confirmed and probable cases.

Anthrax

Anthrax is an acute disease caused by the spores of the bacterium *Bacillus anthracis*.¹ Human infections are rare and in industrialized countries, a single case is considered an outbreak given the rarity and severity of infections, and the potential for use as a bioterrorism agent.¹

There are three forms of anthrax, each defined by its mode of transmission and presenting symptoms.

Cutaneous anthrax is transmitted through direct inoculation of lesions with infected animal tissue or contaminated soil. Gastrointestinal anthrax occurs following ingestion of raw or undercooked meat from infected animals, while inhalation anthrax occurs following inhalation of anthrax spores aerosolized during industrial and other processes.¹

Symptoms of anthrax vary based on the route of transmission and usually appear one to seven days after exposure.¹ Cutaneous anthrax is the most commonly acquired human infection and is characterized by a painless black ulcer.¹ Gastrointestinal anthrax manifests as bloody diarrhea, abdominal pain, acute vomiting and fever.¹ Inhalation anthrax is the most lethal form of anthrax, resulting in cold or flu-like symptoms that can progress to respiratory distress and shock with a case fatality rate as high as 85%.¹

Anthrax is mainly a disease of herbivores including cattle and sheep. Therefore, prevention is primarily based on safe disposal of anthrax infected carcasses, vaccination of livestock and active treatment of animal cases.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

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

Botulism

Botulism is a rare but serious infection caused by the toxin producing spore of the bacterium *Clostridium botulinum*. *C. botulinum* spores are found in soil and are frequently detected in agricultural products and the intestinal tracts of animals including fish.¹

There are four forms of botulism.¹ Foodborne botulism is most common and occurs following the ingestion of foods containing pre-formed *C. botulinum* toxins. Improperly canned fruits and vegetables and fermented fish and meat products have been associated with illness. Infant botulism is associated with ingestion of spores that later form toxins in the intestinal tract. It is most often associated with the consumption of raw honey,¹ but have been implicated in illnesses associated with exposure to environmental sources such as dust, and with the consumption of contaminated infant formula.^{4,5} Adult intestinal botulism occurs in the same way as infant botulism, but is usually preceded by intestinal surgery or altered bacterial gut flora due to the use of antibiotics. Wound botulism is the rarest form of botulism and results from contamination of open wounds with soil containing spores that germinate and release toxins directly into the wound.¹ Injection drug use is a primary risk factor for wound botulism.⁶

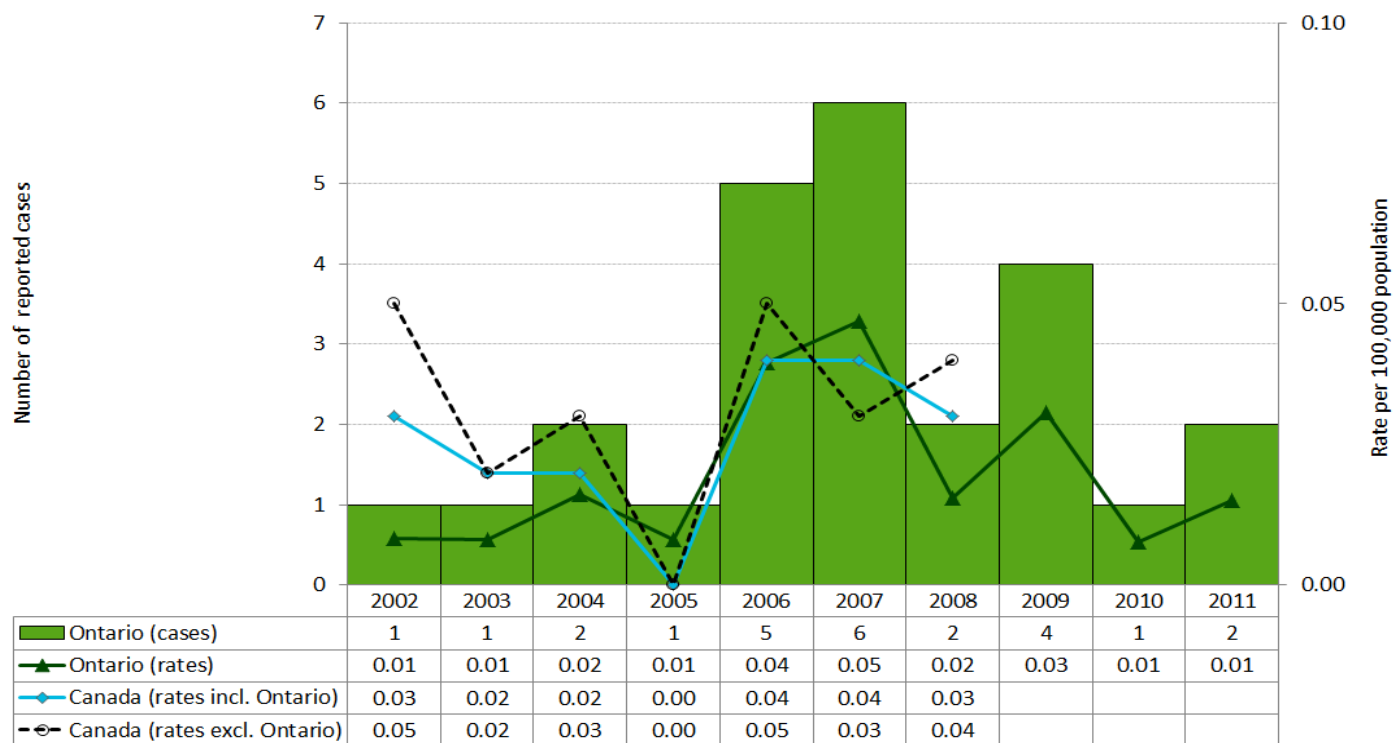
Symptoms of botulism in adults include blurred vision, nausea and vomiting, difficulty swallowing, speaking and breathing, fatigue, weakness and ultimately paralysis.¹ In infants, symptoms also include loss of appetite and head control, constipation, altered cry and limited movement of the limbs.¹ Susceptibility to botulism is general, but persons with intestinal problems and children less than six months of age have higher risk of illness following infection.¹ The risk of botulism can be reduced by preparing and canning foods safely, eliminating unpasteurized honey and peanut butter from the diets of infants, covering wounds to avoid contamination with non-sterile substances and soil and abstaining from injection drug use.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Twenty-five cases of botulism were reported in Ontario from 2002 to 2011, including two cases in 2011 (Figure 1-4). The annual number of reported cases ranged from one to six cases with an average of three cases per year.

The two cases reported in 2011 were from Sudbury & District and Waterloo Region.

Figure 1-4. Incidence of Botulism: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Brucellosis

Brucellosis is an acute and systemic bacterial infection that can be transmitted from animals to humans. Livestock such as cattle and sheep are known reservoirs of the disease.¹ Ontario has a brucellosis free status for cattle and thus most human cases are linked to travel outside of Canada.⁷ *Brucella* bacteria are potential bioterrorism agents.

Brucellosis occurs worldwide and is primarily an occupational disease of hunters, farm workers, abattoir workers, veterinarians and laboratory personnel.¹ Foodborne transmission resulting from the consumption of unpasteurized milk and milk products (e.g. soft cheeses) and undercooked meat from infected animals is the most common way in which people become infected. Transmission can also occur through direct contact between broken skin and infected animal tissue and through inhalation of the bacteria in settings such as abattoirs and laboratories.¹

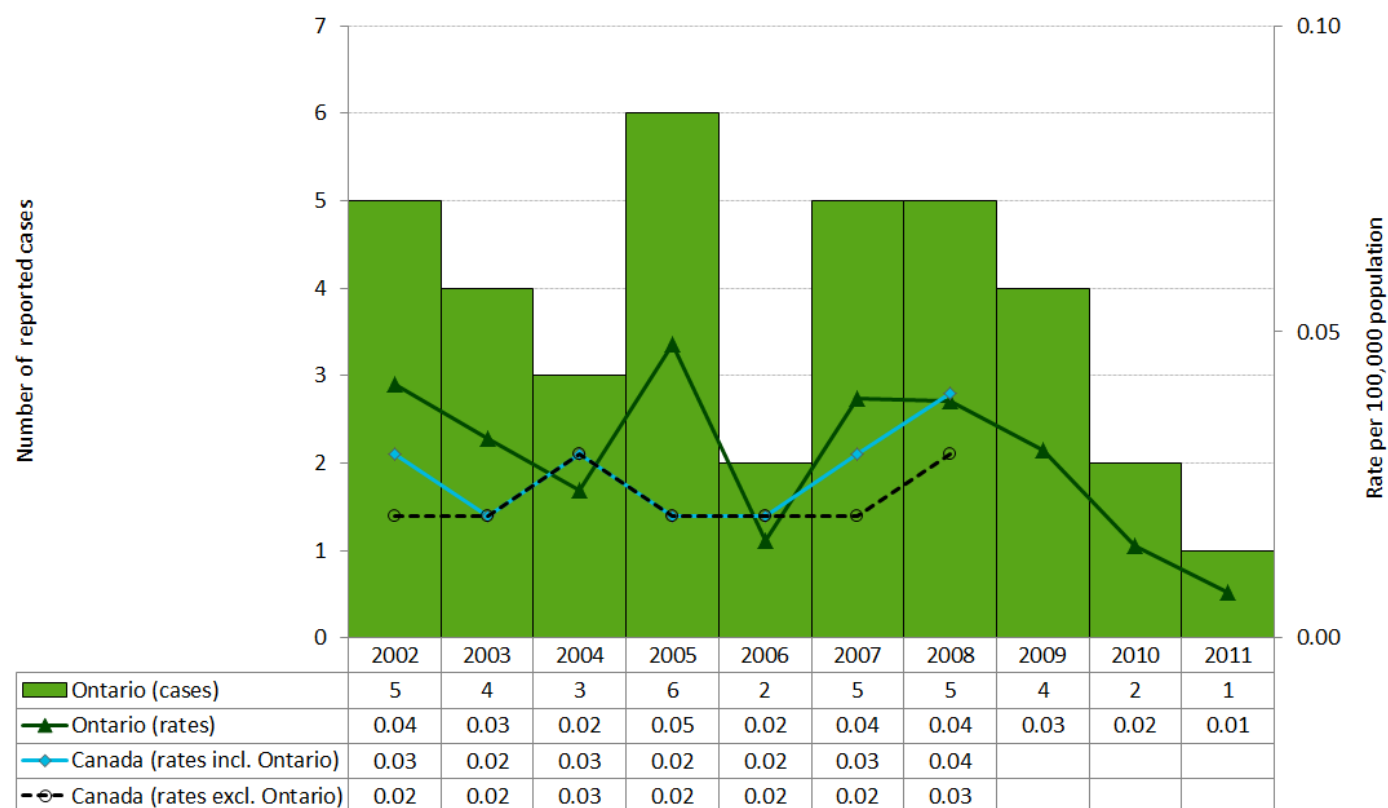
The onset of symptoms of brucellosis following exposure ranges from five to sixty days and usually include intermittent fever, headache, weakness, chills, sweating, depression, weight loss, and generalized body pain.¹ Meningitis, inflammation of heart tissue and arthritis are possible long-term complications of brucellosis.¹

Brucellosis can be prevented by consuming only milk and milk products that have been pasteurized, eating meat that has been thoroughly cooked, and by wearing personal protective clothing when handling animal tissue.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

One case of brucellosis was reported in Ontario in 2011, representing the lowest rate of disease since 2002. Over the period 2002 to 2011, an average of four cases per year (range one to six cases) was reported in Ontario for a total of 37 cases over the period (Figure 1-5). Travel outside Ontario was reported as the most likely source of exposure for 86% of brucellosis cases reported in Ontario from 2007 to 2011.

Figure 1-5. Incidence of Brucellosis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Campylobacteriosis

- **Campylobacteriosis continues to be the most commonly reported enteric disease in Ontario with 3,500 cases reported in 2011.**
- **Children under the age of five years had the highest incidence rate of campylobacteriosis in 2011.**
- **The incidence of campylobacteriosis follows a seasonal distribution with increased activity in the summer, peaking in July and August.**
- **Animal contact and travel were the most commonly reported risk factors for campylobacteriosis in 2011.**

Campylobacteriosis is the most frequently reported enteric disease in Ontario. *Campylobacter jejuni* and, less commonly, *C. coli* bacteria are the usual causes of campylobacteriosis.¹ The disease is transmitted through ingestion of the bacteria in undercooked meat and poultry, contaminated food and water, or raw milk and raw milk products. Contact with pets, farm animals and infected infants also constitute important sources of infection. Symptoms of campylobacteriosis generally appear two to five days after exposure and may include diarrhea, abdominal pain, malaise, fever, nausea and vomiting that last for one to two weeks. In some cases, infection with *Campylobacter* does not result in clinically apparent signs and symptoms.¹ Complications can also arise where the illness mimics acute appendicitis and post-infectious complications such as Guillain-Barre syndrome can also occur. Convulsions and reactive arthritis may also occur.¹

In industrialized countries, at risk populations are predominantly immunocompromised persons who are also at greater risk of severe illness, children under the age of five years, and young adults. Infection with campylobacteriosis can be prevented by thoroughly cooking all foods, especially meats and poultry; consuming only pasteurized milk and milk products;

drinking water from a safe supply; and practicing good hand hygiene.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Campylobacteriosis continued to be the most frequently reported enteric disease in Ontario, accounting for 37% of enteric disease cases reported in 2011. There were 3,500 cases reported in 2011, which represents an incidence rate of 26.17 cases per 100,000 population. Similar to other endemic enteric diseases in Ontario, the incidence of campylobacteriosis has been on the decline since the early 2000s. Over the period 2002 to 2011, the incidence rate of campylobacteriosis decreased by 31% from a high of 38.14 cases per 100,000 population in 2002. During this period, the largest year over year decline of 16% occurred between 2008 and 2009 (Figure 1-6). However, since 2010 the incidence of campylobacteriosis has increased slightly.

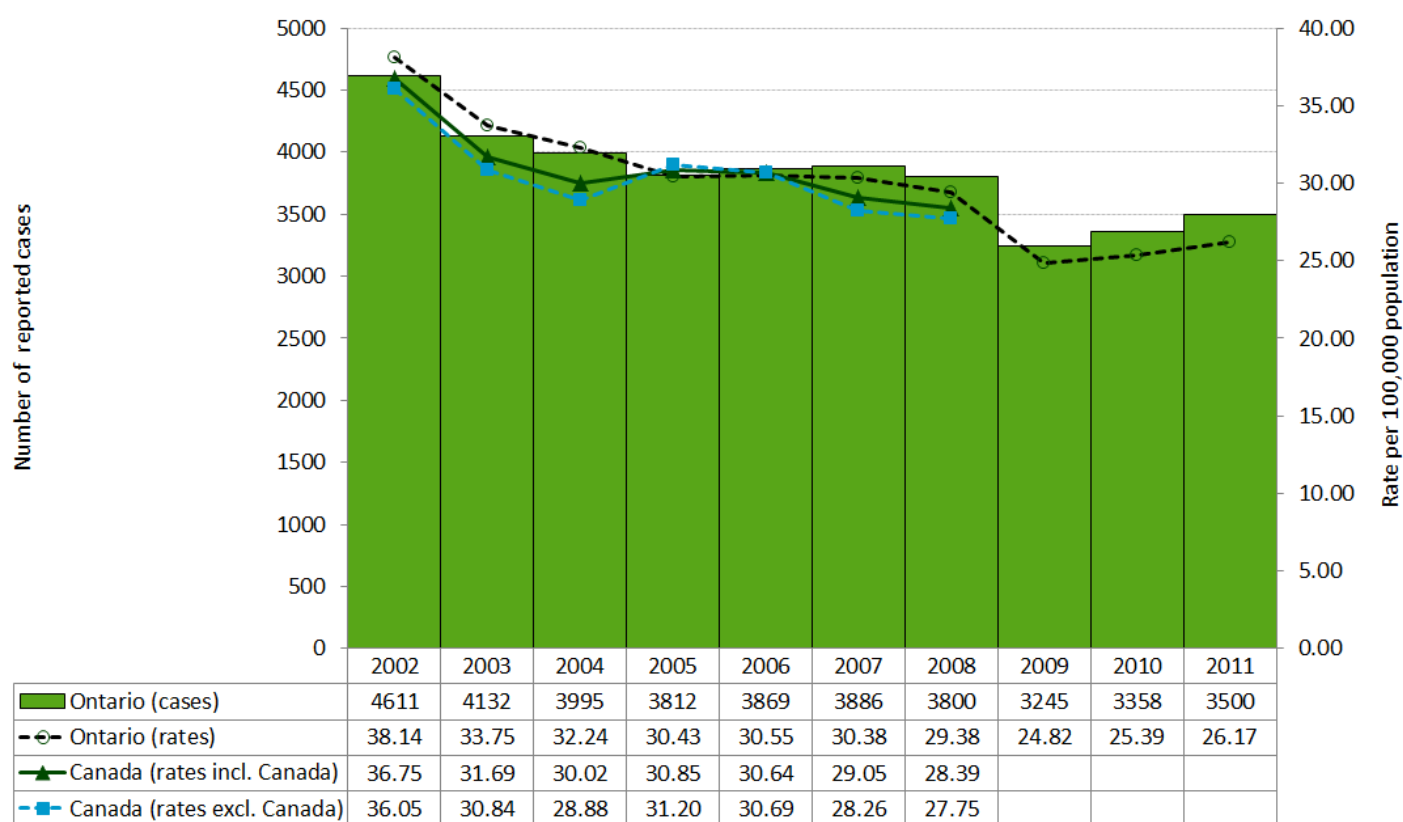
Annual incidence rates of campylobacteriosis for Canada were comparable to those of Ontario for the period 2002 to 2008, with both Ontario and Canada showing an overall pattern of decline. However, throughout most of this period, the Ontario rates were slightly higher than the national rates (Figure 1-6).

AGE AND SEX DISTRIBUTION

Similar to past years, the incidence rate of campylobacteriosis was highest among children under five years of age. In 2011, the overall incidence rate for this age group was 40.44 cases per 100,000 population (Table 1-4, Figure 1-7). Young adults in the 20-29 year age group had the second highest overall incidence rate at 32.82 cases per 100,000 population. Incidence rates were higher among males in all age categories. Overall, males had an incidence rate of 29.68 cases per 100,000 population and accounted for 56% of all cases reported

in 2011. In contrast, females had a corresponding incidence rate of 22.68 cases per 100,000 population. These trends are comparable to the general age- and sex-specific incidence patterns for campylobacteriosis in other industrialized countries.¹

Figure 1-6. Incidence of Campylobacteriosis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Table 1-4. Incidence of Campylobacteriosis by Age and Sex: Ontario, 2011

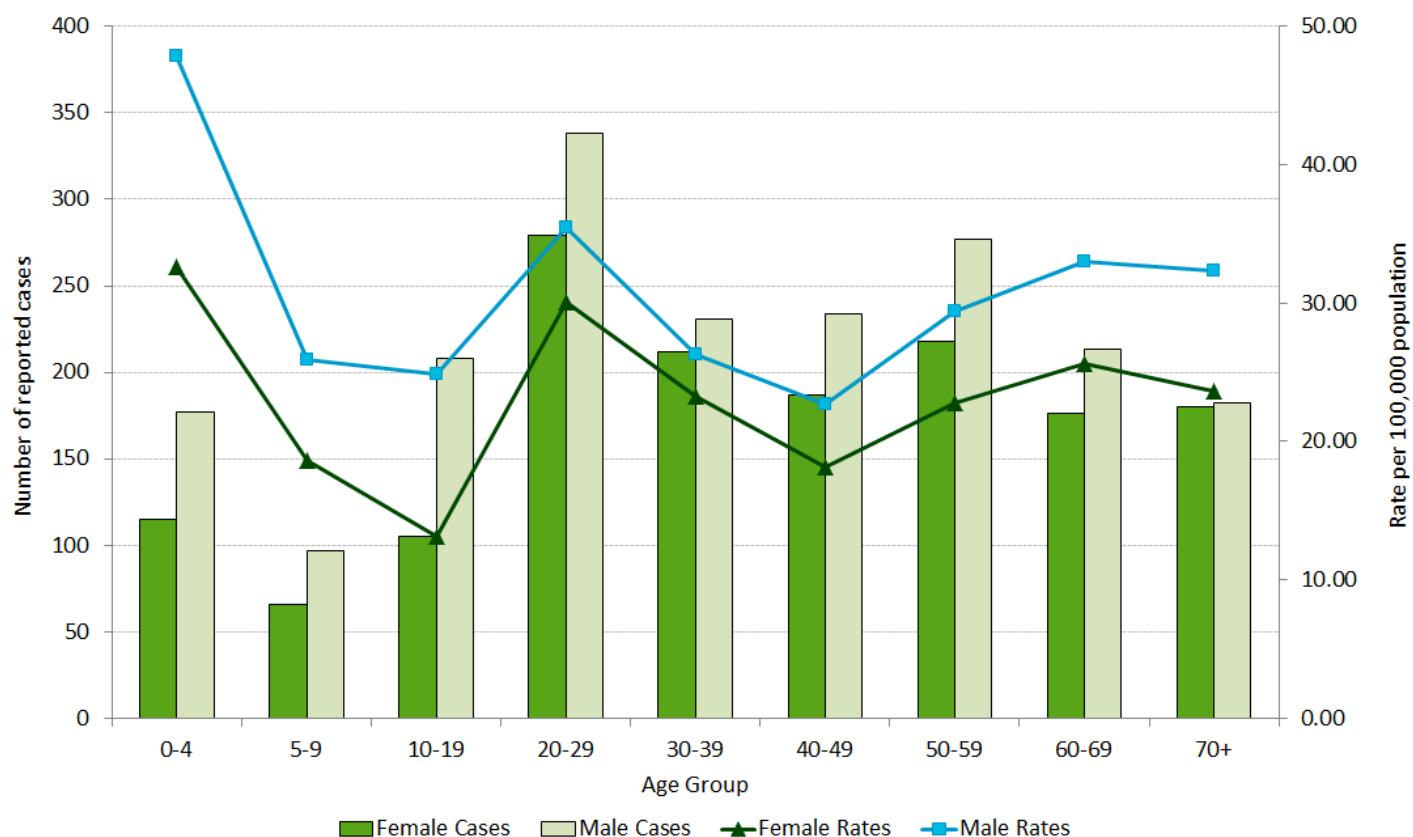
Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	115	32.64	177	47.86	292	40.44
5-9	66	18.65	97	25.91	163	22.38
10-19	105	13.17	208	24.90	313	19.18
20-29	279	30.08	338	35.48	617	32.82
30-39	212	23.22	231	26.26	443	24.71
40-49	187	18.15	234	22.68	421	20.42
50-59	218	22.77	277	29.43	495	26.07
60-69	176	25.60	213	33.00	389	29.18
70+	180	23.64	182	32.38	362	27.35
Total	1,538	22.68	1,957	29.68	3,495	26.13

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes five cases of unknown age and/or sex.

Figure 1-7. Incidence of Campylobacteriosis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes five cases of unknown age and/or sex.

HOSPITALIZATIONS AND DEATHS

In 2011, approximately five percent (178/3,500 cases) of campylobacteriosis cases were hospitalized, and no fatal cases were reported.

MONTHLY DISTRIBUTION

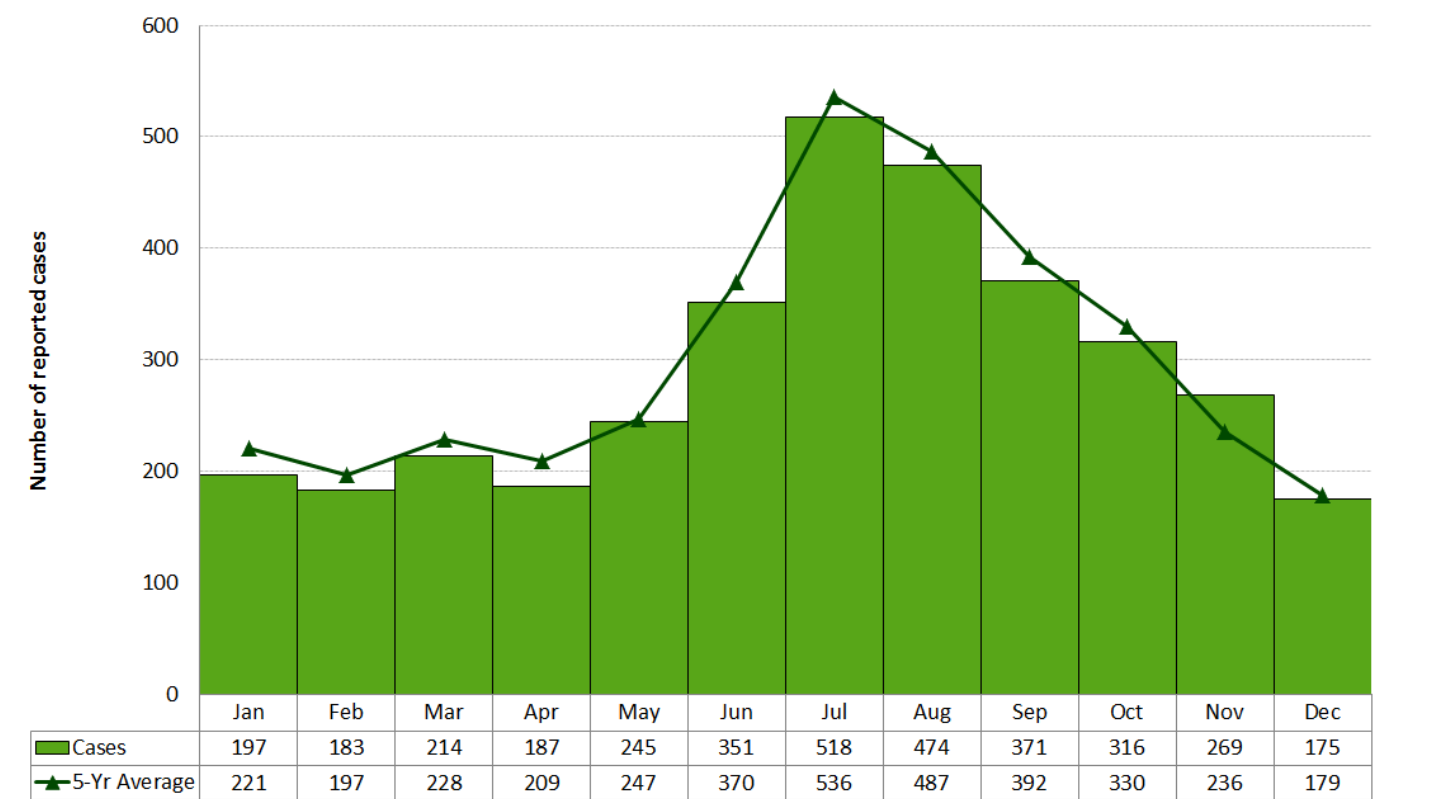
Campylobacteriosis occurs throughout the year, but tends to follow a seasonal pattern with increased incidence in the warmer months (Figure 1-8). In 2011, the incidence of campylobacteriosis peaked in July and August, which together accounted for 28% (992/3,500) of reported cases in 2011. Overall, monthly case counts for campylobacteriosis in 2011 showed seasonality similar to the average monthly case counts reported for the period 2006 to 2010.

GEOGRAPHIC DISTRIBUTION

Campylobacteriosis cases were reported by all of Ontario’s 36 health units in 2011 (Map 1-2, Table 1-5). The highest number of cases was reported by Toronto with 826 cases (24%). The second and third highest number of campylobacteriosis cases in 2011 were reported by York Region (351, 10%) and Peel Region (326, 9%).

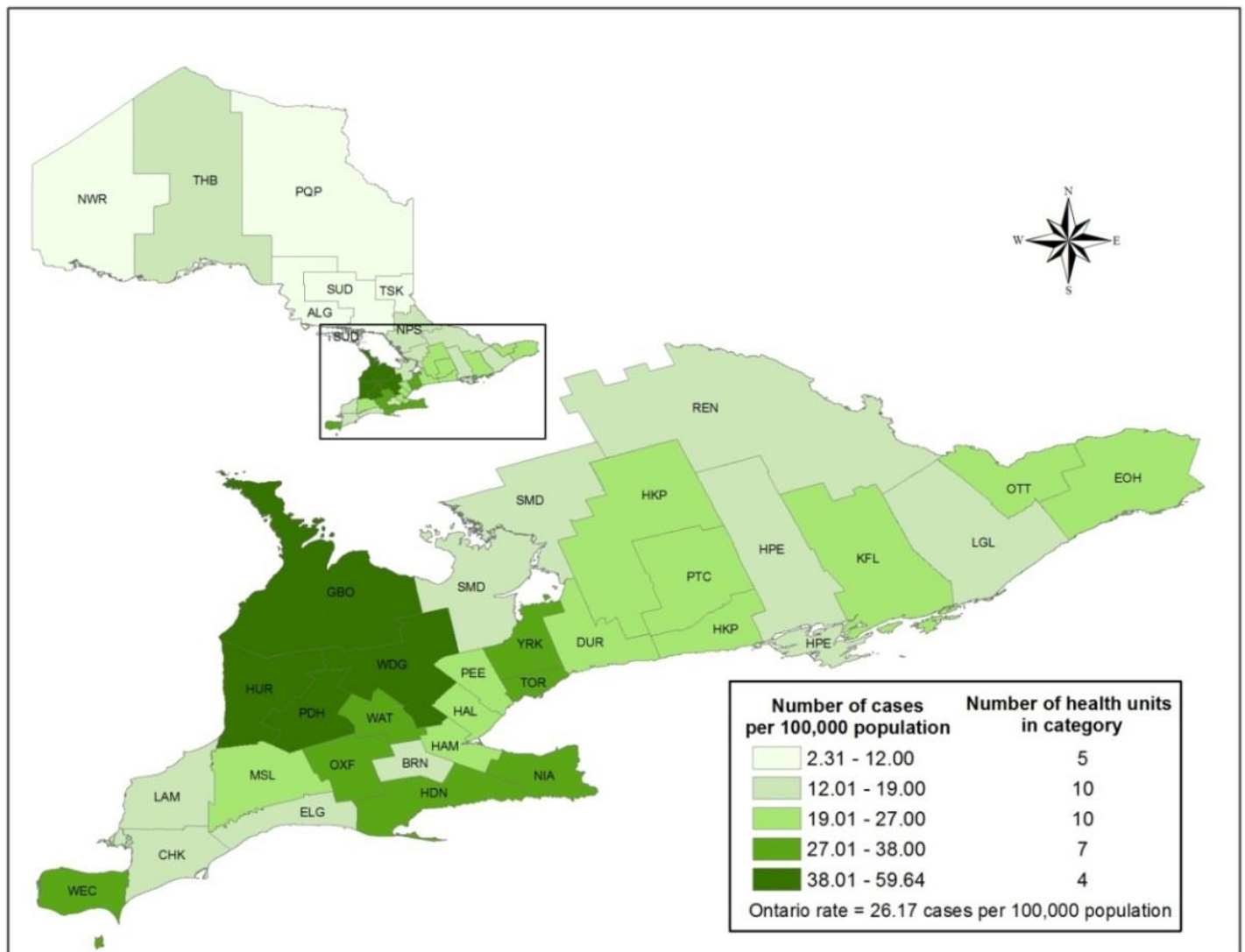
Twelve health units had incidence rates that were higher than the 2011 overall provincial rate of 26.17 per 100,000 population. Perth District (59.64 cases per 100,000 population), Grey Bruce (59.44 cases per 100,000 population) and Huron County (53.03 cases per 100,000 population) reported the highest incidence rates of campylobacteriosis in 2011. These health units are considered rural farming communities where contact with animals and their environment, a key route of transmission for campylobacteriosis, is more likely.⁸

Figure 1-8. Number of Campylobacteriosis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 1-2. Incidence of Campylobacteriosis by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-5. Incidence of Campylobacteriosis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	7	5.94	0.2%	0.9%
Brant County	19	13.49	0.5%	1.1%
Chatham-Kent	20	18.42	0.6%	0.8%
Durham Region	142	22.49	4.1%	4.7%
Eastern Ontario	48	23.87	1.4%	1.5%
Elgin-St. Thomas	14	15.31	0.4%	0.7%
Grey Bruce	98	59.45	2.8%	1.2%
Haldimand-Norfolk	34	30.71	1.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	44	24.58	1.3%	1.3%
Halton Region	123	23.71	3.5%	3.9%
Hamilton, City of	124	22.95	3.5%	4.0%
Hastings & Prince Edward Counties	21	12.91	0.6%	1.2%
Huron County	32	53.03	0.9%	0.5%
Kingston-Frontenac & Lennox & Addington	50	25.34	1.4%	1.5%
Lambton County	16	12.18	0.5%	1.0%
Leeds, Grenville and Lanark District	25	14.69	0.7%	1.3%
Middlesex-London	123	26.69	3.5%	3.4%
Niagara Region	156	35.03	4.5%	3.3%
North Bay Parry Sound District	21	16.49	0.6%	1.0%
Northwestern	9	10.98	0.3%	0.6%
Ottawa, City of	223	24.51	6.4%	6.8%
Oxford County	34	31.42	1.0%	0.8%
Peel Region	326	23.87	9.3%	10.2%
Perth District	46	59.64	1.3%	0.6%
Peterborough County-City	27	19.21	0.8%	1.1%
Porcupine	2	2.31	0.1%	0.6%
Renfrew County & District	19	18.45	0.5%	0.8%
Simcoe Muskoka District	88	16.75	2.5%	3.9%
Sudbury & District	23	11.63	0.7%	1.5%
Thunder Bay District	24	15.33	0.7%	1.2%
Timiskaming	4	11.61	0.1%	0.3%
Toronto	826	30.10	23.6%	20.5%
Waterloo Region	158	29.80	4.5%	4.0%
Wellington-Dufferin-Guelph	108	38.78	3.1%	2.1%
Windsor-Essex County	115	28.51	3.3%	3.0%
York Region	351	32.81	10.0%	8.0%
Ontario	3,500	26.17	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Fifty-nine percent (2,067/3,500) of campylobacteriosis cases reported at least one risk factor in 2011. The most frequently reported risk factors were contact with an animal at 40% and travel outside of Ontario in the 10-day period before symptom onset at 34%. Consumption of raw or undercooked poultry, poultry products and eggs was reported by 15% of cases but this was substantially lower than the expected 7-day food consumption pattern of approximately 92% for chicken alone (Table 1-6).⁹

Table 1-6. Reported Risk Factors for Campylobacteriosis Cases: Ontario, 2011 (n=2,076)

Risk Factors	Cases	
	Number	Percent
Animal contact	809	40.0%
Travel out of Ontario	711	34.2%
Raw/undercooked poultry/eggs	315	15.2%
Recreational water	284	13.7%
Consumption of potentially contaminated drinking water	230	11.1%
Raw/undercooked meats	219	10.6%
Cross contamination of ready to eat foods	164	7.9%
Unpasteurized milk or products	137	6.6%
Failure to wash hands after handling raw poultry/meat	108	5.2%
Other	190	9.2%
Unknown	268	13.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/6/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to the sum of risk factors reported as "Other, specify" and risk factors with frequency <1%. "Unknown" refers to risk factors reported solely as "Unknown".

Cholera

Vibrio cholerae is the bacterium that causes cholera, one of the world's oldest epidemic diseases.¹ Cholera is commonly found in areas with drinking water supplies that has been contaminated. The disease is not endemic in Canada and cases in Ontario are directly or indirectly associated with travel to endemic regions of the world.¹⁰

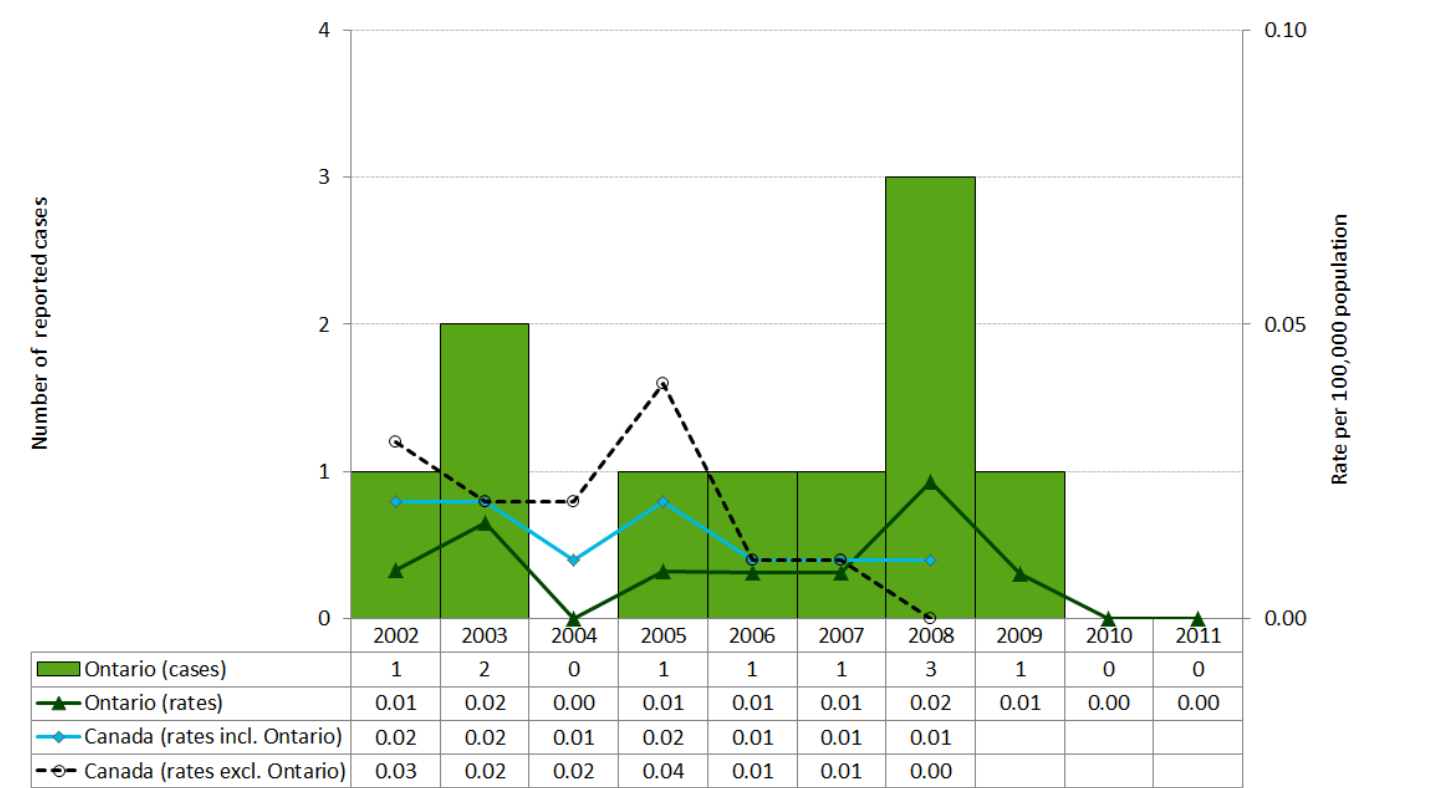
Following infection, some people may become symptom-free carriers of *V. cholerae* with the ability to pass on the infection through the fecal-oral route.¹ Transmission of cholera is usually through ingestion of food or water contaminated by the feces of infected persons and carriers. Raw or undercooked seafood, especially those obtained from sewage contaminated waters, and other foods and beverages prepared with untreated water have been implicated as sources of cholera.¹

Painless watery diarrhea, nausea and vomiting are the first symptoms of cholera, developing two to three days after exposure. In severe cases, death can occur if rehydration is not initiated. In industrialized countries, travelers and their close personal contacts have the highest risk of infection. However, susceptibility and illness severity is higher among those who are immunocompromised or have low stomach acid levels.¹ Two oral cholera vaccines that provide significant protection against cholera for several months are available for travelers to endemic countries.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

No cases of cholera were reported in Ontario in 2010 and 2011 (Figure 1-9). Over the period 2002 to 2011, ten cases of cholera were reported in Ontario for an average of one case per year (range zero to three cases). Nationally, incidence rates for cholera from 2002 to 2008 ranged from 0.01 to 0.02 cases per 100,000 population.

Figure 1-9. Incidence of Cholera: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].
Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Cryptosporidiosis

- **Cryptosporidiosis is the fifth most frequently reported enteric disease in Ontario.**
- **Incidence rates of cryptosporidiosis in 2011 were highest among young children and lowest among older people.**
- **Incidence of cryptosporidiosis peaks in the warmer months from July to September.**
- **Animal contact and recreational water exposures were the most commonly reported risk factors for cryptosporidiosis in 2011.**

Cryptosporidiosis is a parasitic infection which results in gastroenteritis. Humans, cattle and other domesticated and wild animals are the primary reservoirs of the *Cryptosporidium* parasite.¹ The parasite is shed in feces and is transmitted through the fecal-oral route. Transmission is usually through ingestion of food or water that has been contaminated by the feces of infected persons or animals, or through person-to-person or animal-to-person contact.

Symptoms of cryptosporidiosis usually develop between one and 12 days (average seven days) after exposure, with the predominant symptoms being watery diarrhea and abdominal pain. Other symptoms such as fever, malaise, vomiting and nausea occur less often. The *Cryptosporidium* oocyst can remain infective for up to six months or longer in moist environments.¹

Outbreaks of cryptosporidiosis are generally associated with child care centres, recreational water and contaminated drinking water sources.¹ Children under the age of two years, men who have sex with men, travelers, animal handlers and close contacts of infected persons have higher risk of infection. However, persons with weakened immune systems are more likely to develop serious and reoccurring illness upon infection.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Cryptosporidiosis accounted for three percent of all enteric disease cases reported in Ontario in 2011, making it one of the top five most frequently reported enteric diseases. A total of 301 cases were reported in 2011, which is equivalent to an incidence rate of 2.25 cases per 100,000 population (Figure 1-10).

Over the period 2002 to 2011, the incidence rate of cryptosporidiosis fluctuated, with rates ranging from a low of 1.91 cases per 100,000 population in 2002 to a high of 3.17 cases per 100,000 in 2006 and 2007. Since 2008, a general declining trend has been observed, but the annual number of reported cases is still higher than the annual average for the period from 2002 to 2005.

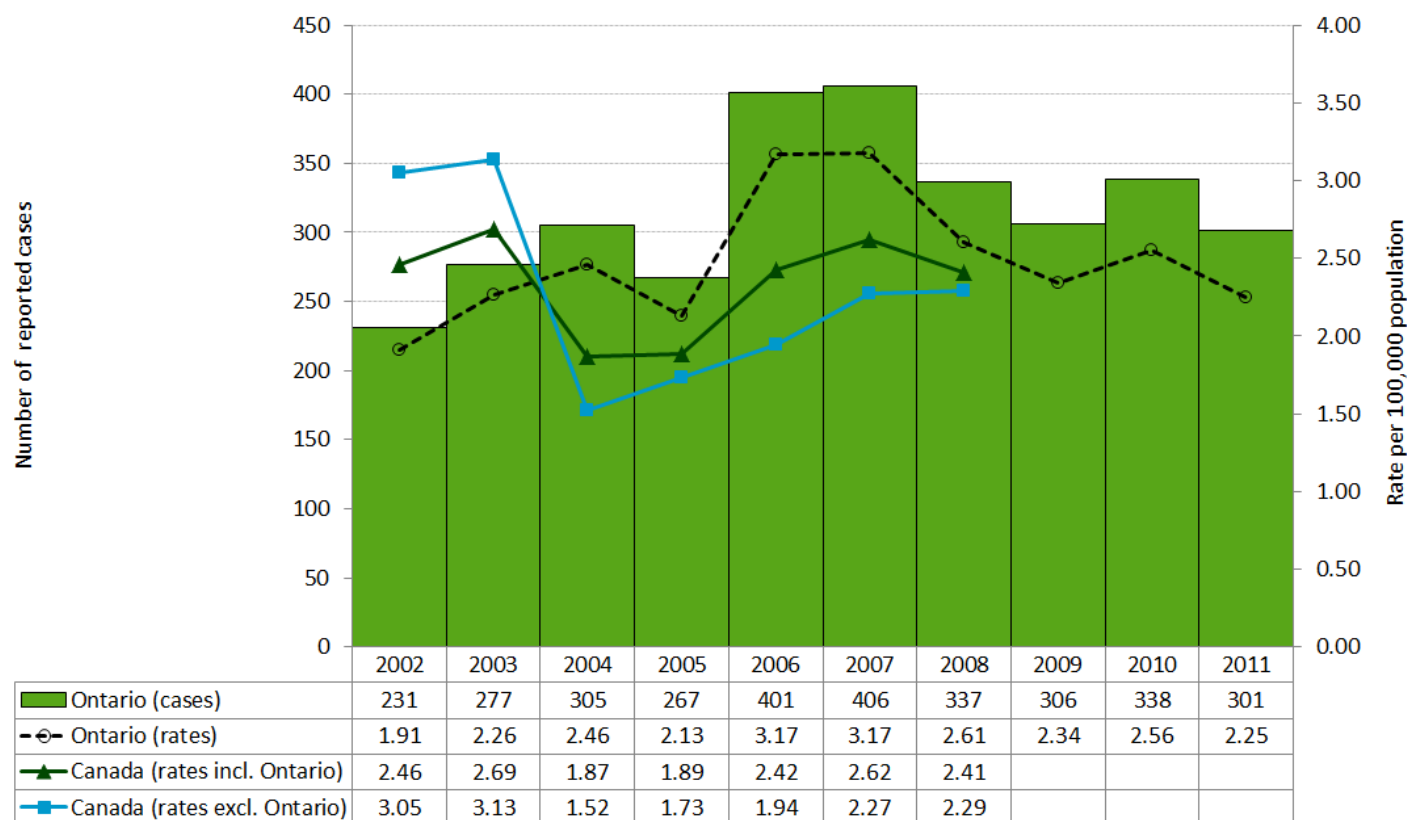
From 2004 to 2008, annual provincial rates for cryptosporidiosis exceeded the rates for the rest of Canada by 14 to 63%. Comparisons to later years could not be made because national rates were unavailable after 2008.

AGE AND SEX DISTRIBUTION

The incidence rate of cryptosporidiosis decreased with increasing age, with persons under the age of 40 years accounting for more than 90% of cases reported in 2011. The highest incidence rates were reported for children under the age of five years with 9.97 cases per 100,000 population, followed by persons in the 10-19 year age group with an incidence rate of 4.72 cases per 100,000 population (Table 1-7, Figure 1-11).

Males accounted for 53% (160/301) of cryptosporidiosis cases and had a corresponding incidence rate of 2.43 cases per 100,000 per population. The incidence rate of cryptosporidiosis among females was lower at 2.08 cases per 100,000 population.

Figure 1-10. Incidence of Cryptosporidiosis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15]

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

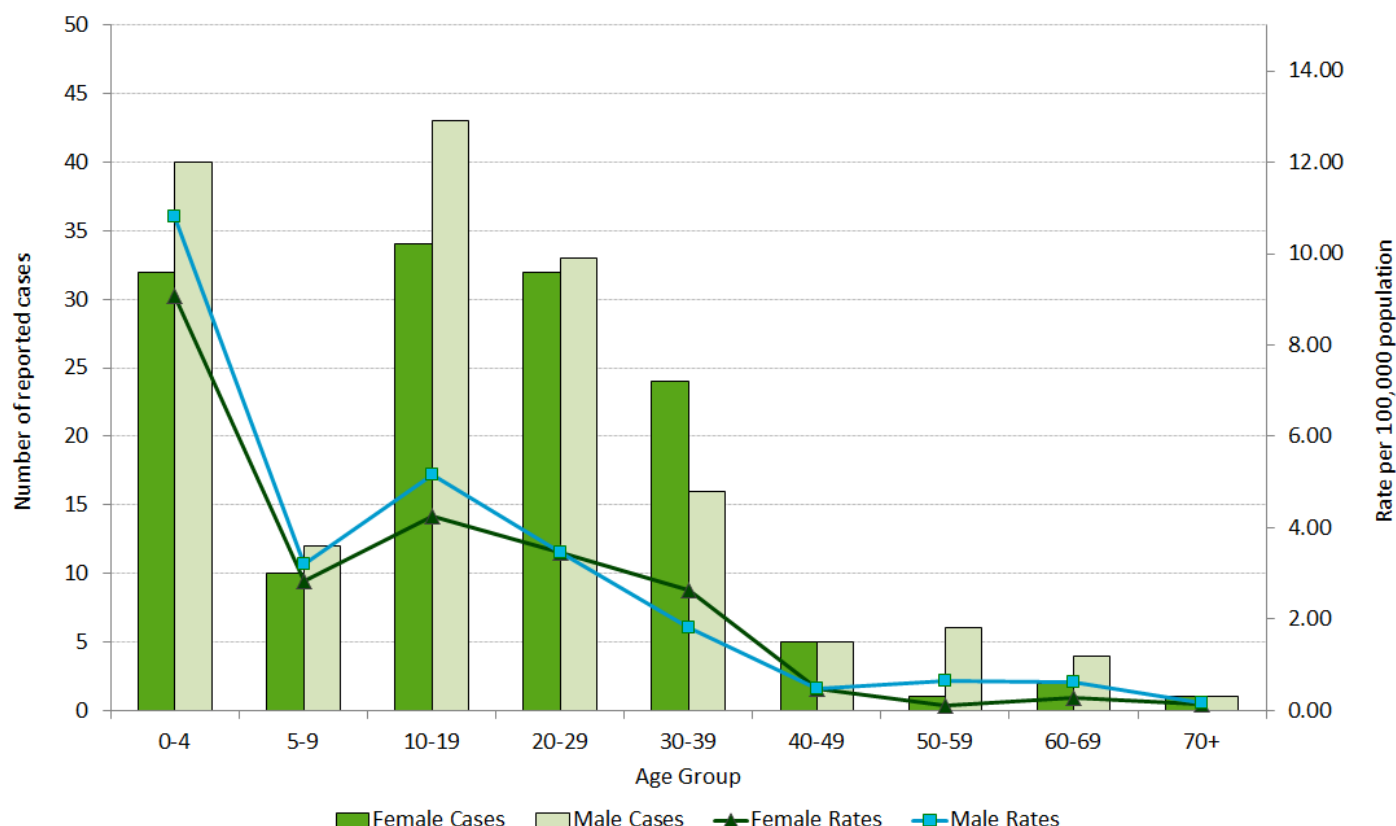
Table 1-7. Incidence of Cryptosporidiosis by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	32	9.08	40	10.82	72	9.97
5-9	10	2.83	12	3.21	22	3.02
10-19	34	4.27	43	5.15	77	4.72
20-29	32	3.45	33	3.46	65	3.46
30-39	24	2.63	16	1.82	40	2.23
40-49	5	0.49	5	0.48	10	0.48
50-59	1	0.10	6	0.64	7	0.37
60-69	2	0.29	4	0.62	6	0.45
70+	1	0.13	1	0.18	2	0.15
Total	141	2.08	160	2.43	301	2.25

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Figure 1-11. Incidence of Cryptosporidiosis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

HOSPITALIZATIONS AND DEATHS

In 2011, approximately four percent (13/301) of cryptosporidiosis cases were hospitalized, and none of the cases were fatal.

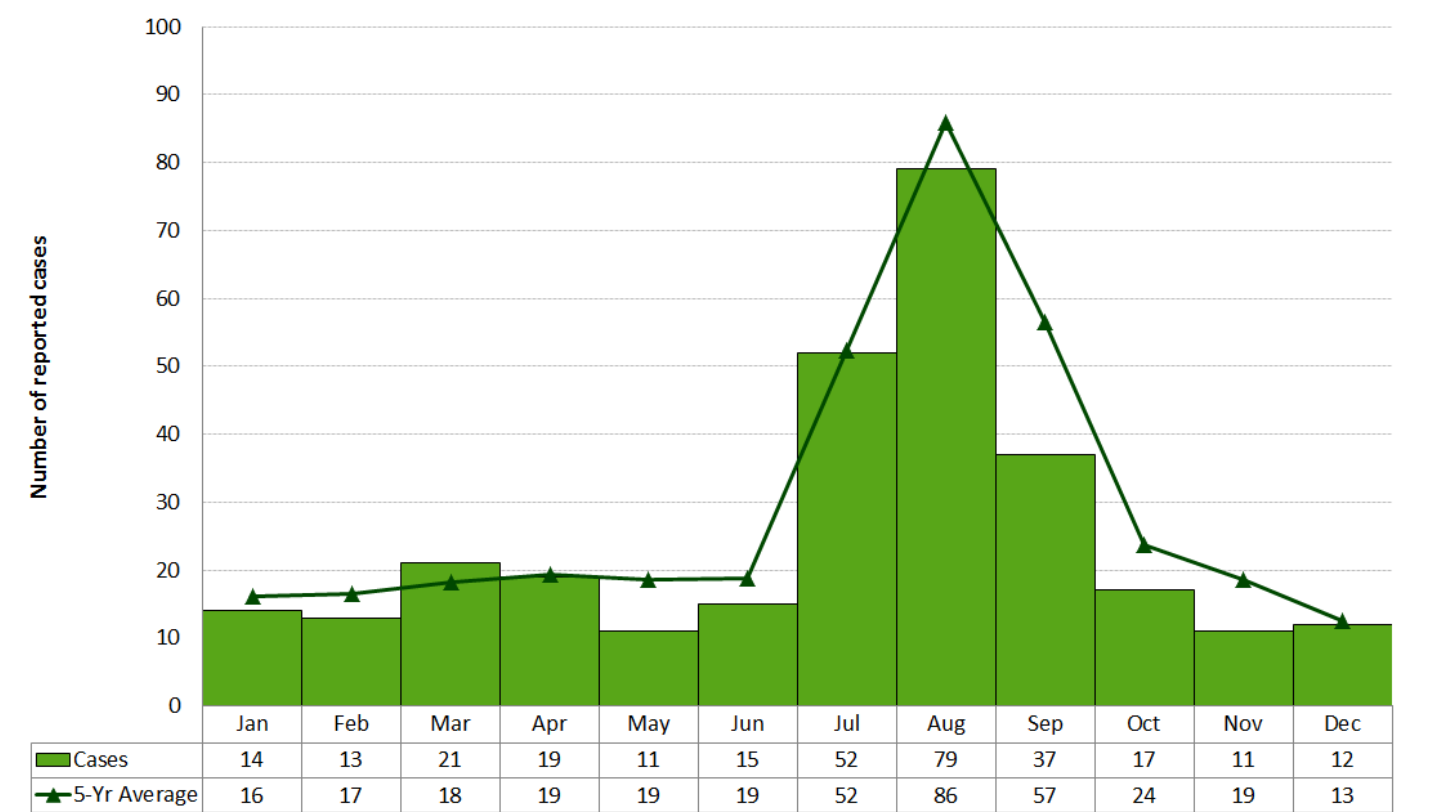
MONTHLY DISTRIBUTION

Cryptosporidiosis follows a seasonal pattern with increased incidence towards the end of summer (Figure 1-12). In 2011, the incidence of cryptosporidiosis peaked from July to September, which together accounted for 56% (168/301) of reported cases (Figure 3). Compared to the five-year monthly averages for the period 2006 to 2010, fewer cases were reported in most months in 2011.

GEOGRAPHIC DISTRIBUTION

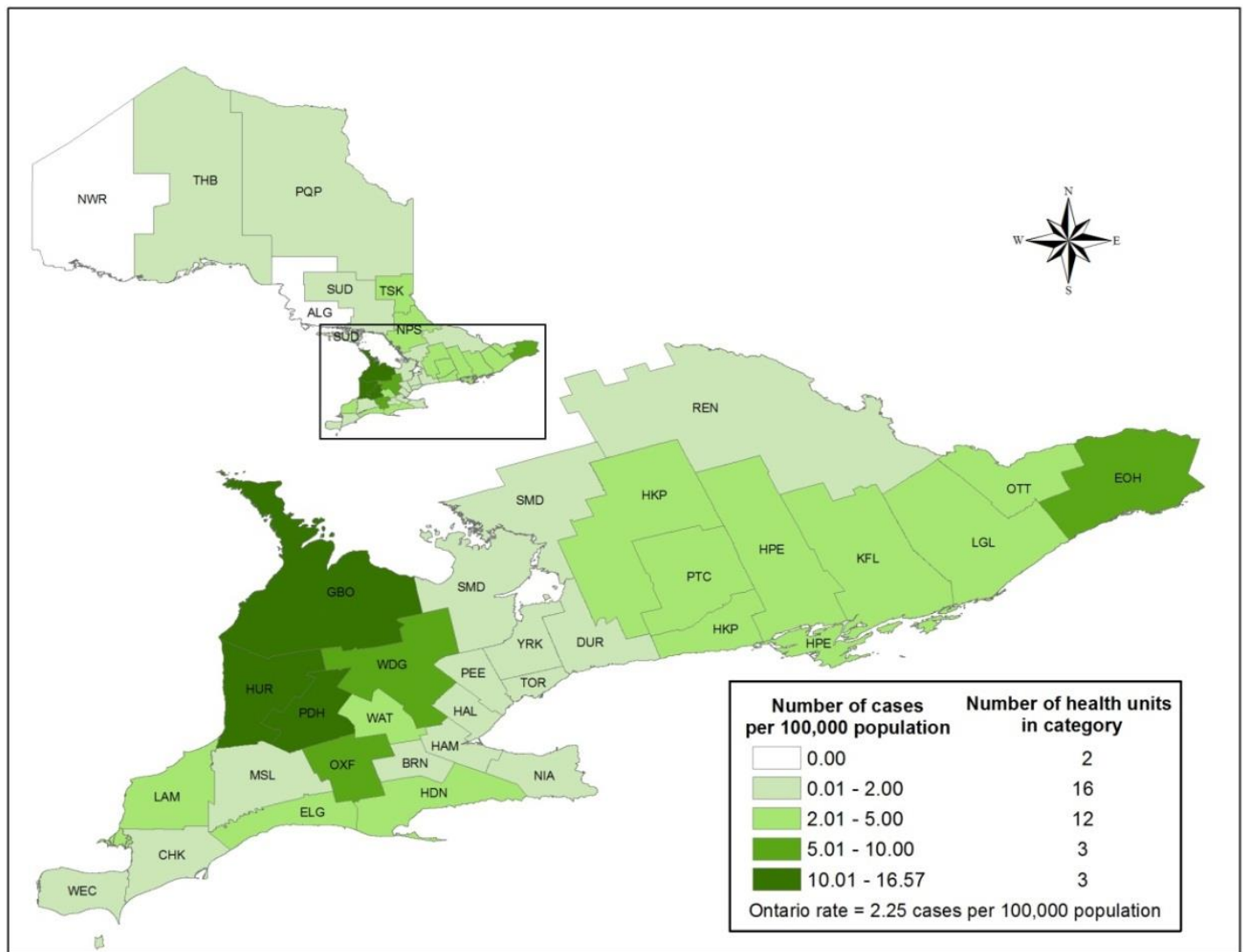
The three highest rates of cryptosporidiosis in 2011 were reported by health units in South West Region. Huron County reported the highest incidence rate of cryptosporidiosis, with 16.57 cases per 100,000, followed by Perth District with 15.56 cases per 100,000 population and Grey Bruce with 10.31 cases per 100,000 population. Toronto reported the most cases in 2011 (40, 13.1%) (Map 1-3, Table 1-8).

Figure 1-12. Number of Cryptosporidiosis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 1-3. Incidence of Cryptosporidiosis by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-8. Incidence of Cryptosporidiosis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	1	0.71	0.3%	1.1%
Chatham-Kent	1	0.92	0.3%	0.8%
Durham Region	8	1.27	2.7%	4.7%
Eastern Ontario	13	6.46	4.3%	1.5%
Elgin-St. Thomas	2	2.19	0.7%	0.7%
Grey Bruce	17	10.31	5.6%	1.2%
Haldimand-Norfolk	4	3.61	1.3%	0.8%
Haliburton, Kawartha, Pine Ridge District	6	3.35	2.0%	1.3%
Halton Region	5	0.96	1.7%	3.9%
Hamilton, City of	6	1.11	2.0%	4.0%
Hastings & Prince Edward Counties	8	4.92	2.7%	1.2%
Huron County	10	16.57	3.3%	0.5%
Kingston-Frontenac & Lennox & Addington	7	3.55	2.3%	1.5%
Lambton County	3	2.28	1.0%	1.0%
Leeds, Grenville and Lanark District	5	2.94	1.7%	1.3%
Middlesex-London	8	1.74	2.7%	3.4%
Niagara Region	8	1.80	2.7%	3.3%
North Bay Parry Sound District	3	2.36	1.0%	1.0%
Northwestern	0	0.00	0.0%	0.6%
Ottawa, City of	26	2.86	8.6%	6.8%
Oxford County	7	6.47	2.3%	0.8%
Peel Region	21	1.54	7.0%	10.2%
Perth District	12	15.56	4.0%	0.6%
Peterborough County-City	3	2.13	1.0%	1.1%
Porcupine	1	1.15	0.3%	0.6%
Renfrew County & District	1	0.97	0.3%	0.8%
Simcoe Muskoka District	4	0.76	1.3%	3.9%
Sudbury & District	3	1.52	1.0%	1.5%
Thunder Bay District	3	1.92	1.0%	1.2%
Timiskaming	1	2.90	0.3%	0.3%
Toronto	40	1.46	13.3%	20.5%
Waterloo Region	20	3.77	6.6%	4.0%
Wellington-Dufferin-Guelph	20	7.18	6.6%	2.1%
Windsor-Essex County	7	1.74	2.3%	3.0%
York Region	17	1.59	5.6%	8.0%
Ontario	301	2.25	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Approximately 72% (218/301) of cryptosporidiosis cases reported at least one risk factor in 2011 (Table 1-9). Of those reporting a risk factor, 46% reported animal contact, 39% reported recreational water contact and 35% reported out of province travel in the 12 days before the onset of symptoms.

Table 1-9. Reported Risk Factors for Cryptosporidiosis Cases: Ontario, 2011 (n=218)

Risk Factors	Cases	
	Number	Percent
Animal contact	101	46.3%
Recreational water contact	84	38.5%
Travel out of Ontario	77	35.3%
Consumption of potentially contaminated drinking water	60	27.5%
Consumption of raw/unwashed fruits/vegetables	36	16.5%
Poor hand hygiene	22	10.1%
Close contact with a case	14	6.4%
Consumption of unpasteurized milk or milk products	13	6.0%
Other	22	10.6%
Unknown	9	4.1%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/6/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to the sum of risk factors reported as "Other, specify" and risk factors with frequency <3%. "Unknown" refers to risk factors reported solely as "Unknown".

Cyclosporiasis

- **Excluding years in which outbreaks occurred, the annual incidence rate of cyclosporiasis in Ontario has remained relatively stable at approximately 100 cases per year since 2004.**
- **Incidence rates in 2011 were highest for males and females aged 30-59 years.**
- **The incidence of cyclosporiasis peaks during the warmer months.**
- **The most commonly reported risk factor among cyclosporiasis cases in Ontario in 2011 was out of province travel.**

Cyclosporiasis is not an endemic disease in Canada and is frequently associated with travel to areas such as Asia, the Caribbean and Latin America.¹ It is transmitted primarily through ingestion of food or water contaminated by the feces of infected persons (fecal-oral route). Contamination of food is usually due to contact with infected workers or contaminated water during cultivation, harvesting, packaging or transportation.¹¹ Fresh raspberries, basil and mesclun lettuce have been implicated in outbreaks in the United States and Canada.¹² There is no evidence of person-to-person transmission of cyclosporiasis.¹¹

Not everyone infected with *Cyclospora* will develop symptoms. Among symptomatic persons, symptoms generally appear one to 14 days after exposure (average seven days). The most common symptom is watery and profuse diarrhea. Other symptoms such as vomiting, nausea, anorexia, weight loss, abdominal cramping or bloating and prolonged fatigue may also occur.¹¹ If left untreated, diarrhea can persist for several weeks.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Cyclosporiasis accounted for one percent of enteric infections reported in Ontario in 2011. A total of 105 cases were reported, representing an incidence rate of 0.79 cases per 100,000 population (Figure 1-13). This also represented a decline of 38% compared to the number of cases reported in 2010. Of cases reported in 2011, 21% (22/105) were linked to a province-wide outbreak for which the source was not identified.

Cyclosporiasis became reportable in Ontario in 2001. From 2002 to 2011, incidence rates fluctuated, ranging from 0.32 to 1.27 cases per 100,000. Notable increases in annual incidence rates in 2005, 2009 and 2010 were attributed to local outbreaks. The increase in 2005 was due to an outbreak linked to the consumption of fresh basil, while the 2009 increase was attributed to a restaurant outbreak. The 2010 increase was due to a province-wide increase of unknown cause. In 2002 and 2003, the incidence of cyclosporiasis was relatively low, a common phenomenon with diseases newly designated as reportable. Excluding these years as well as years in which outbreaks occurred (2005, 2009 and 2010), the number of reported cases of cyclosporiasis has remained relatively stable at approximately 100 cases per year.

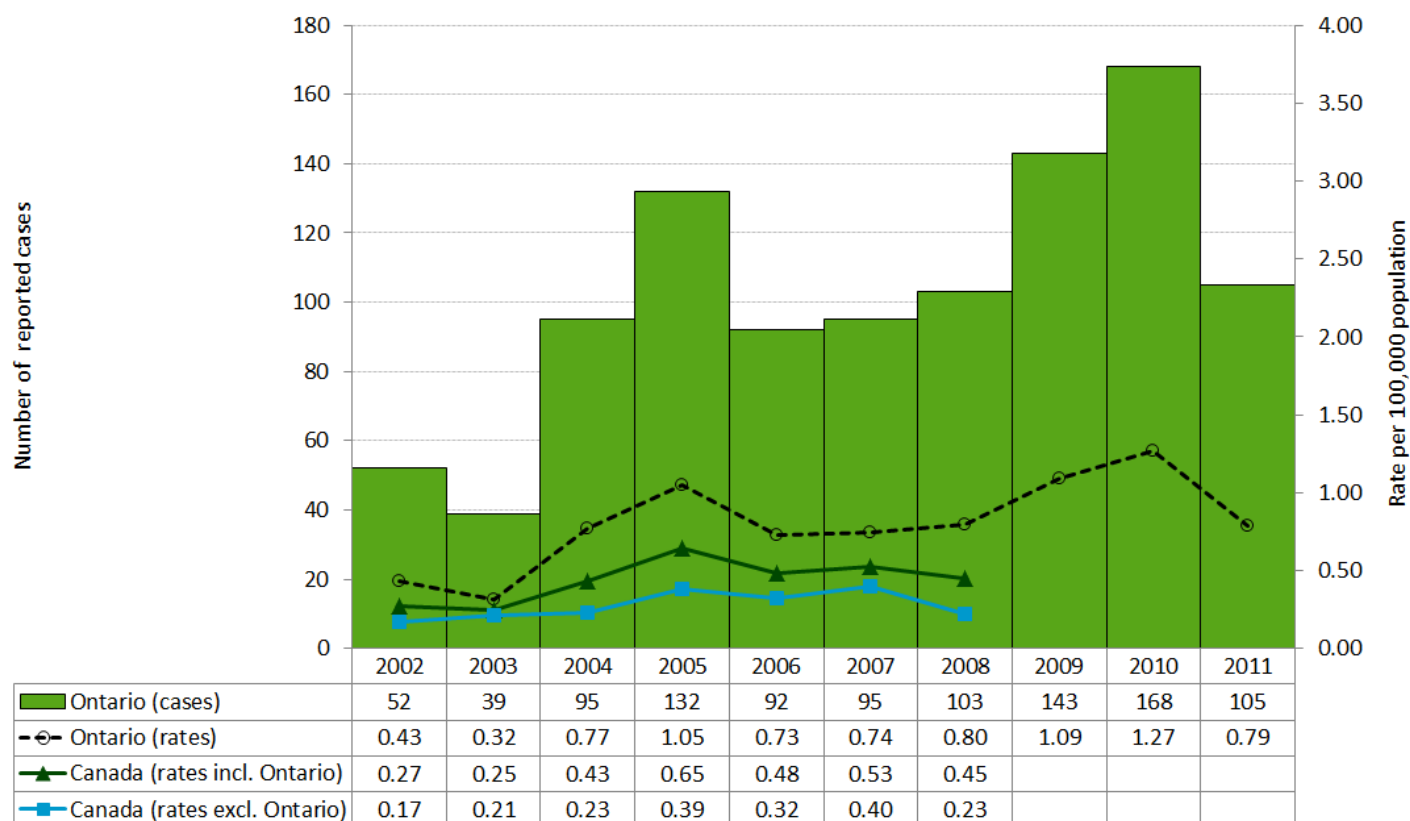
The annual incidence rates of cyclosporiasis in Canada for the years 2002 to 2008 were consistently lower than Ontario's (Figure 1-13).

AGE AND SEX DISTRIBUTION

Females accounted for 59% (62/105) of cyclosporiasis cases reported in Ontario in 2011 (Table 1-10, Figure 1-14). The incidence rate of cyclosporiasis in 2011 was also higher for females compared to males at 0.91 and 0.65 cases per 100,000 population, respectively. Overall, cases ranged in age from 4 to 80 years, with a median age of 46 years. The incidence of cyclosporiasis peaked

for both males and females in the age groups from 30 to 59 years of age, with persons in this age range accounting for 71% (75/105) of cyclosporiasis cases reported in 2011. In contrast, persons under the age of 19 years accounted for less than five percent (5/105) of cases reported in 2011. These differences in incidence by age may be reflective of travel patterns rather than increased susceptibility due to age.

Figure 1-13. Incidence of Cyclosporiasis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

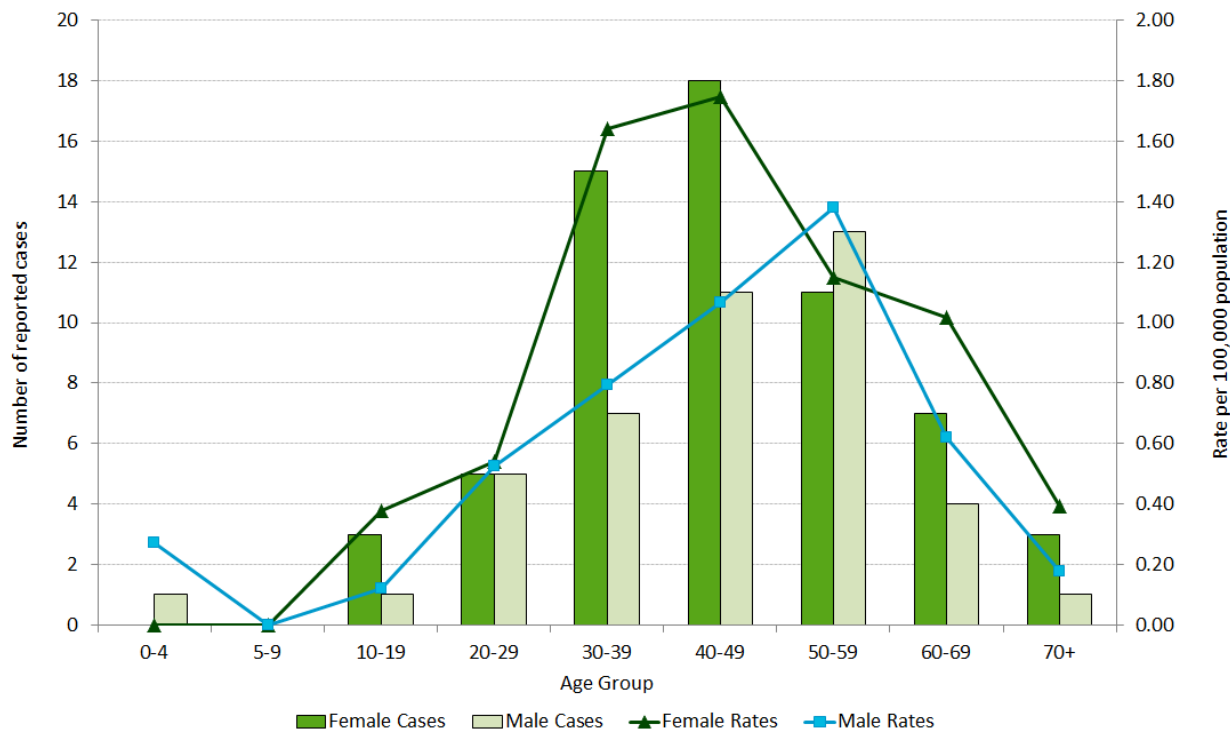
Table 1-10. Incidence of Cyclosporiasis by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	0	0.00	1	0.27	1	0.14
5-9	0	0.00	0	0.00	0	0.00
10-19	3	0.38	1	0.12	4	0.25
20-29	5	0.54	5	0.52	10	0.53
30-39	15	1.64	7	0.80	22	1.23
40-49	18	1.75	11	1.07	29	1.41
50-59	11	1.15	13	1.38	24	1.26
60-69	7	1.02	4	0.62	11	0.83
70+	3	0.39	1	0.18	4	0.30
Total	62	0.91	43	0.65	105	0.79

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Figure 1-14. Incidence of Cyclosporiasis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

HOSPITALIZATIONS AND DEATHS

In 2011, approximately two percent (two cases) of cyclosporiasis cases were hospitalized. No deaths were reported among cases in 2011.

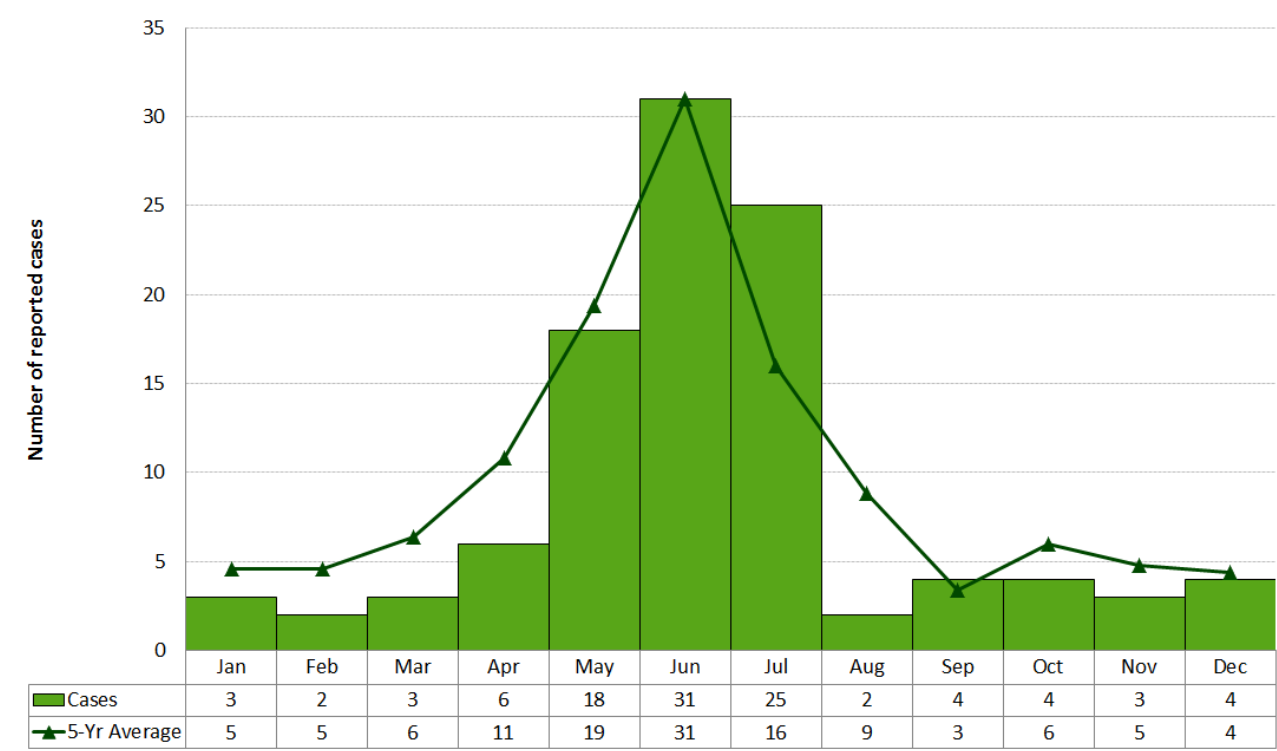
MONTHLY DISTRIBUTION

Cyclosporiasis occurs throughout the year, but with increases in incidence coinciding with peaks in importation of fresh fruits and vegetables from countries where *Cyclospora* is common.¹² As in past years, the incidence of cyclosporiasis peaked from May to July in 2011, with these three months accounting for 70% (74/105) of reported cases (Figure 1-15). Compared to the five-year historical average, case counts were lower in most months in 2011 with the exception of July when counts were higher than the five year average.

GEOGRAPHIC DISTRIBUTION

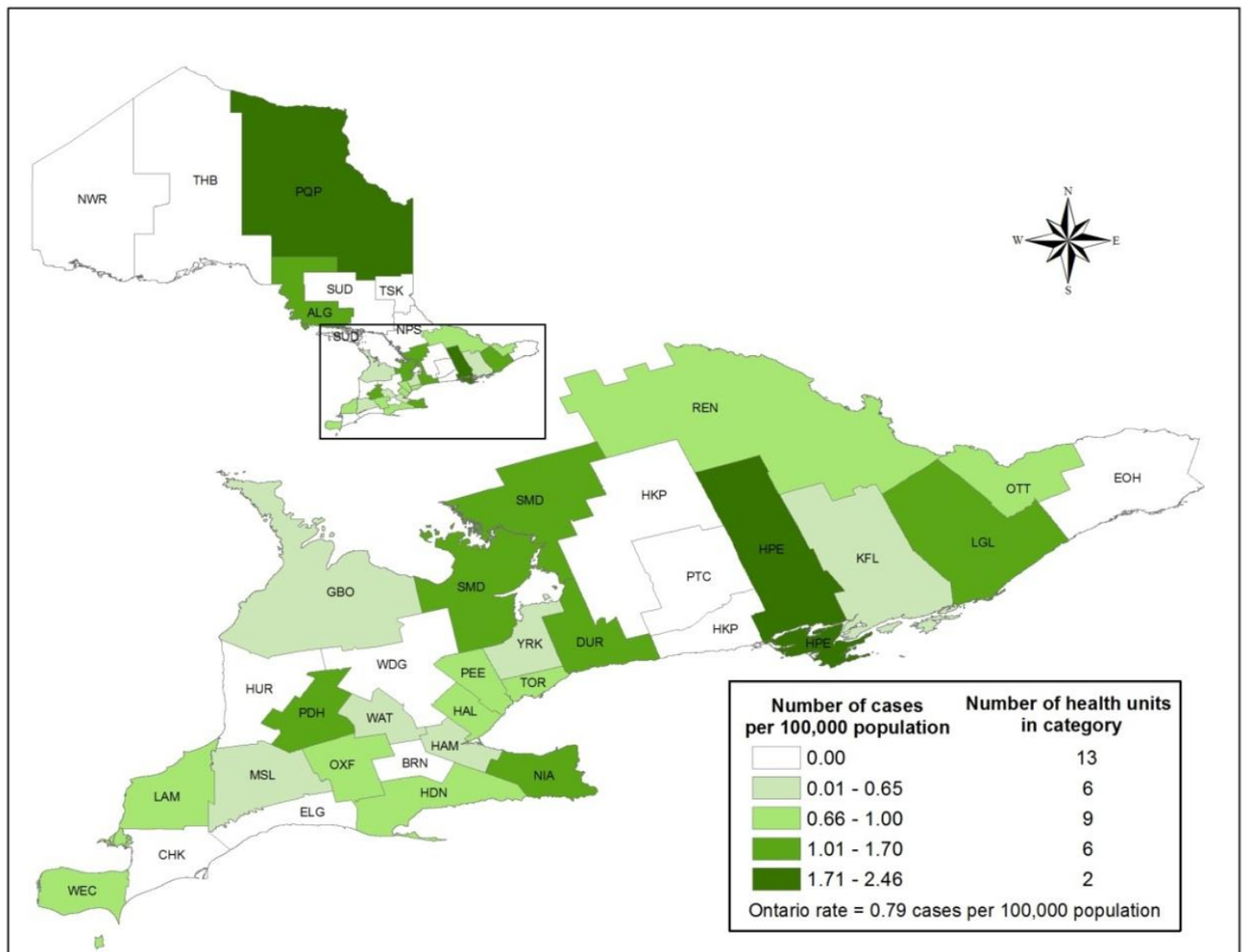
Most health units (64%, 23/36) reported at least one case of cyclosporiasis in 2011 (Map 1-4, Table 1-11). Toronto (24), Peel Region (11) and Durham Region (9) reported the highest number of cases and together accounted for over 40% of total cases. The highest incidence rates in 2011 were observed in Hastings and Prince Edward Counties with 2.46 cases per 100,000 population and Porcupine with 2.31 cases per 100,000 population. However, these rates are unstable due to the small number of cases on which they are based.

Figure 1-15. Number of Cyclosporiasis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 1-4. Incidence of Cyclosporiasis by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-11. Incidence of Cyclosporiasis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	2	1.70	1.9%	0.9%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	0	0.00	0.0%	0.8%
Durham Region	9	1.43	8.6%	4.7%
Eastern Ontario	0	0.00	0.0%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	1	0.61	1.0%	1.2%
Haldimand-Norfolk	1	0.90	1.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	0	0.00	0.0%	1.3%
Halton Region	5	0.96	4.8%	3.9%
Hamilton, City of	2	0.37	1.9%	4.0%
Hastings & Prince Edward Counties	4	2.46	3.8%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	1	0.51	1.0%	1.5%
Lambton County	1	0.76	1.0%	1.0%
Leeds, Grenville and Lanark District	2	1.18	1.9%	1.3%
Middlesex-London	2	0.43	1.9%	3.4%
Niagara Region	7	1.57	6.7%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	0	0.00	0.0%	0.6%
Ottawa, City of	8	0.88	7.6%	6.8%
Oxford County	1	0.92	1.0%	0.8%
Peel Region	11	0.81	10.5%	10.2%
Perth District	1	1.30	1.0%	0.6%
Peterborough County-City	0	0.00	0.0%	1.1%
Porcupine	2	2.31	1.9%	0.6%
Renfrew County & District	1	0.97	1.0%	0.8%
Simcoe Muskoka District	7	1.33	6.7%	3.9%
Sudbury & District	0	0.00	0.0%	1.5%
Thunder Bay District	0	0.00	0.0%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	24	0.87	22.9%	20.5%
Waterloo Region	2	0.38	1.9%	4.0%
Wellington-Dufferin-Guelph	0	0.00	0.0%	2.1%
Windsor-Essex County	4	0.99	3.8%	3.0%
York Region	7	0.65	6.7%	8.0%
Ontario	105	0.79	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Risk factors for cyclosporiasis were reported by 71 (68%) cases in 2011 (Table 1-12). Of these cases, 59% (42/71) reported travel outside Ontario, 34% (24/71) reported consumption of raw unwashed fruits or vegetables and 32% (23/71) reported consumption of unwashed fresh berries.

Table 1-12. Reported Risk Factors for Cyclosporiasis Cases: Ontario, 2011 (n=71)

Risk Factors	Cases	
	Number	Percent
Travel out of Ontario	42	59.2%
Consumption of raw unwashed fruits/vegetables	24	33.8%
Consumption of fresh/unwashed berries	23	32.4%
Contact with recreational water	18	25.4%
Consumption of fresh herbs	18	25.4%
Consumption of potentially contaminated water	15	21.1%
Other	4	5.6%
Unknown	3	4.2%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/6/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers solely to risk factors reported as "Other, specify".

"Unknown" refers to risk factors reported solely as "Unknown".

Giardiasis

- **The incidence rate of giardiasis in Ontario declined steadily over the period from 2002 to 2011.**
- **Young children and males between the ages of 20 and 49 years had the highest incidence rates of giardiasis in 2011.**
- **In Ontario, the incidence of giardiasis peaks during the late summer and early fall.**
- **Out of province travel, water-borne exposures and animal contact were the most commonly reported risk factors among giardiasis cases reported in 2011.**

Giardiasis is a diarrheal illness caused by the parasite *Giardia lamblia*.¹³ It is the third most frequently reported enteric disease in Ontario and the most common intestinal parasitic infection of humans globally.¹³ Giardiasis is transmitted through a variety of routes, but most commonly through person-to-person contact that results from hand-to-mouth transfer of *Giardia* cysts contained in the feces of infected persons. Transmission may also occur through the ingestion of cysts in fecally contaminated food and drinking and recreational water, as well as sexually through the anal-oral route.¹

Giardiasis infections are frequently self-limited, primarily affecting the small intestine. Symptoms generally appear three to 25 days after exposure (median seven to ten days) and may include chronic diarrhea, bloating and abdominal cramps, fatigue, weight loss, dehydration and frequent loose pale greasy stools. Prolonged infections can lead to arthritis and damage to the intestinal tract.¹ Many persons infected with giardiasis do not show any symptoms of illness.^{1,14}

In North America, endemic cases (locally acquired) tend to occur in late summer with children under the age of five years and adults aged 25 to 39 years having the greatest risk of infection. Outbreaks of giardiasis have been associated with childcare settings, recreational water use (swimming and wading pools) and consumption of unfiltered drinking water.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, giardiasis accounted for 14% of enteric disease cases reported in Ontario. A total of 1,295 cases were reported for an annual incidence rate of 9.68 cases per 100,000 population (Figure 1-16). The number of reported cases of giardiasis in 2011 represented a decline of eight percent in comparison to the 2010 total of 1,409 cases.

Over the ten-year period from 2002-2011, the incidence rate of giardiasis declined by 39% from a high of 15.91 cases per 100,000 population in 2002 to a low of 9.68 cases per 100,000 population in 2011.

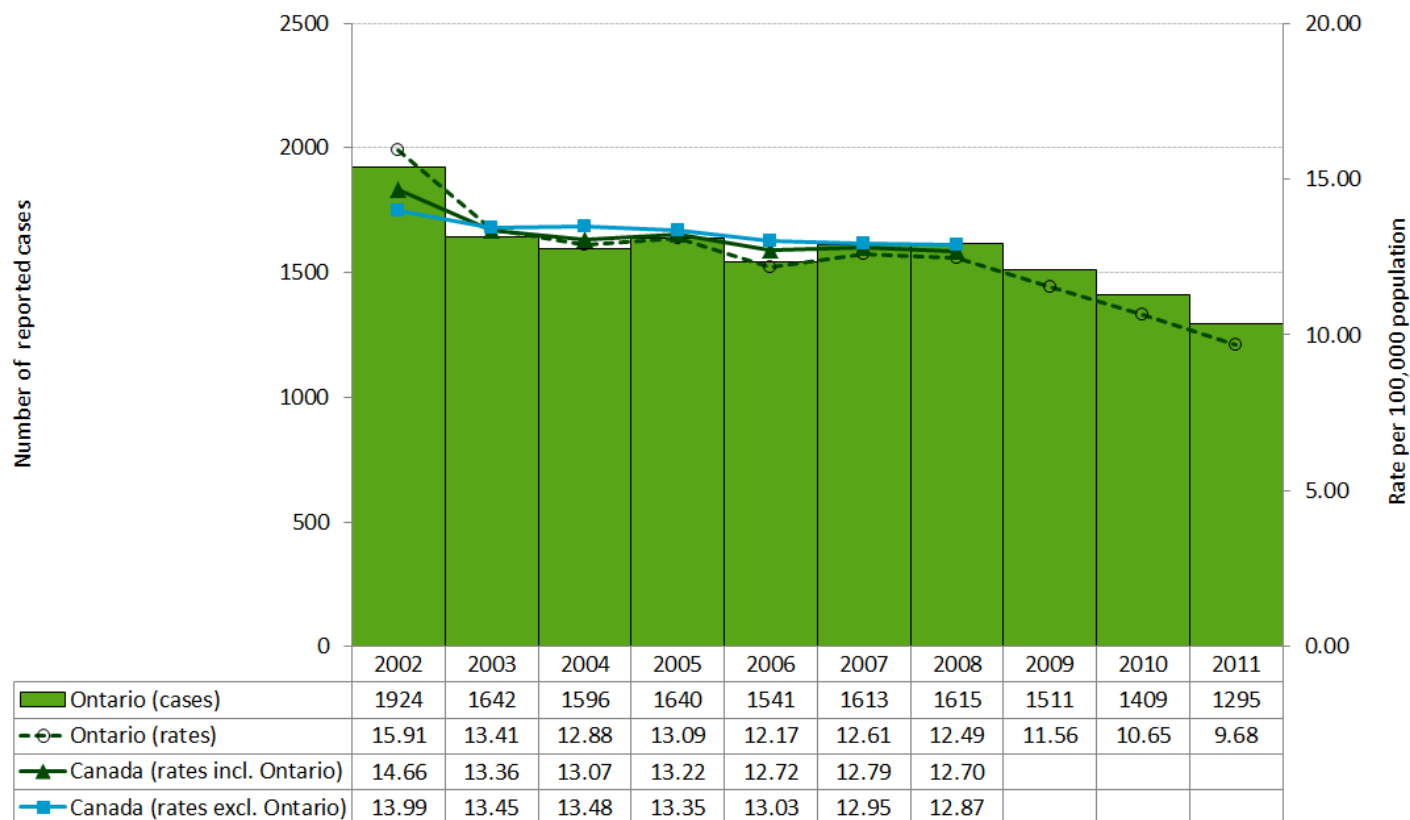
From 2002 to 2008, annual incidence rates for giardiasis in Canada were comparable to those of Ontario (Figure 1-16).

AGE AND SEX DISTRIBUTION

The sex-specific incidence rate for giardiasis in 2011 was higher for males compared to females at 11.95 and 7.46 cases per 100,000 population, respectively (Table 1-13, Figure 1-17). Cases ranged in age from less than one year to 92 years, with a median age of 34 years; males accounted for 61% of cases in 2011. Incidence rates of giardiasis were highest among children in the 0-4 and 5-9 age groups, which is consistent with the known epidemiology of giardiasis. Young adults, specifically males, in the 20 to 49 year age range also had relatively high incidence rates of giardiasis.

Higher rates among young children may be reflective of the fact that children may not be toilet trained and may have poor hand hygiene. Children are also often in close contact with other children in child care settings where person-to-person spread can occur due to the low infectious dose of giardiasis, which enables transmission more readily. In adults, higher rates in men may be due to transmission among men having sex with men.^{1,3}

Figure 1-16. Incidence of Giardiasis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Table 1-13. Incidence of Giardiasis by Age and Sex: Ontario, 2011

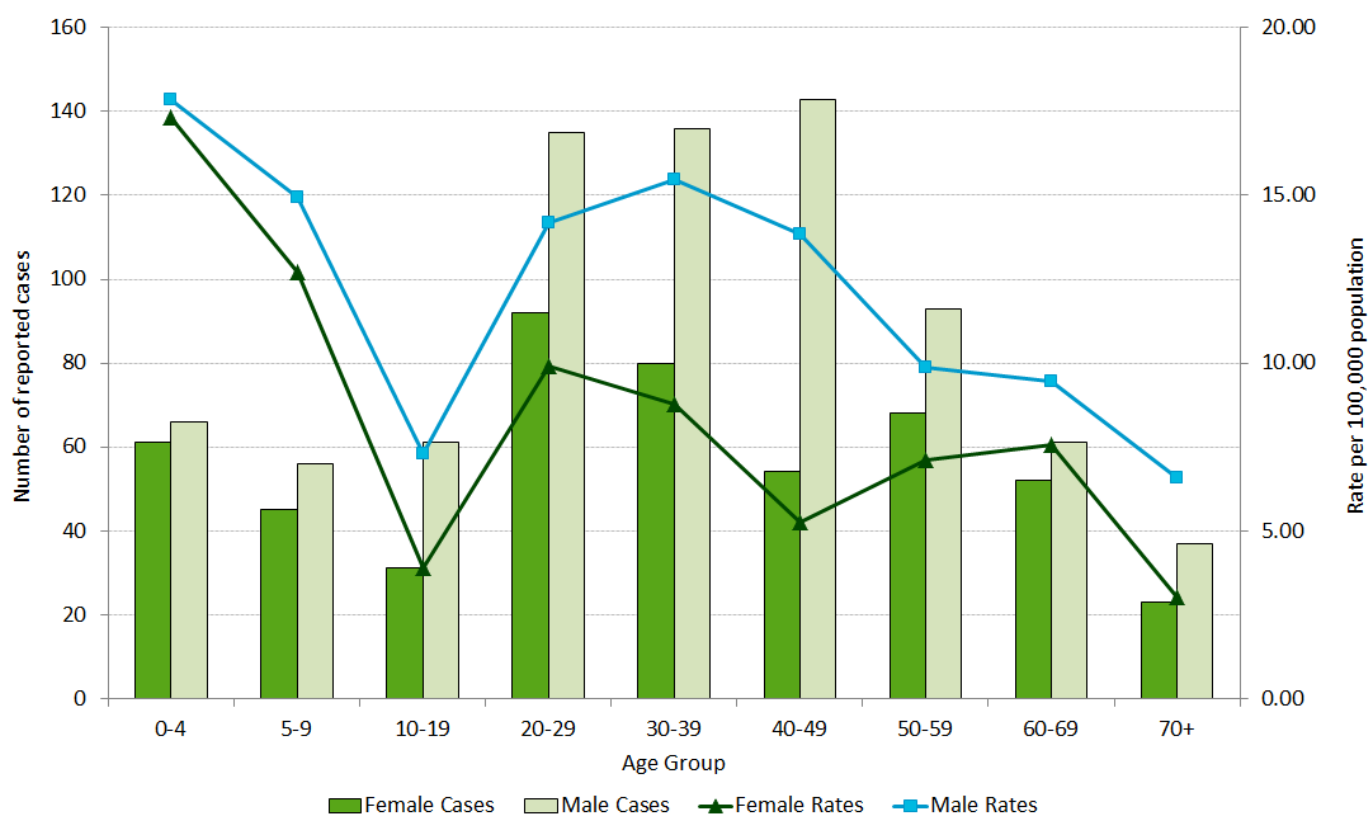
Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	61	17.31	66	17.85	127	17.59
5-9	45	12.72	56	14.96	101	13.87
10-19	31	3.89	61	7.30	92	5.64
20-29	92	9.92	135	14.17	227	12.07
30-39	80	8.76	136	15.46	216	12.05
40-49	54	5.24	143	13.86	197	9.55
50-59	68	7.10	93	9.88	161	8.48
60-69	52	7.56	61	9.45	113	8.48
70+	23	3.02	37	6.58	60	4.53
Total	506	7.46	788	11.95	1,294	9.68

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes one case of unknown age and/or sex.

Figure 1-17. Incidence of Giardiasis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes one case of unknown age and/or sex.

HOSPITALIZATIONS AND DEATHS

In 2011, approximately two percent (19/1,295) of giardiasis cases were hospitalized. None of the cases reported in 2011 were fatal.

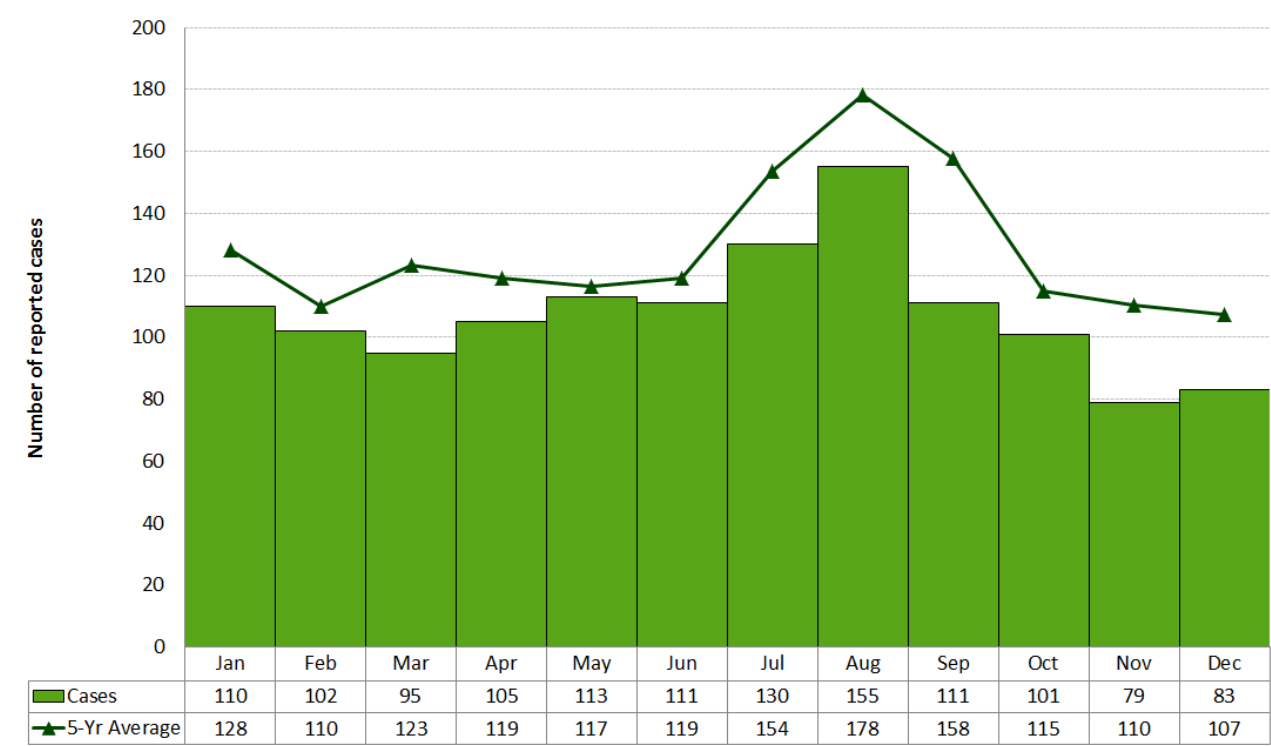
MONTHLY DISTRIBUTION

Giardiasis occurs throughout the year, but tends to follow a seasonal pattern with increased incidence towards the end of summer and early fall (Figure 1-18). In 2011, the incidence of giardiasis peaked in July and August. Compared to the monthly five-year historical averages, fewer cases of giardiasis were reported 2011.

GEOGRAPHIC DISTRIBUTION

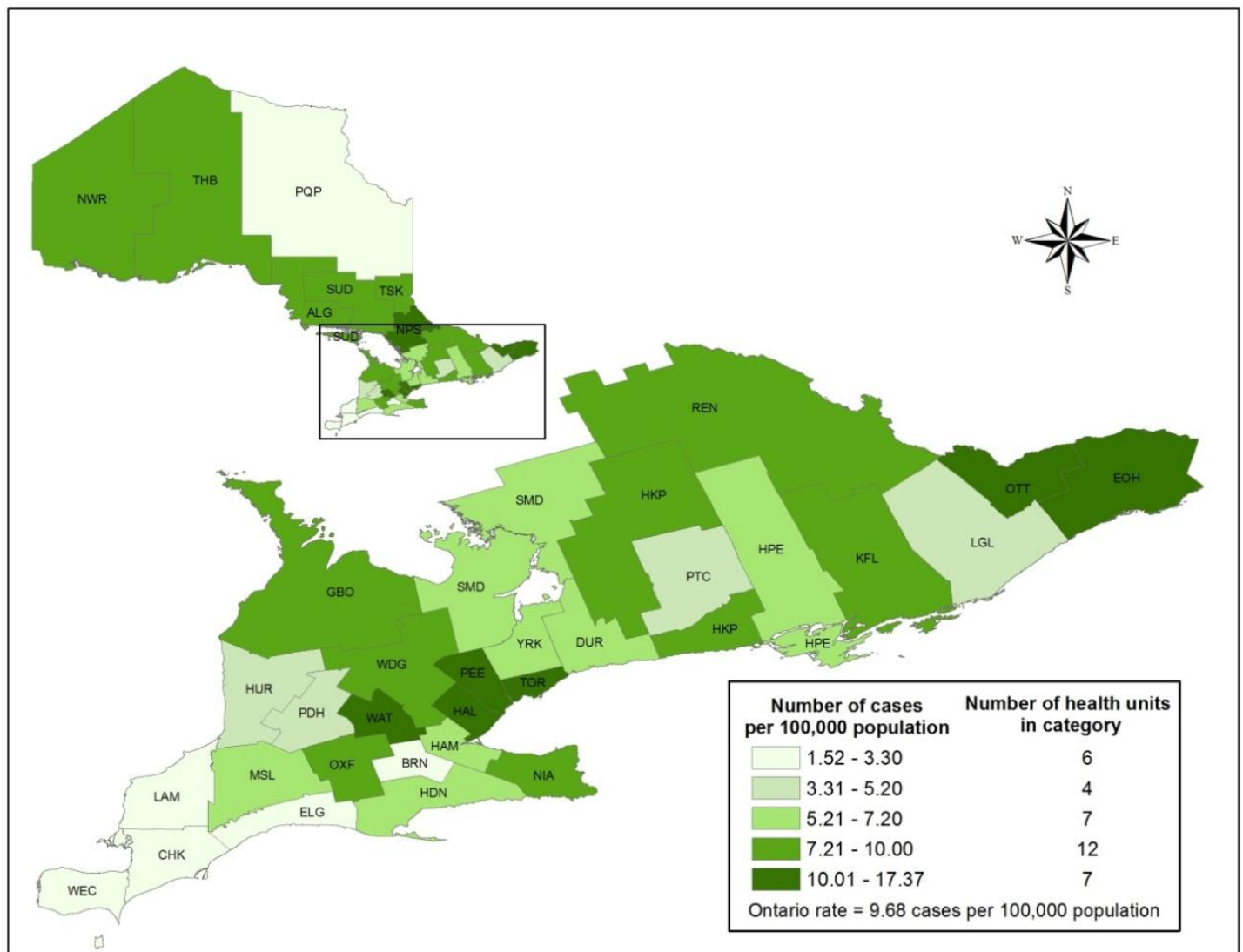
The City of Ottawa reported the highest incidence rate of giardiasis in Ontario in 2011, with 17.4 cases per 100,000. Toronto reported the highest number of cases (368) in 2011 and the second highest incidence rate at 13.4 cases per 100,000 population (Map 1-5, Table 1-14).

Figure 1-18. Number of Giardiasis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 1-5. Incidence of Giardiasis by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-14. Incidence of Giardiasis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	10	8.49	0.8%	0.9%
Brant County	3	2.13	0.2%	1.1%
Chatham-Kent	3	2.76	0.2%	0.8%
Durham Region	39	6.18	3.0%	4.7%
Eastern Ontario	21	10.44	1.6%	1.5%
Elgin-St. Thomas	3	3.28	0.2%	0.7%
Grey Bruce	15	9.10	1.2%	1.2%
Haldimand-Norfolk	7	6.32	0.5%	0.8%
Haliburton, Kawartha, Pine Ridge District	14	7.82	1.1%	1.3%
Halton Region	62	11.95	4.8%	3.9%
Hamilton, City of	35	6.48	2.7%	4.0%
Hastings & Prince Edward Counties	11	6.76	0.8%	1.2%
Huron County	2	3.31	0.2%	0.5%
Kingston-Frontenac & Lennox & Addington	17	8.61	1.3%	1.5%
Lambton County	2	1.52	0.2%	1.0%
Leeds, Grenville and Lanark District	8	4.70	0.6%	1.3%
Middlesex-London	32	6.94	2.5%	3.4%
Niagara Region	37	8.31	2.9%	3.3%
North Bay Parry Sound District	13	10.21	1.0%	1.0%
Northwestern	7	8.54	0.5%	0.6%
Ottawa, City of	158	17.37	12.2%	6.8%
Oxford County	9	8.32	0.7%	0.8%
Peel Region	160	11.71	12.4%	10.2%
Perth District	4	5.19	0.3%	0.6%
Peterborough County-City	6	4.27	0.5%	1.1%
Porcupine	2	2.31	0.2%	0.6%
Renfrew County & District	9	8.74	0.7%	0.8%
Simcoe Muskoka District	33	6.28	2.5%	3.9%
Sudbury & District	17	8.60	1.3%	1.5%
Thunder Bay District	13	8.30	1.0%	1.2%
Timiskaming	3	8.71	0.2%	0.3%
Toronto	368	13.41	28.4%	20.5%
Waterloo Region	60	11.32	4.6%	4.0%
Wellington-Dufferin-Guelph	22	7.90	1.7%	2.1%
Windsor-Essex County	13	3.22	1.0%	3.0%
York Region	77	7.20	5.9%	8.0%
Ontario	1,295	9.68	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Over half (60%, 773/1,295) of giardiasis cases in 2011 reported at least one risk factor (Table 1-15). The most frequently reported risk factors were travel or living out of province (53%), consumption of potentially contaminated water (31%), and contact with recreational water (29%).

Table 1-15. Reported Risk Factor for Giardiasis Cases: Ontario, 2011 (n=773)

Risk Factors	Cases	
	Number	Percent
Travel or lived outside of province	413	53.4%
Consumption of potentially contaminated water	243	31.4%
Contact with recreational water	224	29.0%
Animal contact	194	25.1%
Consumption of raw unwashed fruits/vegetables	126	16.3%
Close contact with case	51	6.6%
Poor hand hygiene	47	6.1%
Anal-oral Contact	45	5.8%
Other	96	12.4%
Unknown	56	7.2%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to risk factors reported solely as "Other". "Unknown" refers to risk factors reported solely as "Unknown".

Hantavirus Pulmonary Syndrome

Hantavirus pulmonary syndrome (HPS) is a rare but serious viral infection.¹ In North America, the main reservoir of Hantavirus is the deer mouse, which is often found in buildings and barns in rural areas.¹ Transmission of HPS is primarily through inhalation of aerosolized rodent saliva, droppings and/or urine that contains live virus. Bites from infected rodents and direct contact between broken skin and rodent excreta are other routes by which HPS can be contracted.¹³

Onset of symptoms is usually two weeks after exposure but can range from a few days and up to six weeks. Symptoms of HPS initially present as a flu-like illness with some gastrointestinal involvement that progresses to respiratory tract symptoms after five days. The respiratory stage of illness is characterized by shortness of breath, fluid in the lungs and rapid deterioration of cardiopulmonary functions.^{1,13} The crude fatality rate following infection ranges from 30 to 40%.¹³

Rural dwellers, campers, cottagers and anyone that comes into contact with the saliva, droppings and urine of infected rodents are at risk for HPS. As a result, rodent control in and around the home is the most effective preventive strategy against hantavirus infection.¹ The use of face masks and gloves when cleaning up rodent droppings also protects against exposure to HPS.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

No human cases of HPS have been reported in Ontario since the disease became reportable in 2001. However, HPS has been identified in mice and meadow voles in Ontario.¹⁵ In Canada, human cases of HPS occur infrequently with annual incidence rates for the years 2002 to 2008 ranging from 0.01 to 0.02 cases per 100,000 population.

Hepatitis A

- **The incidence rate and number of reported cases of Hepatitis A in Ontario in 2011 were at their lowest for the period 2002 to 2011.**
- **Children and young adults in the age groups from five to 29 years accounted for the highest incidence rates of Hepatitis A in 2011.**
- **Out of province travel was the most frequently reported risk factor among Hepatitis A cases in Ontario in 2011.**

Hepatitis A occurs worldwide but mostly in developing countries with poor sanitary and hygienic conditions.¹ The disease is caused by the Hepatitis A virus and is mainly transmitted from person-to-person through the fecal-oral route. Infections usually occur following ingestion of food or water that has been contaminated by the feces of infected persons. Shellfish that has been harvested from contaminated water sources, produce such as berries that has been irrigated with contaminated water, and foods that have been handled by infected food handlers are commonly identified sources of Hepatitis A infections.¹

On average, symptoms of Hepatitis A develop 28 to 30 days after exposure, but can occur from 15 to 50 days. Fever, nausea, malaise, anorexia, abdominal discomfort and loss of appetite are the usual symptoms of infection with Hepatitis A. Jaundice may also occur after a few days. Not everyone infected with Hepatitis A will have symptoms. Among those that become ill, symptoms range from mild to severe, depending on age and overall health status.¹ Complications following infection are rare and death among cases is low, ranging from 0.1 to 0.3%.¹ Travelers to endemic areas, men who have sex with men, sexual contacts of cases, injection drug users and children in daycare settings are at higher risk for infection.¹ A Hepatitis A vaccine is recommended for travelers to endemic areas and other high risk persons.¹⁶ It is also offered free of cost to Ontario residents who have been exposed to the virus.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, a total of 103 cases of Hepatitis A were reported in Ontario, representing an incidence rate of 0.77 cases per 100,000 population (Figure 1-19). This is the lowest incidence rate and number of cases reported since 2002 when 151 cases were reported for an incidence rate of 1.25 cases per 100,000 population. The incidence rate of Hepatitis A declined by 38% in 2011 compared to 2002. No outbreaks of Hepatitis A were reported in 2011.

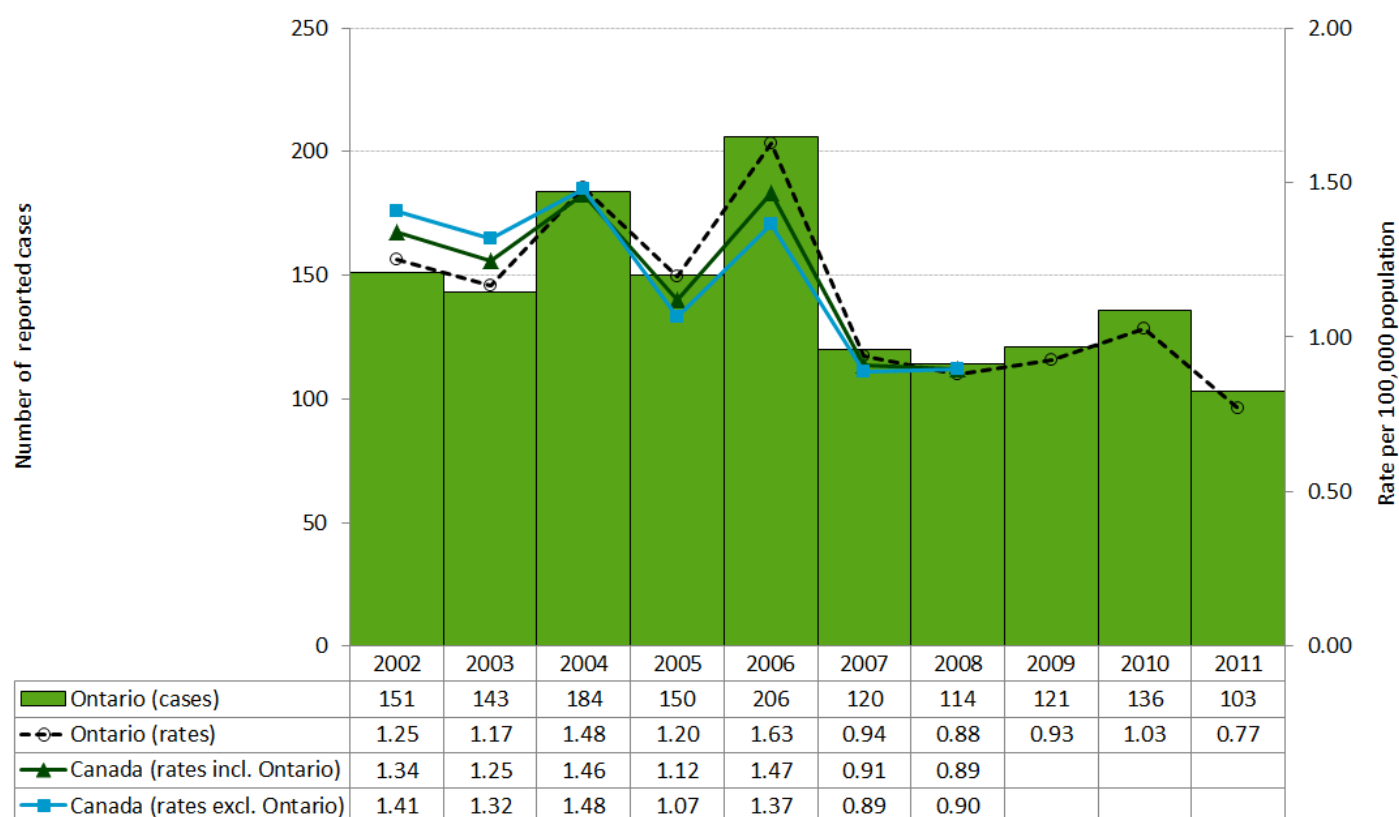
The incidence rates for Hepatitis A in Ontario fluctuated over the period from 2002 to 2011 with rates ranging from 0.77 cases per 100,000 population in 2011 to 1.63 cases per 100,000 population in 2006.

Annual incidence rates of Hepatitis A in Ontario were comparable to those of Canada for the period 2002 to 2008 (Figure 1-19).

AGE AND SEX DISTRIBUTION

In 2011, males comprised more than half (57%, 57/103) of all cases of Hepatitis A reported in Ontario (Table 1-16, Figure 1-20). The sex-specific incidence rate for Hepatitis A was also higher for males compared to females at 0.86 and 0.68 cases per 100,000 population, respectively. Hepatitis A cases ranged in age from less than one year to 87 years. Children in the 5-9 and 10-19 age groups and young adults in the 20-29 age group accounted for the highest incidence rates with rates ranging from 1.44 to 1.65 cases per 100,000 population. After age 29 years, the incidence of Hepatitis A decreased sharply and rates ranged from 0.29 to 0.56 cases per 100,000 population. This trend of higher rates among children and young adults is consistent with the known age distribution of Hepatitis A in industrialized countries such as Canada.¹ There is also evidence of higher rates of hepatitis A among men who have sex with men which may partially explain the higher rates among males compared to females.¹⁷

Figure 1-19. Incidence of Hepatitis A: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

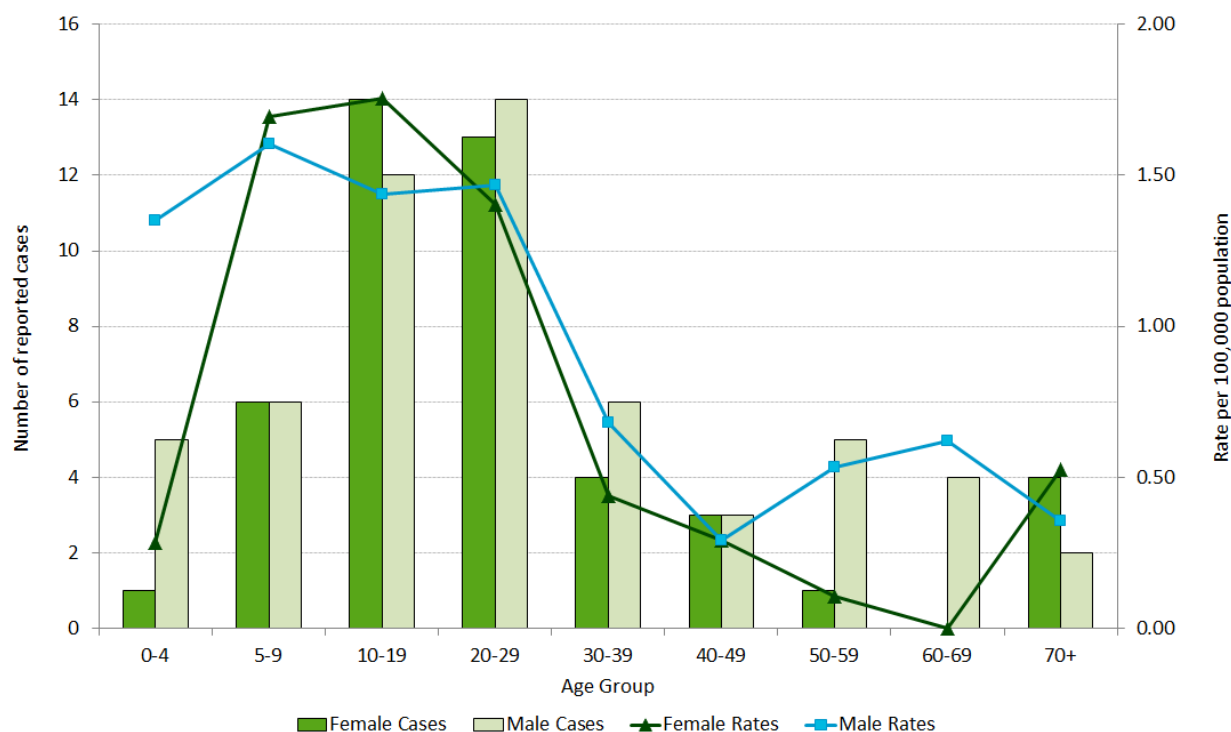
Table 1-16. Incidence of Hepatitis A by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	1	0.28	5	1.35	6	0.83
5-9	6	1.70	6	1.60	12	1.65
10-19	14	1.76	12	1.44	26	1.59
20-29	13	1.40	14	1.47	27	1.44
30-39	4	0.44	6	0.68	10	0.56
40-49	3	0.29	3	0.29	6	0.29
50-59	1	0.10	5	0.53	6	0.32
60-69	0	0.00	4	0.62	4	0.30
70+	4	0.53	2	0.36	6	0.45
Total	46	0.68	57	0.86	103	0.77

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Figure 1-20. Incidence of Hepatitis A by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

HOSPITALIZATIONS AND DEATHS

In 2011, approximately 31% (32/103) of Hepatitis A cases were hospitalized. None of the cases reported in 2011 were fatal.

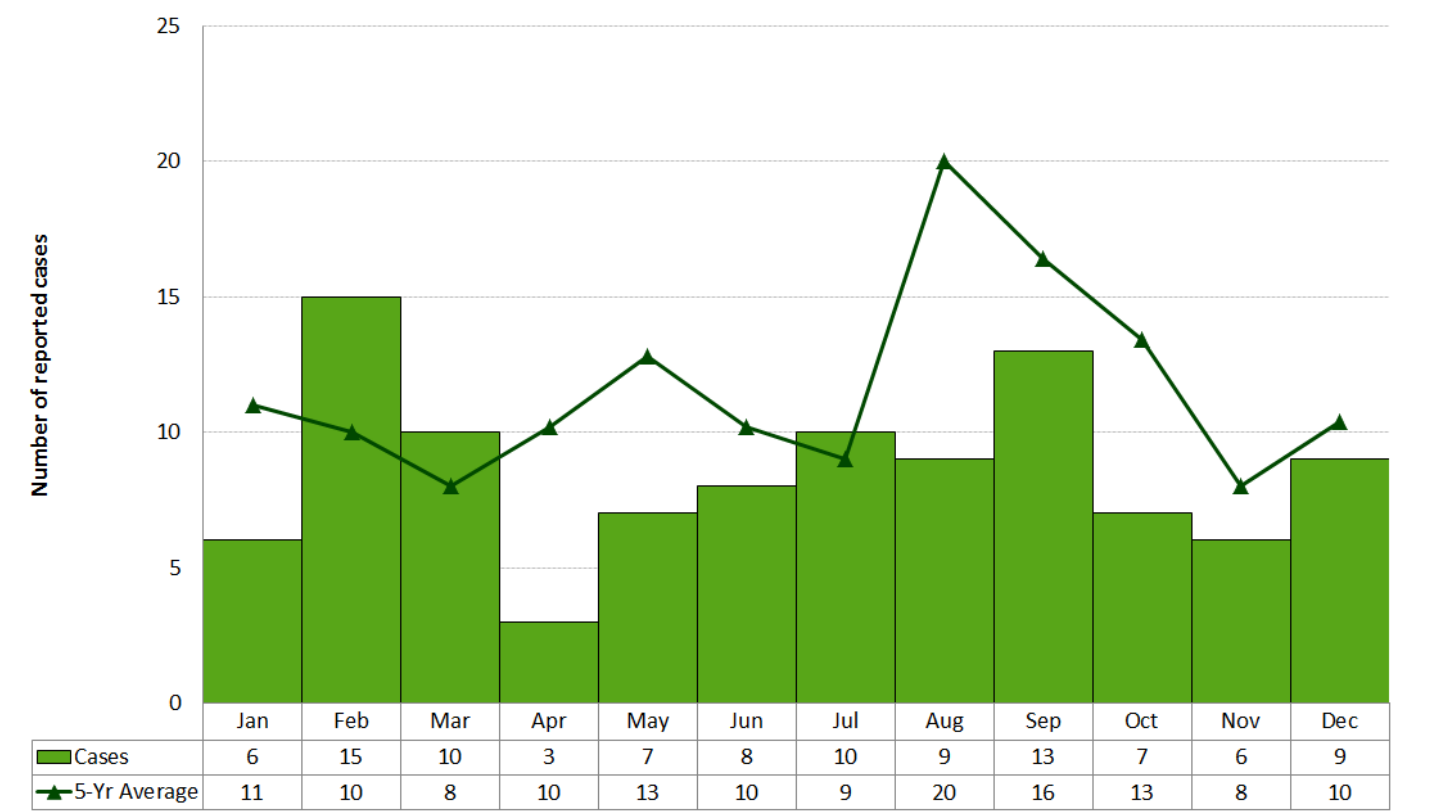
MONTHLY DISTRIBUTION

The number of reported Hepatitis A cases fluctuated throughout 2011 with no marked seasonal pattern. This is typical for Hepatitis A as incidence tends to follow travel patterns.^{1,16} In 2011, the highest number of Hepatitis A cases occurred in the months of February (15) and September (13), which together accounted for 27% (28) of reported cases (Figure 1-21). Compared to the five-year average from 2006 to 2010, case counts for Hepatitis A were lower in most months in 2011.

GEOGRAPHIC DISTRIBUTION

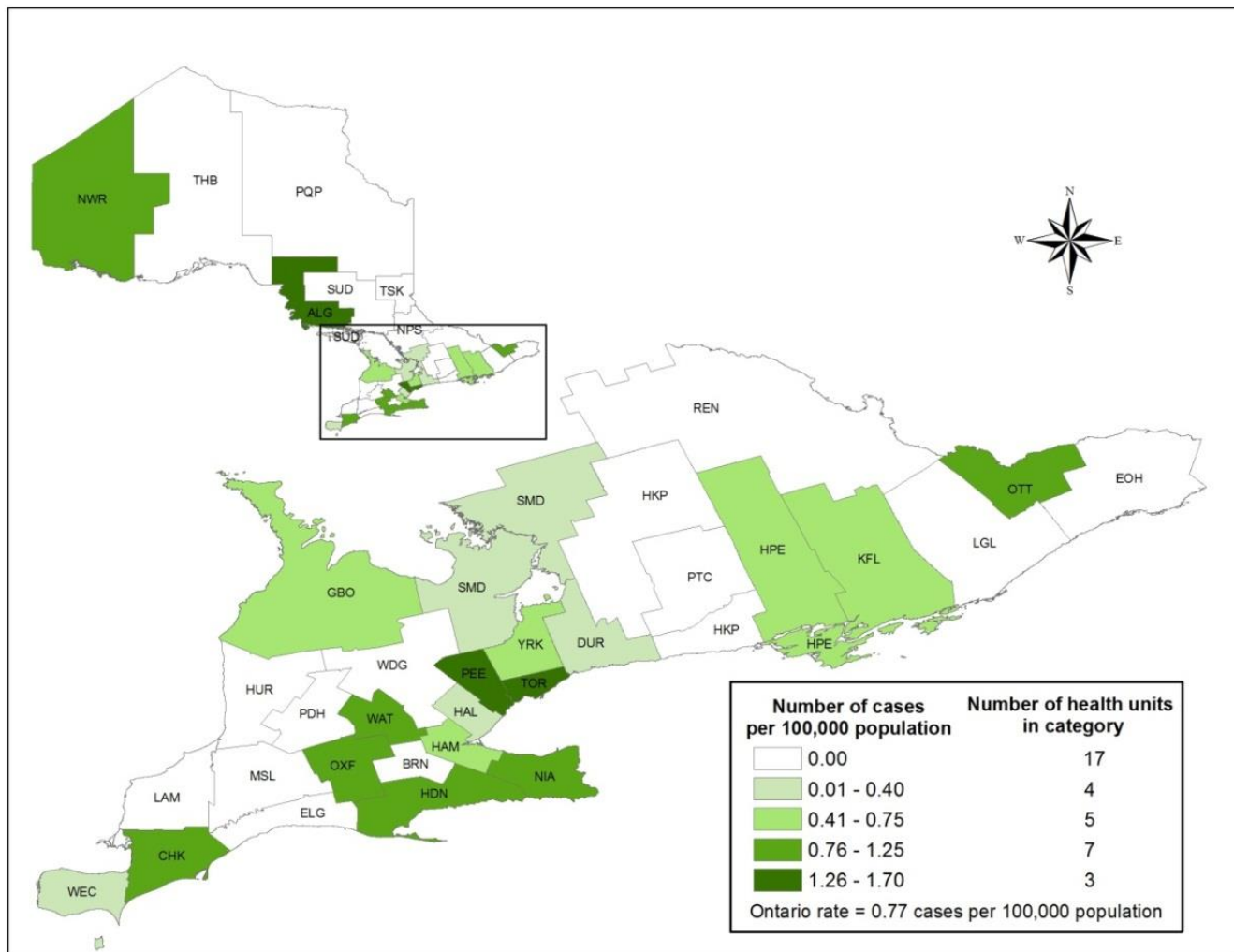
The highest incidence rate of Hepatitis A in 2011 was reported by Algoma District with 1.70 cases per 100,000 population, followed by Peel Region and Toronto with 1.54 and 1.42 cases per 100,000, respectively (Map 1-6, Table 1-17). Toronto also reported the highest number of cases (39), representing a disproportionately higher proportion (38%) of all Hepatitis A cases reported in Ontario in 2011. Cases from Peel Region also represented a disproportionate share (20%) of Hepatitis A cases in 2011.

Figure 1-21. Number of C Hepatitis A Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 1-6. Incidence of Hepatitis A by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-17. Incidence of Hepatitis A by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	2	1.70	1.9%	0.9%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	1	0.92	1.0%	0.8%
Durham Region	2	0.32	1.9%	4.7%
Eastern Ontario	0	0.00	0.0%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	1	0.61	1.0%	1.2%
Haldimand-Norfolk	1	0.90	1.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	0	0.00	0.0%	1.3%
Halton Region	1	0.19	1.0%	3.9%
Hamilton, City of	4	0.74	3.9%	4.0%
Hastings & Prince Edward Counties	1	0.61	1.0%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	1	0.51	1.0%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	0	0.00	0.0%	1.3%
Middlesex-London	0	0.00	0.0%	3.4%
Niagara Region	4	0.90	3.9%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	1	1.22	1.0%	0.6%
Ottawa, City of	9	0.99	8.7%	6.8%
Oxford County	1	0.92	1.0%	0.8%
Peel Region	21	1.54	20.4%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	0	0.00	0.0%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	2	0.38	1.9%	3.9%
Sudbury & District	0	0.00	0.0%	1.5%
Thunder Bay District	0	0.00	0.0%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	39	1.42	37.9%	20.5%
Waterloo Region	5	0.94	4.9%	4.0%
Wellington-Dufferin-Guelph	0	0.00	0.0%	2.1%
Windsor-Essex County	1	0.25	1.0%	3.0%
York Region	6	0.56	5.8%	8.0%
Ontario	103	0.77	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Of the 103 reported cases with Hepatitis A, 73 (71%) reported at least one risk factor. Of cases reporting risk factors in 2011, 75% (55/73) reported travel outside of Ontario, 19% (14/73) reported consumption of potentially contaminated water and 14% (10/73) reported consumption of raw unwashed fruits and vegetables.

Table 1-18. Reported Risk Factors for Hepatitis A Cases: Ontario, 2011 (n=73)

Risk Factors	Cases	
	Number	Percent
Travel out of province	55	75.3%
Consumption of potentially contaminated water	14	19.2%
Consumption of raw or unwashed fruits/vegetables	10	13.7%
Consumption of raw/undercooked shellfish	6	8.2%
Close contact with a case	5	6.8%
Contact with recreational water	5	6.8%
Other	10	13.7%
Unknown	10	13.7%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to the sum of risk factors reported as "Other, specify" and risk factors with frequency <3%. "Unknown" refers to risk factors reported solely as "Unknown".

Listeriosis

- **Since 2009, the incidence of listeriosis has increased by approximately 50%.**
- **Adults aged 60 years and older accounted for 75% of listeriosis cases reported in 2011.**
- **Cases 60 years or older represented 76% of hospitalized individuals in 2011 and 83% of deaths reported in 2011.**
- **Ninety-three percent of cases reported either being immunocompromised or having a chronic/underlying medical condition.**

Listeriosis is a serious but rare infection caused by the bacterium *Listeria monocytogenes*. Infections can be asymptomatic (without symptoms), but can also be invasive, affecting not just the intestinal tract. Symptoms of listeriosis appear three to 70 days after exposure (median of three weeks) and present as muscle aches, fever, diarrhea, nausea and vomiting. Complications such as meningitis and septicemia are common in newborns, older adults and in persons with other underlying health conditions. In pregnant women, infection can lead to premature delivery, fetal infection, stillbirth or spontaneous abortion.¹ The case fatality rate of listeriosis in adults is 30% but can be as high as 50% in newborns.¹

Listeriosis is widespread in the environment. The main route of transmission is foodborne- through the ingestion of contaminated foods such as unpasteurized milk, ready-to-eat meats, soft cheeses and vegetables.¹ However, it can also be transmitted from mother to child during pregnancy or birth. Infection can be prevented by following safe food handling practices such as avoiding soft cheeses, deli meats and unpasteurized milk and milk products; washing fresh produce using clean running water; and cooking meats thoroughly. Frequent hand washing and proper

sanitizing of food contact surfaces also reduces the risk of listeriosis.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

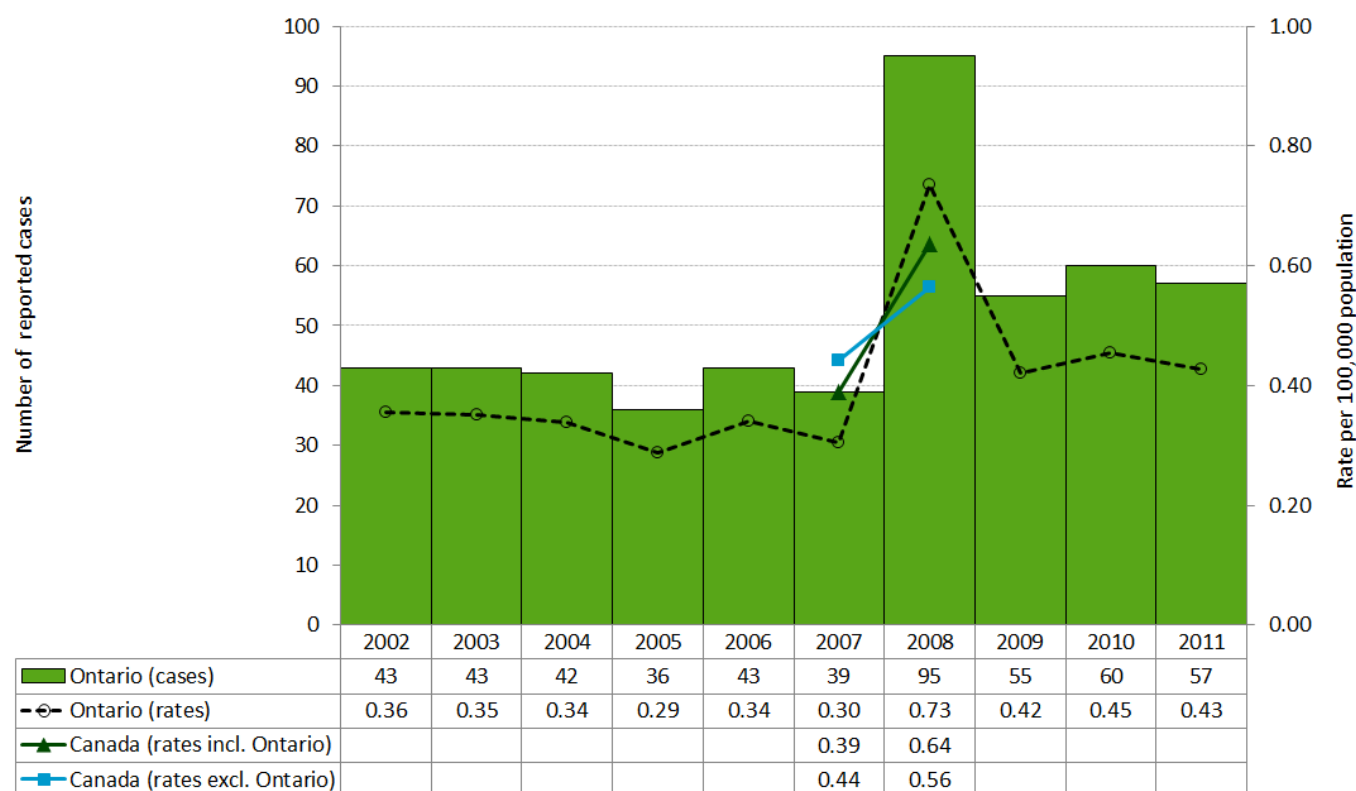
Listeriosis accounted for less than one percent of enteric disease cases reported in Ontario in 2011. In 2011, 57 cases were reported, representing an incidence rate of 0.43 cases per 100,000 population (Figure 1-22). The number of reported cases in 2011 also represented a five percent decline compared to the 2010 total of 60 cases. Overall, the incidence rate of listeriosis increased by 19% from 0.36 cases per 100,000 population in 2002 to 0.43 cases per 100,000 population in 2011. From 2002-2007, the incidence of listeriosis in Ontario was relatively stable with an annual average of 40 cases. Following an outbreak in 2008, the incidence of listeriosis remained elevated at approximately 60 cases per year. The 2008 outbreak was linked to ready-to-eat deli meats and affected 56 persons in seven provinces, 75% (42 cases) of which were in Ontario.¹⁸

Listeriosis became nationally notifiable in 2007, thus trends in the annual incidence of listeriosis in Canada are not defined in this report. National data are available for 2007 and 2008 and show an increase over this period which is due largely to the 2008 outbreak.

AGE AND SEX DISTRIBUTION

Males accounted for 42% (24) of listeriosis cases reported in Ontario in 2011 and had a corresponding incidence rate of 0.36 cases per 100,000 population. Females accounted for 58% (33) of cases and had a corresponding incidence rate of 0.49 cases per 100,000 population. Overall, listeriosis cases ranged in age from <1 to 96 years, with a median age of 71 years. Consistent with the epidemiology of listeriosis,¹ the incidence of listeriosis was relatively low in the age groups under 60 years, with adults over 60 years accounting for 75% of reported cases in 2011 (Table 1-19, Figure 1-23).

Figure 1-22. Incidence of Listeriosis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available from 2007 to 2008.

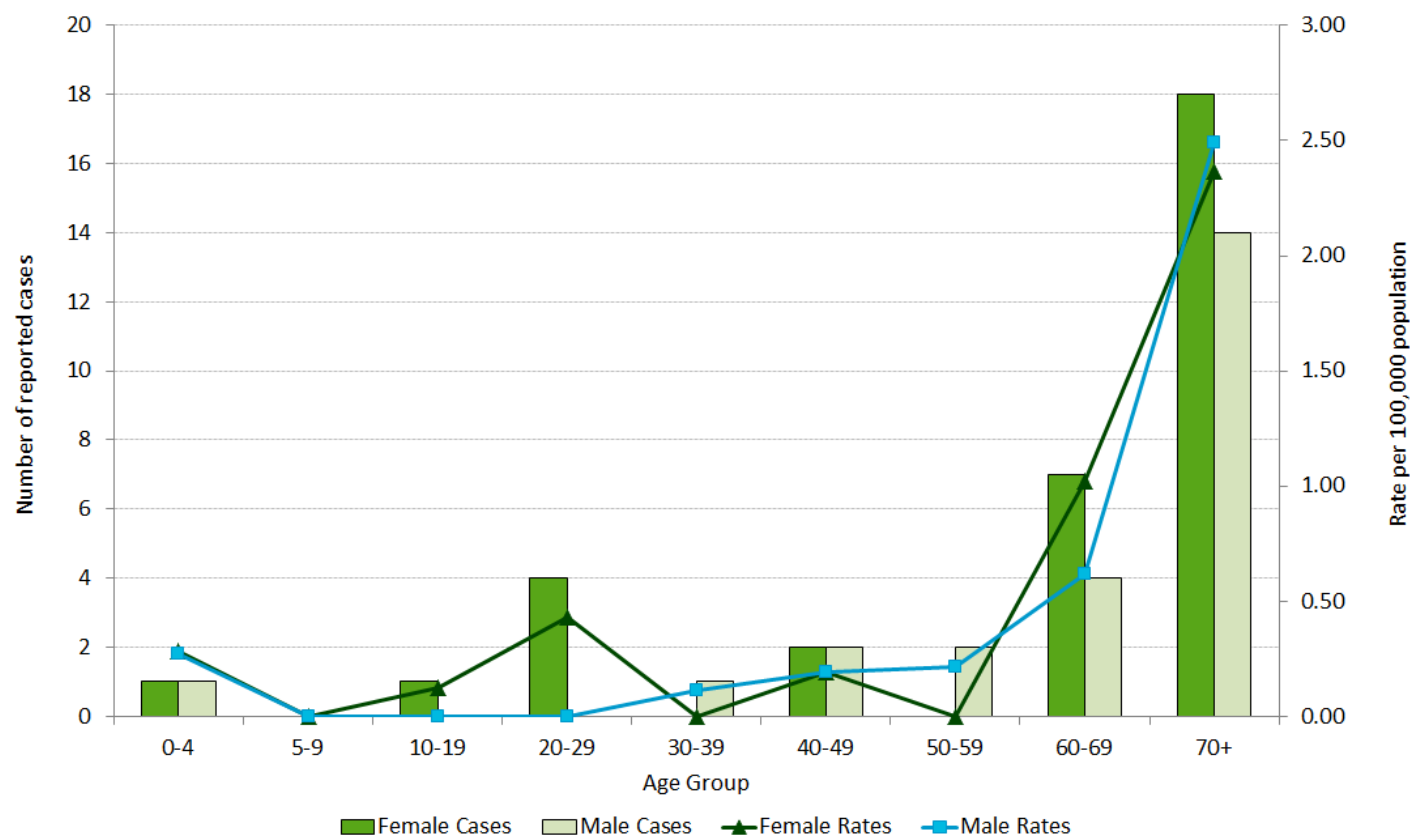
Table 1-19. Incidence of Listeriosis by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	1	0.28	1	0.27	2	0.28
5-9	0	0.00	0	0.00	0	0.00
10-19	1	0.13	0	0.00	1	0.06
20-29	4	0.43	0	0.00	4	0.21
30-39	0	0.00	1	0.11	1	0.06
40-49	2	0.19	2	0.19	4	0.19
50-59	0	0.00	2	0.21	2	0.11
60-69	7	1.02	4	0.62	11	0.83
70+	18	2.36	14	2.49	32	2.42
Total	33	0.49	24	0.36	57	0.43

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Figure 1-23. Incidence of Listeriosis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

HOSPITALIZATIONS AND DEATHS

In 2011, 60% (34/57) of listeriosis cases were hospitalized, which is lower than reported rates of over 90% in the U.S.¹⁹ A case fatality ratio of 11% (6/57) was reported in 2011, which is less than the average case fatality ratio of 16% in the U.S.¹⁹ Hospitalized (26/34) and fatal (5/6) cases of listeriosis were predominantly older (≥ 60 years). Hospitalized cases had a median age of 71 years, whereas fatal cases had a median age of 77 years.

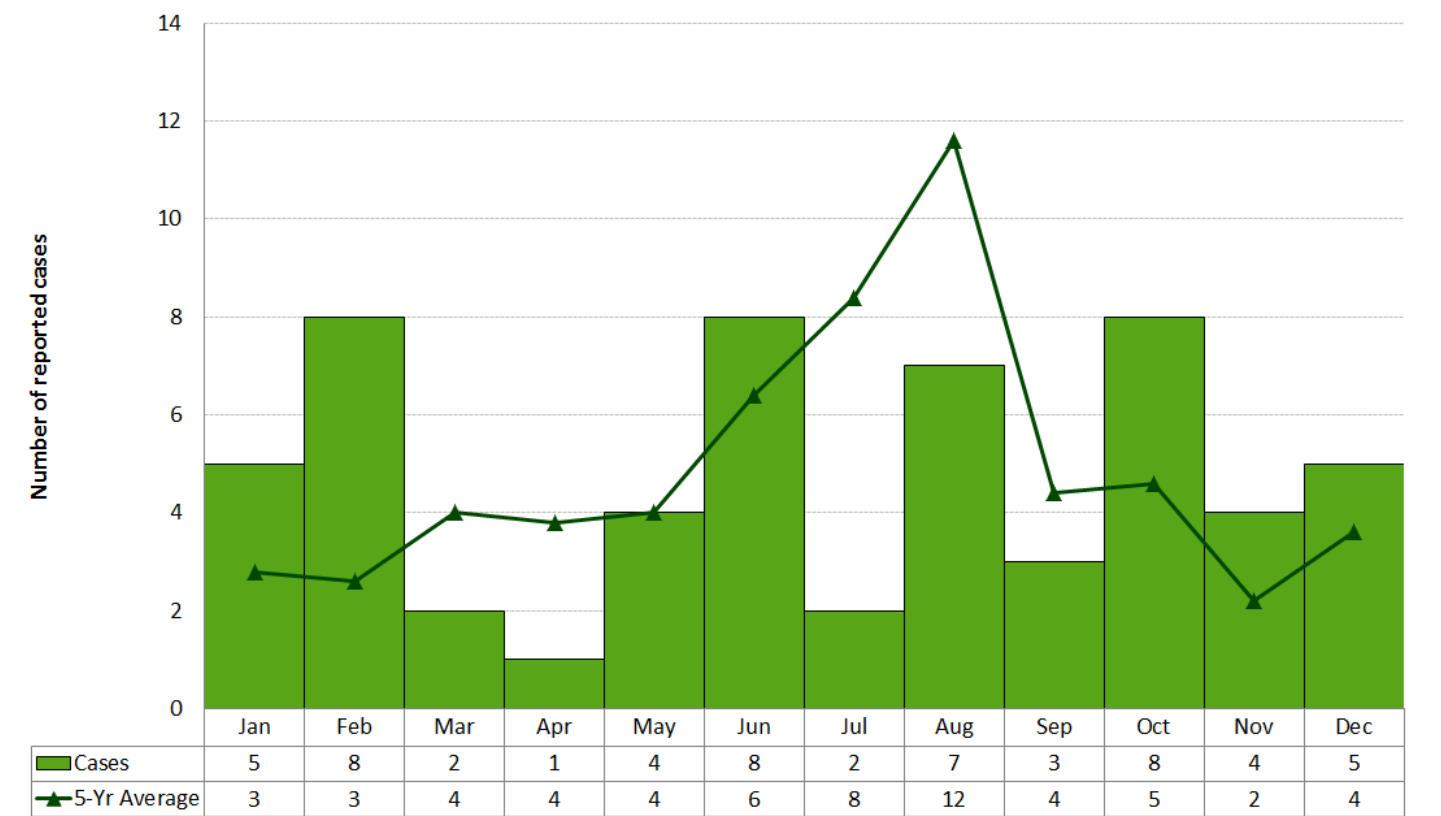
MONTHLY DISTRIBUTION

Listeriosis occurs throughout the year with no clear seasonal pattern. A range of one to eight cases are reported per month (Figure 1-24).

GEOGRAPHIC DISTRIBUTION

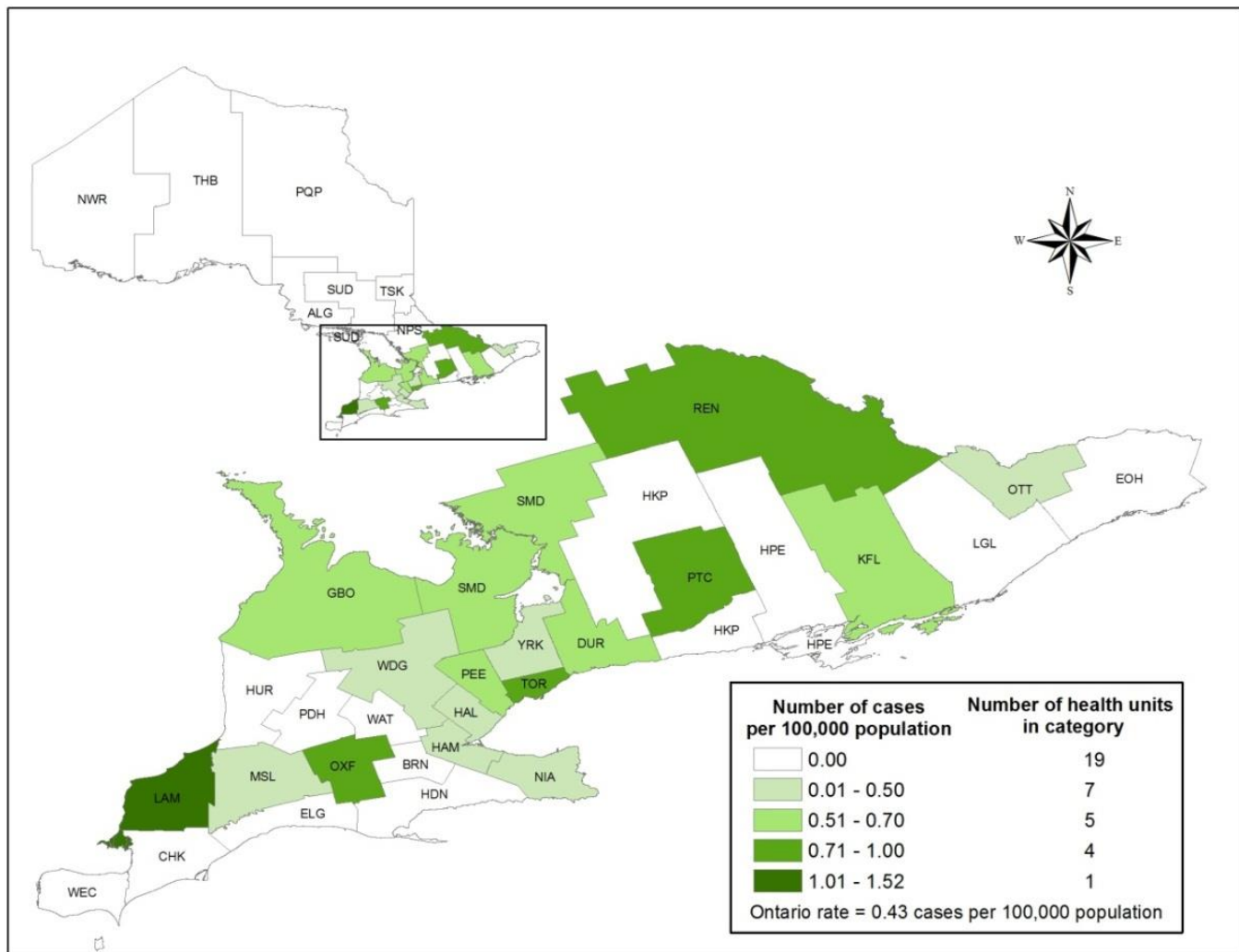
Over half of the health units (19/36) reported at least one case of listeriosis in 2011. Toronto reported the highest number of cases (20), accounting for 35% of reported cases in Ontario. Outside of Toronto, the number of reported cases ranged from one to eight among health units that reported cases in 2011 (Map 1-7, Table 1-20).

Figure 1-24. Number of Listeriosis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 1-7. Incidence of Listeriosis by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-20. Incidence of Listeriosis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	0	0.00	0.0%	0.8%
Durham Region	4	0.63	7.0%	4.7%
Eastern Ontario	0	0.00	0.0%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	1	0.61	1.8%	1.2%
Haldimand-Norfolk	0	0.00	0.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	0	0.00	0.0%	1.3%
Halton Region	2	0.39	3.5%	3.9%
Hamilton, City of	1	0.19	1.8%	4.0%
Hastings & Prince Edward Counties	0	0.00	0.0%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	1	0.51	1.8%	1.5%
Lambton County	2	1.52	3.5%	1.0%
Leeds, Grenville and Lanark District	0	0.00	0.0%	1.3%
Middlesex-London	2	0.43	3.5%	3.4%
Niagara Region	1	0.22	1.8%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	0	0.00	0.0%	0.6%
Ottawa, City of	4	0.44	7.0%	6.8%
Oxford County	1	0.92	1.8%	0.8%
Peel Region	8	0.59	14.0%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	1	0.71	1.8%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	1	0.97	1.8%	0.8%
Simcoe Muskoka District	3	0.57	5.3%	3.9%
Sudbury & District	0	0.00	0.0%	1.5%
Thunder Bay District	0	0.00	0.0%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	20	0.73	35.1%	20.5%
Waterloo Region	0	0.00	0.0%	4.0%
Wellington-Dufferin-Guelph	1	0.36	1.8%	2.1%
Windsor-Essex County	0	0.00	0.0%	3.0%
York Region	4	0.37	7.0%	8.0%
Ontario	57	0.43	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

The risk of infection with *Listeria* and of serious outcomes following infection is higher for older adults.¹ Having a compromised immune system or an underlying chronic/medical condition (93%; 40 cases) was the most commonly reported medical risk factor among the 43 listeriosis cases that reported at least one medical risk factor in 2011. Two cases were pregnant, of which one resulted in transmission during birth.

Of the 35 listeriosis cases reporting a behavioural risk factor, 40% reported consumption of ready to eat salads, 37% reported consumption of ready to eat meats and 26% reported consumption of other food items excluding soft cheeses (Table 1-21).

Table 1-21. Reported Risk Factors for Listeriosis Cases: Ontario, 2011 (n=35)

Risk Factors	Cases	
	Number	Percent
Consumption of ready-to-eat salads	14	40.0%
Consumption of ready-to-eat meats	13	37.1%
Consumption of other food items	9	25.7%
Consumption of soft cheeses	5	14.3%
Travel	4	11.4%
Contact with soil/untreated manure	3	8.6%
Other	6	17.1%
Unknown	5	14.3%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to risk factors reported solely as "Other, specify". "Unknown" refers to risk factors reported solely as "Unknown".

Paratyphoid Fever

- The annual incidence rate of paratyphoid fever increased by more than 100% from 2002 to 2011.
- Paratyphoid fever is not endemic in Canada and the occurrence of cases is reflective of travel patterns.

Paratyphoid fever is caused by *Salmonella Paratyphi*, which is part of the same family as the bacterium that causes salmonellosis. The disease occurs worldwide and is common particularly in developing countries.¹ It is not endemic in Ontario and almost all cases are associated with international travel.²⁰ Travelers visiting friends and relatives are at higher risk of getting paratyphoid fever because they are more likely to be in close contact with the local population and to visit rural areas.¹

Illness with *S. Paratyphi* is distinct from salmonellosis but similar to typhoid fever in that the infection is systemic and illness is not limited to gastrointestinal symptoms.¹ Symptoms of paratyphoid fever generally appear one to ten days after exposure and can vary from mild illness with low-grade fever to severe illness with abdominal discomfort and multiple complications that usually manifest in the absence of appropriate treatment.¹ Cases may also present symptoms of headache, malaise, anorexia, slow heart rate, diminished stool, rose spots on the trunk and an enlarged spleen.¹ Following infection, some people may become chronic carriers with the ability to transmit the bacteria through the fecal-oral route¹.

Humans are the only reservoir of *S. Paratyphi* and transmission is usually through ingestion of food or water that has been contaminated by the feces and urine of infected persons or carriers. Food vehicles for paratyphoid fever include contaminated milk, raw fruit, vegetables fertilized with human manure and shellfish harvested from sewage contaminated water.¹ Persons who are immunocompromised or have low stomach acid levels are at increased risk of infection.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, 62 cases of paratyphoid fever were reported in Ontario for an incidence rate of 0.46 cases per 100,000 population (Figure 1-25). The number of cases reported in 2011 represented a slight increase of three percent compared to the 2010 total of 60 cases. The number of cases reported in 2011 was also the highest since electronic reporting began in 1991.

The incidence of paratyphoid fever increased by 109% between 2002 and 2011. Over this period, incidence rates fluctuated from year to year, ranging from 0.17 to 0.46 cases per 100,000 population.

Data on the incidence of paratyphoid fever in Canada are not available since paratyphoid fever cases are broadly reported as salmonellosis at the national level.

SEROTYPES

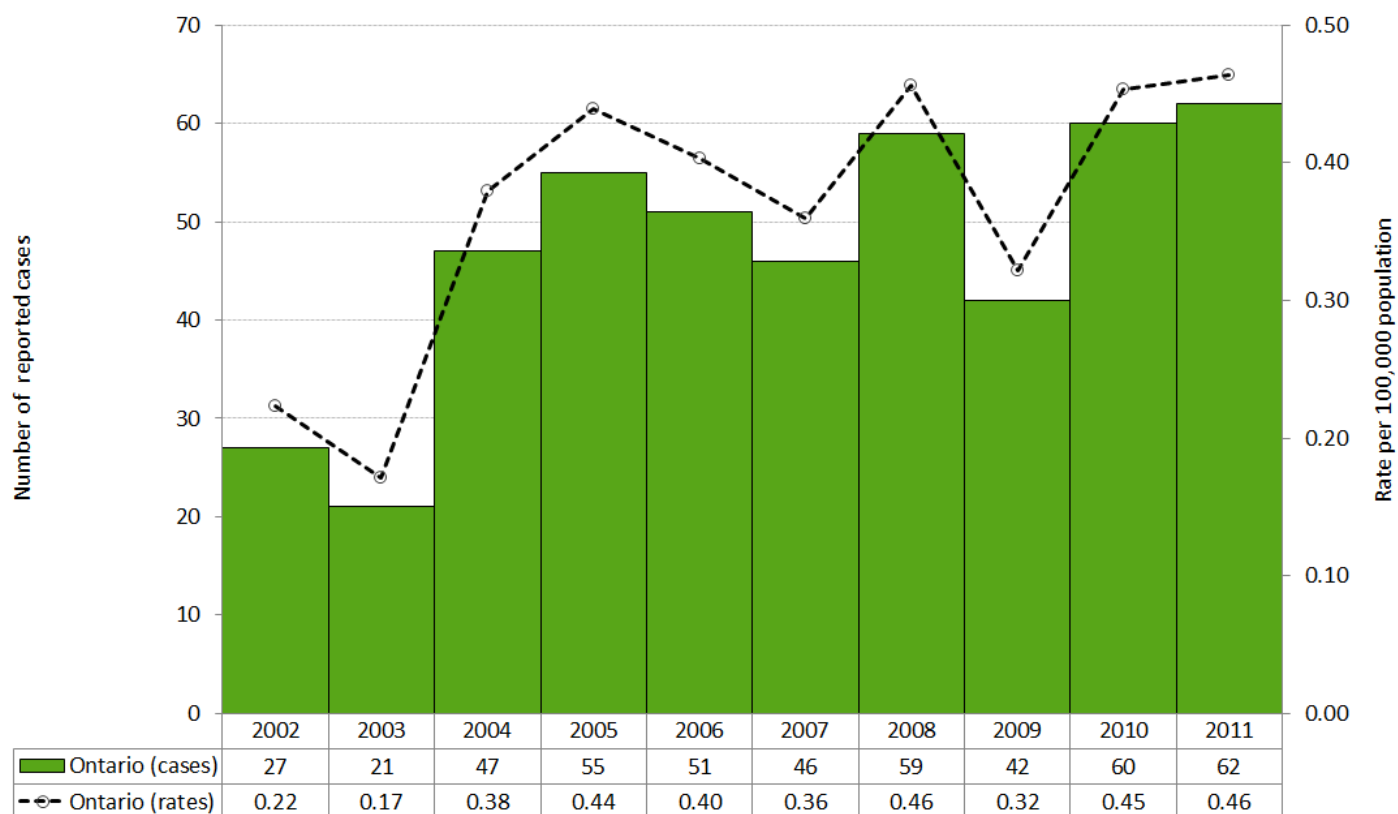
In 2011, *S. Paratyphi* A was the leading cause of paratyphoid fever in Ontario, accounting for 68 % (42/62) of cases. *S. Paratyphi* B accounted for 23% (14/62) of paratyphoid fever cases. No cases of *S. Paratyphi* C were reported and serotype was unspecified for approximately 10% of reported cases (Table 1-22).

Table 1-22. Paratyphoid Fever Cases by Serotype: Ontario, 2011

<i>S. Paratyphi</i> Serotypes	Cases	
	Number	Percent
<i>S. Paratyphi</i> A	42	67.7%
<i>S. Paratyphi</i> B	14	22.6%
<i>S. Paratyphi</i> C	0	0.0%
Unspecified serotype	6	9.7%
Total	62	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Figure 1-25. Incidence of Paratyphoid Fever: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Canadian data for paratyphoid fever are not available as paratyphoid fever is reported as salmonellosis at the national level.

AGE AND SEX DISTRIBUTION

The sex-specific incidence rate for paratyphoid fever in 2011 was slightly higher for males compared to females at 0.53 and 0.40 cases per 100,000 population, respectively (Table 1-23, Figure 1-26). Cases ranged in age from less than one year to 82 years, with a median age of 23 years. More than half of all cases reported in 2011 (37/62) occurred among the 10-19, 20-29 and 30-39 age groups. However, children in the 0-4 age group had the highest incidence rate of paratyphoid fever at 1.25 cases per 100,000 population.

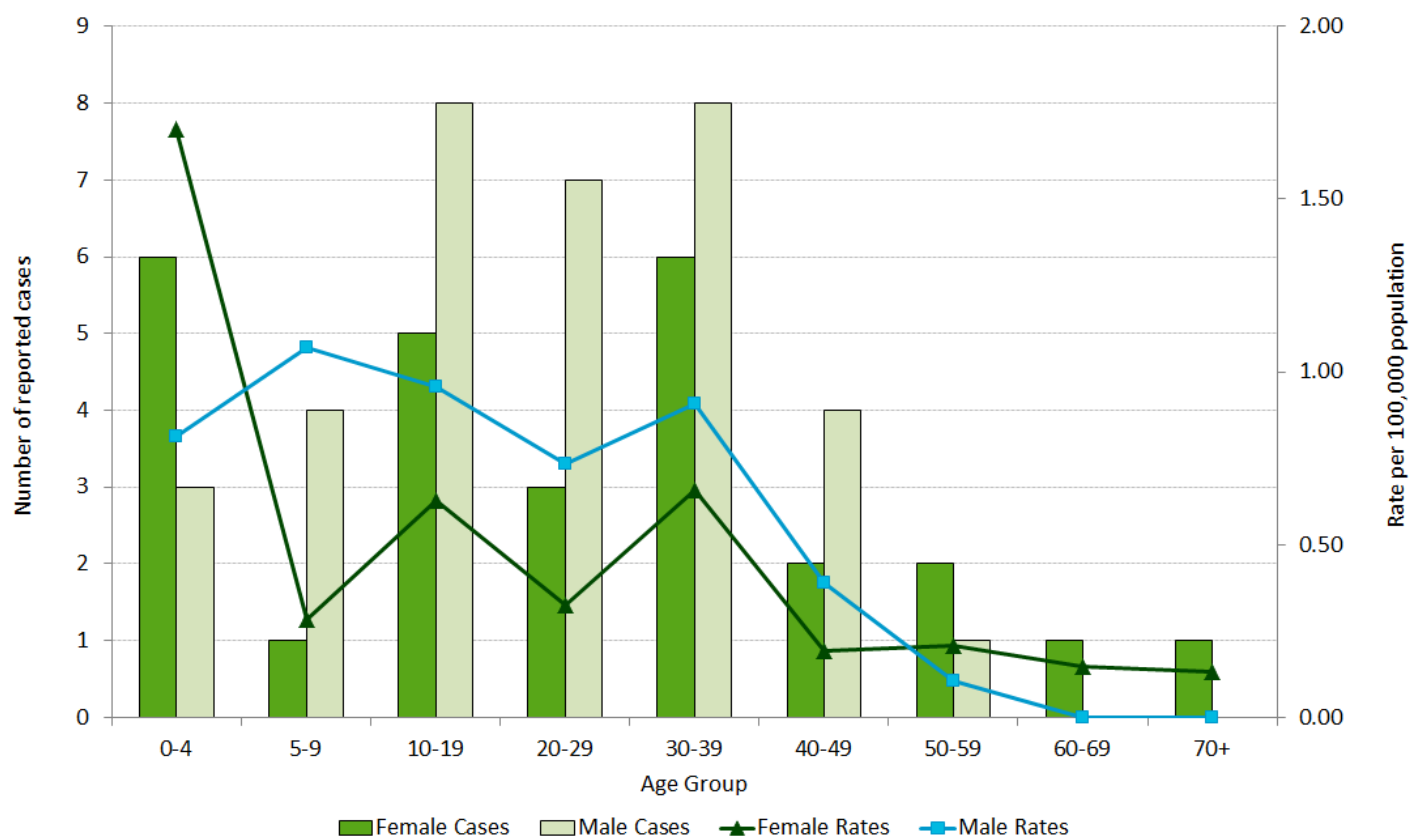
Table 1-23. Incidence of Paratyphoid Fever by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	6	1.70	3	0.81	9	1.25
5-9	1	0.28	4	1.07	5	0.69
10-19	5	0.63	8	0.96	13	0.80
20-29	3	0.32	7	0.73	10	0.53
30-39	6	0.66	8	0.91	14	0.78
40-49	2	0.19	4	0.39	6	0.29
50-59	2	0.21	1	0.11	3	0.16
60-69	1	0.15	0	0.00	1	0.08
70+	1	0.13	0	0.00	1	0.08
Total	27	0.40	35	0.53	62	0.46

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Figure 1-26. Incidence of Paratyphoid Fever by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

HOSPITALIZATIONS AND DEATHS

In 2011, approximately 19% (12/62) of paratyphoid fever cases were hospitalized; no cases were fatal.

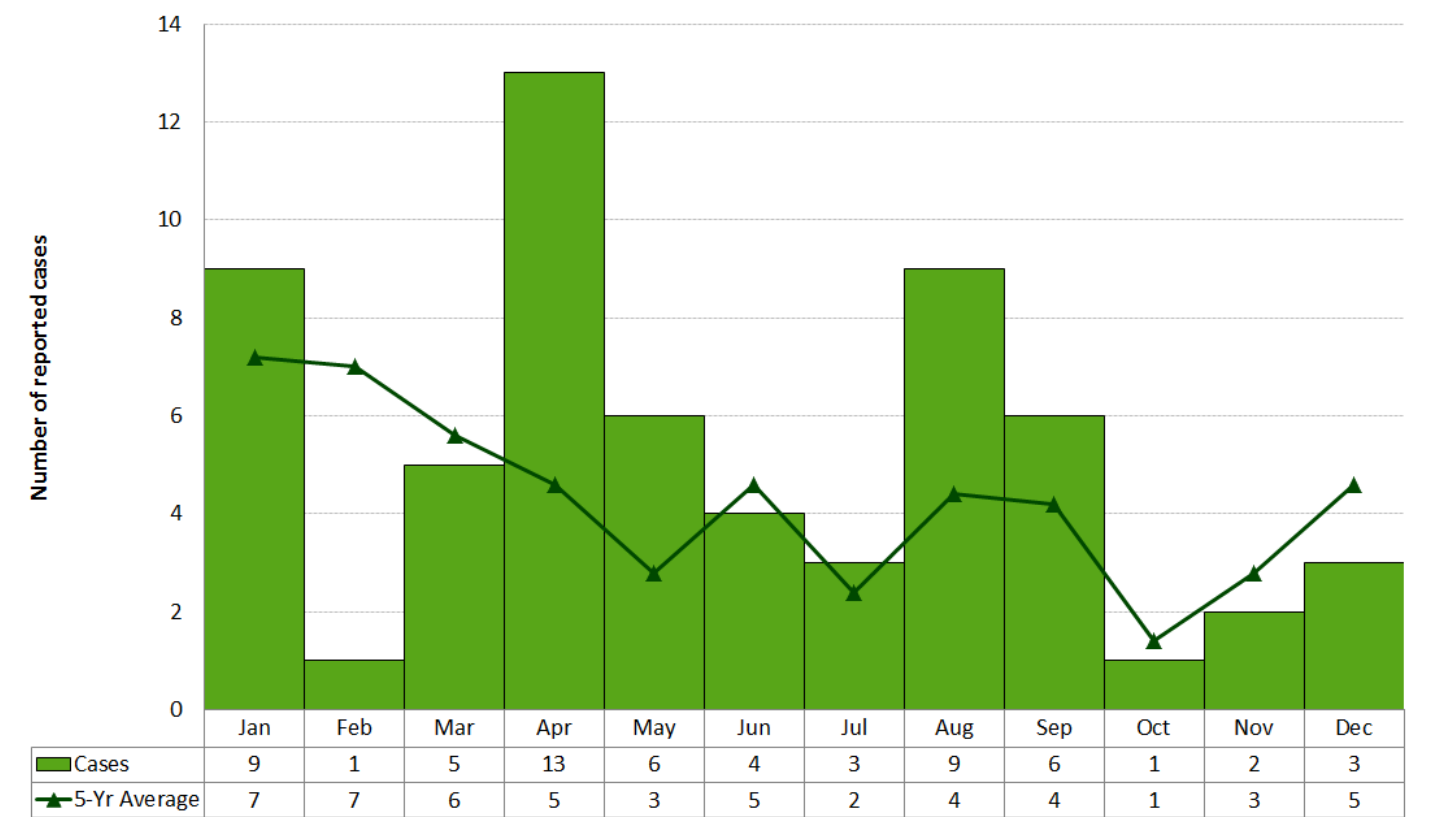
MONTHLY DISTRIBUTION

Paratyphoid fever cases are reported throughout the year, and its incidence reflects peak travel periods to endemic regions of the world such as Indo-China, South Asia and other regions of the developing world.¹ In 2011, the incidence of paratyphoid fever peaked in the months of January, April and August, which together accounted for 50% of reported cases in Ontario (Figure 1-27).

GEOGRAPHIC DISTRIBUTION

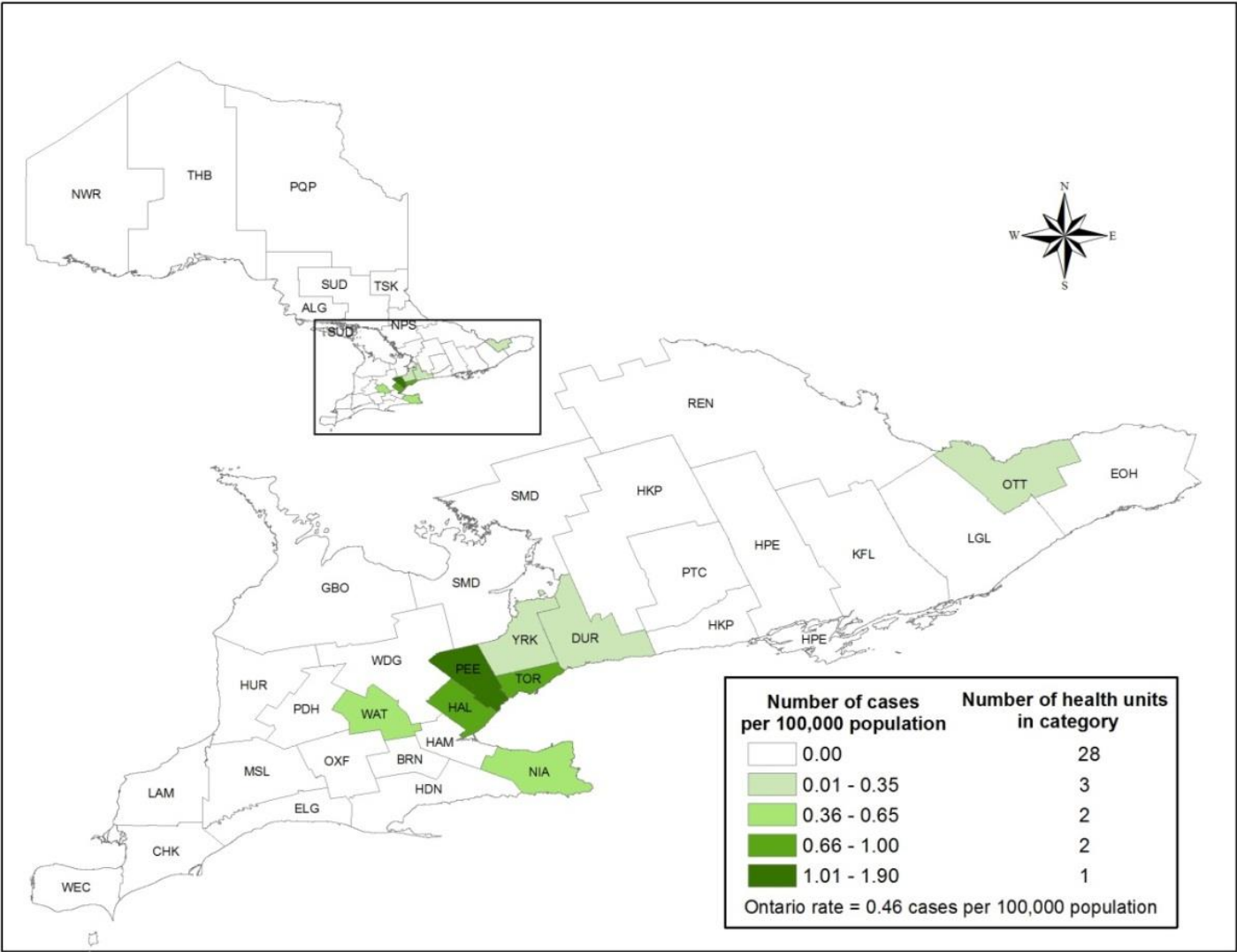
Eight out of 36 health units in Ontario reported cases of paratyphoid fever in 2011 (Map 1-8, Table 1-24). The highest incidence rates were reported by Peel Region at 1.90 cases per 100,000 population, followed by Halton Region at 0.96 cases per 100,000 population and Toronto at 0.69 cases per 100,000 population. Peel Region (26) and Toronto (19) reported the most cases and together accounted for 73% of paratyphoid fever cases in 2011. In contrast, these two health units comprised just 31% of the Ontario population. The disproportional number of cases among these two health units may be explained in part by the relatively larger share of foreign-born residents who have a greater desire to travel abroad to maintain links with family and friends in their home country.^{21,22}

Figure 1-27. Number of Paratyphoid Fever Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 1-8. Incidence of Paratyphoid Fever by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-24. Incidence of Paratyphoid Fever by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	0	0.00	0.0%	0.8%
Durham Region	1	0.16	1.6%	4.7%
Eastern Ontario	0	0.00	0.0%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	0	0.00	0.0%	1.2%
Haldimand-Norfolk	0	0.00	0.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	0	0.00	0.0%	1.3%
Halton Region	5	0.96	8.1%	3.9%
Hamilton, City of	0	0.00	0.0%	4.0%
Hastings & Prince Edward Counties	0	0.00	0.0%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	0	0.00	0.0%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	0	0.00	0.0%	1.3%
Middlesex-London	0	0.00	0.0%	3.4%
Niagara Region	2	0.45	3.2%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	0	0.00	0.0%	0.6%
Ottawa, City of	3	0.33	4.8%	6.8%
Oxford County	0	0.00	0.0%	0.8%
Peel Region	26	1.90	41.9%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	0	0.00	0.0%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	0	0.00	0.0%	3.9%
Sudbury & District	0	0.00	0.0%	1.5%
Thunder Bay District	0	0.00	0.0%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	19	0.69	30.6%	20.5%
Waterloo Region	3	0.57	4.8%	4.0%
Wellington-Dufferin-Guelph	0	0.00	0.0%	2.1%
Windsor-Essex County	0	0.00	0.0%	3.0%
York Region	3	0.28	4.8%	8.0%
Ontario	62	0.46	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS AND EXPOSURES

Paratyphoid fever is not endemic in Canada and its incidence is usually reflective of travel to endemic areas or secondary transmission due to contact with an infected person. The majority (98%, 61/62) of paratyphoid fever cases reported in 2011 had at least one exposure or travel-related risk factor. Of these cases, 84% (51/61) reported travel outside of Ontario as a risk factor or most likely exposure (Table 1-25), while 16% reported unknown (9/61) or other (1/61) exposures or risk factors as their source of illness. India, Pakistan and Bangladesh were the top three destinations for travel-related paratyphoid fever cases in 2011.

Table 1-25. Paratyphoid Fever Cases by Country of Travel: Ontario, 2011 (n=51)

Country of Travel	Cases	
	Number	Percent
India	28	54.9%
Pakistan	10	19.6%
Bangladesh	6	11.8%
Other/unknown country	7	13.7%
Total	51	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution. Risk factors and/or exposures not reported for all cases. Cases may report more than one risk factor/exposure. Reported country of travel based on risk factors pertaining to travel and/or travel-related exposures.

Plague

Plague is caused by the bacterium *Yersinia pestis*.¹ Wild rodents are the natural host of *Y. pestis* with fleas serving as the transmission vector between infected rodents and humans. Plague is commonly transmitted to humans through the bite of an infected flea or through direct contact with infected animal tissue.¹ Inhalation of respiratory droplets from infected persons and animals (especially cats) also results in infection.¹

There are three main forms of plague. Plague most commonly manifests as bubonic plague which is characterized by sudden onset of fever, headache, chills, weakness and painful and swollen lymph nodes (buboes). Bubonic plague usually develops one to six days after being bitten by an infected flea. Left untreated, bubonic plague can progress to septicemic plague wherein the bacteria multiplies in the bloodstream or pneumonic plague wherein the lungs become infected. Plague in its various forms can be treated successfully with antibiotics. However, if left untreated, it is almost invariably fatal for pneumonic and septicemic plague, and fatal for 50 to 60% of bubonic plague cases.¹

Plague is endemic in South America, western USA, Asia, and south-eastern Europe.¹ Susceptibility to the disease is general, requiring contact with infected fleas, animals or persons. The most effective means of eliminating the risk of infection is through the use of rodent control strategies around the home and flea control strategies for family pets.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In Canada, plague is extremely rare with the last reported human case occurring in 1939.²³

Psittacosis/Ornithosis

Psittacosis/ornithosis is an acute infection that is caused by the bacterium *Chlamydia (or Chlamydophila) psittaci*.¹ It is primarily a disease of birds, but can be transmitted to humans through the inhalation of dried secretions from infected birds.¹ Although extremely rare, person-to-person transmission of psittacosis/ornithosis can also occur.¹

In infected persons, symptoms of psittacosis/ornithosis usually appear one to four weeks after exposure and are characterized by mild flu-like illness and in some cases, pneumonia. Symptoms include fever, headache, rash, myalgia, chills, non-productive cough and light intolerance.¹ Severe complications resulting in inflammation of the liver, the lining of the heart cavity, the heart muscle and the brain can also occur.¹

Psittacosis/ornithosis is primarily an occupational health risk for handlers of birds such as parakeets, parrots, love birds and pigeons.¹ However, household transmission

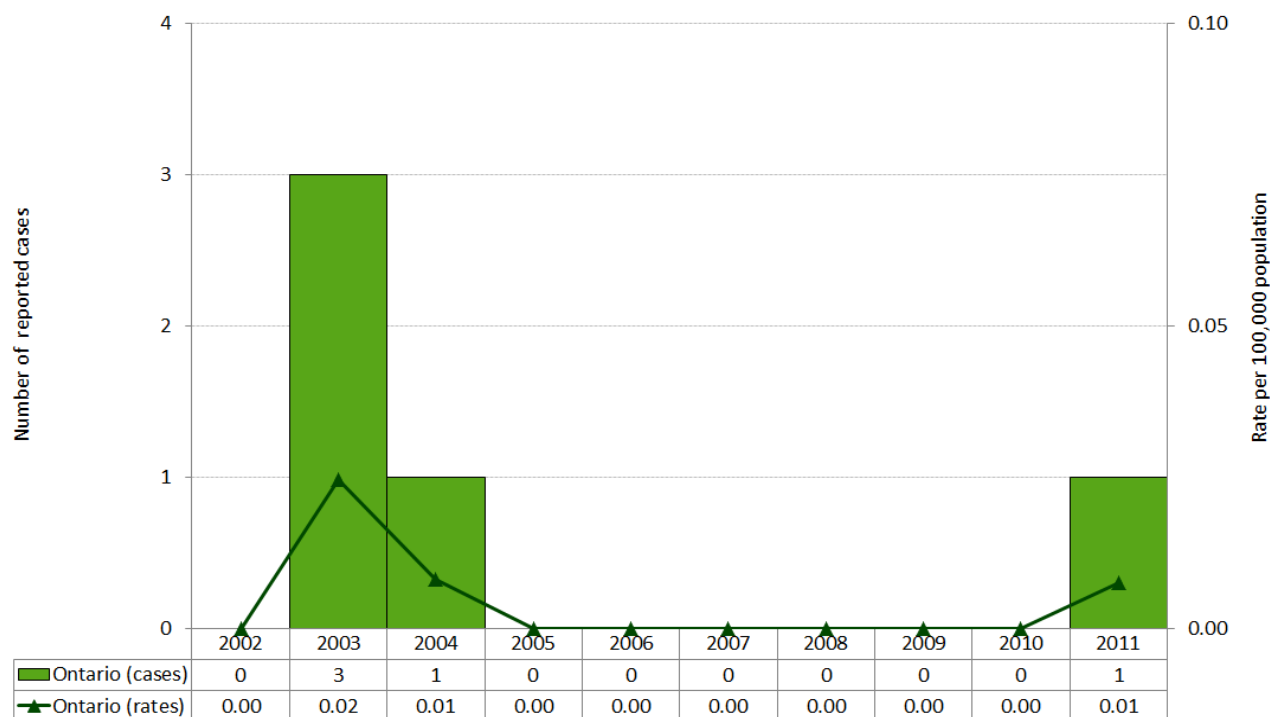
from infected pet birds can also occur. The most effective means of eliminating the risk of infection begins with maintaining safe and sanitary environments for birds and using personal protective equipment that covers the eyes, nose, mouth, hands and clothing when handling birds and their environments.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, one case of psittacosis was reported in Ontario (Figure 1-28). This was the first case of psittacosis in Ontario since 2004 for a total of five cases from 2002 to 2011.

Psittacosis/ornithosis is extremely rare in Canada.²⁴ It is not nationally notifiable, thus a comparison between the Ontario incidence rate and the Canadian rate is not provided.

Figure 1-28. Incidence of Psittacosis/Ornithosis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Psittacosis is not nationally notifiable.

Q Fever

Q fever is caused by the bacterium *Coxiella burnetii*.¹ The disease is primarily transmitted to humans through inhalation of aerosolized bacteria originating from the urine, feces and birth tissues (i.e. placenta, uterus and birth fluids) of infected cattle, sheep and goats.¹ Q fever can also be transmitted to humans through the consumption of contaminated milk as well as through contact between broken skin and infected animal excreta or birth tissues.¹ Although possible, person-to-person transmission is rare.

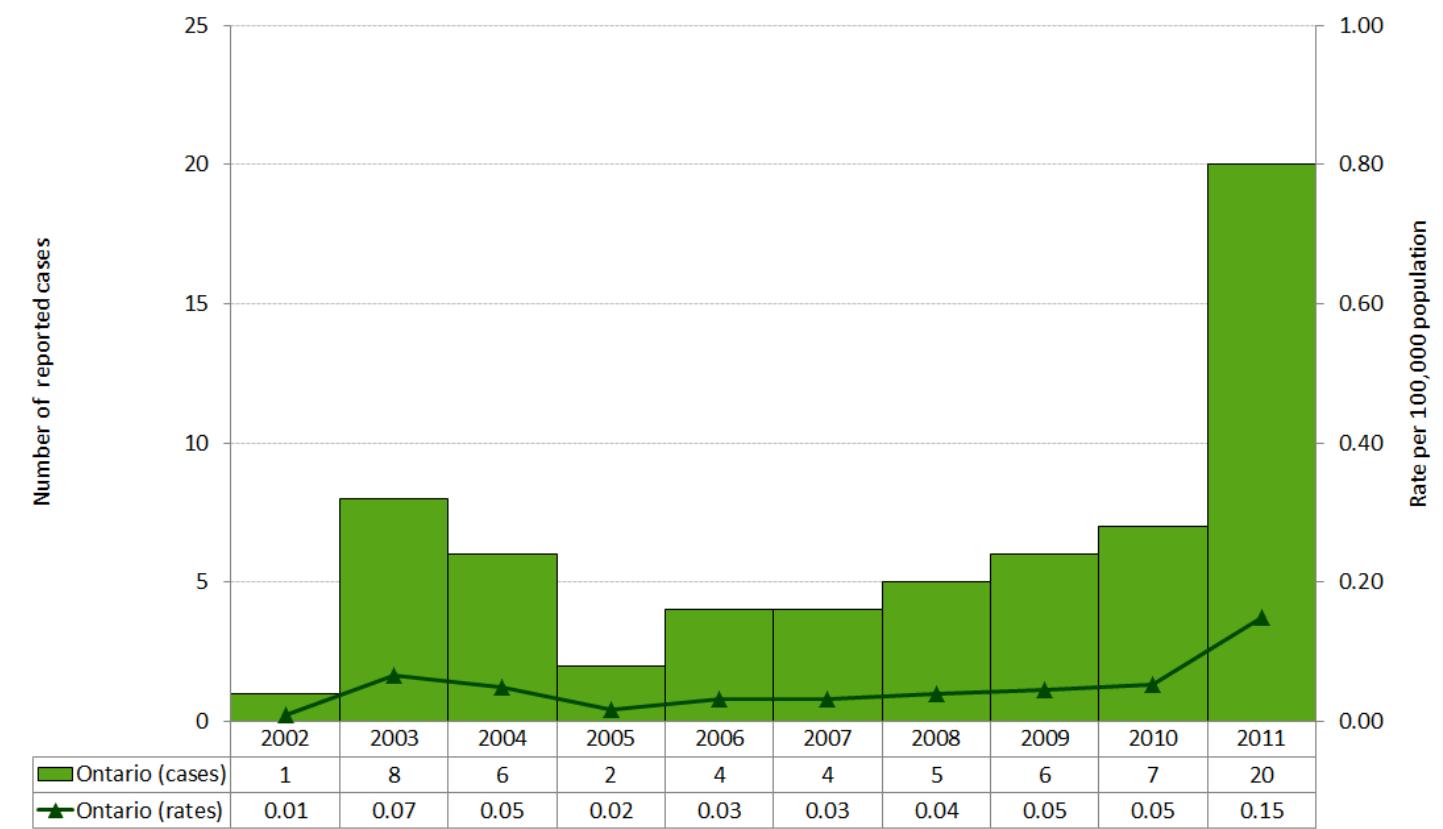
Sixty percent of people with Q fever have no physical signs of illness. For those with symptoms, illness may be acute or chronic with acute illness developing two to three weeks after exposure. Acute Q fever is characterized by abrupt onset of fever, chills, sweats, severe headache, nausea, vomiting, diarrhea, abdominal pain, chest pain, malaise and cough that lasts for up to four weeks.¹ Chronic Q fever is usually more severe with symptoms developing up to two years after exposure.¹ Inflammation of the lining of the heart cavity (pericarditis) occurs in 60-70% of persons with chronic Q fever, leading to death in 25 to 60% of untreated persons. Liver inflammation (hepatitis) and infections of the bone or reproductive organs are other manifestations of chronic Q fever infections.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, 20 cases of Q fever were reported in Ontario, representing an incidence rate of 0.15 cases per 100,000 population (Figure 1-29). The 2011 count of cases was a 186% increase compared to the 2010 total of seven cases. From 2006 to 2010, an average of five cases of Q fever was reported in Ontario. The higher than expected number of cases in 2011 may be associated with increased awareness about the disease and associated testing among the susceptible farming community in Ontario, some of whom are enrolled in an Ontario Q Fever Study.²⁵ The potential link between the increase in 2011 and the Ontario Q Fever Study is indicative of under-reporting of the true number of Q fever cases in Ontario, at least in the years prior to 2011.

Q fever is not nationally notifiable, thus a comparison between annual incidence rates for Ontario and Canada is not provided.

Figure 1-29. Incidence of Q Fever: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Q fever is not nationally notifiable.

Rabies

Rabies is an acute viral infection that only affects mammals.¹ It is commonly transmitted in saliva through the bite of an infected animal, or through contact between saliva and broken skin or mucous membranes.¹ Although possible, person-to-person transmission rarely occurs. Rabies is transmissible to humans and other animals when the virus is present in saliva. This may occur prior to the onset of symptoms and throughout the course of illness.¹ The time from exposure to the rabies virus and development of related symptoms ranges from three to eight weeks, but can be as short as nine days or as long as seven years.^{1,26}

Early symptoms of rabies include fever, headache, general weakness and pain at site of the exposure. As the disease progresses, symptoms such as excitability, apprehension, fear of water and air, delirium, convulsions and hypersalivation occur.¹ These classic symptoms are observed in two-thirds of cases and are collectively known as “furious rabies”.^{1,26} Rabies infection may also manifest as “dumb rabies”, which is characterized by paralysis of the limbs and respiratory muscles.^{1,26} Death usually occurs within two weeks of onset of central nervous system symptoms, with a case fatality rate of almost 100%.¹

In Canada, rabies is largely confined to wildlife, primarily affecting bats, foxes, raccoons and skunks, and occasionally in spill-over populations such as livestock, pets and small rodents. Unvaccinated domestic animals, mainly dogs and cats, are an important bridge for infection between humans and rabid wild animals. In Ontario and Canada, a combination of wildlife vaccination programs and compulsory vaccination of pets against rabies in most jurisdictions has resulted in a significant decrease in transmission between terrestrial animals and humans.²⁷ Following an exposure, rabies can be prevented by appropriate wound care and prompt medical assessment to determine if rabies post-exposure prophylaxis (PEP) is indicated. Where indicated, appropriate PEP for previously unvaccinated persons is comprised of rabies immune globulin and a four-dose series of an approved rabies vaccine.²⁸

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Twenty-four human cases of rabies were reported in Canada from 1924 to 2011, including six cases in Ontario. The last case in Ontario during this period occurred in 1967.²⁶

Salmonellosis

- **Salmonellosis remained the second most frequently reported enteric diseases in Ontario in 2011, with serotype *Salmonella* Enteritidis accounting for the highest number of cases.**
- **The incidence of salmonellosis was highest for males and females under the age of ten years.**
- **Salmonellosis occurs throughout the year, but most cases occur during the warmer months.**
- **Foodborne exposures and travel outside of Ontario were the most frequently reported risk factors among salmonellosis cases in 2011.**

Salmonellosis is second to campylobacteriosis as a leading reportable enteric disease in Ontario. It is caused by over 2,500 serotypes of the bacterium *Salmonella enterica*. It is estimated that each reported case of salmonellosis represents 13 to 37 unreported cases in the population.²⁹

Salmonellosis is transmitted primarily through ingestion of food or water contaminated by the feces of infected persons or animals.¹ Transmission can also occur through direct or indirect contact with animals, such as birds and reptiles, and their environment. Symptoms generally appear six to 72 hours after exposure and may include abdominal pain, fever and diarrhea, usually lasting from four to seven days.¹

Susceptibility to salmonellosis is universal, but infants, young children, the elderly, and those with impaired immune systems or low stomach acid levels are at greatest risk of severe illness and complications. Recovery from salmonellosis is usually complete, however a small number of people can develop chronic arthritis, which can last for months or years.¹ Salmonellosis can be prevented by cooking meats, poultry and eggs thoroughly, avoiding unpasteurized milk, and by washing hands before and after handling

food, after using the washroom, and after handling animals and their environments.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Salmonellosis was the second most frequently reported enteric disease in Ontario in 2011, accounting for 25% of all reported cases of enteric diseases. There were 2,576 cases reported in 2011, which corresponds with an incidence rate of 19.26 cases per 100,000 population. This was a five percent decrease in 2011 compared to the 2010 total of 2,724 cases (Figure 1-30). In 2011, two percent (54/2,576) of salmonellosis cases were associated with outbreaks or clusters ranging in size from two to 13 cases.

The annual incidence rate of salmonellosis fluctuated from year to year but showed an overall decline of six percent from 20.49 cases per 100,000 population in 2002 to 19.26 cases per 100,000 population in 2011. During this time, two notable increases in incidence were observed in 2005 and 2007. The increase in 2005 was attributed to a provincial outbreak of *S. Enteritidis* that was linked to contaminated mung bean sprouts.³⁰ The 2007 increase was attributed to a province-wide increase of *S. Typhimurium* that also included a point-source outbreak in London, Ontario (Figure 1-30).³¹

In 2008, the most recent year for which national data are available, the Canadian incidence rate of salmonellosis was comparable to the incidence rate in Ontario after several years of higher rates in Ontario.

SEROTYPES

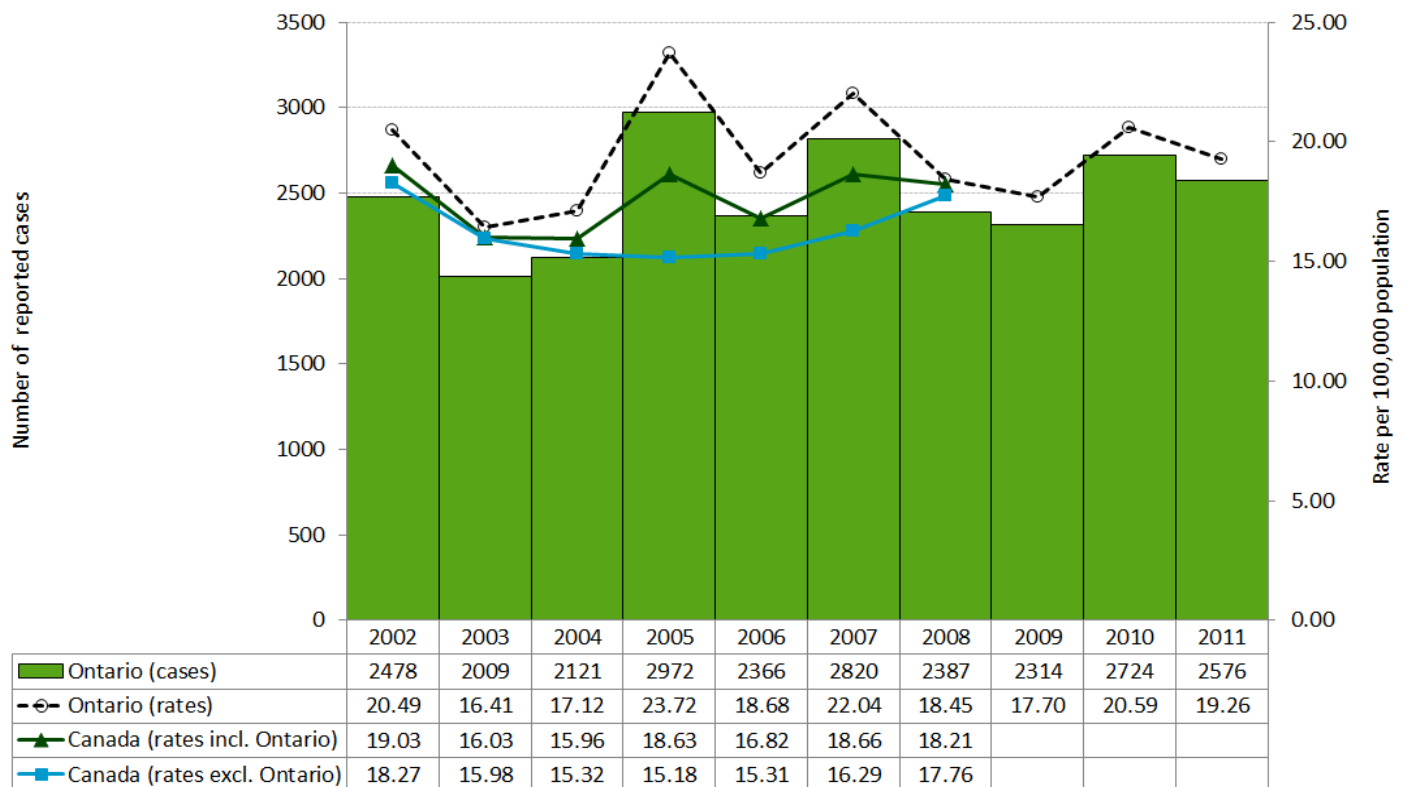
Since 2007, a decline in *S. Typhimurium* cases and a concurrent increase in *S. Enteritidis* cases have been observed.³² In 2011, *S. Enteritidis* was the most common *Salmonella* serotype in Ontario, accounting for 36% of reported cases. *S. Typhimurium* and *S. Heidelberg* were also frequently reported, accounting for 12% and 11% of salmonellosis cases, respectively (Table 1-26).

Table 1-26. Salmonellosis Cases by Serotype: Ontario, 2011

<i>Salmonella</i> Serotypes	Cases	
	Number	Percent
S. Enteritidis	933	36.2%
S. Typhimurium	302	11.7%
S. Heidelberg	278	10.8%
S. Newport	93	3.6%
S. Thompson	86	3.3%
S. Infantis	80	3.1%
Other	657	25.5%
Unspecified serotype	106	4.1%
Total	2,576	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Figure 1-30. Incidence of Salmonellosis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15]

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008 and includes paratyphoid fever cases.

AGE AND SEX DISTRIBUTION

The highest incidence rates of salmonellosis occurred in the 0-4 and 5-9 year age groups (Table 1-27, Figure 1-31). Rates remained relatively stable for persons aged ten years and older. Overall, cases ranged in age from less than one year to 96 years and had a median age of 29 years. Females accounted for 51% of cases in 2011 and had an incidence rate of 19.34 cases per 100,000 population. The incidence rate among males was slightly lower at 19.01 cases per 100,000 population.

Table 1-27. Incidence of Salmonellosis by Age and Sex: Ontario, 2011

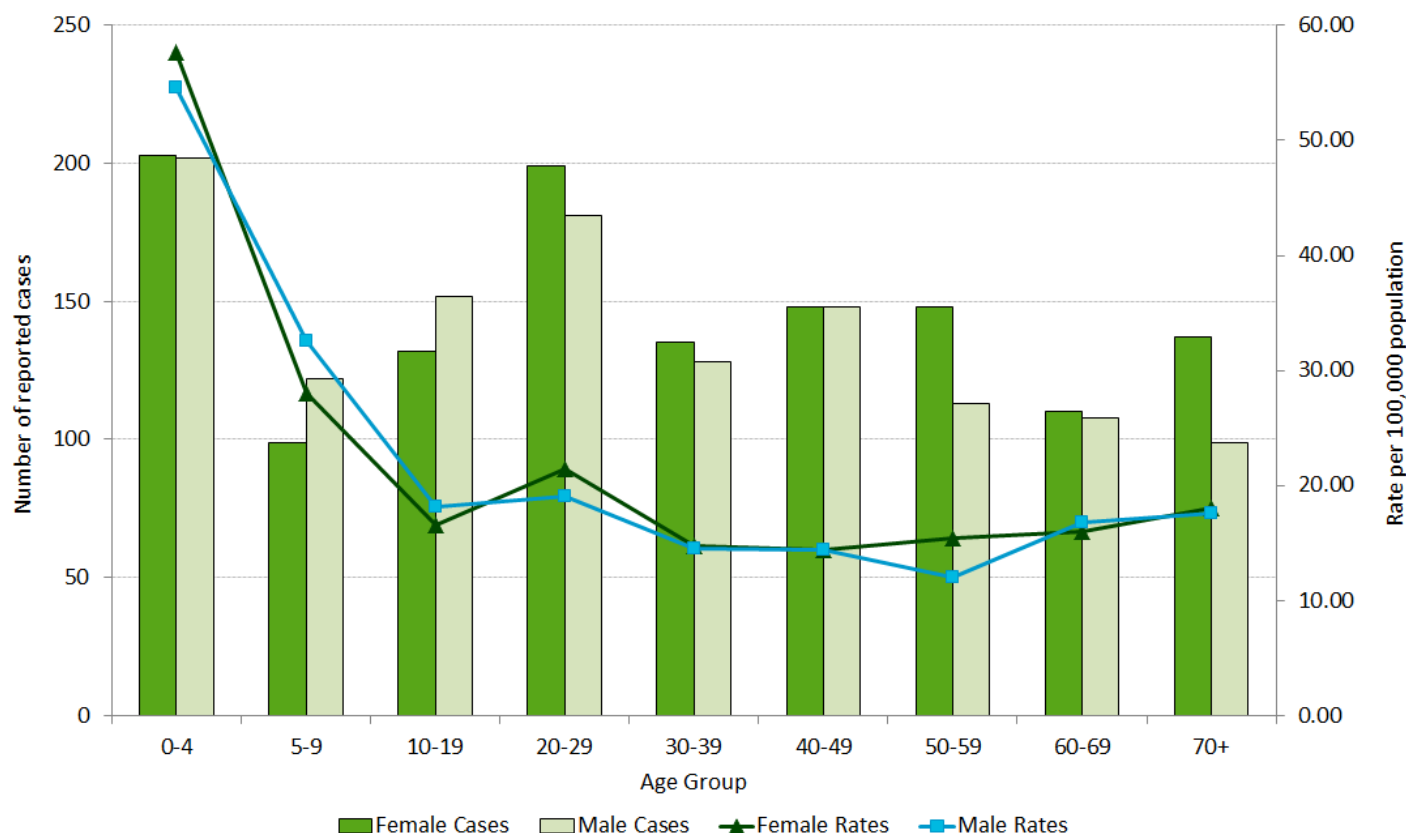
Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	203	57.62	202	54.62	405	56.09
5-9	99	27.97	122	32.59	221	30.35
10-19	132	16.56	152	18.20	284	17.40
20-29	199	21.46	181	19.00	380	20.21
30-39	135	14.79	128	14.55	263	14.67
40-49	148	14.37	148	14.34	296	14.36
50-59	148	15.46	113	12.01	261	13.75
60-69	110	16.00	108	16.73	218	16.35
70+	137	17.99	99	17.61	236	17.83
Total	1,311	19.34	1,253	19.01	2,564	19.17

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15]

Note: Excludes 12 cases of unknown age and/or sex.

Figure 1-31. Incidence of Salmonellosis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes 12 cases of unknown age and/or sex.

HOSPITALIZATIONS AND DEATHS

In 2011, approximately 10% (255/2,576) of salmonellosis cases were hospitalized, and 0.2% (5/2,576) of cases were fatal.

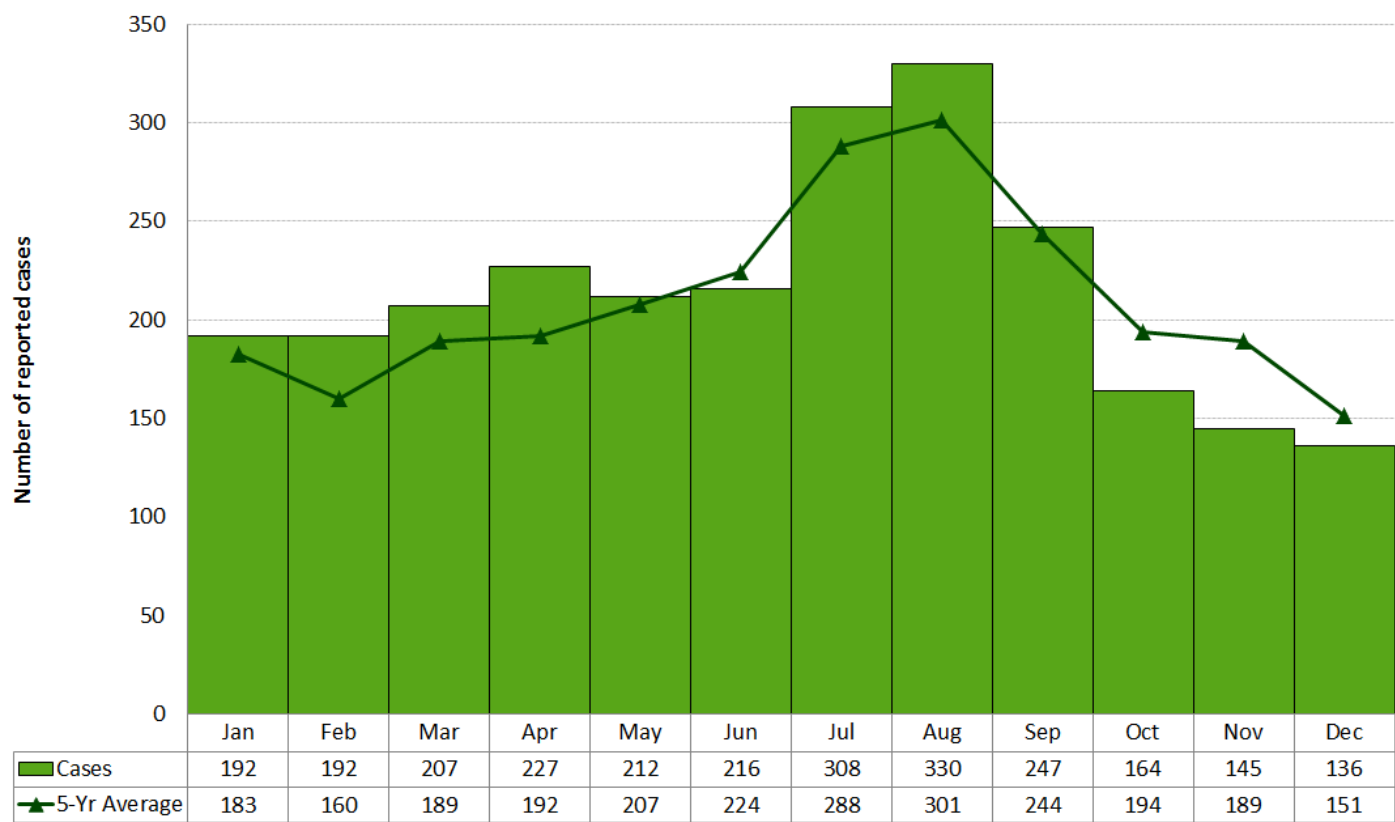
MONTHLY DISTRIBUTION

Salmonellosis occurs throughout the year, but tends to follow a seasonal pattern with increased incidence towards the end of summer (Figure 1-32). In 2011, the incidence of salmonellosis peaked in the months of July and August, which accounted for 25% of reported cases. Compared to previous years, monthly case counts in 2011 were similar to the previous five-year historical average.

GEOGRAPHIC DISTRIBUTION

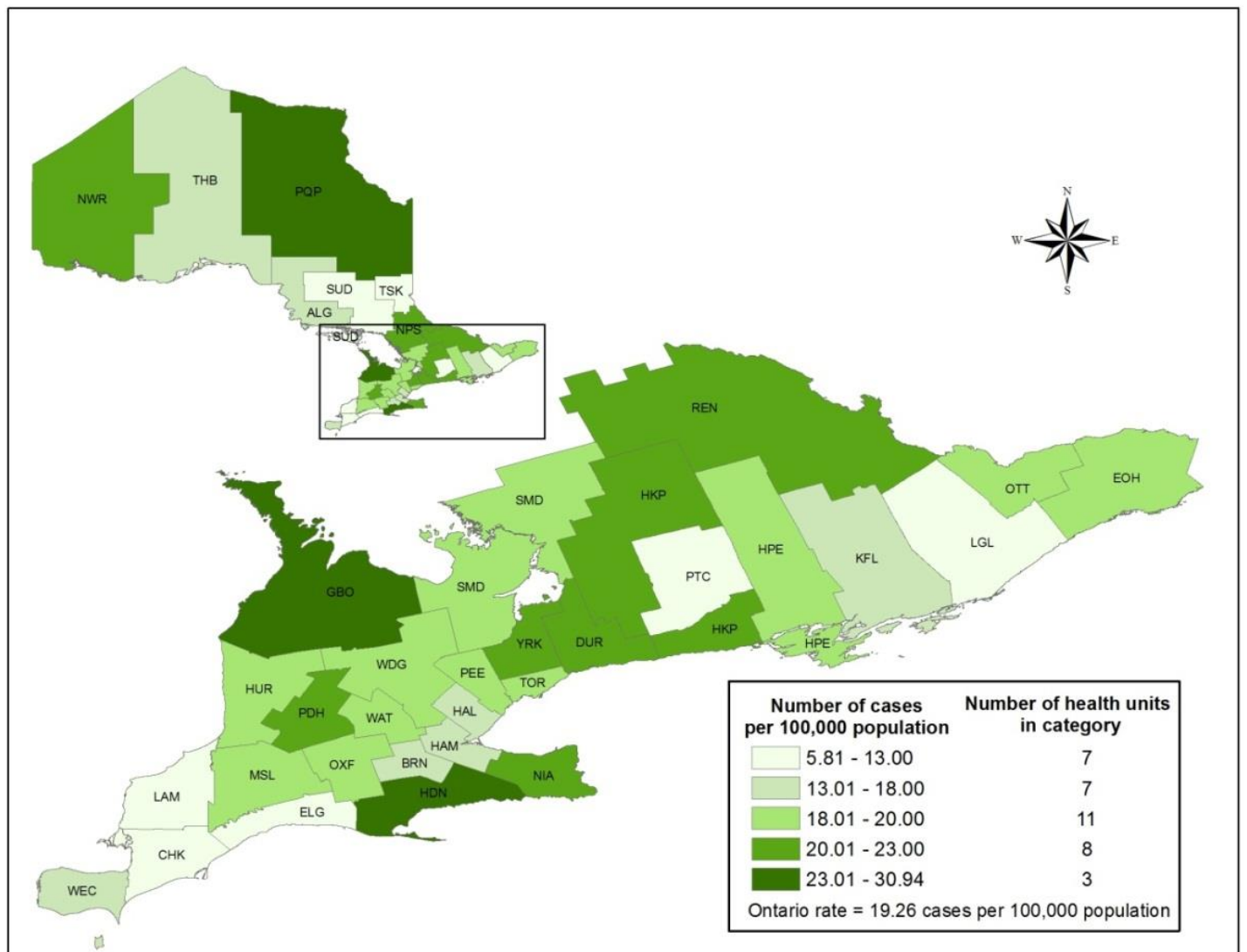
Cases of salmonellosis were reported in each of Ontario's 36 health units in 2011 (Map 1-9, Table 1-28). The three highest rates were reported by Grey Bruce with 30.94 cases per 100,000, Porcupine with 29.99 cases per 100,000 and Haldimand-Norfolk with 26.19 cases per 100,000. The high rate in Porcupine may be explained by two outbreaks of *S. Heidelberg* that affected a total of 16 residents. Timiskaming reported the lowest rate of salmonellosis in 2011 with two cases and a rate of 5.81 cases per 100,000. Toronto reported the highest number of cases (543), accounting for 21% of salmonellosis cases in 2011.

Figure 1-32. Number of Salmonellosis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 1-9. Incidence of Salmonellosis by Health Unit of Residence: Ontario of Residence, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-28. Incidence of Salmonellosis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	19	16.13	0.7%	0.9%
Brant County	25	17.75	1.0%	1.1%
Chatham-Kent	14	12.89	0.5%	0.8%
Durham Region	135	21.39	5.2%	4.7%
Eastern Ontario	39	19.39	1.5%	1.5%
Elgin-St. Thomas	10	10.94	0.4%	0.7%
Grey Bruce	51	30.94	2.0%	1.2%
Haldimand-Norfolk	29	26.19	1.1%	0.8%
Haliburton, Kawartha, Pine Ridge District	39	21.79	1.5%	1.3%
Halton Region	92	17.74	3.6%	3.9%
Hamilton, City of	96	17.77	3.7%	4.0%
Hastings & Prince Edward Counties	30	18.44	1.2%	1.2%
Huron County	11	18.23	0.4%	0.5%
Kingston-Frontenac & Lennox & Addington	30	15.20	1.2%	1.5%
Lambton County	15	11.41	0.6%	1.0%
Leeds, Grenville and Lanark District	20	11.75	0.8%	1.3%
Middlesex-London	88	19.10	3.4%	3.4%
Niagara Region	95	21.33	3.7%	3.3%
North Bay Parry Sound District	29	22.78	1.1%	1.0%
Northwestern	18	21.97	0.7%	0.6%
Ottawa, City of	176	19.34	6.8%	6.8%
Oxford County	20	18.48	0.8%	0.8%
Peel Region	266	19.48	10.3%	10.2%
Perth District	17	22.04	0.7%	0.6%
Peterborough County-City	18	12.81	0.7%	1.1%
Porcupine	26	29.99	1.0%	0.6%
Renfrew County & District	21	20.40	0.8%	0.8%
Simcoe Muskoka District	104	19.79	4.0%	3.9%
Sudbury & District	24	12.14	0.9%	1.5%
Thunder Bay District	28	17.89	1.1%	1.2%
Timiskaming	2	5.81	0.1%	0.3%
Toronto	543	19.79	21.1%	20.5%
Waterloo Region	104	19.61	4.0%	4.0%
Wellington-Dufferin-Guelph	53	19.03	2.1%	2.1%
Windsor-Essex County	66	16.36	2.6%	3.0%
York Region	223	20.85	8.7%	8.0%
Ontario	2,576	19.26	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Two-thirds (1,699/2,576) of salmonellosis cases reported in 2011 had at least one risk factor reported (Table 1-29). Risk factors associated with the consumption of foods such as poultry and eggs, travel outside the province in the three days before illness onset, animal contact and recreational water contact were the most frequently reported risk factors among salmonellosis cases reported in 2011.

Table 1-29. Reported Risk Factors for Salmonellosis Cases: Ontario, 2011 (n=1,699)

Risk Factors	Cases	
	Number	Percent
Travel outside province in the last three days	612	36.0%
Consumption or handling of raw/undercooked/pre-cooked/frozen poultry or poultry products	556	32.7%
Animal contact	488	28.7%
Recreational water contact	274	16.1%
Consumption of raw unwashed fruits or vegetables	219	12.9%
Consumption of undercooked eggs	213	12.5%
Poor hygiene	161	9.5%
Consumption of potentially contaminated water	156	9.2%
Consumption of raw/undercooked meats (e.g. beef, lamb, pork)	119	7.0%
Contact of a case	101	5.9%
Unknown	182	10.7%
Other	214	12.6%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to the sum of risk factors reported as "Other, specify" and risk factors with frequency <2%. "Unknown" refers to risk factors reported as "Unknown".

Shigellosis

- **The incidence rate of shigellosis in Ontario increased by 19% between 2006 and 2011.**
- ***S. flexneri* was the leading cause of shigellosis in Ontario in 2011.**
- **Children under the age of ten years had the highest rates of shigellosis in 2011.**
- **Out of province travel was the most frequently reported risk factor among shigellosis cases in Ontario in 2011.**

Shigellosis is an acute bacterial infection that causes gastrointestinal illness.¹ Humans are the primary reservoir of *Shigella*, the bacterium that causes shigellosis. There are four species of *Shigella*, of which *S. sonnei* is the most common in developed countries.¹

Shigella is easily transmitted from person-to-person, with as few as ten to one hundred organisms causing illness.¹ Transmission is through direct or indirect contact with feces.¹ Direct transmission is often the result of poor hand hygiene by ill persons or asymptomatic (without symptoms) carriers of the bacteria, but can also occur through anal-oral sexual contact. Indirect transmission occurs through ingestion of, or contact with contaminated food, water, or inanimate objects.¹ Following exposure to *Shigella*, symptoms generally appear within one to three days and may include diarrhea with or without mucus and blood, fever, nausea, vomiting, and stomach cramps that last from four to seven days.¹

The risk of transmission of shigellosis is high in institutions and in areas with poor sanitation and overcrowding.¹ Men who have sex with men, young children who are not fully toilet trained, the elderly, and disabled are also at higher risk of infection. Most cases of shigellosis can be prevented by practicing frequent and thorough hand washing following potential contact

with feces, by taking appropriate food safety measures, and avoiding water that has not been treated.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Shigellosis accounted for three percent (255) of enteric disease cases reported in Ontario in 2011 (Figure 1-33). The incidence rate in 2011 was 1.91 cases per 100,000 population, which was the same as 2010 (252 cases).

Over the period 2002 to 2011, the highest number of shigellosis cases was reported in 2002. In that year, an outbreak of over 600 cases linked to Greek-style pasta salad occurred in Ontario.³³ The incidence rate of shigellosis increased by 19% between 2006 and 2011. During this period, rates ranged from 1.61 to 1.94 cases per 100,000 population.

Annual incidence rates of shigellosis for the rest of Canada have generally been higher than in Ontario, except for 2002 when the Greek-style pasta salad outbreak occurred.

SEROTYPES

In 2011, *S. flexneri* was the leading cause of shigellosis in Ontario, accounting for 47% (120/255) of cases, followed by *S. sonnei* at 43% (109/255) and *S. boydii* at six percent (Table 1-30). Other *Shigella* serogroups accounted for less than two percent of reported cases (4/255). The *Shigella* species was unspecified for two percent of cases (4/255).

Table 1-30. Shigella Cases by Species: Ontario, 2011

Shigella Serogroups	Cases	
	Number	Percent
S. flexneri	120	47.1%
S. sonnei	109	42.7%
S. boydii	14	5.5%
S. dysenteriae	3	1.2%
Other species	4	1.6%
Unknown species	5	2.0%
Total	255	100%

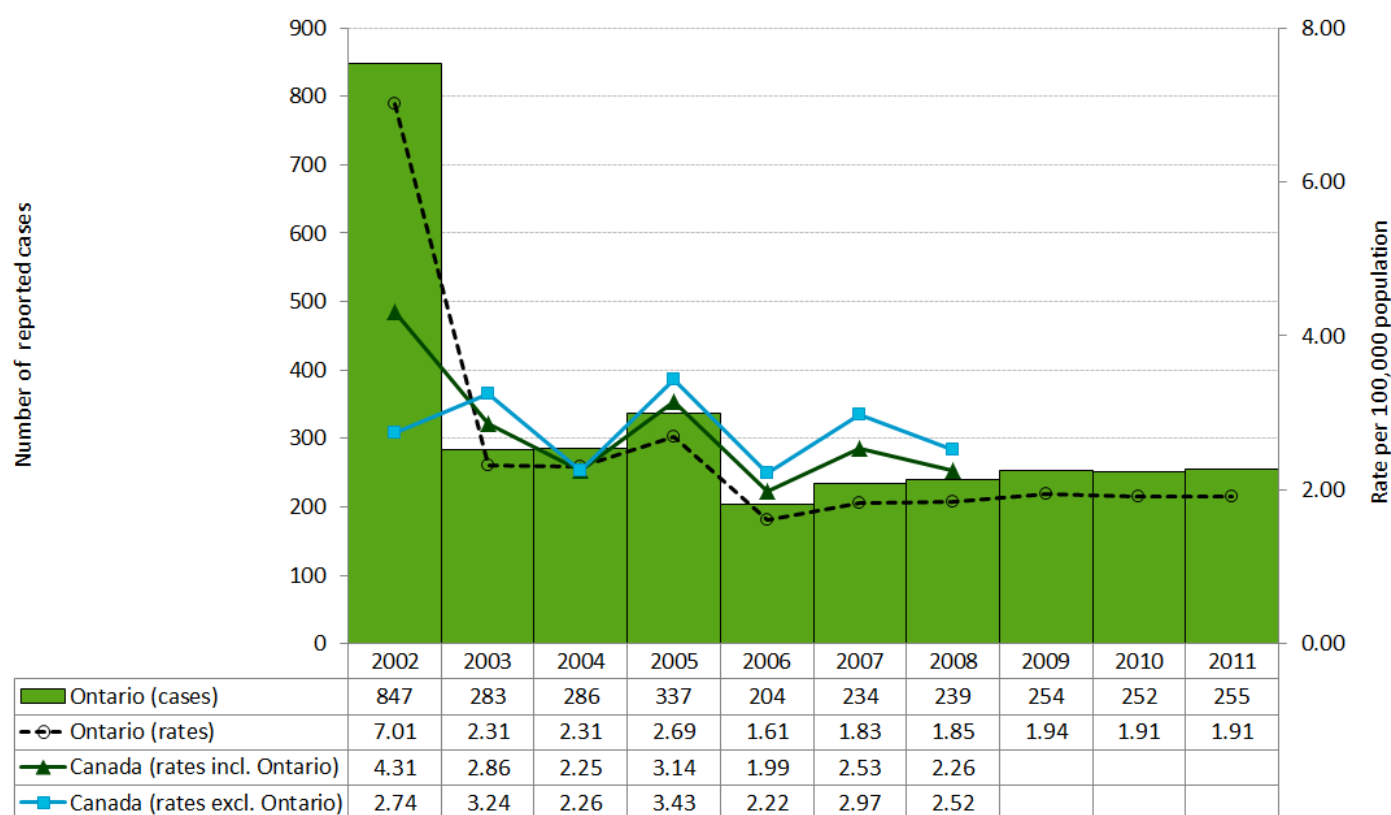
Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/12].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/03/18].

AGE AND SEX DISTRIBUTION

The incidence rate of shigellosis in 2011 was higher for males compared to females at 2.12 and 1.67 cases per 100,000 population, respectively (Figure 1-34, Table 1-31). Overall, cases ranged in age from less than one year to 86 years, with males accounting for 55% (140) of reported cases. Incidence rates were highest in children under the age of ten years who had rates that were more than two times higher than the overall rate for Ontario. Males aged 20 to 59 years also had relatively high rates of shigellosis. Higher rates in males may be reflective of same-sex sexual contact, which is a risk factor for enteric diseases such as shigellosis that are easily transmitted from person-to-person. In contrast, higher rates among young children may be reflective of transmission occurring through close contact in institutional settings such as child care centres.

Figure 1-33. Incidence of Shigellosis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/12].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008].

Table 1-31. Incidence of Shigellosis by Age and Sex: Ontario, 2011

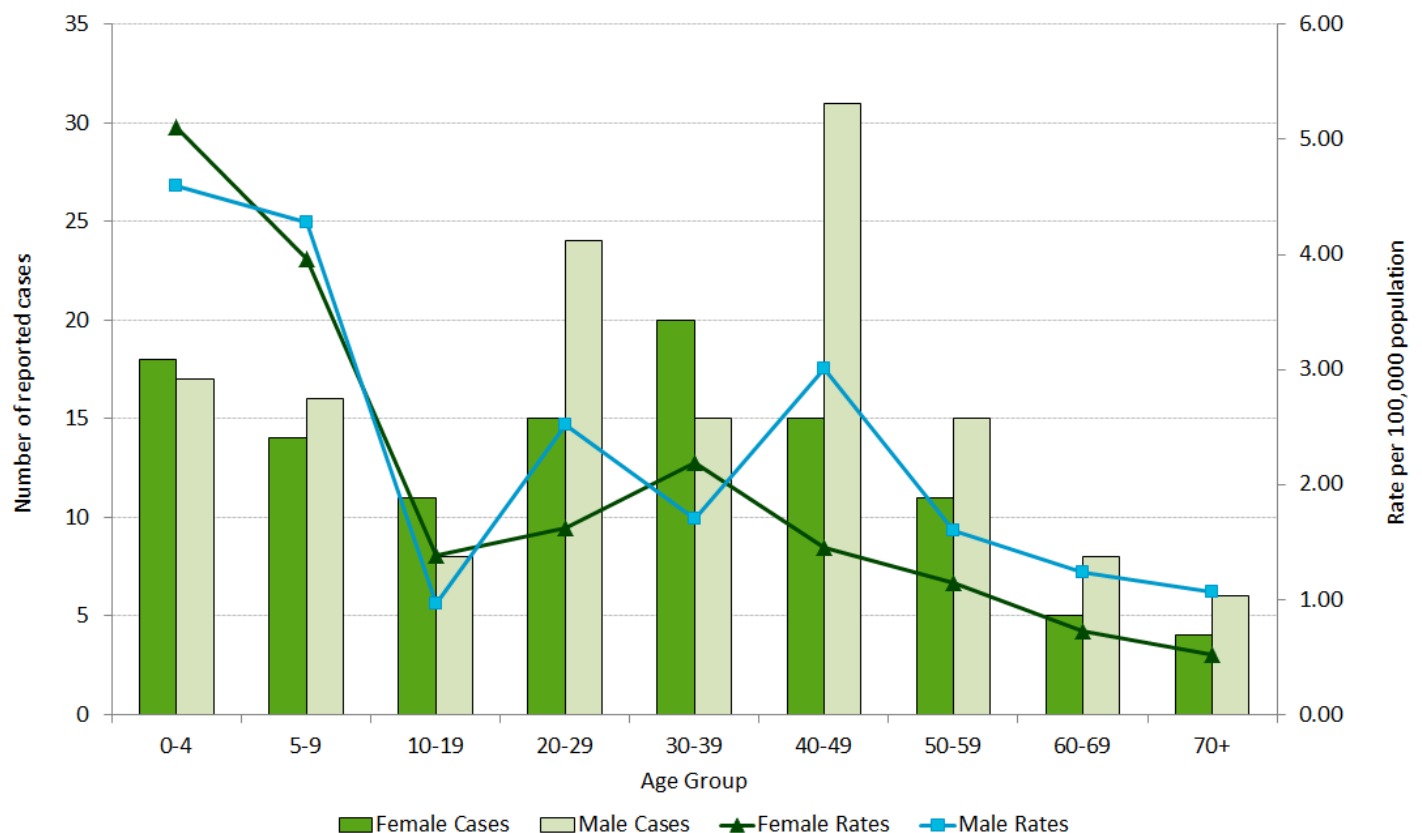
Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	18	5.11	17	4.60	35	4.85
5-9	14	3.96	16	4.27	30	4.12
10-19	11	1.38	8	0.96	19	1.16
20-29	15	1.62	24	2.52	39	2.07
30-39	20	2.19	15	1.70	35	1.95
40-49	15	1.46	31	3.00	46	2.23
50-59	11	1.15	15	1.59	26	1.37
60-69	5	0.73	8	1.24	13	0.98
70+	4	0.53	6	1.07	10	0.76
Total	113	1.67	140	2.12	253	1.89

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/12].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes two cases of unknown age and/or sex.

Figure 1-34. Incidence of Shigellosis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/12].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes two cases of unknown age and/or sex.

HOSPITALIZATIONS AND DEATHS

In 2011, approximately 12% (29/255) of shigellosis cases were hospitalized. None were fatal.

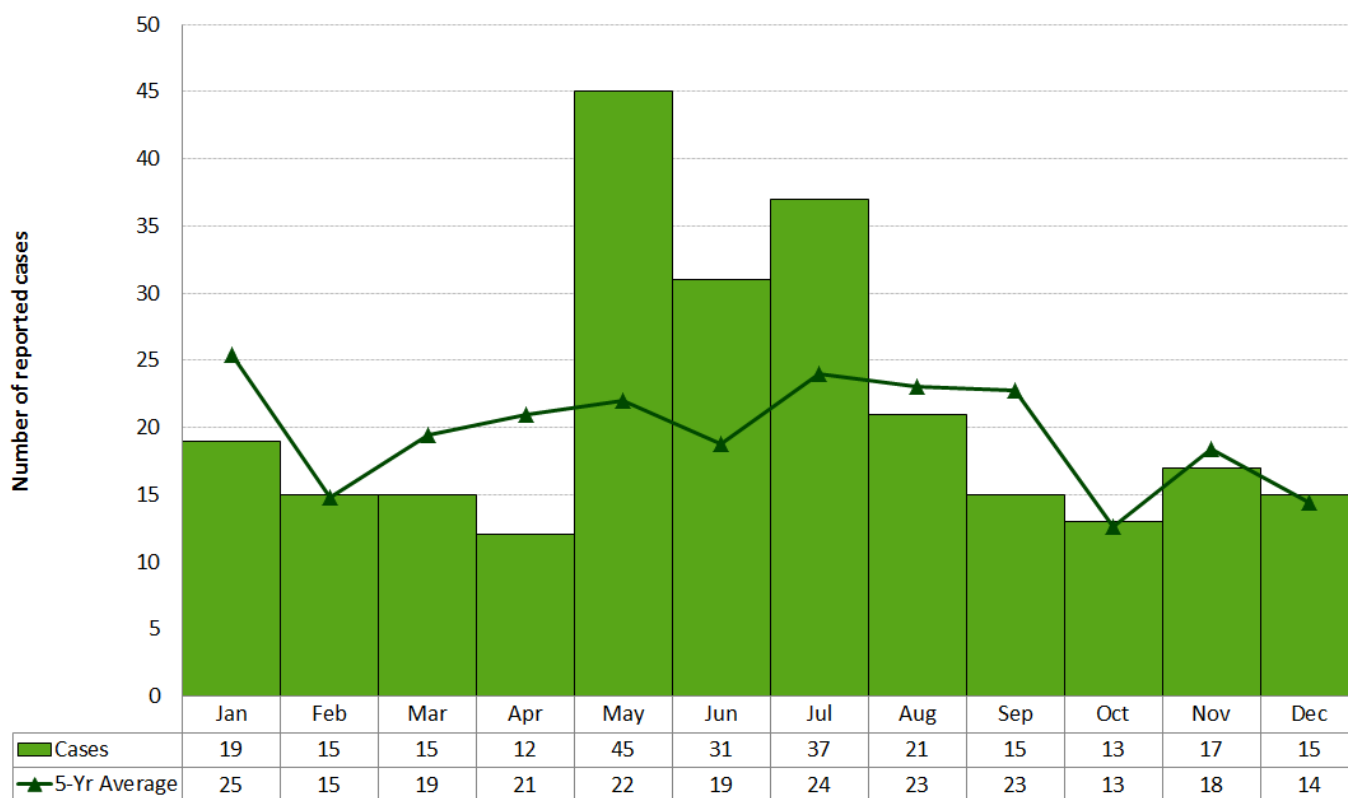
MONTHLY DISTRIBUTION

Shigellosis occurs throughout the year (Figure 1-35). In 2011, the incidence of shigellosis peaked from May to July, with these months accounting for 44% of reported cases. This pattern of seasonal occurrence in 2011 differed from the previous five years when no clear seasonal peak in incidence was observed.

GEOGRAPHIC DISTRIBUTION

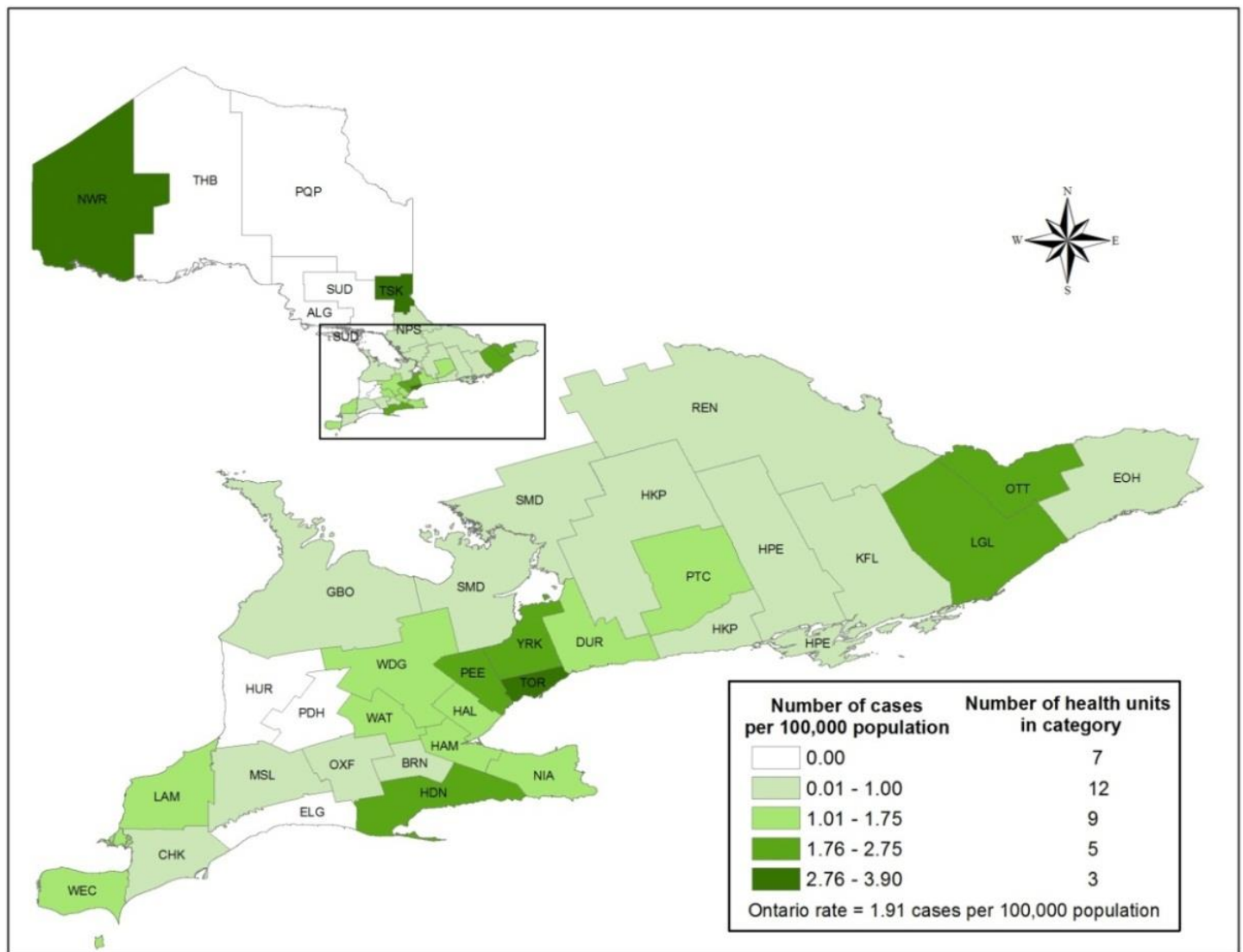
The three highest rates of shigellosis in 2011 were reported by Toronto and Northwestern, and Timiskaming health unit in the north. Toronto's incidence rate was 3.9 cases per 100,000 population. Incidence rates in Northwestern and Timiskaming health units were 3.7 cases per 100,000 population and 2.9 cases per 100,000 population, respectively. Rates in the two northern health units are likely unstable due to the small number of cases on which the rates were based. Toronto also reported the highest number of shigellosis cases in 2011 (42%, 107), which was disproportionately higher in relation to its share of the provincial population (Map 1-10, Table 1-32). Peel Region (12%, 30) and York Region (11%, 27) reported the second and third highest number of shigellosis cases in 2011.

Figure 1-35. Number of Shigellosis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/12].

Map 1-10. Incidence of Shigellosis by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/12].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-32. Incidence of Shigellosis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Population as Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	1	0.71	0.4%	1.1%
Chatham-Kent	1	0.92	0.4%	0.8%
Durham Region	7	1.11	2.7%	4.7%
Eastern Ontario	1	0.50	0.4%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	1	0.61	0.4%	1.2%
Haldimand-Norfolk	2	1.81	0.8%	0.8%
Haliburton, Kawartha, Pine Ridge District	1	0.56	0.4%	1.3%
Halton Region	6	1.16	2.4%	3.9%
Hamilton, City of	6	1.11	2.4%	4.0%
Hastings & Prince Edward Counties	1	0.61	0.4%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	1	0.51	0.4%	1.5%
Lambton County	2	1.52	0.8%	1.0%
Leeds, Grenville and Lanark District	3	1.76	1.2%	1.3%
Middlesex-London	4	0.87	1.6%	3.4%
Niagara Region	7	1.57	2.7%	3.3%
North Bay Parry Sound District	1	0.79	0.4%	1.0%
Northwestern	3	3.66	1.2%	0.6%
Ottawa, City of	19	2.09	7.5%	6.8%
Oxford County	1	0.92	0.4%	0.8%
Peel Region	30	2.20	11.8%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	2	1.42	0.8%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	1	0.97	0.4%	0.8%
Simcoe Muskoka District	3	0.57	1.2%	3.9%
Sudbury & District	0	0.00	0.0%	1.5%
Thunder Bay District	0	0.00	0.0%	1.2%
Timiskaming	1	2.90	0.4%	0.3%
Toronto	107	3.90	42.0%	20.5%
Waterloo Region	6	1.13	2.4%	4.0%
Wellington-Dufferin-Guelph	4	1.44	1.6%	2.1%
Windsor-Essex County	6	1.49	2.4%	3.0%
York Region	27	2.52	10.6%	8.0%
Ontario	255	1.91	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/12].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Seventy-two percent (184/255) of shigellosis cases in 2011 reported at least one risk factor. Out of province travel in the seven days before the onset of illness was the most frequently reported risk factor at 53%. Anal-oral contact (21%); consumption of or contact with potentially contaminated water (17%); and consumption of raw unwashed fruits, vegetables or unpasteurized juices (15%) were also frequently reported by cases. (Table 1-33).

Table 1-33. Reported Risk Factors for Shigellosis Cases: Ontario, 2011 (n=184)

Risk Factors	Cases	
	Number	Percent
Travel outside Ontario	98	53.3%
Anal-oral contact	32	17.4%
Consumption of potentially contaminated water	32	16.8%
Recreational water contact	29	15.8%
Consumption of raw unwashed fruit or vegetable	28	15.2%
Consumption of ready-to-eat products	18	9.8%
Close contact with case	17	9.2%
Poor hand hygiene	11	6.0%
Other	33	17.9%
Unknown	20	10.9%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/12].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to the sum of risk factors reported as "Other, specify" and risk factors with frequency <4%. "Unknown" refers to risk factors reported solely as "Unknown".

Trichinosis

Trichinosis is a parasitic intestinal infection caused by the roundworm, *Trichinella spiralis*.¹ The disease is acquired through consumption of raw or undercooked meat containing the *T. spiralis* larvae (trichinae). Pork and meat from wild animals (e.g. wild boar, moose) are commonly identified sources of trichinosis.¹

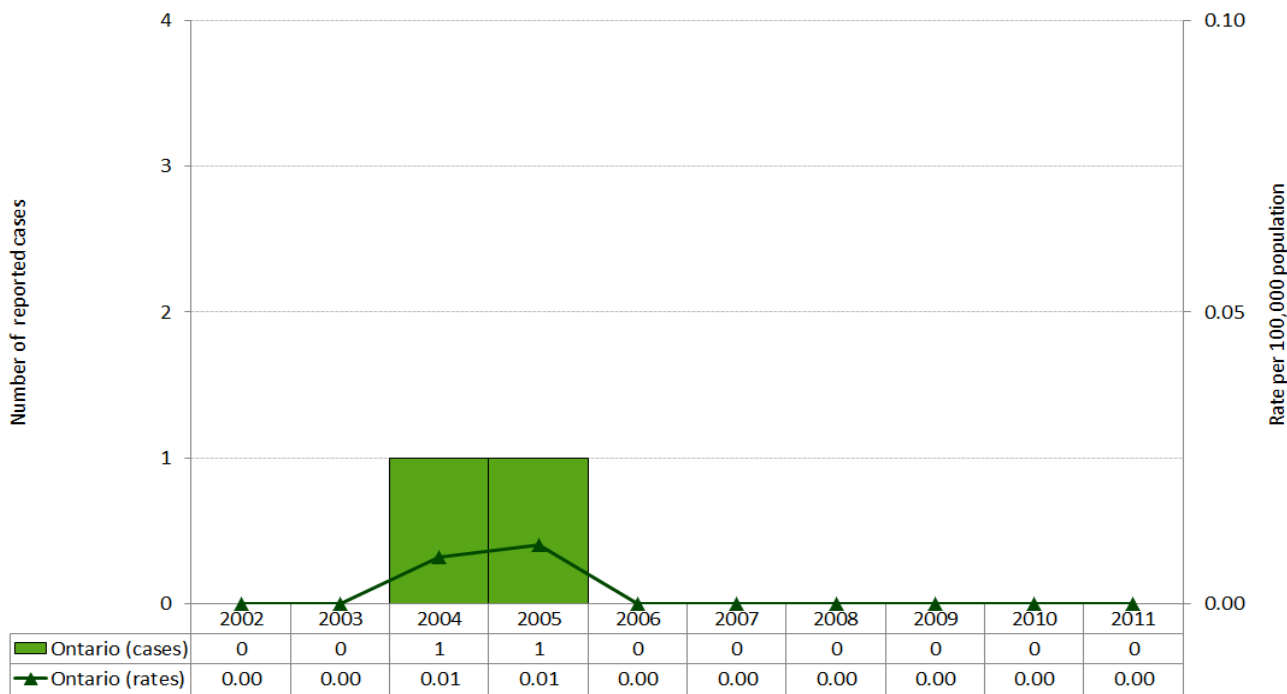
Trichinosis occurs in two stages. Gastrointestinal symptoms due to the ingested trichinae larvae develop within a few days and may include diarrhea, abdominal pain, vomiting and nausea. Systemic symptoms of trichinosis due to the development and migration of the larvae from the small intestine to muscle occur within eight to 15 days after infection.¹ Illness at this stage includes fever, muscle soreness and weakness, swelling of the upper eyelids, sweats and chills, with possible progression to cardiac and neurological complications which can be fatal.¹

Trichinosis occurs worldwide with variable incidence due to differences in food preparation and consumption practices.¹ Susceptibility to the disease is universal with transfer of partial immunity after infection.¹ At risk populations are primarily those that eat raw or undercooked meats. Trichinosis is not transmitted from person-to-person and can be prevented by cooking all meat products to an internal temperature of 71 °C and for a time that is long enough to destroy the trichinae larvae.³⁴

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Two cases of trichinosis were reported in Ontario from 2002 to 2011, with one case occurring in 2004 and the other in 2005; no cases were reported in 2011 (Figure 1-36). Trichinosis was removed from the national notifiable diseases list in 2000. Prior to 2000, there was a national average of 24 cases reported annually from 1990 to 1999.³⁵

Figure 1-36. Incidence of Trichinosis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Trichinosis is not nationally notifiable.

Tularemia

Tularemia, also known as rabbit fever, is a zoonotic disease that can be spread from animals to humans.¹ It is caused by the bacterium *Francisella tularensis* which is found in animals such as rabbits, muskrats and beavers. *F. tularensis* is a potential bioterrorism agent.

Tularemia is transmitted to humans through contact with infected animals and their environment, and is not transmissible between humans. Transmission usually involves inoculation of skin or mucous membranes with contaminated water, infected animal blood or tissue; tick or deer fly bites; inhalation of air contaminated with the bacteria; consumption of undercooked meat from infected animals; or ingestion of contaminated water.¹

Symptoms of tularemia usually develop three to five days after exposure with sudden onset of influenza-like illness. Ulcers at the site of introduction of the bacteria, swollen and painful lymph nodes, fever, chills, myalgia

and headache are symptoms of tularemia.¹

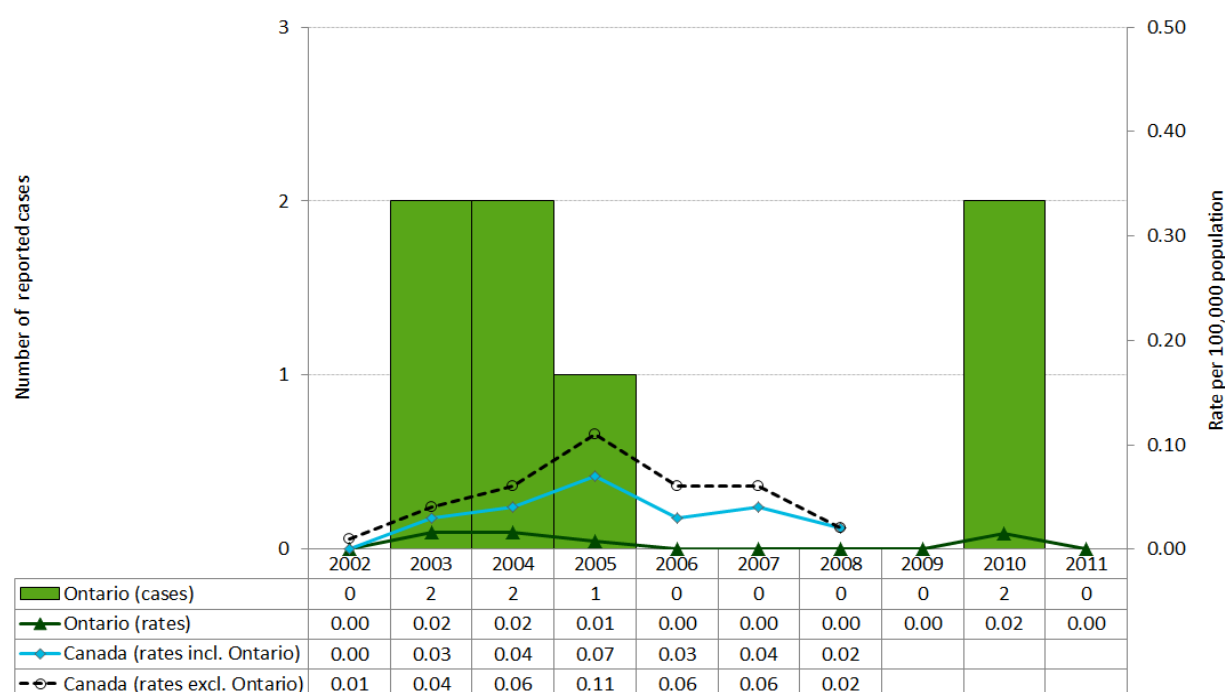
Susceptibility to tularemia is universal and reinfection is rare after recovery.¹

Tularemia occurs in North America and in many parts of continental Europe, Japan and China.¹ It is an occupational risk for laboratory personnel and a recreational risk for outdoor persons, particularly animal trappers and hunters.¹³ It can be prevented by using insect repellent especially in wooded areas to prevent insect bites, by wearing personal protective clothing such as gloves when handling sick or dead animals, and by cooking foods thoroughly and using only water that has been properly treated.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

No tularemia cases were reported in Ontario in 2011. Seven cases in total were reported in Ontario from 2002 to 2011 (Figure 1-37).

Figure 1-37. Incidence of Tularemia: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Typhoid fever

- **The incidence of typhoid fever increased by more than 50% between 2002 and 2011.**
- **Persons under the age of 30 years had the highest incidence rates of typhoid fever in 2011.**
- **The majority of typhoid fever cases in 2011 were reported by Peel Region and Toronto.**
- **Travel outside of Canada was the most frequently reported exposure for typhoid fever cases in 2011.**

Typhoid fever occurs worldwide, commonly in countries with poor sanitation. It is not endemic in Ontario, with almost all cases associated with international travel.³⁶ The disease is caused by *Salmonella* Typhi, for which humans are the only reservoir. *S. Typhi* is part of the same family of bacteria that causes salmonellosis, but unlike salmonellosis, illness with typhoid fever results in distinct systemic symptoms that are not limited to gastrointestinal illness.¹ Symptoms of typhoid fever generally appear three to 60 days after exposure, ranging from fever to severe systemic complications such as intestinal damage, brain damage and delirium.¹ However, in most cases, symptoms manifest as low-grade fever, anorexia, headache, myalgia, malaise or abdominal pain.¹ Rose-coloured spots may also occur on the trunk within the first week.¹

Following infection, some people may become symptom-free chronic carriers of *S. Typhi* with the ability to transmit the bacteria through the fecal-oral route.¹ Typhoid fever is transmitted through ingestion of food, water or beverages contaminated by the feces of infected persons and carriers.¹ Contaminated foods such as milk, ice-cream, raw fruit and vegetables fertilized with raw sewage, and shellfish harvested from contaminated water have been implicated as sources of typhoid fever. In Canada, travelers to endemic countries

have the highest risk of infection, but susceptibility and illness severity is higher among those who are immunocompromised or have low stomach acid levels.^{36,1} A vaccine against typhoid fever is available for travelers to endemic countries and certain other high risk groups.³⁷

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Typhoid fever accounted for one percent of enteric disease cases reported in Ontario in 2011, with 103 reported cases (Figure 1-38). Over the ten-year period from 2002 to 2011, the incidence rate of typhoid fever increased by 54%. In 2002, the incidence rate was 0.50 cases per 100,000 population compared to 0.77 cases per 100,000 population in 2011.

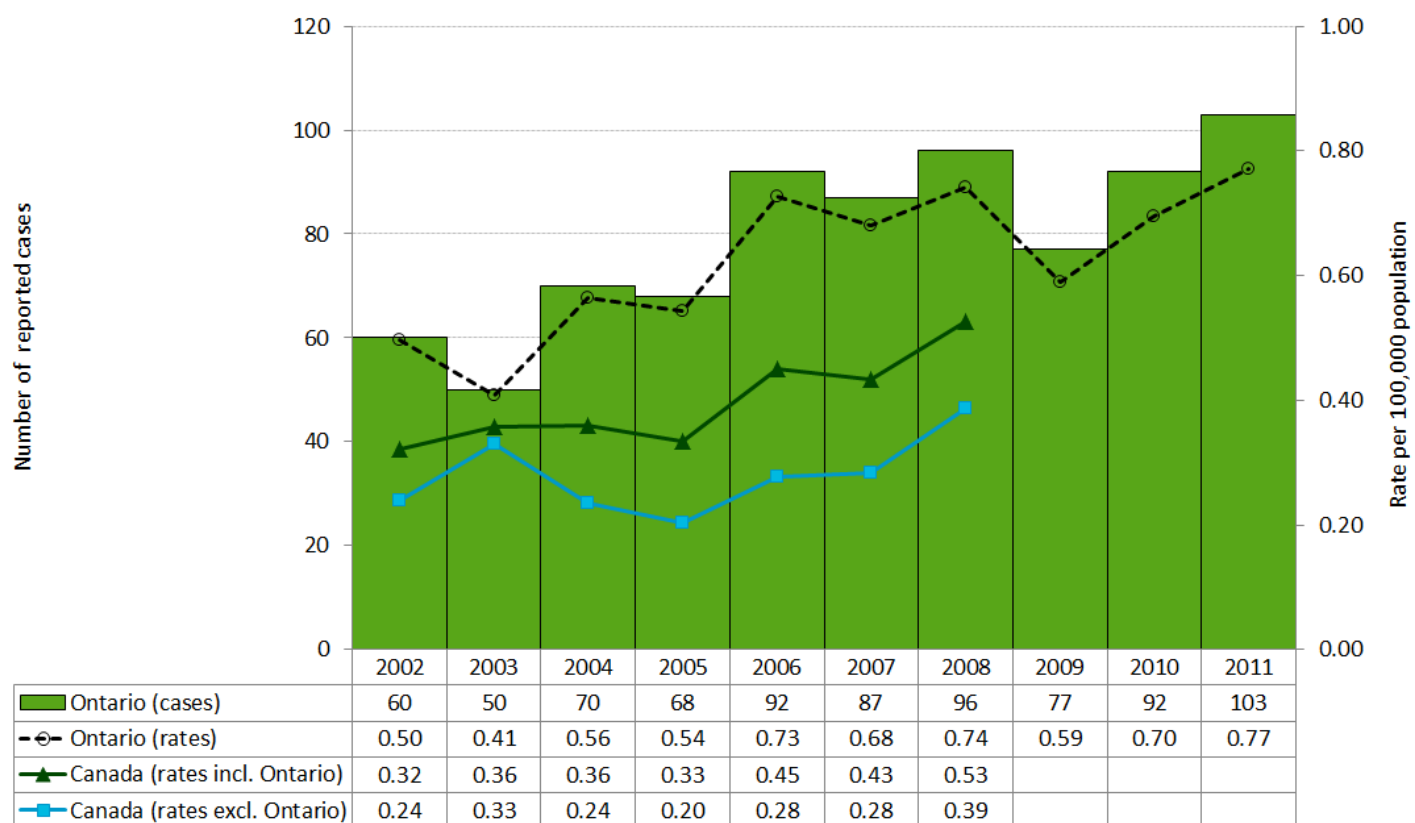
Since 2006, the national trend in the incidence rate of typhoid fever has followed a similar pattern of increase, but with rates that have been consistently lower than Ontario's. In 2008, the most recent year for which national data are available, the incidence rate for typhoid fever for the rest of Canada was more than 50% lower than that of Ontario. The incidence rate for typhoid fever for the rest of Canada (i.e. excluding Ontario) in 2008 was 0.39 cases per 100,000 population compared to 0.74 cases per 100,000 population for Ontario. Higher incidence rates in Ontario are likely reflective of migration patterns that see a larger share of newcomers from typhoid endemic countries settling in the province.²²

AGE AND SEX DISTRIBUTION

In 2011, the incidence of typhoid fever decreased with increasing age, with the highest incidence rates occurring in individuals under the age of 30 years. Persons in this age range accounted for 69% of typhoid fever cases reported in Ontario in 2011 (Table 1-34, Figure 1-39). Overall, cases reported in 2011 ranged in age from one to 69 years, with a median age of 23 years.

For males, the incidence rate of typhoid fever was highest in the 5-9 year age group at 2.14 cases per 100,000 population. For females, the highest incidence rate occurred in the 10-19 year age group at 1.76 cases per 100,000 population. Males and females each accounted for 51 cases in 2011. The corresponding incidence rate of typhoid fever among males was 0.77 cases per 100,000, which was similar to the incidence rate of 0.75 cases per 100,000 population among females.

Figure 1-38. Incidence of Typhoid Fever: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Table 1-34. Incidence of Typhoid Fever by Age and Sex: Ontario, 2011

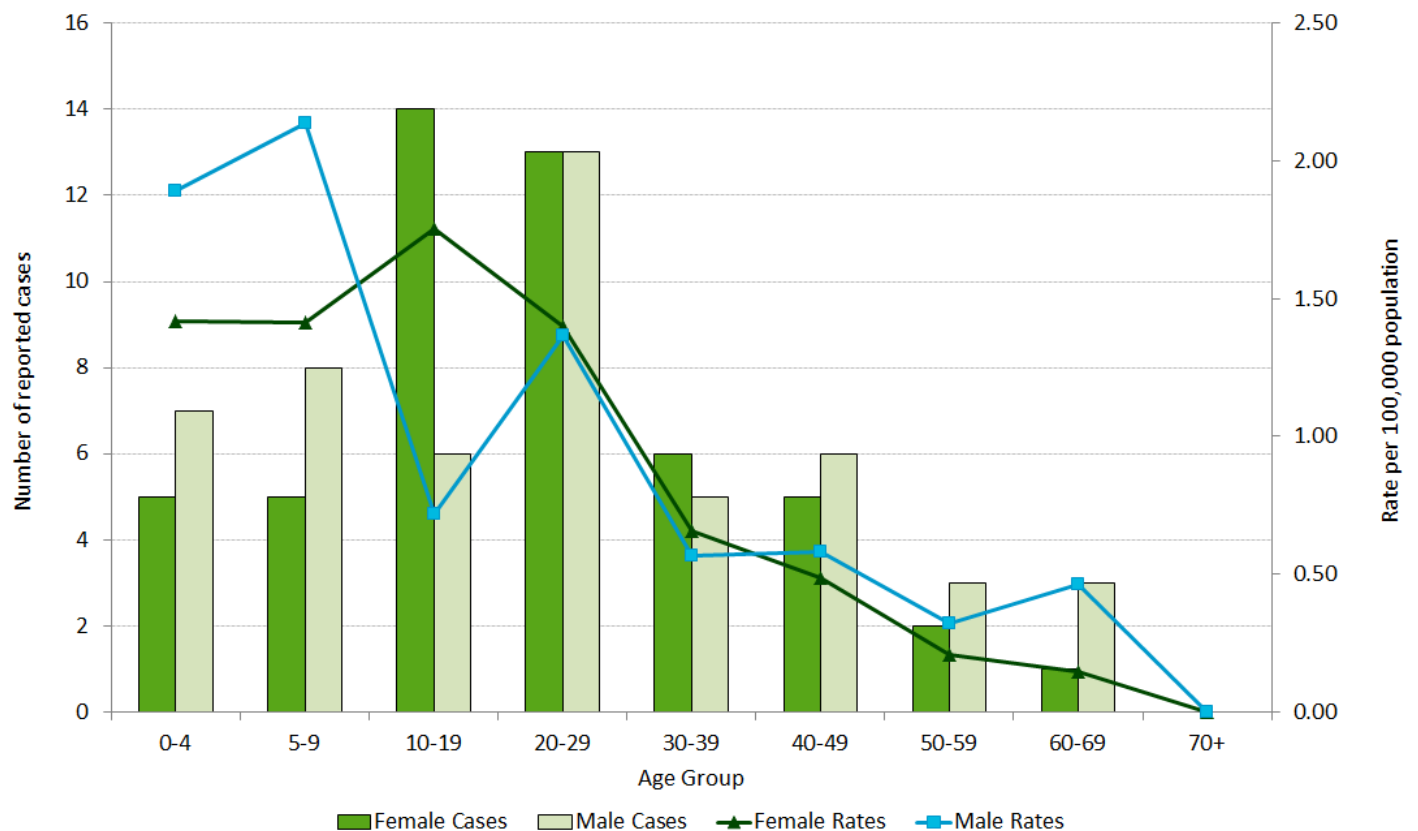
Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	5	1.42	7	1.89	12	1.66
5-9	5	1.41	8	2.14	13	1.79
10-19	14	1.76	6	0.72	20	1.23
20-29	13	1.40	13	1.36	26	1.38
30-39	6	0.66	5	0.57	11	0.61
40-49	5	0.49	6	0.58	11	0.53
50-59	2	0.21	3	0.32	5	0.26
60-69	1	0.15	3	0.46	4	0.30
70+	0	0.00	0	0.00	0	0.00
Total	51	0.75	51	0.77	102	0.76

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes one case of unknown age and sex.

Figure 1-39. Incidence of Typhoid Fever by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes one case of unknown age and/or sex.

HOSPITALIZATIONS AND DEATHS

In 2011, approximately 31% (32/103) of typhoid fever cases were hospitalized. No fatalities were reported among cases in 2011.

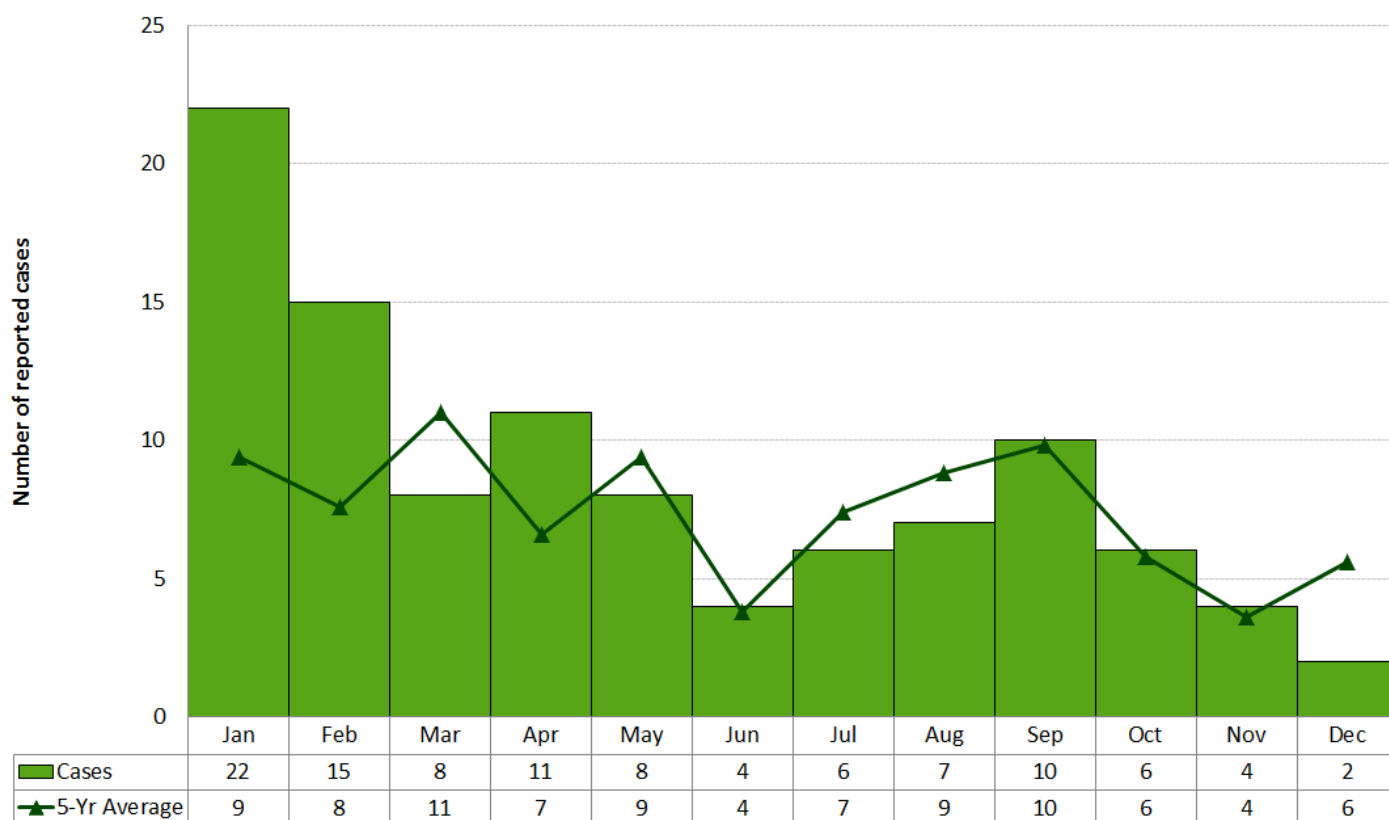
MONTHLY DISTRIBUTION

Typhoid fever occurs throughout the year without any clear seasonal trend (Figure 1-40). The distribution of typhoid fever cases is reflective of travel patterns as demonstrated by the high proportion of cases that are associated with travel to endemic countries.

GEOGRAPHIC DISTRIBUTION

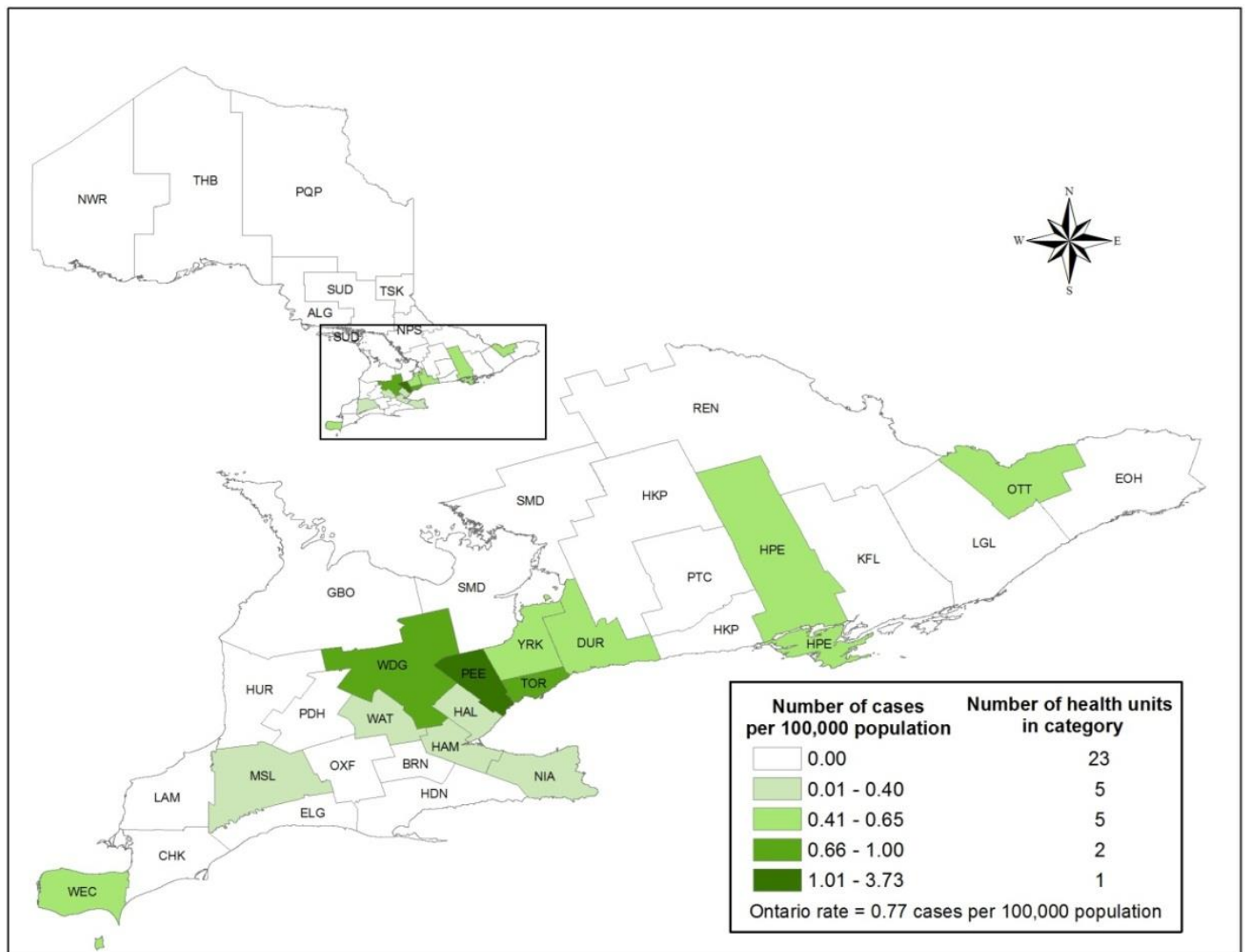
Thirteen (36%) health units reported cases of typhoid fever in 2011 (Map 1-11, Table 1-35). Peel Region and Toronto reported the highest number of cases. Toronto reported 21 (25%) cases and Peel Region reported 51 (50%) cases. Peel Region and Toronto also had the highest incidence rates of typhoid fever in 2011 with 3.73 and 0.95 cases per 100,000 population, respectively. The higher incidence in these health units compared to others may be attributed to more frequent travel to areas where typhoid fever is endemic by foreign-born residents who travel to their home countries to maintain links with family and friends.^{21,22}

Figure 1-40. Number of Typhoid Fever Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 1-11. Incidence of Typhoid Fever by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-35. Incidence of Typhoid Fever by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	0	0.00	0.0%	0.8%
Durham Region	3	0.48	2.9%	4.7%
Eastern Ontario	0	0.00	0.0%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	0	0.00	0.0%	1.2%
Haldimand-Norfolk	0	0.00	0.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	0	0.00	0.0%	1.3%
Halton Region	2	0.39	1.9%	3.9%
Hamilton, City of	2	0.37	1.9%	4.0%
Hastings & Prince Edward Counties	1	0.61	1.0%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	0	0.00	0.0%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	0	0.00	0.0%	1.3%
Middlesex-London	1	0.22	1.0%	3.4%
Niagara Region	1	0.22	1.0%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	0	0.00	0.0%	0.6%
Ottawa, City of	4	0.44	3.9%	6.8%
Oxford County	0	0.00	0.0%	0.8%
Peel Region	51	3.73	49.5%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	0	0.00	0.0%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	0	0.00	0.0%	3.9%
Sudbury & District	0	0.00	0.0%	1.5%
Thunder Bay District	0	0.00	0.0%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	26	0.95	25.2%	20.5%
Waterloo Region	2	0.38	1.9%	4.0%
Wellington-Dufferin-Guelph	2	0.72	1.9%	2.1%
Windsor-Essex County	2	0.50	1.9%	3.0%
York Region	6	0.56	5.8%	8.0%
Ontario	103	0.77	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS AND EXPOSURES

Exposures and risk factors for typhoid fever were reported by 101 of 103 typhoid fever cases reported in Ontario in 2011. Of these cases, 95% (96/101) reported travel outside of Canada as their most likely source of exposure. The majority of these cases travelled to India, Pakistan or Bangladesh (Table 1-36). Of the remaining cases, one case had a workplace exposure to feces, another was a close contact of a typhoid fever case and three had unknown exposures or risks.

Table 1-36. Paratyphoid Fever Cases by Country of Travel: Ontario, 2011 (n=96)

Country of Travel	Cases	
	Number	Percent
India	71	74.0%
Pakistan	11	11.5%
Bangladesh	5	5.2%
Other/unknown country	9	9.4%
Total	96	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution. Risk factors and/or exposures not reported for all cases. Cases may report more than one risk factor/exposure. Reported country of travel based on risk factors pertaining to travel and/or travel-related exposures.

Verotoxin-producing *E. coli*

- The annual incidence rate of Verotoxin-producing *Escherichia coli* (VTEC) increased in 2011 after four years of consistent decline.
- In 2011, the incidence rate of VTEC was highest among persons under the age of ten years.
- VTEC cases occur throughout the year, but most cases occur from May to October.

Verotoxin-producing *Escherichia coli* (VTEC) is the most frequently identified strain of *E. coli* in North America that causes diarrheal illness. It was first recognized in 1982 and is a part of a diverse group of bacteria that live in the intestines of people and animals.^{1,13} However, most strains of *E. coli* do not cause disease. Ruminants such as cattle, sheep and goats are natural reservoirs of *E. coli* bacteria.¹

VTEC is transmitted through ingestion of food or water that has been contaminated by the feces of infected persons or animals.¹ Contact with animals and their surroundings and person-to-person contact where poor hygiene practices occur are also important sources of infection.¹ Undercooked ground beef, fresh produce such as lettuce, spinach and sprouts, unpasteurized milk and fruit juices, and inadequately treated drinking water have been implicated in large outbreaks of VTEC in North America.¹

Symptoms of VTEC usually occur three to four days after exposure and may include bloody or non-bloody diarrhea, vomiting and abdominal cramping lasting up to five days. Susceptibility is universal, but children and the elderly are more likely to develop severe illness and complications including hemolytic uremic syndrome (HUS). HUS occurs in up to 15% of infected children and causes death in three to five percent of children.^{1,13}

Proper personal hygiene and safe food handling practices are key to preventing the spread of VTEC.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

VTEC accounted for two percent of all reported cases of enteric diseases reported in Ontario in 2011. In that year, 232 cases were reported for an incidence rate of 1.73 cases per 100,000 population (Figure 1-41). In 2011, the number of reported cases increased by 52% in comparison to 2010 (153 cases), and by 40% in comparison to 2009 (166 cases). Of VTEC cases reported in 2011, 19% (44/234) were associated with clusters or outbreaks ranging in size from three to thirteen cases.

The incidence rate of VTEC declined over the ten-year period from 2002-2011. The incidence rate decreased by 47%, down from 3.3 cases per 100,000 population in 2002 to 1.73 cases per 100,000 population in 2011. The lowest number of cases and incidence rates during this timeframe were in 2009 and 2010 (1.27 and 1.16 cases per 100,000 population, respectively).

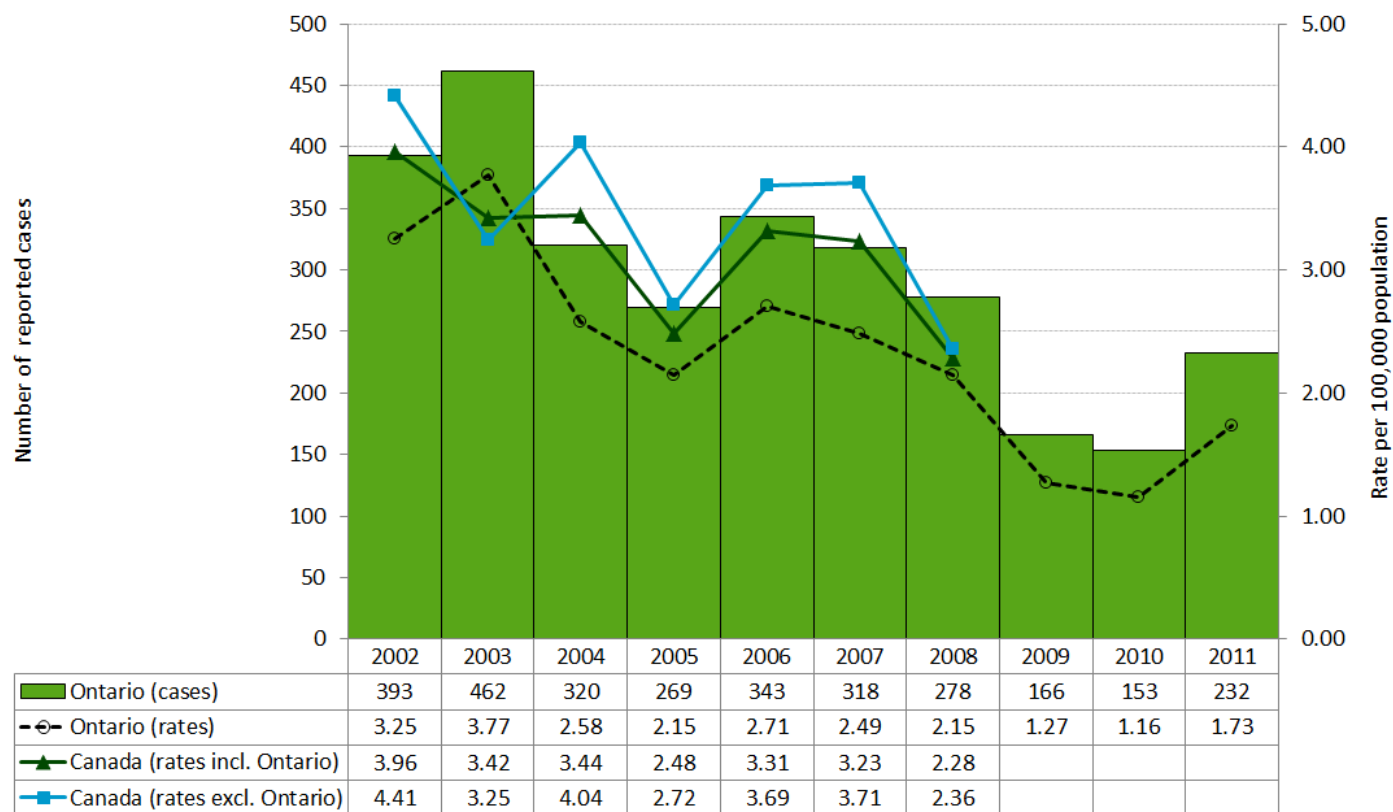
From 2002 to 2008, annual incidence rates of VTEC for Canada were higher than Ontario's with the exception of 2003. Separate outbreaks in the City of Hamilton and Halton Region in 2003 pushed Ontario's incidence to its highest in the ten-year period from 2002 to 2011.

AGE AND SEX DISTRIBUTION

The incidence rate for VTEC in 2011 was highest among children and lowest among older adults for both males and females. The highest rates occurred in the 0-4 and 5-9 age groups (Table 1-37, Figure 1-42), which together accounted for 28% of cases reported in 2011. Overall, females accounted for 55% of cases in 2011 for an incidence rate of 1.89 cases per 100,000 population. The corresponding rate for males was 1.60 cases per 100,000 population. Overall, cases ranged in age from less than one to 86 years, with a median age of 22 years.

The higher rates of VTEC observed among the younger age groups may be reflective of children's higher risk of severe illness and complications such as HUS – outcomes that are more likely to prompt parents and guardians to seek medical attention.

Figure 1-41. Incidence of VTEC: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

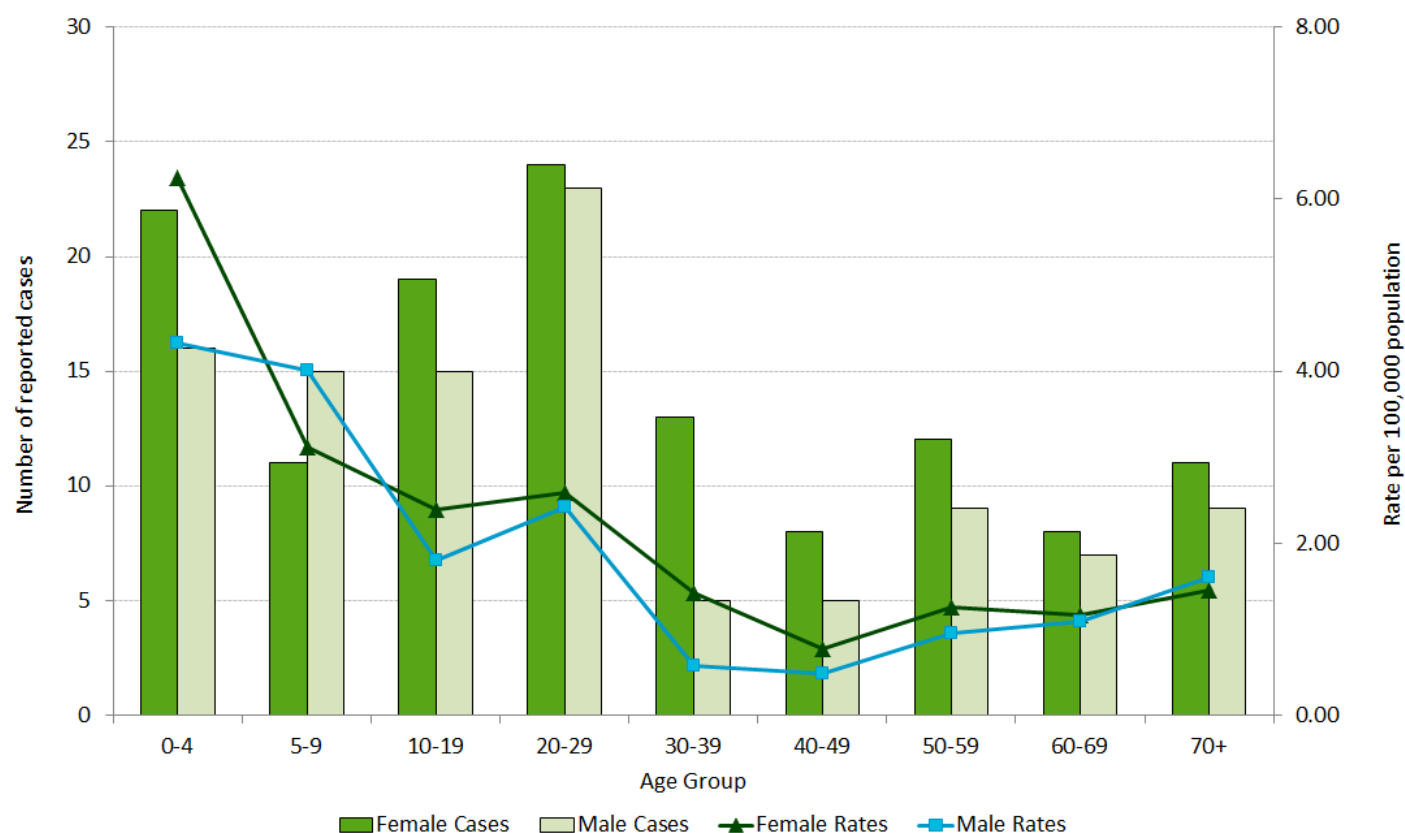
Table 1-37. Incidence of VTEC by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	22	6.24	16	4.33	38	5.26
5-9	11	3.11	15	4.01	26	3.57
10-19	19	2.38	15	1.80	34	2.08
20-29	24	2.59	23	2.41	47	2.50
30-39	13	1.42	5	0.57	18	1.00
40-49	8	0.78	5	0.48	13	0.63
50-59	12	1.25	9	0.96	21	1.11
60-69	8	1.16	7	1.08	15	1.13
70+	11	1.44	9	1.60	20	1.51
Total	128	1.89	104	1.58	232	1.73

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15]

Figure 1-42. Incidence of VTEC by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

HOSPITALIZATIONS AND DEATHS

In 2011, approximately 26% (60/232) of VTEC cases were hospitalized. Of these cases, 85% (51/60) had bloody diarrhea reported as a symptom and 13% (8/60) had HUS reported as a complication of illness. None of the cases reported in 2011 were fatal.

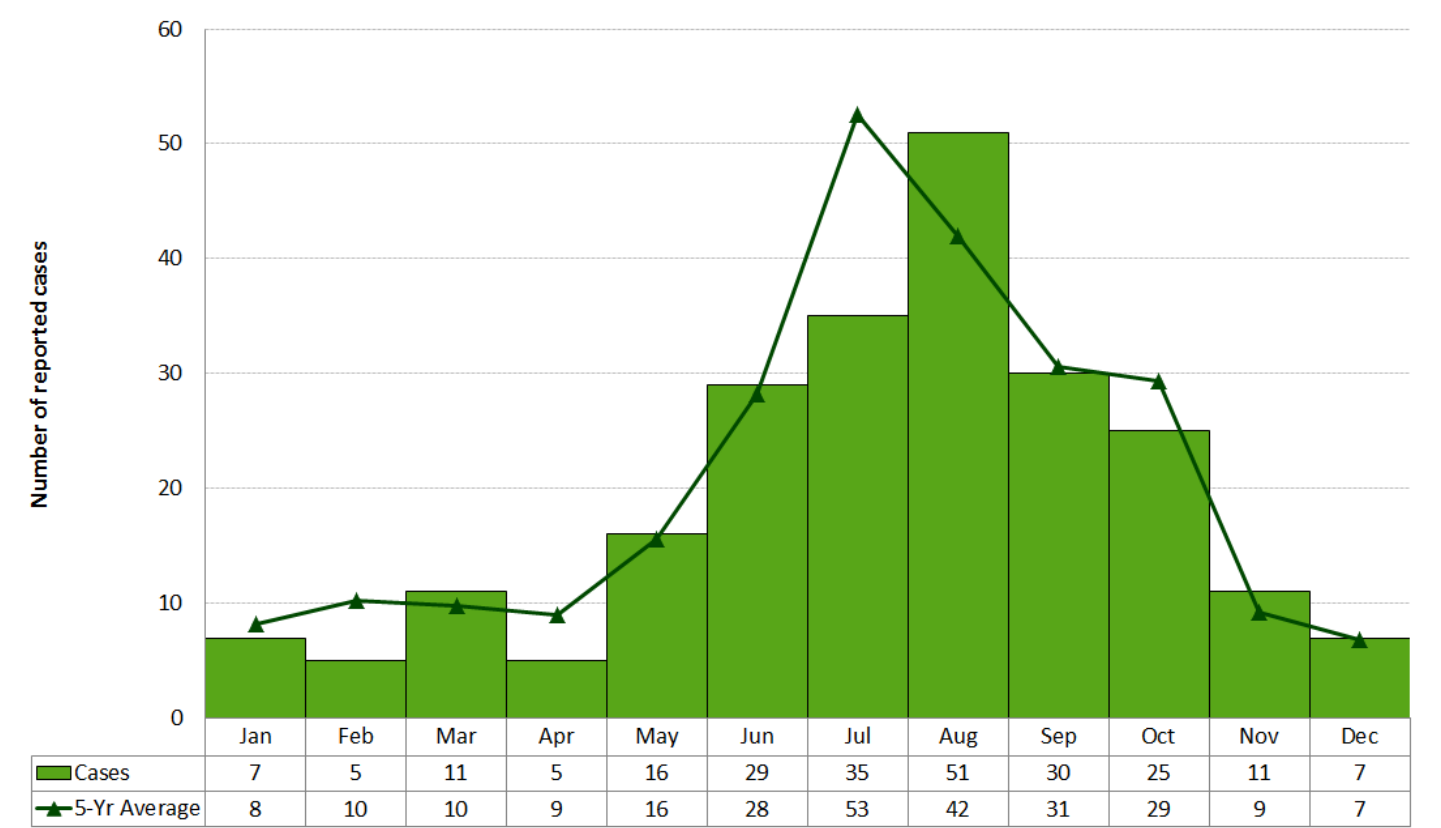
MONTHLY DISTRIBUTION

Cases of VTEC are reported throughout the year, but increases are typically observed in the warmer months from May to October. In 2011, the number of reported cases peaked in August, which alone accounted for 22% (51/232) of cases (Figure 1-43). Overall, monthly case counts for VTEC in 2011 were similar to the five-year monthly averages for the period 2006 to 2010.

GEOGRAPHIC DISTRIBUTION

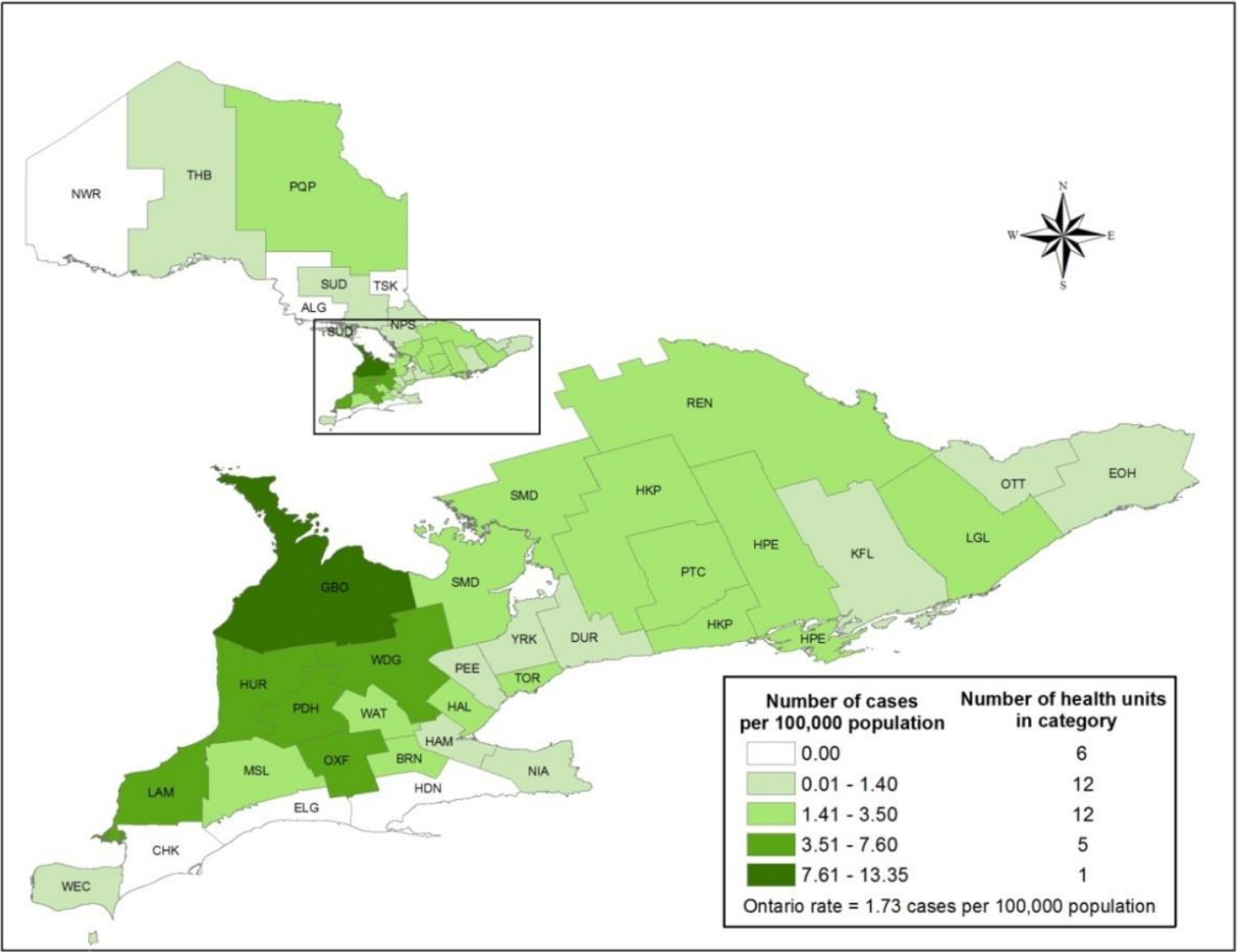
In 2011, VTEC cases were reported in 30 (83%) health units (Map 1-12, Table 1-38). The highest number of cases was reported by Toronto with 44 cases, followed by Grey-Bruce with 22 cases and Wellington-Dufferin-Guelph with 21 cases. The highest incidence rate of VTEC was reported by Grey-Bruce with 13.35 cases per 100,000 population. This was due largely to a local outbreak in the summer of 2011, for which a source was not identified. Wellington-Dufferin-Guelph (7.54 cases per 100,000), Perth District (5.19 cases per 100,000) and Huron County (4.97 cases per 100,000) also reported high rates of VTEC in 2011.

Figure 1-43. Number of VTEC Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].
Ontario Population: MOHLTC, IntelliHealth Ontario, extracted [2012/10/15].

Map 1-12. Incidence of VTEC by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-38. Incidence of VTEC by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	2	1.42	0.9%	1.1%
Chatham-Kent	0	0.00	0.0%	0.8%
Durham Region	8	1.27	3.4%	4.7%
Eastern Ontario	1	0.50	0.4%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	22	13.35	9.5%	1.2%
Haldimand-Norfolk	0	0.00	0.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	3	1.68	1.3%	1.3%
Halton Region	8	1.54	3.4%	3.9%
Hamilton, City of	1	0.19	0.4%	4.0%
Hastings & Prince Edward Counties	5	3.07	2.2%	1.2%
Huron County	3	4.97	1.3%	0.5%
Kingston-Frontenac & Lennox & Addington	2	1.01	0.9%	1.5%
Lambton County	6	4.57	2.6%	1.0%
Leeds, Grenville and Lanark District	5	2.94	2.2%	1.3%
Middlesex-London	10	2.17	4.3%	3.4%
Niagara Region	2	0.45	0.9%	3.3%
North Bay Parry Sound District	1	0.79	0.4%	1.0%
Northwestern	0	0.00	0.0%	0.6%
Ottawa, City of	12	1.32	5.2%	6.8%
Oxford County	5	4.62	2.2%	0.8%
Peel Region	18	1.32	7.8%	10.2%
Perth District	4	5.19	1.7%	0.6%
Peterborough County-City	3	2.13	1.3%	1.1%
Porcupine	2	2.31	0.9%	0.6%
Renfrew County & District	3	2.91	1.3%	0.8%
Simcoe Muskoka District	11	2.09	4.7%	3.9%
Sudbury & District	2	1.01	0.9%	1.5%
Thunder Bay District	1	0.64	0.4%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	44	1.60	19.0%	20.5%
Waterloo Region	14	2.64	6.0%	4.0%
Wellington-Dufferin-Guelph	21	7.54	9.1%	2.1%
Windsor-Essex County	1	0.25	0.4%	3.0%
York Region	12	1.12	5.2%	8.0%
Ontario	232	1.73	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Seventy percent (163/232) of VTEC cases in 2011 reported at least one risk factor (Table 1-39). The most frequently reported risk factors were animal contact at 45% (73/163), consumption of raw unwashed fruits or vegetables or unpasteurized juices at 26% (43/163), and recreational water contact at 23% (37/163).

Table 1-39. Reported Risk Factors for VTEC Cases: Ontario, 2011 (n=163)

Risk Factor	Cases	
	Number	Percent
Animal contact	73	44.8%
Consumption of raw unwashed fruits/vegetables or unpasteurized juices	43	26.4%
Recreational water contact	37	22.7%
Consumption of ready-to-eat salads	34	20.9%
Consumption of raw/undercooked ground beef	24	14.7%
Consumption of potentially contaminated water	23	14.1%
Travel outside Ontario	22	13.5%
Poor hand hygiene	20	12.3%
Contact with ill case	13	8.0%
Consumption of raw/undercooked poultry/meats	11	6.7%
Unknown	11	6.7%
Other	30	18.4%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to the sum of risk factors reported as "Other, specify" and risk factors with frequency <2%. "Unknown" refers to risk factors reported solely as "Unknown".

Yersiniosis

- **The incidence rate of yersiniosis in Ontario declined by 50% from 2002 to 2011.**
- **Children less than five years old had the highest incidence rate of yersiniosis in 2011.**
- **Out of province travel, animal contact and consumption of pork and pork products were the most commonly reported risk factors among yersiniosis cases in Ontario in 2011.**

Yersiniosis is caused by bacteria of the genus *Yersinia*.¹ In North America, most cases in humans and animals are due to *Y. enterocolitica*.¹ Animals, in particular pigs, are the primary reservoir of yersiniosis.¹ Transmission to humans can occur through ingestion of contaminated food or water, as well as through direct contact with the feces of infected persons or animals. Raw and undercooked pork and unpasteurized milk have been identified as common food vehicles of infection.¹

Following exposure, symptoms of yersiniosis occur within three to seven days, and typically manifest as diarrhea and fever with abdominal pain in young children.¹ In older children and adults, fever and pseudo-appendicitis, which may be mistaken for appendicitis, are the predominant symptoms. Globally, approximately two-thirds of yersiniosis cases due to *Y. enterocolitica* occur among infants and children. While susceptibility is universal, risk of severe illness is higher in children due to dehydration resulting from diarrhea, and in adolescents and older adults as a result of post-infection arthritis.¹ Persons with high levels of iron in their blood are also more susceptible to infection and have greater probability of septicemia (infection of the blood stream).¹

Yersiniosis can be prevented by avoiding consumption of raw or undercooked pork products, unpasteurized milk products, and untreated water, and by hand washing with soap and running water before and after handling food and after contact with animals and their surroundings.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Yersiniosis accounted for two percent of enteric disease cases reported in Ontario in 2011. Two-hundred and eleven cases were reported in that year, yielding a provincial incidence rate of 1.58 cases per 100,000 population (Figure 1-44).

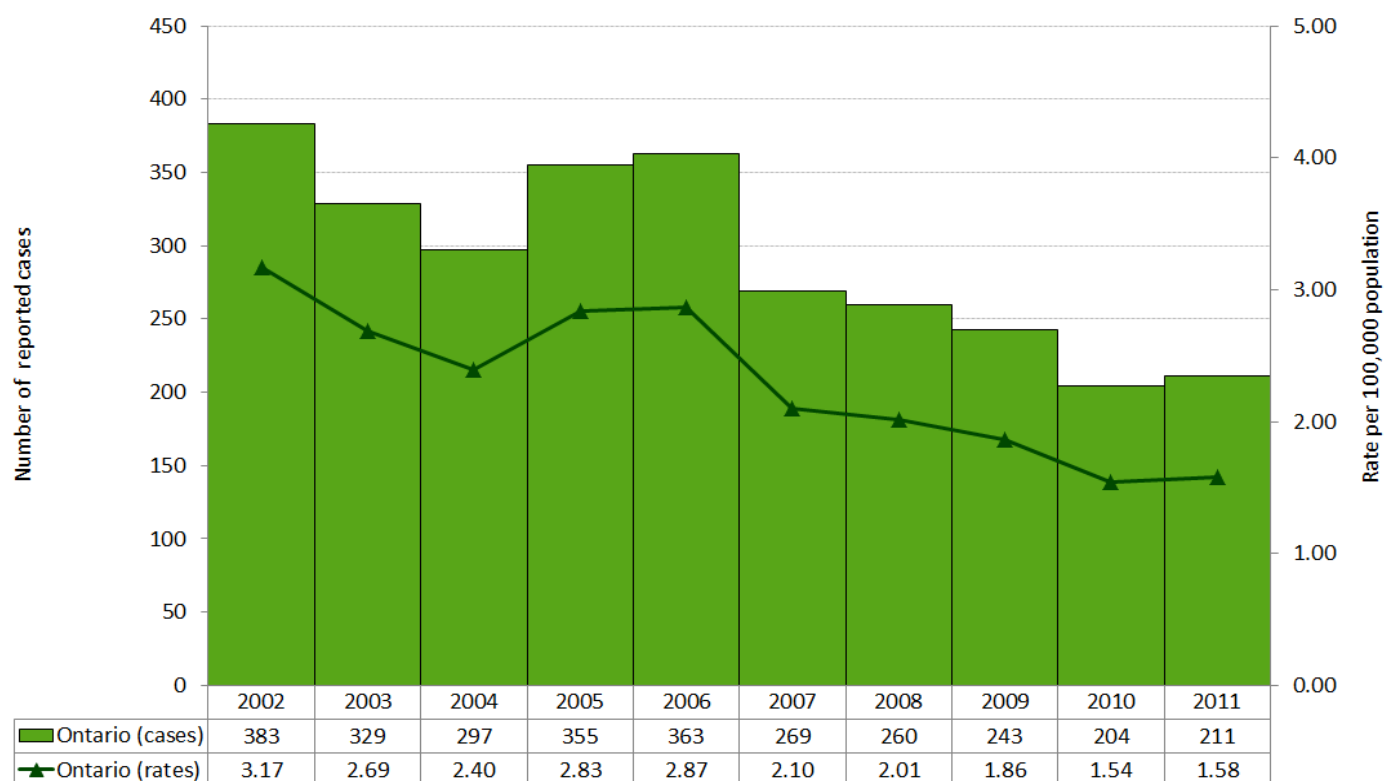
Over the ten-year period from 2002 to 2011, the incidence rate of yersiniosis declined by 50% from 3.17 cases per 100,000 population in 2002 to 1.58 cases per 100,000 population in 2011.

Yersiniosis is not nationally notifiable, thus a comparison between the Ontario and Canadian incidence rates has not been provided.

AGE AND SEX DISTRIBUTION

Males (105) and females (106) each accounted for 50% of yersiniosis cases reported in Ontario in 2011 (Table 1-40, Figure 1-45). The corresponding incidence rates for males and females were also similar at 1.59 and 1.56 cases per 100,000 population, respectively. Cases ranged in age from less than one year to 94 years, with a median age of 36 years. In 2011, the incidence of yersiniosis decreased with increasing age for both males and females, with children less than five years having the highest incidence rate. Incidence in this age group was 6.92 cases per 100,000 population, which was more than four times higher than the overall rate for Ontario.

Figure 1-44. Incidence of Yersiniosis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Yersiniosis is not nationally notifiable.

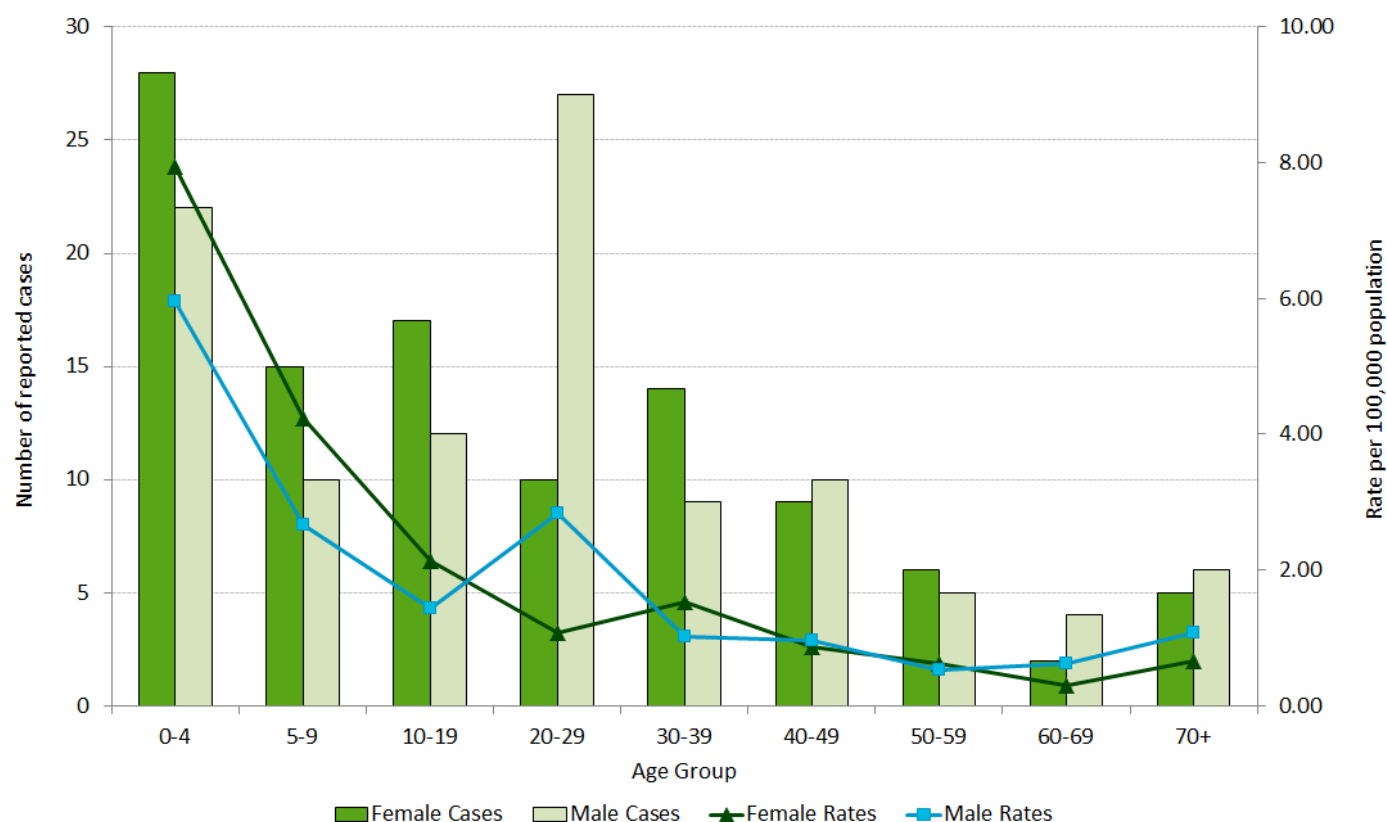
Table 1-40. Incidence of Yersiniosis by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	28	7.95	22	5.95	50	6.92
5-9	15	4.24	10	2.67	25	3.43
10-19	17	2.13	12	1.44	29	1.78
20-29	10	1.08	27	2.83	37	1.97
30-39	14	1.53	9	1.02	23	1.28
40-49	9	0.87	10	0.97	19	0.92
50-59	6	0.63	5	0.53	11	0.58
60-69	2	0.29	4	0.62	6	0.45
70+	5	0.66	6	1.07	11	0.83
Total	106	1.56	105	1.59	211	1.58

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Figure 1-45. Incidence of Yersiniosis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

HOSPITALIZATIONS AND DEATHS

In 2011, four percent (9/211) of yersiniosis cases were hospitalized. None of the cases were fatal.

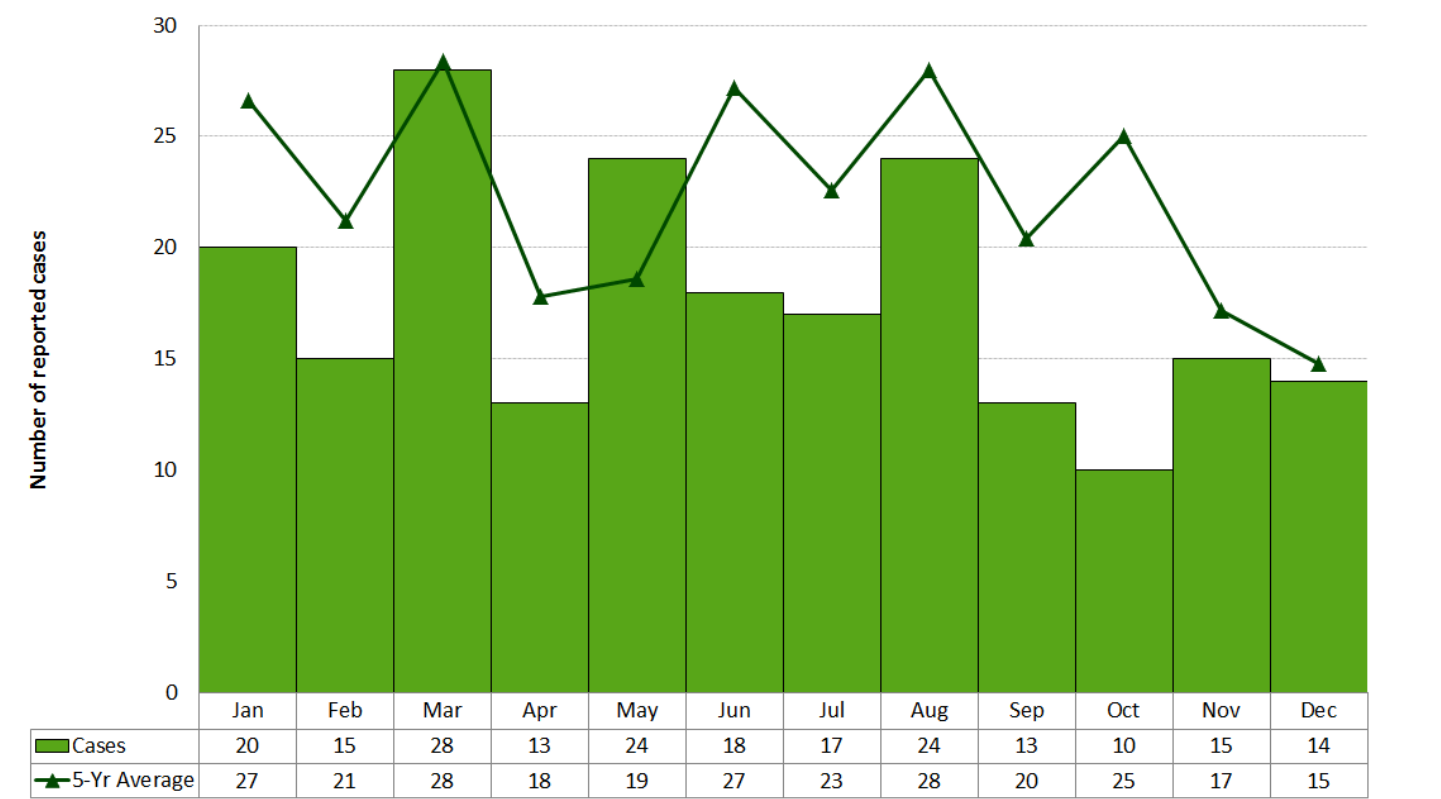
MONTHLY INCIDENCE

Yersiniosis occurs most frequently in the colder regions of the world.¹ In Ontario, cases occur throughout the year. Unlike most endemic enteric diseases, yersiniosis does not demonstrate a seasonal increase in incidence (Figure 1-46). Compared to the five-year monthly averages for the period 2006 to 2010, fewer cases of yersiniosis were reported in most months in 2011.

GEOGRAPHIC DISTRIBUTION

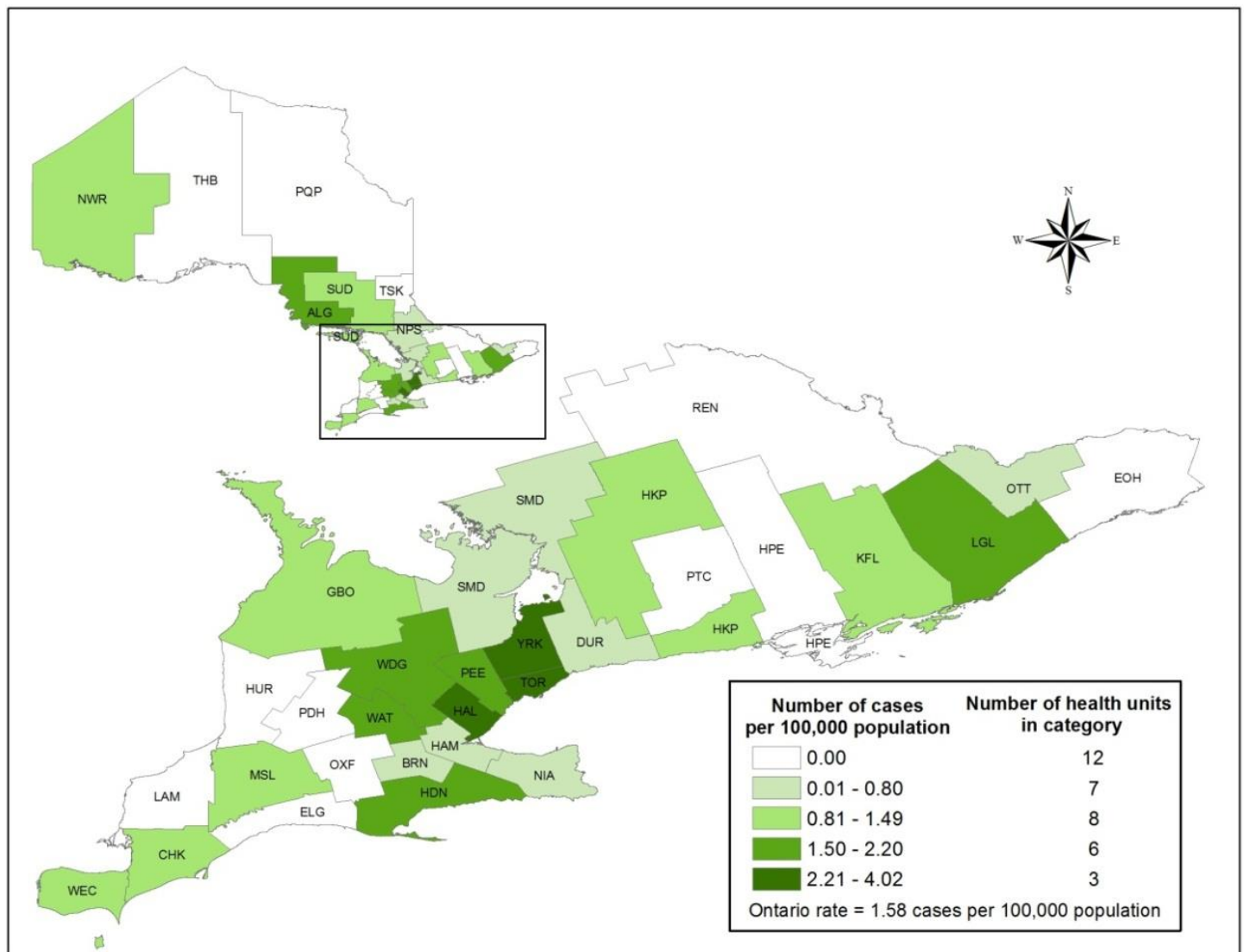
In 2011, 24 health units reported at least one case of yersiniosis, with cases clustering around the Greater Toronto Area (Table 1-41, Map 1-13). Several rural (e.g. Lambton County) and northern (e.g. Thunder Bay District) health units did not report any cases of yersiniosis in 2011. The highest rates were reported by York Region (4.02 cases per 100,000 population), Halton Region (2.89 cases per 100,000 population) and Toronto (2.22 cases per 100,000 population), each of which accounted for a higher than expected proportion of total cases based on the size of their population. Toronto and York Region combined accounted for almost half (49%) of cases reported in 2011.

Figure 1-46. Number of Yersiniosis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 1-13. Incidence of Yersiniosis by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 1-41. Incidence of Yersiniosis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	2	1.70	0.9%	0.9%
Brant County	1	0.71	0.5%	1.1%
Chatham-Kent	1	0.92	0.5%	0.8%
Durham Region	4	0.63	1.9%	4.7%
Eastern Ontario	0	0.00	0.0%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	2	1.21	0.9%	1.2%
Haldimand-Norfolk	2	1.81	0.9%	0.8%
Haliburton, Kawartha, Pine Ridge District	2	1.12	0.9%	1.3%
Halton Region	15	2.89	7.1%	3.9%
Hamilton, City of	4	0.74	1.9%	4.0%
Hastings & Prince Edward Counties	0	0.00	0.0%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	2	1.01	0.9%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	3	1.76	1.4%	1.3%
Middlesex-London	5	1.08	2.4%	3.4%
Niagara Region	2	0.45	0.9%	3.3%
North Bay Parry Sound District	1	0.79	0.5%	1.0%
Northwestern	1	1.22	0.5%	0.6%
Ottawa, City of	6	0.66	2.8%	6.8%
Oxford County	0	0.00	0.0%	0.8%
Peel Region	29	2.12	13.7%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	0	0.00	0.0%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	2	0.38	0.9%	3.9%
Sudbury & District	2	1.01	0.9%	1.5%
Thunder Bay District	0	0.00	0.0%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	61	2.22	28.9%	20.5%
Waterloo Region	9	1.70	4.3%	4.0%
Wellington-Dufferin-Guelph	6	2.15	2.8%	2.1%
Windsor-Essex County	6	1.49	2.8%	3.0%
York Region	43	4.02	20.4%	8.0%
Ontario	211	1.58	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Of the 131 confirmed yersiniosis cases reporting at least one risk factor in 2011, 40% (52/131) reported travel outside the province in the seven days before illness onset (Table 1-42). More than one-quarter (27%, 35/131) of cases reported animal contact, and 24% (31/131) reported consumption of raw or undercooked pork or pork products.

Table 1-42. Reported Risk Factors for Yersiniosis cases: Ontario, 2011 (n=131)

Risk Factors	Cases	
	Number	Percent
Travel outside Ontario	52	39.7%
Animal contact	35	26.7%
Consumption of raw/undercooked pork or pork products	31	23.7%
Consumption of potentially contaminated water	13	9.9%
Poor hand hygiene	9	6.9%
Consumption of raw/unpasteurized milk or milk products	6	4.6%
Other	30	22.9%
Unknown	24	18.3%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/6/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to the sum of risk factors reported as "Other, specify" and risk factors with frequency <3%. "Unknown" refers to risk factors reported as "Unknown".

Section 2

Respiratory diseases and diseases transmitted by direct contact

Overview

In Ontario, influenza, tuberculosis, invasive group A streptococcal (iGAS) disease and legionellosis are the most commonly reported diseases transmitted by direct contact (not sexual) and respiratory routes. Although these diseases affect individuals of all ages, they are disproportionately reported among the elderly and also result in relatively higher rates of hospitalization in this population for influenza, iGAS and legionellosis. With the exception of tuberculosis which has remained fairly stable since 2007, the incidence of all other respiratory diseases and diseases transmitted by direct contact has increased since 2002.

Most cases of tuberculosis reported in Ontario occur among foreign-born individuals who emigrated from countries with relatively higher rates of tuberculosis such as China, India and the Philippines.

The 2010/2011 influenza season was the first surveillance season following the H1N1 pandemic. Case counts were relatively high compared to pre-pandemic seasons due in part to the established use of more sensitive laboratory tests which started during the pandemic.

No cases of severe acute respiratory syndrome (SARS) have been reported in Ontario since the end of the outbreak in 2003 when the disease first emerged.

Several quick reference data tables for the diseases covered in this section are included in Appendix 4.

Group A streptococcal disease, invasive

- **The incidence rate of invasive group A streptococcal disease (iGAS) in Ontario increased over the ten-year period from 2002 to 2011.**
- **Cases in the 70 year and older age group had the highest incidence rate of iGAS, accounting for 24% of cases that occurred in 2011.**
- ***Emm1*, *emm3*, *emm89* and *emm12* were the most commonly reported *emm* types among iGAS cases that specified an *emm* type in 2011.**
- **In 2011, approximately 67% of iGAS cases were hospitalized; nine percent were fatal.**

Group A *Streptococcus pyogenes* (GAS) causes a variety of diseases that range in severity from mild illness such as strep throat and impetigo to more serious diseases that are invasive in nature. Invasive GAS (iGAS) disease occurs when sterile body tissues such as blood or cerebrospinal fluid become infected with GAS.³⁸ Severe invasive disease may manifest as septicemia or bacteremia (bloodstream infections), pneumonia, and less commonly as streptococcal toxic shock syndrome (STSS), myositis and necrotizing fasciitis (NF) or flesh eating disease.^{38,1} The mortality rate for myositis and NF is about 20% compared to up to 81% for STSS.

GAS is commonly transmitted from person-to-person through direct or indirect contact with¹ secretions or droplets from the nose or throat of infected persons or healthy carriers of the bacterium.³⁸ Symptoms of GAS usually develop within one to three days of exposure.¹

Healthy individuals can get iGAS disease, although this is rare.^{38,1} However, chronic conditions such as cancer, diabetes and lung disease; use of medications containing steroids; injection drug use; alcohol abuse and soft tissue damage all increase the risk of

developing iGAS disease.³⁸ Hand washing, covering coughs and sneezes and prompt treatment with prophylactic antibiotics for close contacts of infected persons are effective measures in preventing the spread of GAS.^{38,39} Protecting broken skin from contamination also reduces the risk of infection.³⁹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, 678 cases of iGAS disease were reported in Ontario, which corresponds to an incidence rate of 5.07 cases per 100,000 population and a 21% increase compared to the 2010 total of 561 cases (Figure 2-1).

Over the ten year period from 2002 to 2011, the incidence rate of iGAS showed a gradual increase of 59%, up from 3.18 cases per 100,000 population in 2002 to 5.07 cases per 100,000 population in 2011 (Figure 2-1). The reason for the overall increase in iGAS in Ontario over this period, and in 2010 and 2011, is not fully understood. The increases in incidence of iGAS in 2007 and 2008 were attributed to an outbreak in Thunder Bay District Health Unit that spanned both years. This outbreak was due largely to the *Emm59* type of iGAS.

National incidence rates for iGAS were comparable to Ontario's over the period from 2002 to 2008. In 2008, the most recent year for which national data is available, the Canadian incidence rate for iGAS was higher than that of Ontario (Figure 2-1).

EMM TYPES

Emm1 (23%), *emm3* (14%), *emm89* (11%) and *emm12* (9%) were the most commonly reported *emm* types among iGAS cases that specified an *emm* type in 2011 (268/678). Less than two percent of iGAS cases in 2011 were due to *emm59*, which was the predominant *emm* type in the 2007-08 outbreak in Thunder Bay (Table 2-1).

Table 2-1. Cases of iGAS cases by *emm* type: Ontario, 2011

<i>Emm</i> Type	Cases	
	Number	Percent
<i>emm1</i>	62	9.1%
<i>emm3</i>	37	5.5%
<i>emm89</i>	29	4.3%
<i>emm12</i>	24	3.5%
<i>emm82</i>	15	2.2%
Other	101	14.9%
Unspecified	410	60.5%
Total	678	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/6/13].

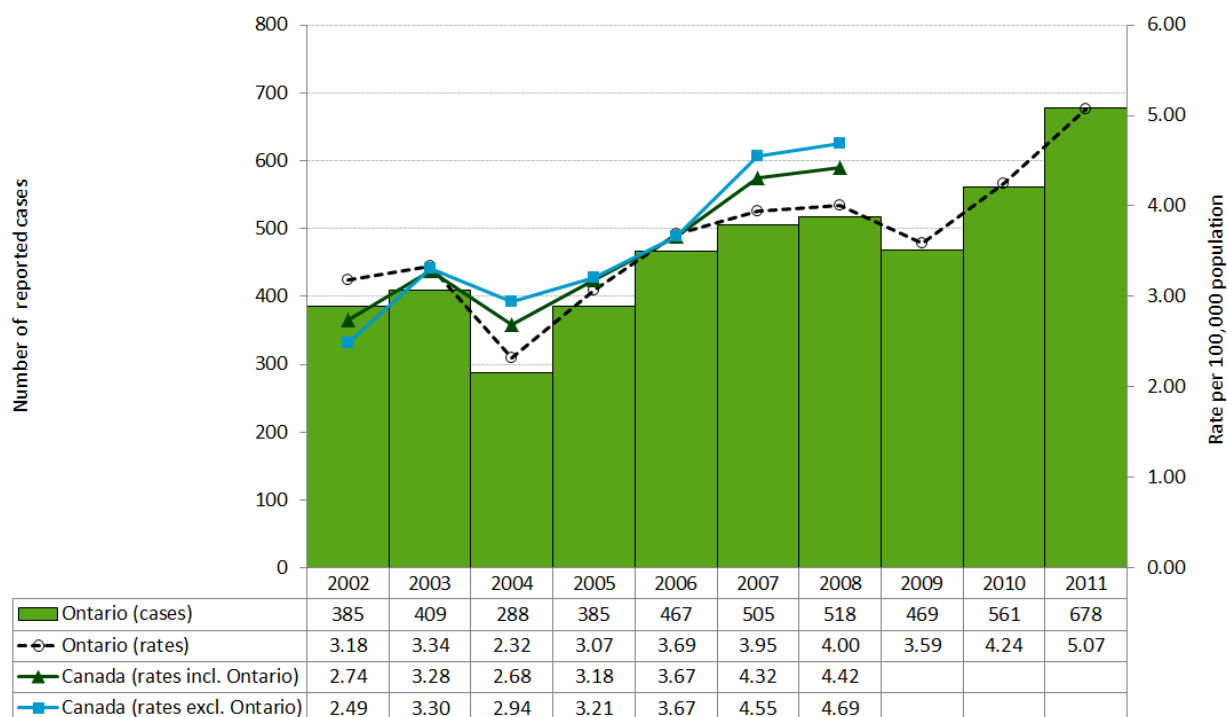
Note: 'Other' is the sum of *emm* types with a frequency <2%. "Unspecified" refers to the sum of cases for which *emm* type was reported as 'unspecified' or not reported at all.

AGE AND SEX DISTRIBUTION

The sex-specific incidence rate for iGAS in 2011 was slightly higher for males compared to females at 5.52 and 4.63 cases per 100,000 population, respectively (Table 2-2, Figure 2-2). Cases ranged in age from <1 to 98 years and had a median age of 50 years. Males accounted for a little over half (54%) of cases in 2011.

In general, the incidence rate for iGAS increased with advancing age. Persons aged 70 years and older had the highest rate at 12.54 cases per 100,000 population (Table 2-2, Figure 2-2). Relatively high rates of iGAS were also observed among children in the <1 and 1-4 age groups and for adults in the 60-69 age group.

Figure 2-1. Incidence of iGAS in Ontario and Canada: 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

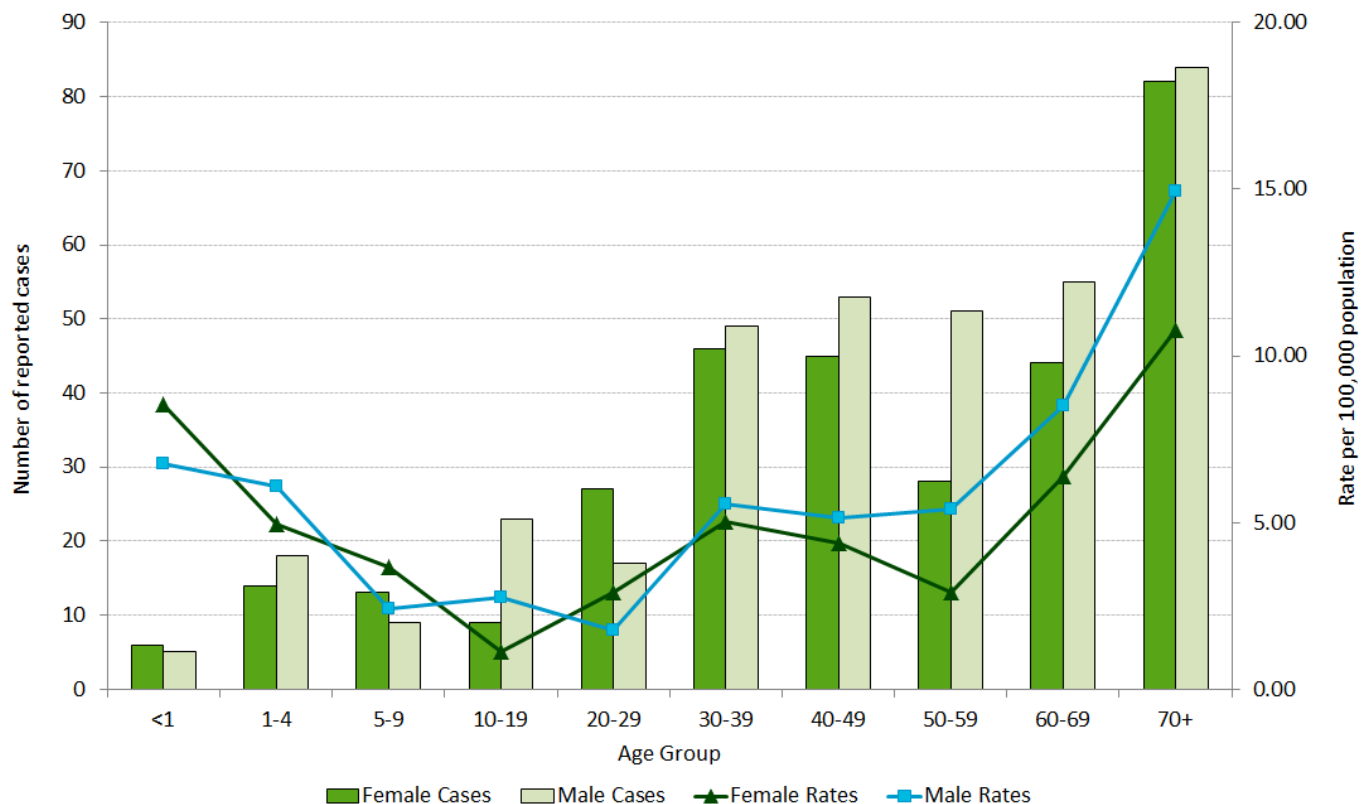
Table 2-2. Incidence of iGAS by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
<1	6	8.53	5	6.77	11	7.63
1-4	14	4.97	18	6.08	32	5.54
5-9	13	3.67	9	2.40	22	3.02
10-19	9	1.13	23	2.75	32	1.96
20-29	27	2.91	17	1.78	44	2.34
30-39	46	5.04	49	5.57	95	5.30
40-49	45	4.37	53	5.14	98	4.75
50-59	28	2.92	51	5.42	79	4.16
60-69	44	6.40	55	8.52	99	7.43
70+	82	10.77	84	14.95	166	12.54
Total	314	4.63	364	5.52	678	5.07

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Figure 2-2. Incidence of iGAS by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

HOSPITALIZATIONS AND DEATHS

In 2011, 67% (455/678) of iGAS cases were hospitalized. The median length of stay was six days for the 241 hospitalized cases for whom a discharge date was reported. *Emm1* (8%), *emm3* (5%) and *emm89* (4%) were the most frequently reported emm types for hospitalized cases for which emm type information was reported. Approximately seven percent (49/678) of iGAS cases reported in 2011 were fatal. Among fatal cases, *emm1* (16%), *emm12* (8%) and *emm3* (6%) were most frequently reported.

MONTHLY DISTRIBUTION

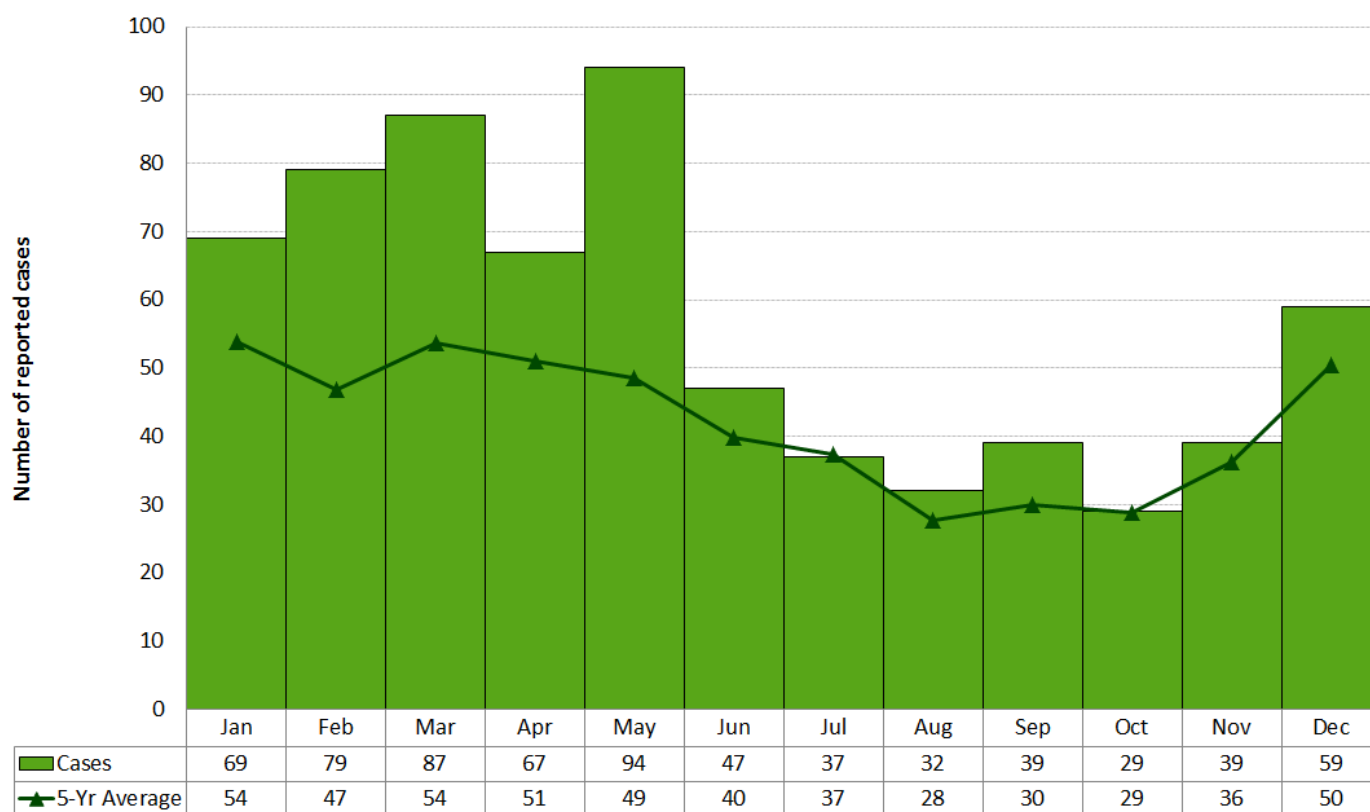
iGAS occurs throughout the year, but tends to follow a seasonal pattern that generally peaks in late winter and spring.¹ In 2011, the incidence of iGAS peaked from

January to May and again in December (Figure 2-3). In general, more cases of iGAS were reported in the first half of 2011 compared to the monthly averages for 2006 to 2010.

GEOGRAPHIC DISTRIBUTION

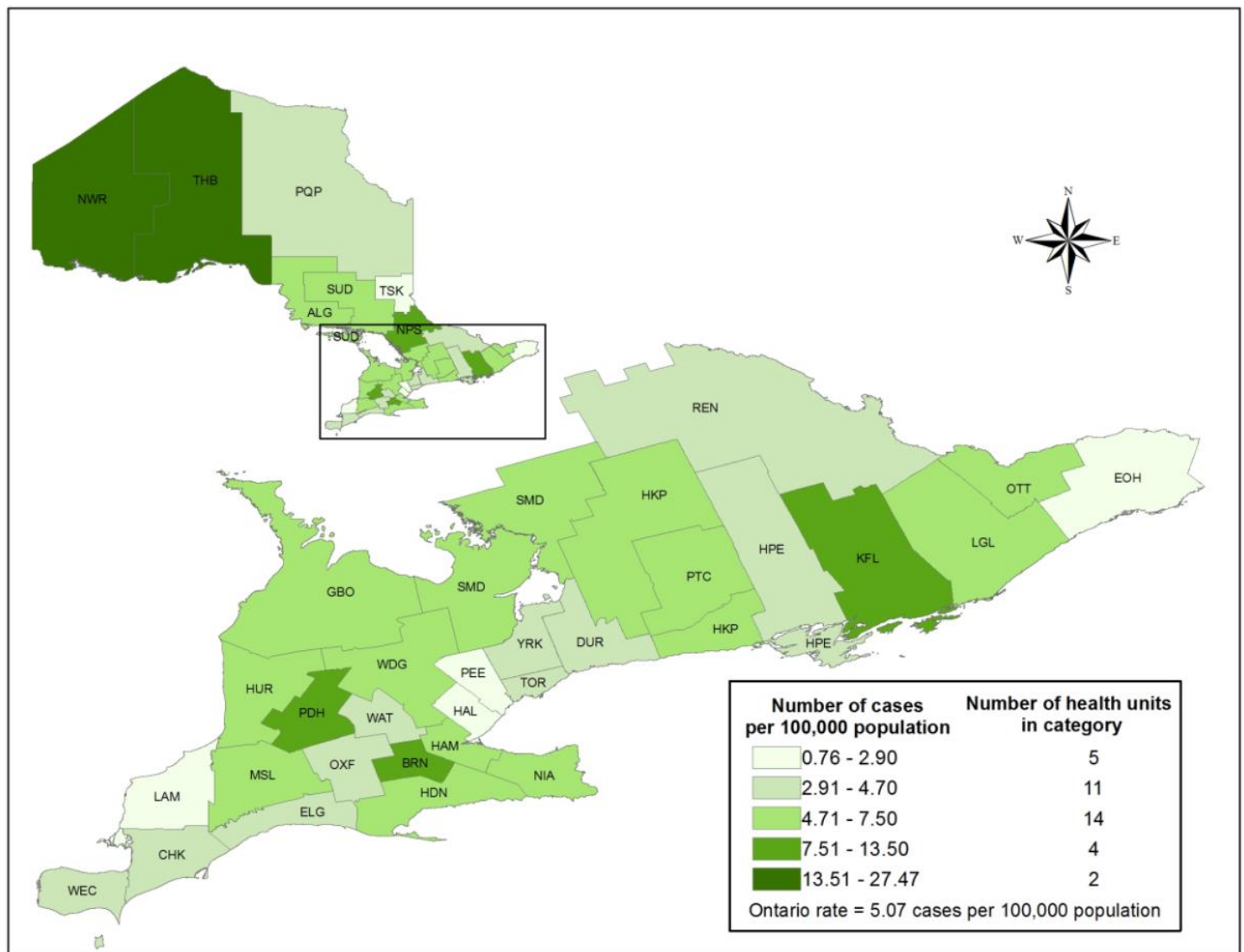
Two health units in the north reported the highest incidence rates of iGAS in Ontario in 2011. Thunder Bay District had an incidence rate of 27.47 cases per 100,000 population and Northwestern had an incidence rate of 21.97 cases per 100,000 population (Map 2-1, Table 2-3). Toronto reported the highest number of iGAS cases at 128, which is 19% of reported iGAS cases in Ontario. The second and third highest numbers of cases were reported by City of Ottawa (50/678) and Thunder Bay District (43/678) health units, respectively.

Figure 2-3. Number of iGAS Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 2-1. Incidence of iGAS by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 2-3. Incidence of iGAS by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	8	6.79	1.2%	0.9%
Brant County	19	13.49	2.8%	1.1%
Chatham-Kent	4	3.68	0.6%	0.8%
Durham Region	23	3.64	3.4%	4.7%
Eastern Ontario	5	2.49	0.7%	1.5%
Elgin-St. Thomas	3	3.28	0.4%	0.7%
Grey Bruce	12	7.28	1.8%	1.2%
Haldimand-Norfolk	6	5.42	0.9%	0.8%
Haliburton, Kawartha, Pine Ridge District	10	5.59	1.5%	1.3%
Halton Region	15	2.89	2.2%	3.9%
Hamilton, City of	38	7.03	5.6%	4.0%
Hastings & Prince Edward Counties	6	3.69	0.9%	1.2%
Huron County	4	6.63	0.6%	0.5%
Kingston-Frontenac & Lennox & Addington	19	9.63	2.8%	1.5%
Lambton County	1	0.76	0.1%	1.0%
Leeds, Grenville and Lanark District	11	6.46	1.6%	1.3%
Middlesex-London	24	5.21	3.5%	3.4%
Niagara Region	24	5.39	3.5%	3.3%
North Bay Parry Sound District	11	8.64	1.6%	1.0%
Northwestern	18	21.97	2.7%	0.6%
Ottawa, City of	50	5.50	7.4%	6.8%
Oxford County	4	3.70	0.6%	0.8%
Peel Region	38	2.78	5.6%	10.2%
Perth District	8	10.37	1.2%	0.6%
Peterborough County-City	7	4.98	1.0%	1.1%
Porcupine	4	4.61	0.6%	0.6%
Renfrew County & District	3	2.91	0.4%	0.8%
Simcoe Muskoka District	32	6.09	4.7%	3.9%
Sudbury & District	11	5.56	1.6%	1.5%
Thunder Bay District	43	27.47	6.3%	1.2%
Timiskaming	1	2.90	0.1%	0.3%
Toronto	128	4.67	18.9%	20.5%
Waterloo Region	18	3.39	2.7%	4.0%
Wellington-Dufferin-Guelph	17	6.10	2.5%	2.1%
Windsor-Essex County	15	3.72	2.2%	3.0%
York Region	38	3.55	5.6%	8.0%
Ontario	678	5.07	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Self-reported chronic/medical conditions (70%, 303 cases), compromised skin (33%, 141), compromised immune system (19%, 84) or recent acute infections (9%, 39) were the most commonly reported health related risk factors among the 432 iGAS cases that reported at least one medical risk factor in 2011. Alcohol abuse (29%, 48) and injection drug use (16%, 27) were most frequently reported among the other reported risk factors (Table 2-4).

Table 2-4. Reported Risk Factors for iGAS cases: Ontario, 2011 (n=167)

Risk Factors	Cases	
	Number	Percent
Alcohol abuse	48	28.7%
Injection drug use	27	16.2%
Under-housed/homeless	22	13.2%
Close contact with an iGAS case	16	9.6%
Unknown	35	21.0%
Other risk factors	45	26.9%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/6/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to risk factors reported solely as "Other, specify". "Unknown" refers to risk factors reported solely as "Unknown".

Influenza

- **Influenza is the leading cause of reportable respiratory illness in Ontario. In the 2010/2011 season there were 6,050 reported cases, most of which were due to influenza A.**
- **Children under the age of five years and adults aged 70 years and older were most affected by influenza in the 2010/2011 season.**
- **Approximately 39% of influenza cases were reported as hospitalized in the 2010/2011 season; two percent of cases were fatal.**

Influenza is an acute respiratory infection caused by the influenza virus.¹ Transmission of the virus is mainly through direct contact with respiratory droplets expelled during coughs, sneezes or while talking. The virus can also be transmitted indirectly through contact with surfaces and objects that have been contaminated with respiratory droplets. Symptoms of influenza infection usually develop within two days of exposure and can last from five to seven days. Influenza infections are characterized by fever, chills, cough, muscle or body aches, headache, runny nose, weakness and sore throat.¹ In children, gastrointestinal symptoms such as nausea, vomiting and diarrhea can also occur, whereas fever may not be present in the elderly.¹

The severity of influenza infections depends on several factors including circulating influenza strains and the number of people that are immune either through previous infection or immunization. In general, the risk of serious illness or complications is greater for children under the age of two years, adults aged 65 years and older, persons with underlying medical conditions (e.g. asthma, heart disease, and diabetes), persons living in long-term care homes, and pregnant women. Complications of influenza include pneumonia and death.¹

The most effective way to prevent influenza infection is by getting immunized every fall.⁴⁰ The influenza vaccine

provides up to 80% protection against influenza among healthy adults.⁴¹ It also reduces the incidence of severe illness, complications and fatalities by approximately 42-46% in long-term care settings.⁴² Primary preventive measures such as hand washing and covering coughs and sneezes are also key to preventing the spread of infection.

2010/11 IN FOCUS AND HISTORICAL HIGHLIGHTS

A total of 6,050 cases were reported in Ontario during the 2010/2011 influenza season, representing an incidence rate of 45.24 cases per 100,000 population (Figure 2-4). The 2010/2011 influenza season ran from September 1, 2010 to August 31, 2011.

The incidence of influenza fluctuated during the period covering the 2001/2002 to 2010/2011 seasons. The highest rates were reported in the 2008/2009 and 2009/2010 seasons. The majority of cases in these seasons were attributed to the first and second waves of the H1N1 influenza pandemic. The H1N1 influenza pandemic strain accounted for 49% of influenza cases in the 2008/2009 season and 62% of influenza cases in the 2009/2010 season. Excluding pandemic seasons, the highest incidence rate for influenza in a single season was in 2004/2005. This increase was attributed to the A/California influenza strain which was not contained in the influenza vaccine for that season. Similarly high rates of influenza were observed in 2010/2011, but this increase may be attributed in part to the use of more sensitive laboratory tests which started during the pandemic seasons.

National incidence rates for influenza were comparable to those of Ontario. They followed a similar pattern during the seasons from 2001/2002 to 2007/2008 (Figure 2-4).

INFLUENZA TYPES

Influenza A accounted for 87% (5,283/6,050) of reported influenza cases in the 2010/2011 season (Table 2-5). Influenza B accounted for 13% (765/6,050) of cases, while cases co-infected with both influenza A and B accounted for less than one percent (2/6,050) of all cases.

Table 2-5. Influenza by Cases Type: Ontario, 2010/2011

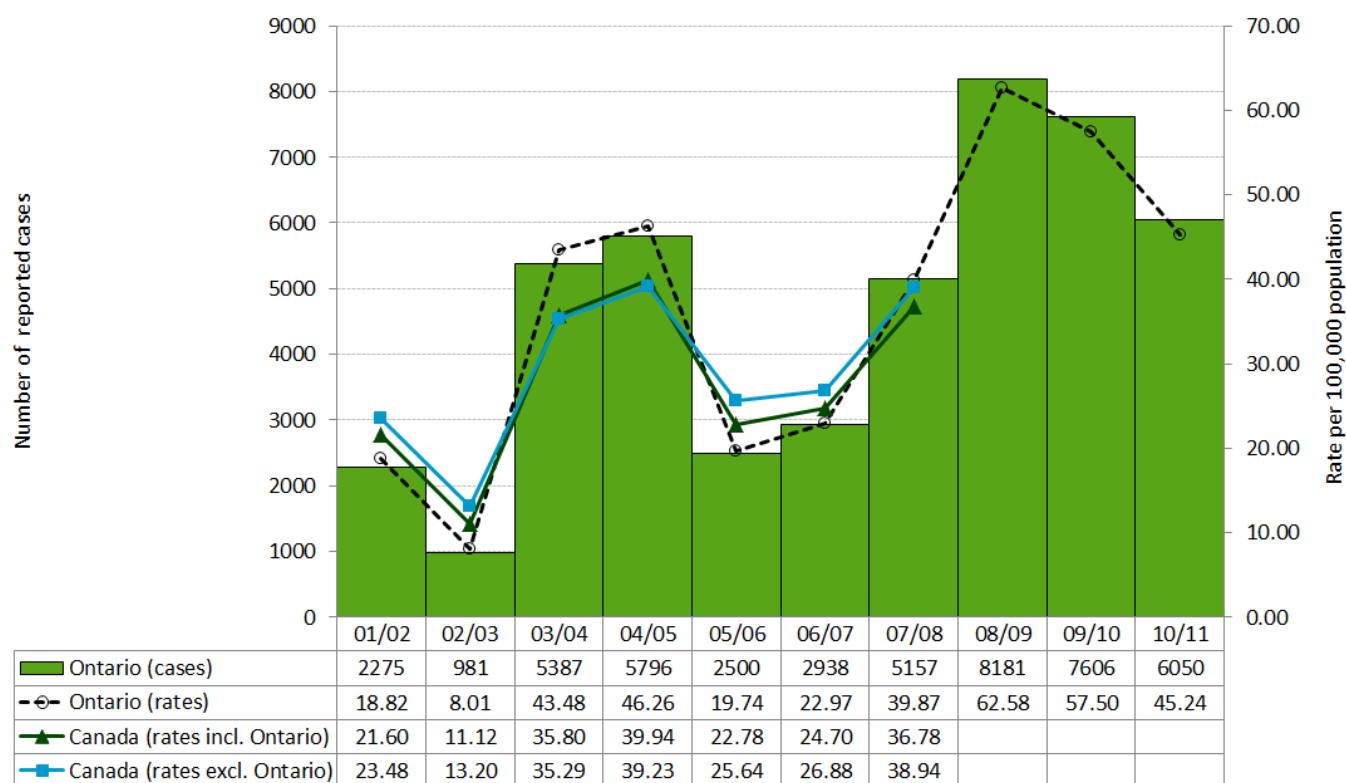
Influenza Strain	Cases	
	Number	Percent
Influenza A	5,283	87.3%
Influenza B	765	12.6%
Influenza A and B	2	0.0%
Total	6,050	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

AGE AND SEX DISTRIBUTION

The incidence rate for influenza in the 2010/11 season was higher for females compared to males at 48.63 versus 41.43 cases per 100,000, population, respectively (Table 2-6, Figure 2-5). Females accounted for 54% of cases. Cases ranged in age from less than one year to 105 years and had a median age of 55 years. Children under the age of five years accounted for 19% of influenza cases reported in the 2010/11 season, while adults aged 70 years and older accounted for 41% of cases. Rates of illness in these two age groups were up to six times higher than the overall provincial rate for the season. Higher rates of disease in these age groups may be reflective of more severe illness, which increases the likelihood of seeking medical attention and thus reporting to public health. This is in contrast to other age groups where illness tends to be less severe with many cases left untested and therefore unreported.

Figure 2-4. Incidence of Influenza: Ontario and Canada, 2001/2002 to 2010/2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Table 2-6. Incidence of Influenza by Age and Sex: Ontario, 2010/2011

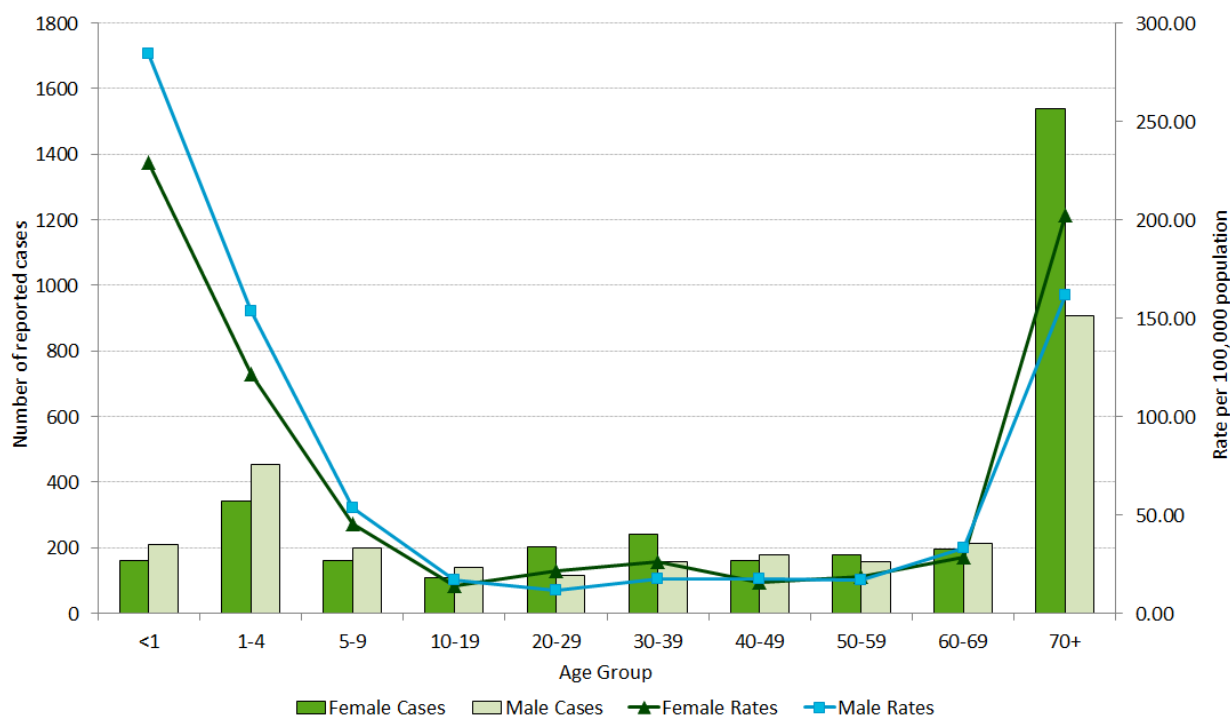
Age Group (Years)	Female		Male		Total	
	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)
<1	161	228.85	210	284.21	371	257.21
1-4	342	121.30	454	153.42	796	137.75
5-9	161	45.49	200	53.43	361	49.57
10-19	110	13.80	140	16.76	250	15.32
20-29	202	21.78	114	11.97	316	16.81
30-39	242	26.50	156	17.73	398	22.20
40-49	162	15.72	179	17.35	341	16.54
50-59	180	18.80	157	16.68	337	17.75
60-69	197	28.65	214	33.15	411	30.83
70+	1540	202.25	907	161.38	2447	184.89
Total	3,297	48.63	2,731	41.43	6,028	45.08

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Does not include 22 cases for which sex and/or age are not known.

Figure 2-5. Incidence of Influenza by Age and Sex: Ontario, 2010/2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Does not include 22 cases for which sex and/or age are not known.

HOSPITALIZATIONS AND DEATHS

Approximately 39% (2,380/6,050) of influenza cases reported in the 2010/2011 season were hospitalized. Children under the age of ten years (27%) and adults aged 60 years and older accounted for 81% of hospitalized cases. The disproportionate share of hospitalized cases in these age groups may be reflective of more severe illness, which increases the likelihood of seeking hospital care. Further, the use of more sensitive testing algorithms in hospital settings may also increase the likelihood of positive influenza diagnoses among hospitalized cases.

Two percent (117/6,050) of influenza cases reported in the 2010/2011 season were fatal.

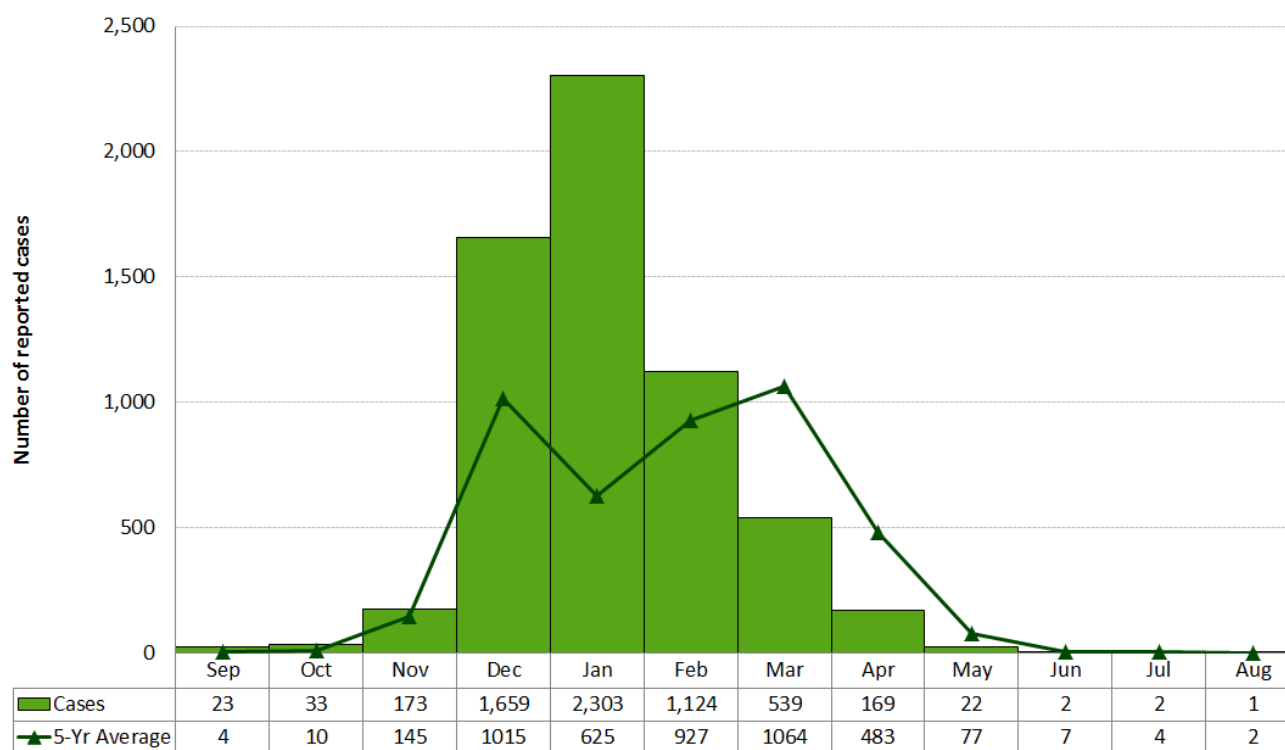
MONTHLY DISTRIBUTION

Although influenza cases occur throughout the season, there is a marked seasonal pattern with increased activity during the winter months. In the 2010/2011 season, the number of reported cases of influenza peaked from December to February (Figure 2-6), with 84% (5,086/6,050) of cases reported during these months.

GEOGRAPHIC DISTRIBUTION

Peterborough City-County (105.3 cases per 100,000 population) and Perth District (99.8 cases per 100,000 population) reported the highest rates of influenza in Ontario in the 2010/2011 season (Map 2-2, Table 2-7). Toronto reported the most cases (1,565), accounting for approximately 26% of influenza cases, followed by Peel Region with 10% (596/6,050) of cases and City of Hamilton with eight percent (496/6,050) of reported cases.

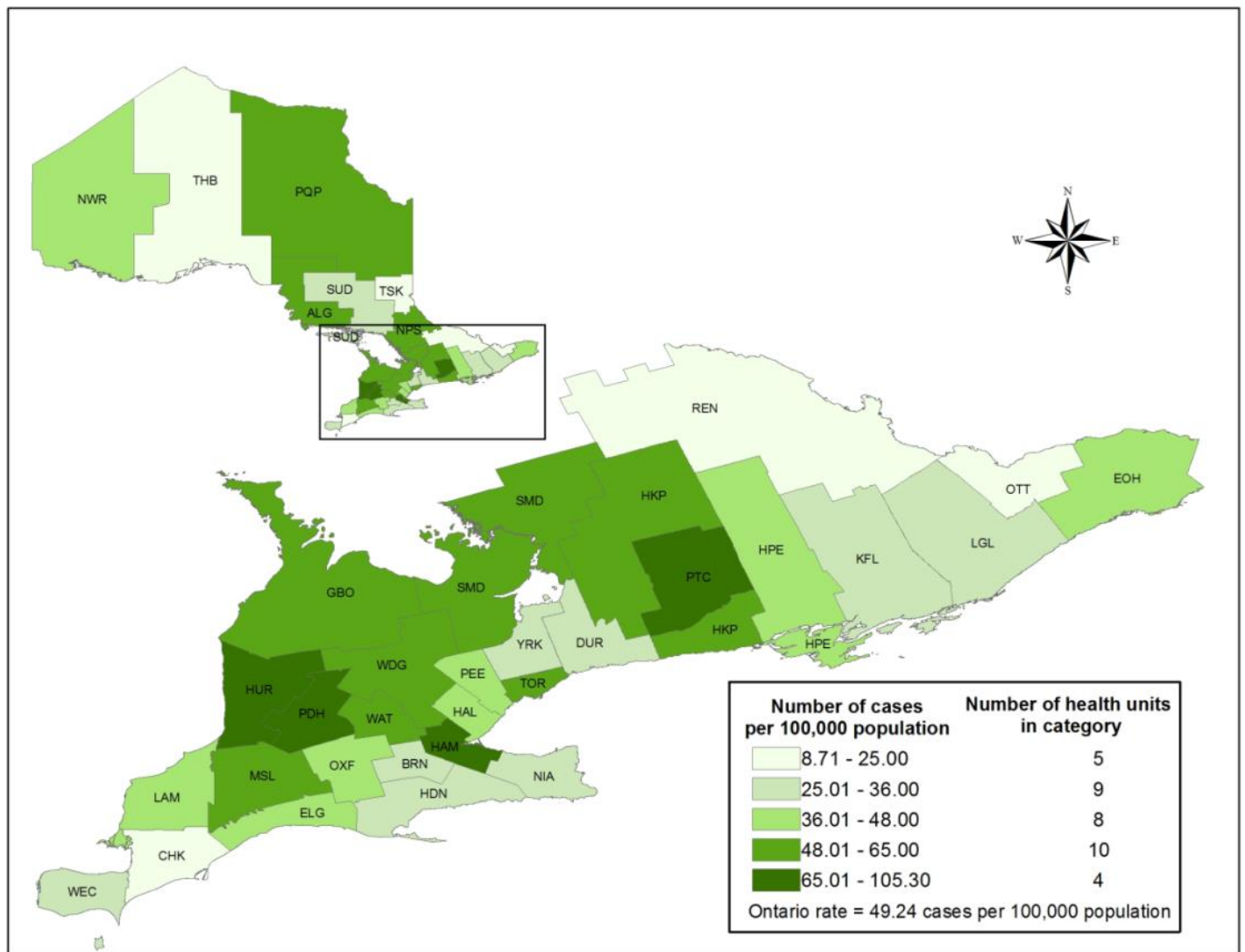
Figure 2-6. Number of Influenza Cases by Month in Ontario in 2011 and Average Number of Cases from 2005/2006 to 2009/2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Note: Monthly five year averages were calculated using the most recent five non-pandemic influenza seasons (2003/2004 to 2007/08).

Map 2-2. Incidence of Influenza by Health Unit of Residence: Ontario, 2010/2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 2-7. Incidence of Influenza by Health Unit of Residence: Ontario, 2010/2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	60	50.93	1.0%	0.9%
Brant County	50	35.51	0.8%	1.1%
Chatham-Kent	20	18.42	0.3%	0.8%
Durham Region	160	25.35	2.6%	4.7%
Eastern Ontario	82	40.77	1.4%	1.5%
Elgin-St. Thomas	37	40.47	0.6%	0.7%
Grey Bruce	88	53.39	1.5%	1.2%
Haldimand-Norfolk	36	32.52	0.6%	0.8%
Haliburton, Kawartha, Pine Ridge District	97	54.19	1.6%	1.3%
Halton Region	219	42.22	3.6%	3.9%
Hamilton, City of	469	86.81	7.8%	4.0%
Hastings & Prince Edward Counties	77	47.32	1.3%	1.2%
Huron County	52	86.18	0.9%	0.5%
Kingston-Frontenac & Lennox & Addington	68	34.46	1.1%	1.5%
Lambton County	54	41.09	0.9%	1.0%
Leeds, Grenville and Lanark District	50	29.38	0.8%	1.3%
Middlesex-London	278	60.32	4.6%	3.4%
Niagara Region	138	30.99	2.3%	3.3%
North Bay Parry Sound District	73	57.34	1.2%	1.0%
Northwestern	36	43.93	0.6%	0.6%
Ottawa, City of	200	21.98	3.3%	6.8%
Oxford County	48	44.35	0.8%	0.8%
Peel Region	596	43.64	9.9%	10.2%
Perth District	77	99.83	1.3%	0.6%
Peterborough County-City	148	105.30	2.4%	1.1%
Porcupine	55	63.44	0.9%	0.6%
Renfrew County & District	22	21.37	0.4%	0.8%
Simcoe Muskoka District	262	49.86	4.3%	3.9%
Sudbury & District	65	32.88	1.1%	1.5%
Thunder Bay District	39	24.91	0.6%	1.2%
Timiskaming	3	8.71	0.0%	0.3%
Toronto	1,565	57.04	25.9%	20.5%
Waterloo Region	274	51.67	4.5%	4.0%
Wellington-Dufferin-Guelph	137	49.20	2.3%	2.1%
Windsor-Essex County	117	29.00	1.9%	3.0%
York Region	298	27.86	4.9%	8.0%
Ontario	6,050	45.24	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

The presence of risk factors may predispose an individual to influenza infection or complications following infection. Two-thirds (3,980/6,050) of influenza cases that occurred in the 2010/11 season reported one or more risk factors for influenza. Among cases reporting risk factors, 49% (1,960/3,980) were not immunized, 46% (1,820/3,980) had at least one underlying medical condition such as diabetes or cardiovascular disease and 20% (778/3,980) had respiratory conditions such as asthma and chronic obstructive pulmonary disease (Table 2-8).

Table 2-8. Reported Risk Factors for Influenza Cases: Ontario, 2010/2011 (n=3,980)

Risk Factors	Cases	
	Number	Percent
Not immunized against influenza	1,960	49.3%
Underlying or immuno-compromising medical condition (not respiratory)	1,820	45.7%
Respiratory conditions	778	19.6%
Other	897	22.5%
Unknown	474	11.9%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/6/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to the sum of risk factors reported as "Other, specify" and pregnant. "Unknown" refers to risk factors reported solely as "Unknown". Risk factors reported as "Underlying medical conditions" may include some respiratory conditions.

Legionellosis

- **The incidence rate of legionellosis in Ontario increased in 2010 and 2011.**
- **Cases aged 50 years and older had the highest incidence rates of legionellosis and accounted for 83% of reported cases in 2011.**
- **In 2011, approximately 75% of legionellosis cases were hospitalized, and 5% were fatal.**

Legionellosis is an infectious disease caused by the bacterium *Legionella*. Most human cases are attributed to *L. pneumophila*, which is ubiquitous in the environment.¹ Legionellosis is not spread from person-to-person; transmission typically occurs through inhalation of aerosolized water droplets containing the bacterium. *Legionella* bacteria are commonly found in soil and water in the natural environment and in contaminated aerosol generating devices such as cooling towers, hot water tanks, decorative water fountains, and shower heads.¹

Legionellosis consists of two distinct clinical syndromes: Pontiac fever and Legionnaires' disease. Pontiac fever is milder and self-limiting, with symptoms developing within five to seventy-two hours after exposure. It is characterized by anorexia, malaise, myalgia, headache, fever, and commonly, abdominal pain and diarrhea.¹ Legionnaires' disease is the more severe form of legionellosis. It is different from Pontiac fever because of the presence of the defining complication of pneumonia.¹

Most healthy individuals do not develop legionellosis following exposure. At risk populations include those who are 50 years of age and older, males, smokers, alcoholics, and individuals with compromised immune systems or chronic conditions such as lung disease, diabetes and cancer.^{1,43} The key to preventing legionellosis is proper maintenance of aerosol generating systems and devices in which *Legionella* bacteria can grow.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, 162 cases of legionellosis were reported in Ontario for an incidence rate of 1.21 cases per 100,000 population (Figure 2-7). The number of cases reported in 2011 represented a 40% increase compared to the 2010 total of 116 cases and an almost six-fold increase compared to 2002.

Following a period of relatively low rates from 2002 to 2004, incidence rates of legionellosis increased in 2005 due to a large outbreak in a Toronto long-term care facility. Since then, annual incidence rates have remained elevated province-wide with two other notable peaks in incidence in 2010 and 2011 (Figure 2-7). While the exact cause of the increase in legionellosis in 2010 and 2011 has not been conclusively determined, increases in legionellosis may more generally be explained by several factors including changes in local environmental conditions and increased awareness, reporting, and testing for the disease.

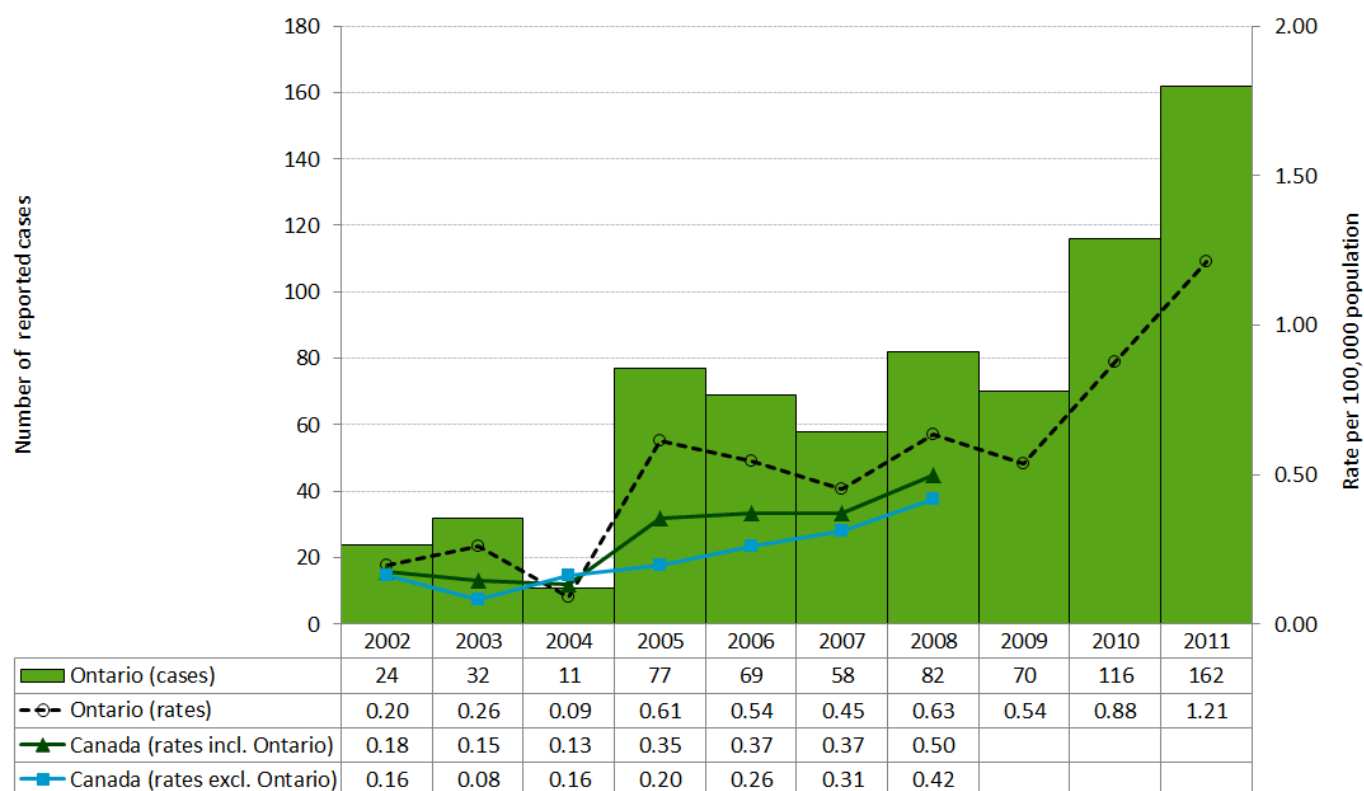
Although annual incidence rates of legionellosis in Canada have been lower than in Ontario, the national rates have also shown a general increasing trend that parallels the increase in incidence in Ontario.

AGE AND SEX DISTRIBUTION

The sex-specific incidence rate for legionellosis in 2011 was almost three times higher for males compared to females. Incidence rates for legionellosis were 1.77 and 0.65 cases per 100,000 population for males and females, respectively (Table 2-9, Figure 2-8). Males accounted for 72% of all legionellosis cases reported in 2011. Overall, cases ranged in age from 28 to 91 years with a median age of 61 years.

The majority of legionellosis cases were among persons aged 50 years and older. Persons in this age range accounted for 83% (133/162) of cases that were reported in 2011. Age-specific incidence rates for both males and females were also highest in this age range. No cases were reported in persons under the age of 20 years and 17% of cases (28/162) occurred among those in the age groups ranging from 20 to 49 years.

Figure 2-7. Incidence of Legionellosis in Ontario and Canada: 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/03/18].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Table 2-9. Incidence of Legionellosis by Age and Sex: Ontario, 2011

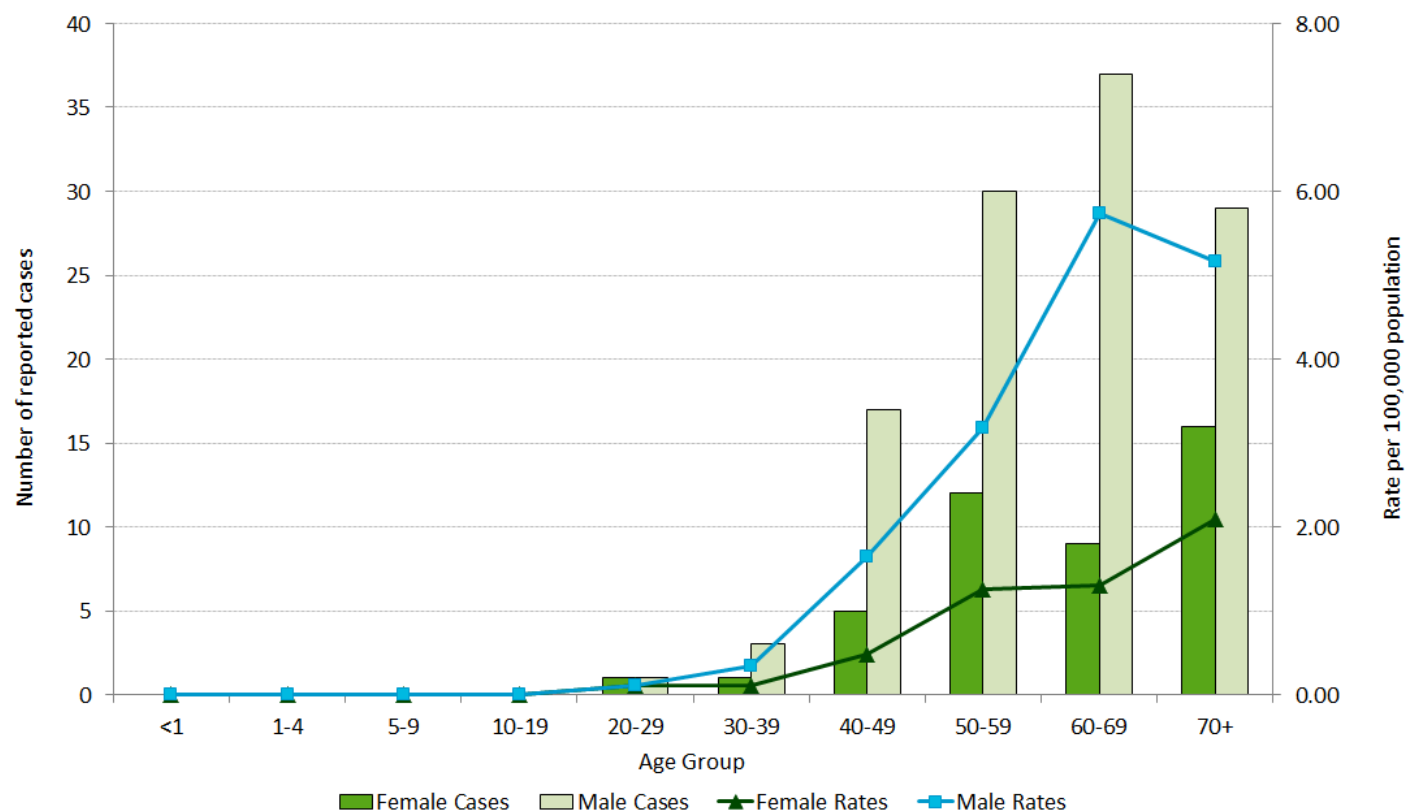
Age Group (Years)	Female		Male		Total	
	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)
<1	0	0.00	0	0.00	0	0.00
1-4	0	0.00	0	0.00	0	0.00
5-9	0	0.00	0	0.00	0	0.00
10-19	0	0.00	0	0.00	0	0.00
20-29	1	0.11	1	0.10	2	0.11
30-39	1	0.11	3	0.34	4	0.22
40-49	5	0.49	17	1.65	22	1.07
50-59	12	1.25	30	3.19	42	2.21
60-69	9	1.31	37	5.73	46	3.45
70+	16	2.10	29	5.16	45	3.40
Total	44	0.65	117	1.77	161	1.20

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/03/18].

Note: Does not include one case with unknown sex.

Figure 2-8. Incidence of Legionellosis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/03/18].

Note: Does not include one case with unknown sex.

HOSPITALIZATIONS AND DEATHS

In 2011, approximately 75% (122/162) of legionellosis cases were hospitalized, and 5% (8/162) of cases were fatal. Illness complicated by pneumonia was reported for 76% (93/122) of hospitalized cases and for 100% (8/8) of cases that died.

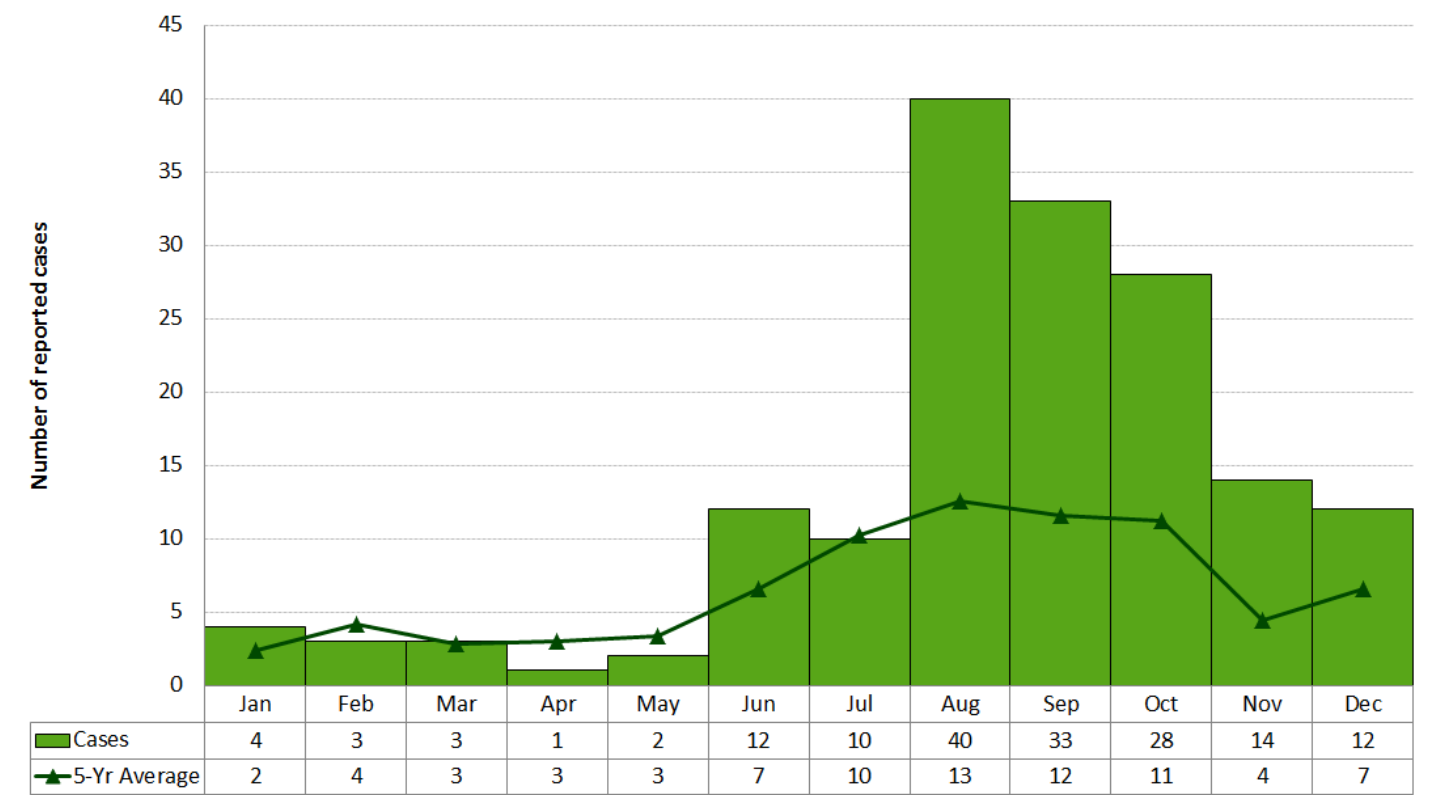
MONTHLY DISTRIBUTION

The incidence of legionellosis is seasonal, with the majority of cases occurring in late summer and fall. In 2011, the incidence of legionellosis peaked from August to October, which together accounted for approximately 62% (101/162) of reported cases (Figure 2-9). Compared to previous years from 2006 to 2010, monthly case counts in 2011 were higher in the latter part of the year.

GEOGRAPHIC DISTRIBUTION

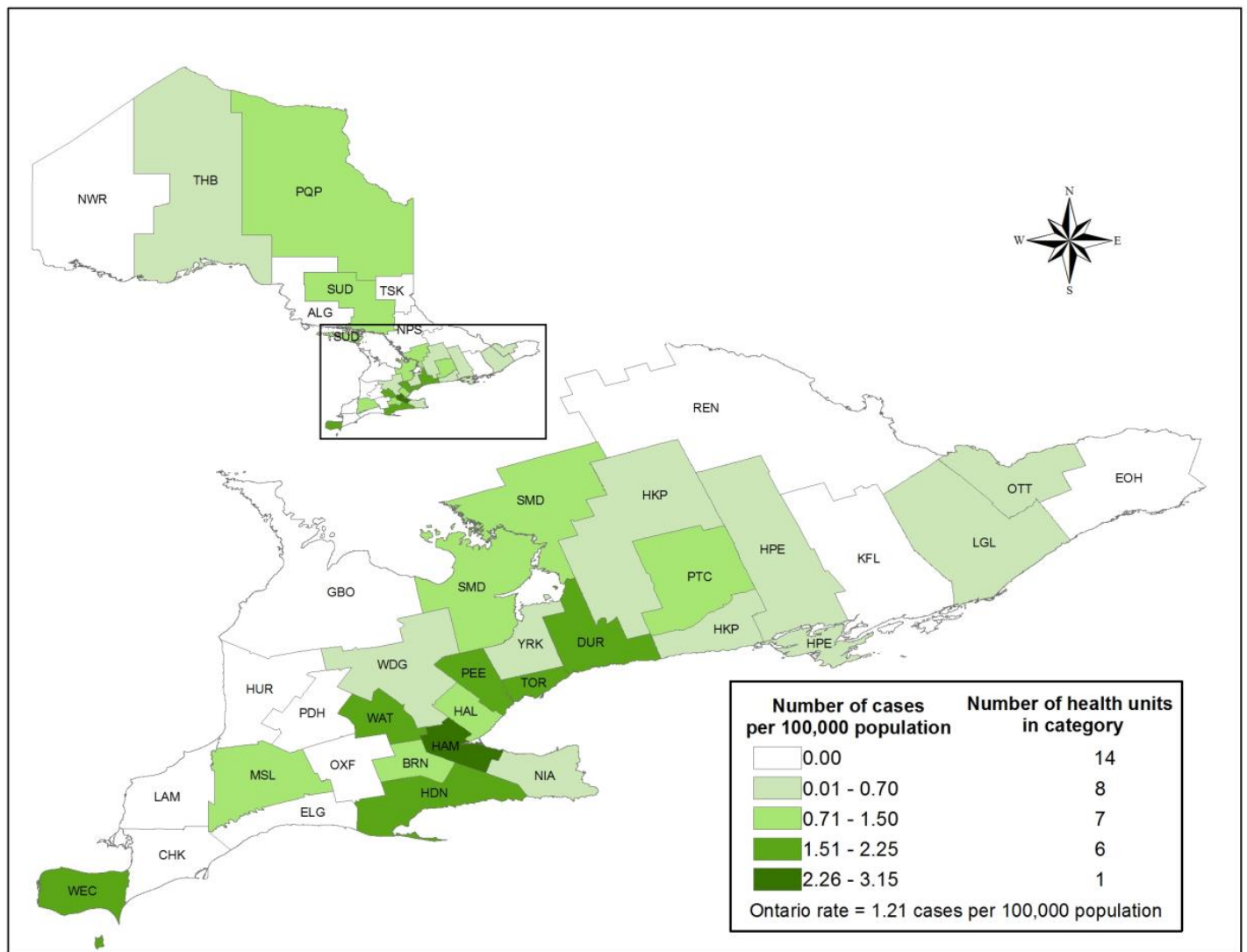
In 2011, the three highest rates of legionellosis were reported by the City of Hamilton which had an incidence rate of 3.15 cases per 100,000, followed by Windsor-Essex County with 2.23 cases per 100,000 population, and Durham Region with 2.22 cases per 100,000 population. Toronto reported the most cases at 54 (33%), accounting for a disproportionate share of cases relative to the size of its population (Map 2-3, Table 2-10). Map 2-3 shows that the highest rates of legionellosis were reported by health units in the Golden Horseshoe area of the province. This geographical distribution of legionellosis cases is similar to previous years. However, the reason for this trend is not fully understood.

Figure 2-9. Number of Legionellosis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Map 2-3. Incidence of Legionellosis by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/03/18].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 2-10. Incidence of Legionellosis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	1	0.71	0.6%	1.1%
Chatham-Kent	0	0.00	0.0%	0.8%
Durham Region	14	2.22	8.6%	4.7%
Eastern Ontario	0	0.00	0.0%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	0	0.00	0.0%	1.2%
Haldimand-Norfolk	2	1.81	1.2%	0.8%
Haliburton, Kawartha, Pine Ridge District	1	0.56	0.6%	1.3%
Halton Region	7	1.35	4.3%	3.9%
Hamilton, City of	17	3.15	10.5%	4.0%
Hastings & Prince Edward Counties	1	0.61	0.6%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	0	0.00	0.0%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	1	0.59	0.6%	1.3%
Middlesex-London	5	1.08	3.1%	3.4%
Niagara Region	1	0.22	0.6%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	0	0.00	0.0%	0.6%
Ottawa, City of	3	0.33	1.9%	6.8%
Oxford County	0	0.00	0.0%	0.8%
Peel Region	21	1.54	13.0%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	1	0.71	0.6%	1.1%
Porcupine	1	1.15	0.6%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	4	0.76	2.5%	3.9%
Sudbury & District	2	1.01	1.2%	1.5%
Thunder Bay District	1	0.64	0.6%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	54	1.97	33.3%	20.5%
Waterloo Region	11	2.07	6.8%	4.0%
Wellington-Dufferin-Guelph	1	0.36	0.6%	2.1%
Windsor-Essex County	9	2.23	5.6%	3.0%
York Region	4	0.37	2.5%	8.0%
Ontario	162	1.21	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/03/18].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Self-reported health related risk factors for legionellosis were reported by more than half (95/162) of legionellosis cases that occurred in 2011. Of those cases, 74% (70/95) reported having a chronic illness or underlying medical condition and 33% (31/95) reported being immuno-compromised. Smoking (59%, 72/122) and recent exposure to aerosolized water (25%, 31) were most frequently reported among non-health related risk factors (Table 2-11).

Table 2-11. Reported Risk Factors for Legionellosis Cases: Ontario, 2011 (n=122)

Risk Factors	Cases	
	Number	Percent
Smoking	72	59.0%
Recent exposure to aerosolized water	31	25.4%
Gardening/disturbing soil	20	16.4%
Alcohol abuse	14	11.5%
Travel outside of Ontario	14	11.5%
Other behavioural risk factors	30	24.6%
Unknown	9	7.4%

Source: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to the sum of risk factors reported as "Other, specify" or "resident of a health care institution". "Unknown" refers to risk factors reported solely as "Unknown".

Severe Acute Respiratory Syndrome (SARS)

Severe acute respiratory syndrome (SARS) is a viral infection, first identified in 2003, belonging to the family *Coronaviridae*.^{1,44} The SARS virus is transmitted from person-to-person through either direct contact or close contact with infectious aerosolized droplets (by coughing or sneezing) or bodily fluids of a confirmed case.¹ Symptoms commonly develop between three to ten days and are characterized by fever, myalgia and malaise, swiftly followed by respiratory distress including shortness of breath and coughing.^{1,44} As the disease progresses, the development of acute respiratory distress is likely.¹

Much of the disease is still not completely understood. SARS is diagnosed through a combination of clinical and epidemiological evidence, along with laboratory testing. While no vaccine is currently available, primary forms of prevention include isolation of cases to avoid transmission of the disease, and early recognition of signs and symptoms of individuals presenting with febrile respiratory illnesses.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Since the 2003 SARS outbreak, there have been no cases identified in Ontario or across the world.¹

Smallpox

Smallpox is a serious and sometimes fatal disease that is caused by the *varola virus*, a member of the genus *Orthopoxvirus*.¹ The disease is characterized by sudden onset of fever, head and body aches, malaise, weakness and occasionally vomiting.¹ These symptoms are followed by a rash that progresses in stages, crusting over after three to four weeks.¹ There is no cure for smallpox and the disease can be fatal in up to 30% of infected persons.⁴⁵

Vaccination campaigns across the world resulted in the successful eradication of smallpox in 1979. However, smallpox is a significant bioterrorism threat.⁴⁶ Canada has a National Smallpox Response Force which has a mandate to respond to and contain any threats resulting from the deliberate release of the smallpox virus.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

There have been no naturally acquired cases of smallpox since 1977.⁴⁷

Tuberculosis

- **There has been no significant change in the number of tuberculosis cases diagnosed in Ontario from 2007 to 2011.**
- **Adults in the 20-29, 30-39 and 70 years and older age groups accounted for a disproportionate share of diagnosed tuberculosis cases in 2011.**
- **The majority of tuberculosis cases diagnosed in 2011 were from Toronto and Peel Region.**
- **Persons born outside of Canada accounted for the majority of tuberculosis cases diagnosed in Ontario in 2011.**

Tuberculosis (TB) is a major cause of disability and death globally, especially in developing countries.¹ Canada has a relatively low incidence rate of TB with the majority of cases attributed to activation of previously acquired infections among foreign-born persons. TB is mainly acquired through the inhalation of airborne droplets produced by persons with active TB. An exposed person may become infected and develop either a latent TB infection (LTBI) or active TB disease.

About 90% of people infected with TB will have LTBI and not develop active disease.¹ LTBI occurs when the bacteria that cause TB remain in a non-infectious dormant stage without any outward signs and symptoms of illness. The onset of active TB disease is variable among people with LTBI. Approximately 90% of people with LTBI never develop active TB disease.¹ However, active TB disease may develop within the first two years in approximately 5% of people, and at a later date for another 5% of persons with newly acquired TB infections. Active TB is infectious and occurs mostly in the form of pulmonary TB (e.g. TB of the lungs). Signs of active TB include cough with or without blood, fatigue, night sweats, fever and weight loss.¹ TB of body sites other than the lungs can also occur and these infections are referred to as extra-pulmonary TB.

Extra-pulmonary TB is usually non-infectious.^{1,48}

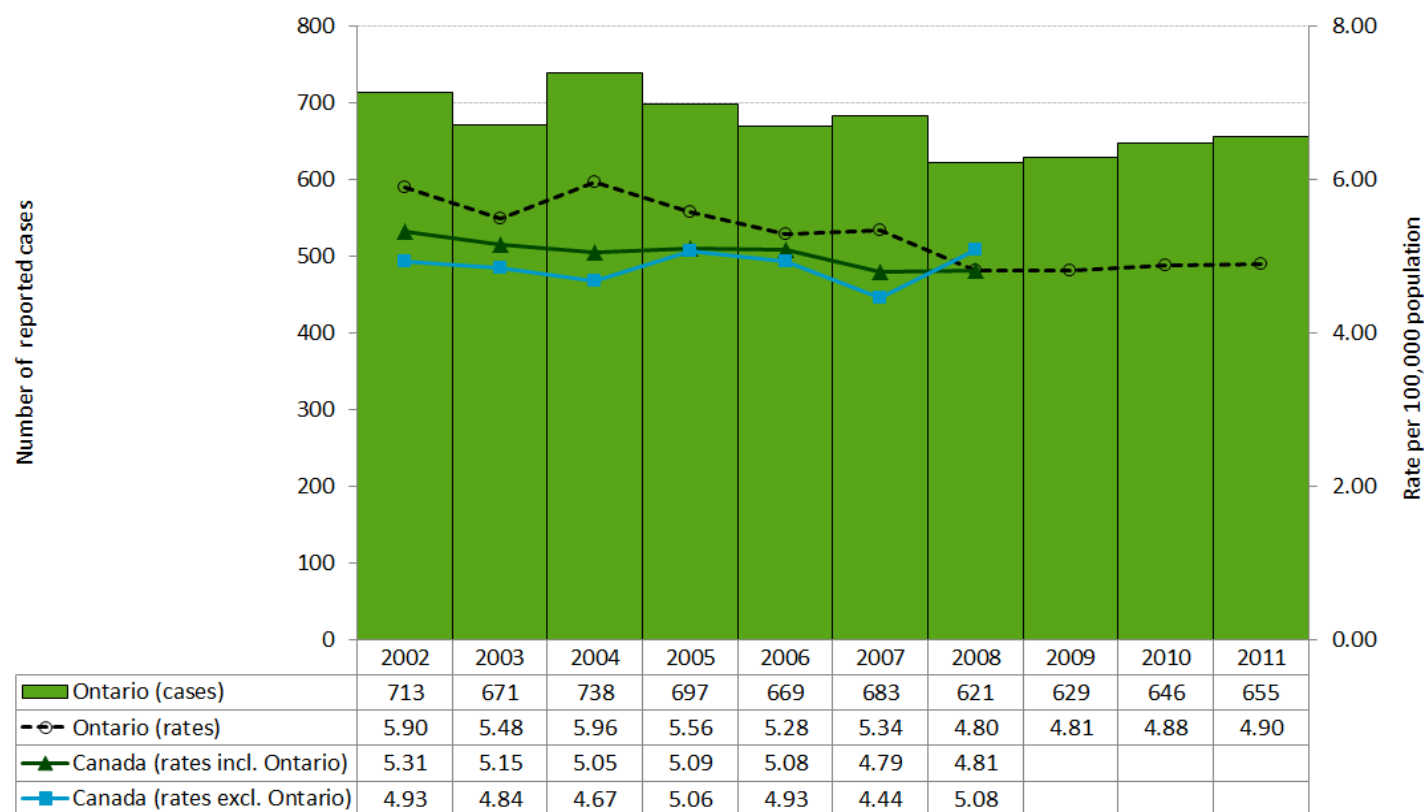
Susceptibility to TB is universal. However, certain people are at greater risk of developing active disease. Children under the age of five years, the elderly, young adults, and persons with compromised immune response including those with HIV and other chronic conditions are especially vulnerable.¹ Prompt diagnosis and treatment of LTBI is the most effective means of preventing active TB in infected individuals.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

A total of 655 active cases of tuberculosis were diagnosed in Ontario in 2011, representing an incidence rate of 4.90 cases per 100,000 population (Figure 2-10). The number of cases diagnosed in 2011 was slightly higher than the 646 cases diagnosed in 2010 (4.88 cases per 100,000 population). Over the ten-year period from 2002 to 2011, the incidence rate of tuberculosis declined. The incidence rate of TB in 2002 was 5.90 cases per 100,000 population, which is 17% higher than the 2011 rate of 4.90 cases per 100,000 population.

With the exception of 2008, annual incidence rates for tuberculosis for the rest of Canada were lower in comparison to the corresponding rates for Ontario for the period 2002 to 2008. Incidence rates at the national level ranged from 4.79 cases per 100,000 population in 2007 to 5.31 cases per 100,000 population in 2002. Higher incidence rates in Ontario are likely reflective of migration patterns that see a larger share of newcomers from TB endemic countries settling in the province.²²

Figure 2-10. Incidence of Tuberculosis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

AGE AND SEX DISTRIBUTION

In 2011, the overall sex-specific incidence rates of tuberculosis for males and females were approximately equal at 4.93 and 4.87 cases per 100,000 population, respectively (Table 2-12, Figure 2-11). Cases ranged in age from one to 93 years, with a median age of 44 years; females (330) and males (325) accounted for a similar proportion of cases at 50%. However, rates were higher in females in the age groups from 20 to 39 years and for males over the age of 50 years.

Young adults in the 20-29 and 30-39 age groups, and older adults aged 70 years and older, accounted for a disproportionate number of diagnosed TB cases in 2011 (Table 2-12, Figure 2-11). The corresponding incidence rates were also highest in these age groups, with rates ranging from 24% to 97% higher than the overall rate for Ontario.

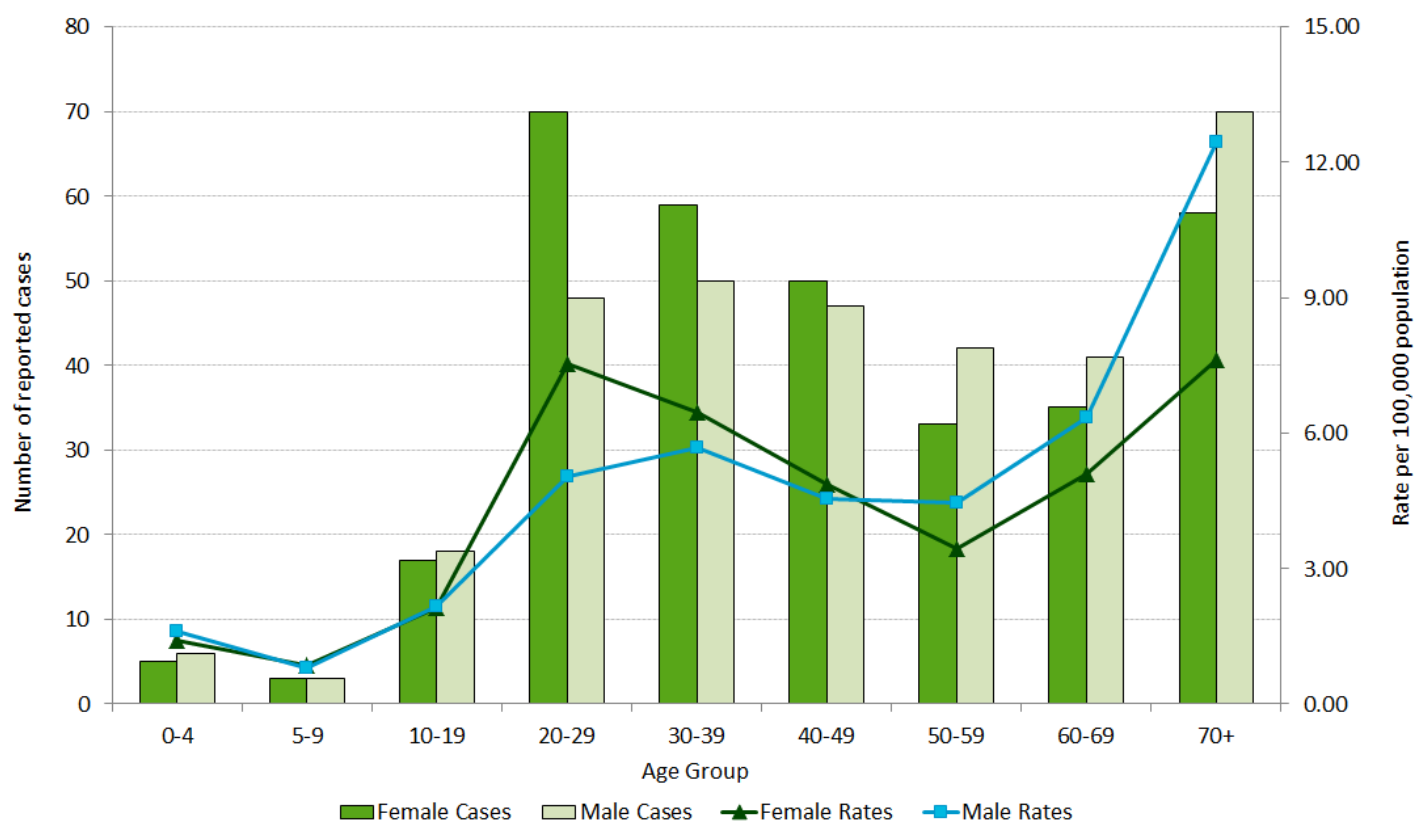
Table 2-12. Incidence of Tuberculosis by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	5	1.42	6	1.62	11	1.52
5-9	3	0.85	3	0.80	6	0.82
10-19	17	2.13	18	2.15	35	2.14
20-29	70	7.55	48	5.04	118	6.28
30-39	59	6.46	50	5.68	109	6.08
40-49	50	4.85	47	4.56	97	4.70
50-59	33	3.45	42	4.46	75	3.95
60-69	35	5.09	41	6.35	76	5.70
70+	58	7.62	70	12.46	128	9.67
Total	330	4.87	325	4.93	655	4.90

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Figure 2-11. Incidence of Tuberculosis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

HOSPITALIZATIONS AND DEATHS

Hospitalizations were reported for 30% (196/655) of tuberculosis cases diagnosed in 2011. The median age of hospitalized case was 51 years and there were more males (117) than females (79) among them. In 2011, thirty-eight (6%) deaths were reported among tuberculosis cases.

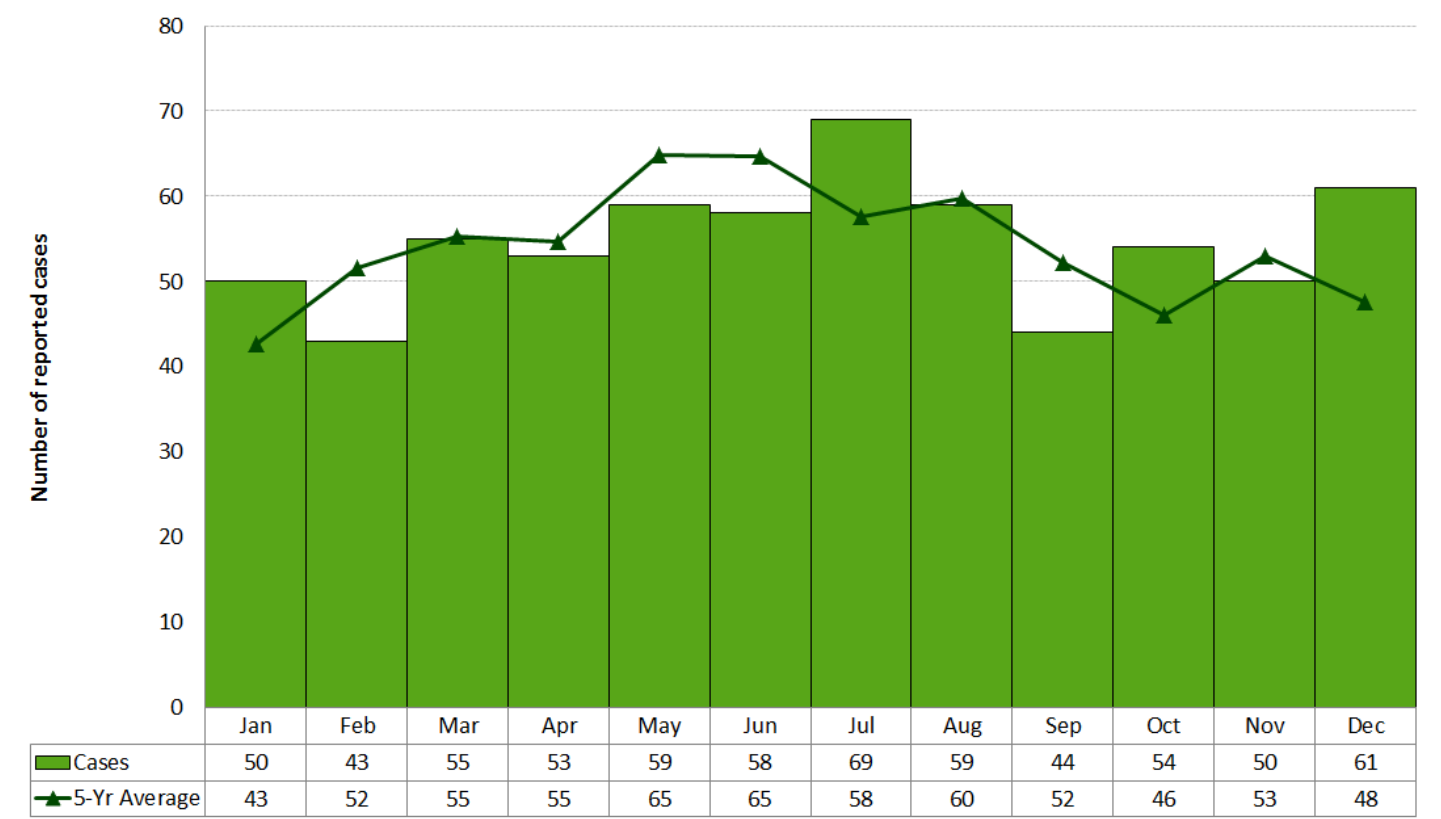
MONTHLY DISTRIBUTION

Tuberculosis occurs throughout the year without any distinct seasonal pattern. Cases were evenly distributed throughout 2011 (Figure 2-12), with a monthly average of 55 diagnosed cases.

GEOGRAPHIC DISTRIBUTION

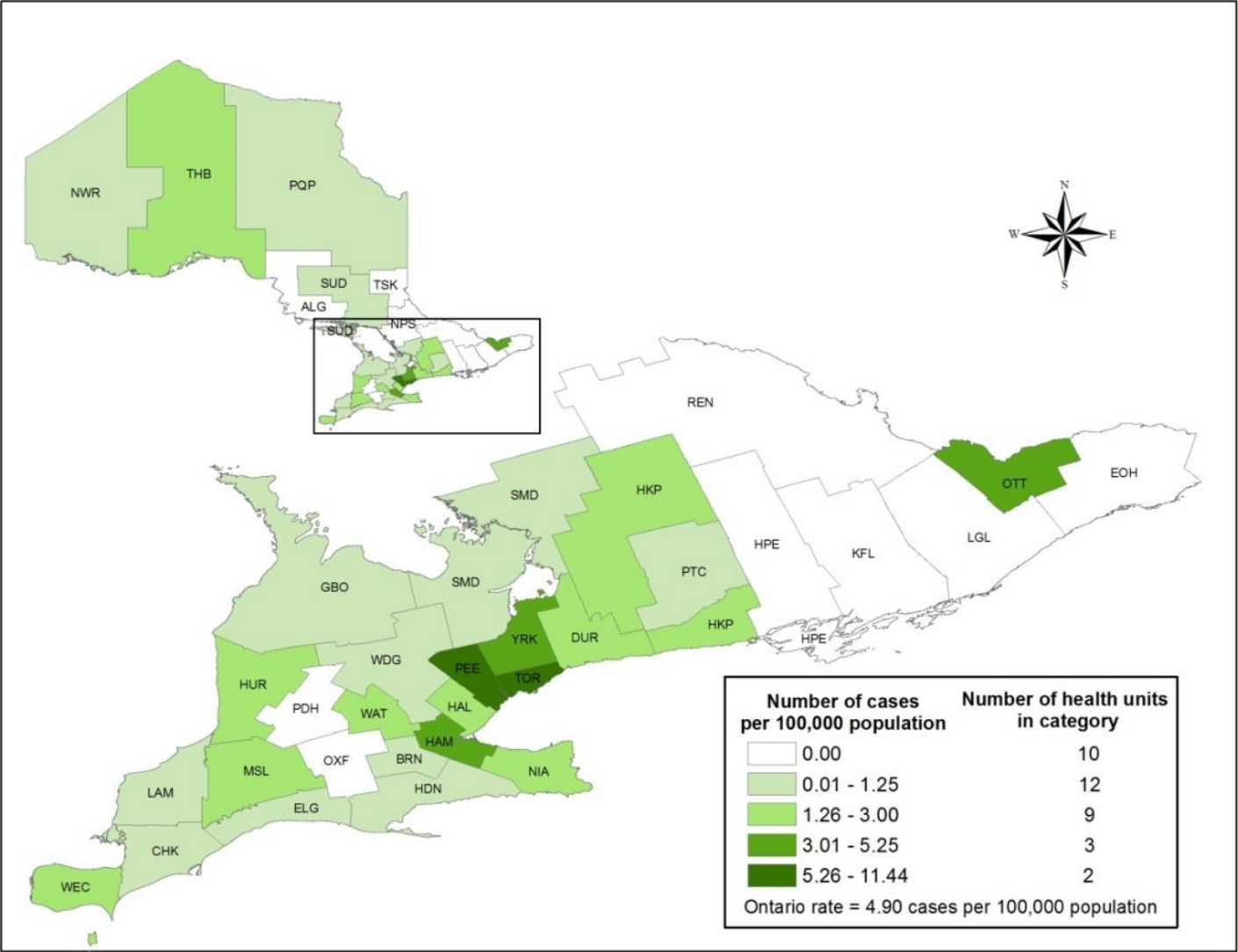
The majority (26/36) of health units in Ontario had at least one diagnosed case of tuberculosis in 2011 (Map 2-4, Table 2-13). Although Toronto (314 cases) and Peel Region (141 cases) accounted for 31% of the Ontario population in 2011, combined they accounted for 70% (455/655) of tuberculosis cases diagnosed in Ontario in 2011. The corresponding incidence rates of tuberculosis for Toronto and Peel Region were also the highest in the province at 11.44 and 10.32 cases per 100,000 population, respectively. This disproportionate share of cases may be explained by migration patterns whereby new immigrants favour larger urban centers to suburban and rural areas of the province.²²

Figure 2-12. Number of Tuberculosis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 2-4. Incidence of Tuberculosis by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 2-13. Incidence of Tuberculosis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	1	0.71	0.2%	1.1%
Chatham-Kent	1	0.92	0.2%	0.8%
Durham Region	13	2.06	2.0%	4.7%
Eastern Ontario	0	0.00	0.0%	1.5%
Elgin-St. Thomas	1	1.09	0.2%	0.7%
Grey Bruce	1	0.61	0.2%	1.2%
Haldimand-Norfolk	1	0.90	0.2%	0.8%
Haliburton, Kawartha, Pine Ridge District	3	1.68	0.6%	1.3%
Halton Region	12	2.31	1.7%	3.9%
Hamilton, City of	18	3.33	2.6%	4.0%
Hastings & Prince Edward Counties	0	0.00	0.0%	1.2%
Huron County	1	1.66	0.2%	0.5%
Kingston-Frontenac & Lennox & Addington	0	0.00	0.0%	1.5%
Lambton County	1	0.76	0.2%	1.0%
Leeds, Grenville and Lanark District	0	0.00	0.0%	1.3%
Middlesex-London	7	1.52	0.9%	3.4%
Niagara Region	7	1.57	1.1%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	1	1.22	0.2%	0.6%
Ottawa, City of	47	5.17	7.3%	6.8%
Oxford County	0	0.00	0.0%	0.8%
Peel Region	141	10.32	21.8%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	1	0.71	0.2%	1.1%
Porcupine	1	1.15	0.2%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	2	0.38	0.3%	3.9%
Sudbury & District	1	0.51	0.2%	1.5%
Thunder Bay District	3	1.92	0.5%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	314	11.44	47.5%	20.5%
Waterloo Region	12	2.26	2.0%	4.0%
Wellington-Dufferin-Guelph	2	0.72	0.3%	2.1%
Windsor-Essex County	10	2.48	1.5%	3.0%
York Region	53	4.95	8.2%	8.0%
Ontario	655	4.90	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

Of tuberculosis cases diagnosed in 2011, 94% (613/655) reported at least one risk factor for acquiring tuberculosis (Table 2-14). The majority of cases (89%) reported having previously lived in an endemic area for greater than six months. Having a chronic or underlying medical condition (24%) was the second most frequently reported risk factor, with diabetes being the most common condition (45%, 65/145 cases). In 2011, 3% (18/655) of tuberculosis cases were co-infected with HIV/AIDS.

COUNTRY OF ORIGIN

Individuals born outside of Canada accounted for the largest proportion of tuberculosis cases diagnosed in Ontario in 2011 (88%, 575/655 cases). The top five countries of birth for tuberculosis cases diagnosed from 2007 to 2011 were India (20%), the Philippines (15%), China (11%), Vietnam (6%) and Pakistan (5%) (Table 2-15).

Table 2-14. Reported Risk Factors for Tuberculosis Cases: Ontario, 2011 (n=613)

Risk Factors	Cases	
	Number	Percent
Lived in an endemic area > 6 months	545	88.9
Chronic or underlying medical condition	145	23.7
Travel to endemic area	98	16.0
Known contact with a confirmed case	80	13.1
Smoker	73	11.9
Granuloma on chest x-ray)	33	5.4
Substance use	26	4.2
Homeless, under housed or lived in a shelter	26	4.2
Private residence	25	4.1
Other	104	17.0
Unknown	4	0.6

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. "Other" refers to the sum of risk factors reported as "Other, specify" and risk factors with frequency <3%. "Unknown" refers to risk factors reported solely as "Unknown".

Table 2-15. Tuberculosis Cases by Diagnosis Year and Country of Birth: Ontario, 2007-2011

Birth Country	Diagnosis Year					Total
	2007	2008	2009	2010	2011	
Born Outside Canada						
India	109	105	121	115	117	567
Philippines	70	88	87	81	89	415
China	72	59	57	56	55	299
Vietnam	32	37	28	42	37	176
Pakistan	38	27	17	25	25	132
Sri Lanka	29	22	12	21	24	108
Somalia	20	26	20	18	18	102
Hong Kong	19	13	13	17	13	75
Ethiopia	12	10	15	12	11	60
Bangladesh	15	8	11	14	7	55
Other	187	150	162	173	174	846
Unknown	0	5	1	0	5	11
Sub Total	603	550	544	574	575	2,846
Born in Canada						
Inuit	1	2	1	1	4	9
Non-Aboriginal	48	53	69	52	58	280
Registered/Status Indian and other Aboriginals	13	7	9	5	7	41
Sub Total	62	62	79	58	69	330
No Birth information available	18	9	6	14	11	58
Sub Total	18	9	6	14	11	58
Total	683	621	629	646	655	3,234

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Note: Registered/Status Indian may include cases that are classified as 'other aboriginal'; unknown includes cases born outside of Canada but for which the country of birth is not provided or is unknown.

Section 3

Sexually transmitted and blood-borne infections

Overview

Sexually transmitted and blood-borne infections (STBBIs) account for the greatest proportion of cases of all reportable diseases in Ontario. In 2011, 71% of reportable diseases were attributed to STBBIs, with chlamydia accounting for almost 80% of these infections. The incidence of the sexually transmitted bacterial infections, chlamydia, gonorrhea and infectious syphilis, increased over the ten year period from 2002 to 2011. In comparison, the incidence of viral blood-borne infections such as hepatitis B and C and HIV/AIDS decreased over the same time period.

In Ontario, increased testing has contributed to the reported increases in the incidence of chlamydia and

gonorrhea. Similar to other provinces in Canada, elevated incidence rates of infectious syphilis have been reported in Ontario since 2009, primarily due to an outbreak among men who have sex with men (MSM). The top reported risk factors for STBBIs, excluding hepatitis C, are MSM, lack of condom use and/or having new or multiple sex partners. For hepatitis C, injection drug use is the most frequently reported risk factor. Although less common, transmission of STBBIs from mother to child has also been reported, with the majority of these cases due to infection with group B streptococcus.

Several quick reference data tables for the diseases covered in this section are included in Appendix 4.

Chancroid

Chancroid is an acute sexually transmitted bacterial infection that occurs very rarely in temperate regions.¹ Symptoms commonly develop between three to five days after sexual contact with an infected person, but can appear after up to 14 days.¹ The resulting infection is localized to the genital area and presents as a single or multiple painful ulcers with pus that may be accompanied by painful and swollen lymph nodes.¹

Chancroid can be prevented through consistent condom use when engaging in sexual activity with partner(s) unknown to be without infection.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Chancroid is very rare in Canada. Since 1997, no new cases have been reported in Ontario.

- **The number of reported chlamydia cases, and corresponding incidence rates, increased from 2002 to 2011 in Ontario.**
- **Incidence rates of chlamydia in Ontario in 2011 were highest among females and among those aged 15 to 24 years.**
- **The most frequently reported risk factors were lack of condom use, sex with the opposite sex and new sexual contacts within the last two months.**

Chlamydia infections are caused by the bacterium *Chlamydia trachomatis*.¹ Transmission occurs primarily through sexual contact, including oral, vaginal and anal sex. In some cases, infected pregnant females can transmit the bacteria to their child through birth.¹

The development of symptoms usually occurs seven to 14 days after exposure to the bacteria. However infected individuals are often asymptomatic, with up to 70% of females and up to 50% of males experiencing no symptoms at all.¹ When present, symptoms may include unusual vaginal discharge or bleeding, urethral bleeding, painful urination, and lower abdominal pain.^{1,49} Left untreated, chlamydia infections can in some instances lead to long-term complications such as pelvic inflammatory disease, ectopic pregnancy and infertility in females; and epididymitis, sterility and Reiter syndrome in males. When transmitted from mother to child during delivery, chlamydia can result in eye infections (ophthalmia neonatorum) in neonates, and pneumonia in infants less than six months of age.¹ Data on the incidence of ophthalmia neonatorum in Ontario are presented in a separate chapter.

Chlamydia can be treated and cured with antibiotics. Condom use during sexual activity reduces the risk of transmission of chlamydia, as well as early diagnosis and treatment of infected persons.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Chlamydia is the most frequently reported sexually transmitted infection (STI) and the most frequently reported reportable disease in Ontario. In 2011, there were 36,343 confirmed cases of chlamydia in Ontario, which accounted for 85% of all reported sexually transmitted and blood-borne infections. This represents an incidence rate of 271.79 cases per 100,000 population, and an increase of seven percent compared to the incidence rate in 2010 (Figure 3-1).

The incidence of chlamydia in Ontario has been steadily increasing (Figure 3-1). From 2002 to 2011, the incidence rate increased 79%, from 151.90 to 271.79 cases per 100,000 population. The increase may be partly explained by changes in screening practices and advances in testing methods which have led to increased testing. Despite this observed increase, chlamydia is still under-reported in large part due to the occurrence of asymptomatic cases.

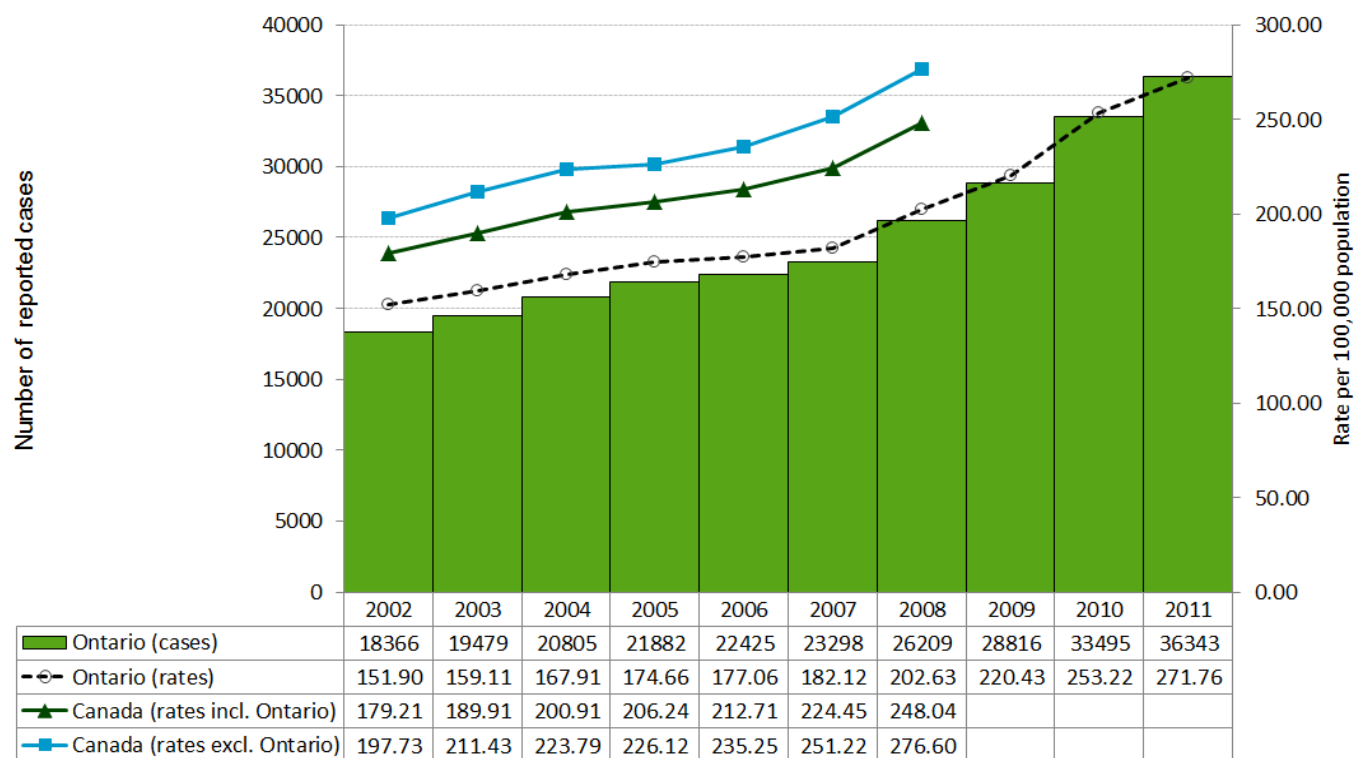
Between 2002 and 2011, annual incidence rates of chlamydia in Canada were consistently higher than the provincial rate, even when Ontario data are excluded from the overall Canadian rate.

AGE AND SEX DISTRIBUTION

The incidence rate of chlamydia in 2011 was higher for females compared to males at 346.20 versus 194.19 cases per 100,000 population, respectively. The highest incidence rates for both males and females were observed in the 20-24 year age group, which had an overall rate of 1,443.54 cases per 100,000 population. Incidence rates of chlamydia decreased with increasing age for both males and females starting at age 25 years (Table 3-1, Figure 3-2).

Females accounted for 65% of reported cases and had an incidence rate that was 78% higher than males, which may be a result of the greater likelihood of chlamydia screening and detection in females during routine medical care.

Figure 3-1. Incidence of Chlamydia in Ontario and Canada: 2002-2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Table 3-1. Incidence of Chlamydia by Age and Sex: Ontario, 2011

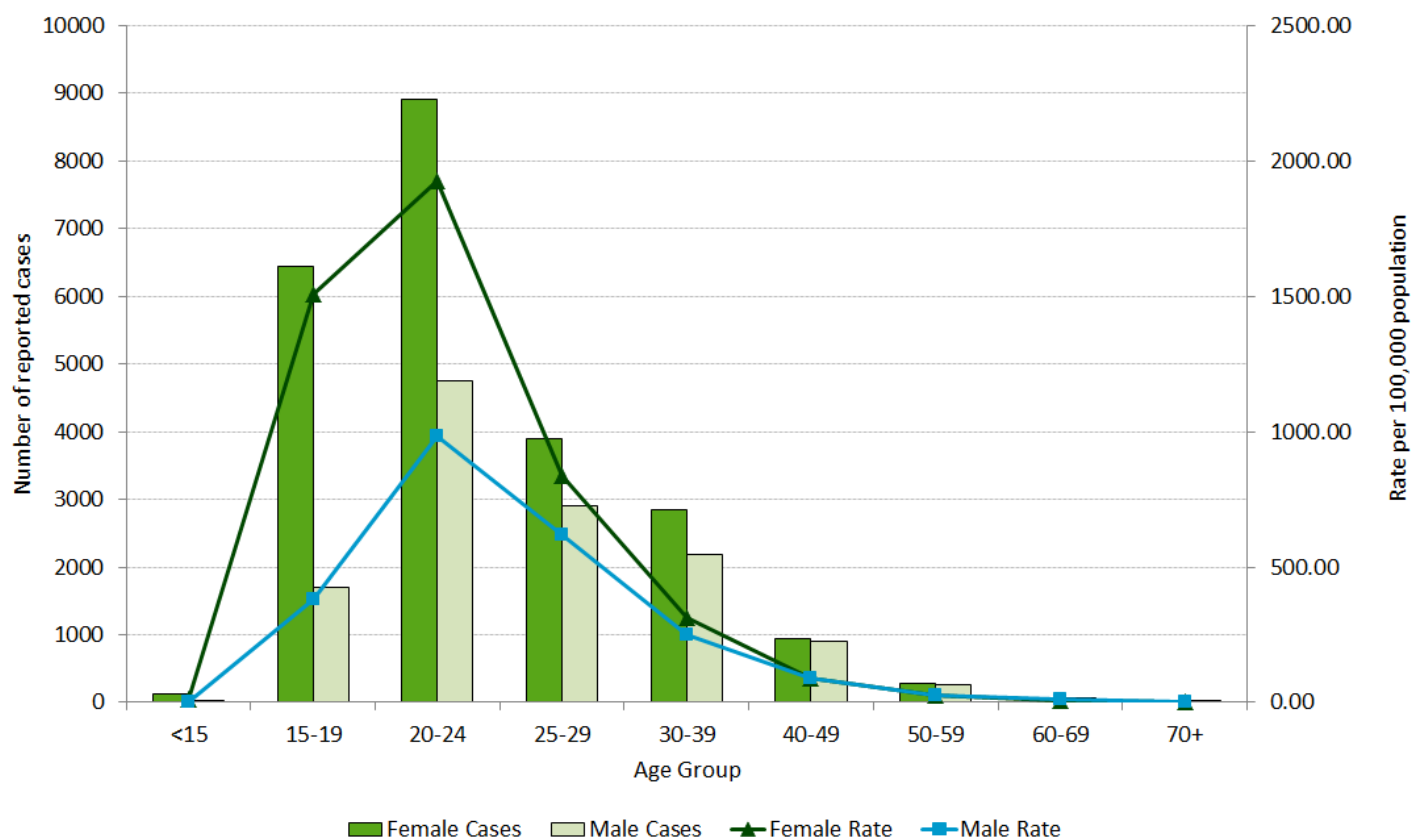
Age Group (Years)	Female		Male		Total	
	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)
<15	122	11.3	16	1.4	138	6.2
15-19	6,442	1,509.9	1,693	379.4	8,135	932.0
20-24	8,905	1,927.1	4,760	982.4	13,665	1,443.5
25-29	3,897	837.5	2,903	620.0	6,800	728.4
30-39	2,842	311.3	2,188	248.7	5,030	280.6
40-49	940	91.2	906	87.8	1,846	89.5
50-59	275	28.7	257	27.3	532	28.0
60-69	46	6.7	66	10.2	112	8.4
70+	5	0.7	13	2.3	18	1.4
Total	23,474	346.2	12,802	194.2	36,276	271.3

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes 67 cases of unknown age and/or sex.

Figure 3-2. Incidence of Chlamydia by Age and Sex: Ontario, 2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes 67 cases of unknown age and/or sex.

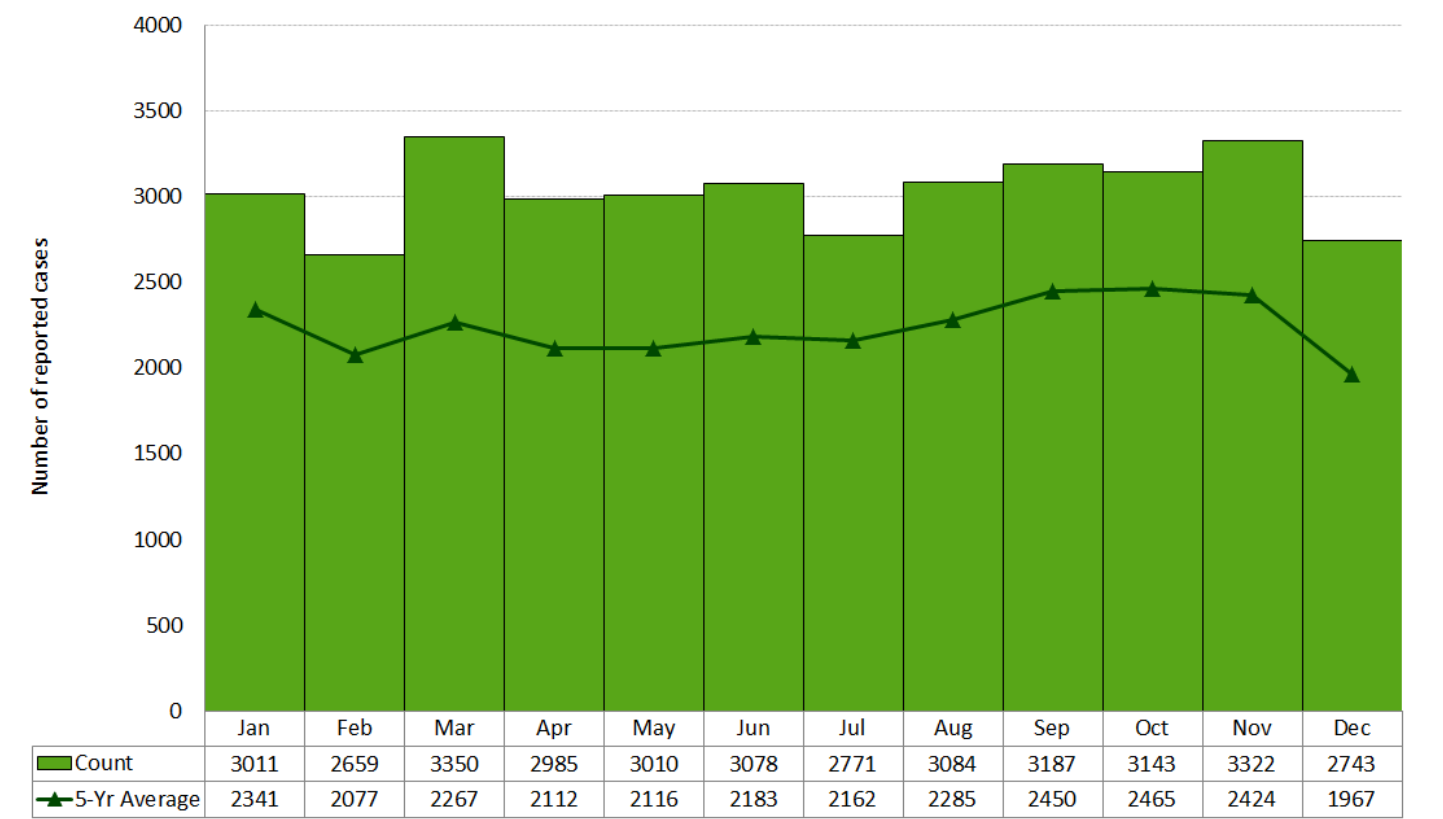
MONTHLY INCIDENCE

In 2011, chlamydia did not follow any discernible seasonal pattern, with case counts and rates that were consistent from month to month throughout the year (Figure 3-3). Monthly case counts in all months of 2011 were higher than the five year monthly average case counts from 2006 to 2010. This is consistent with the steadily increasing trend in incidence in Ontario.

GEOGRAPHIC DISTRIBUTION

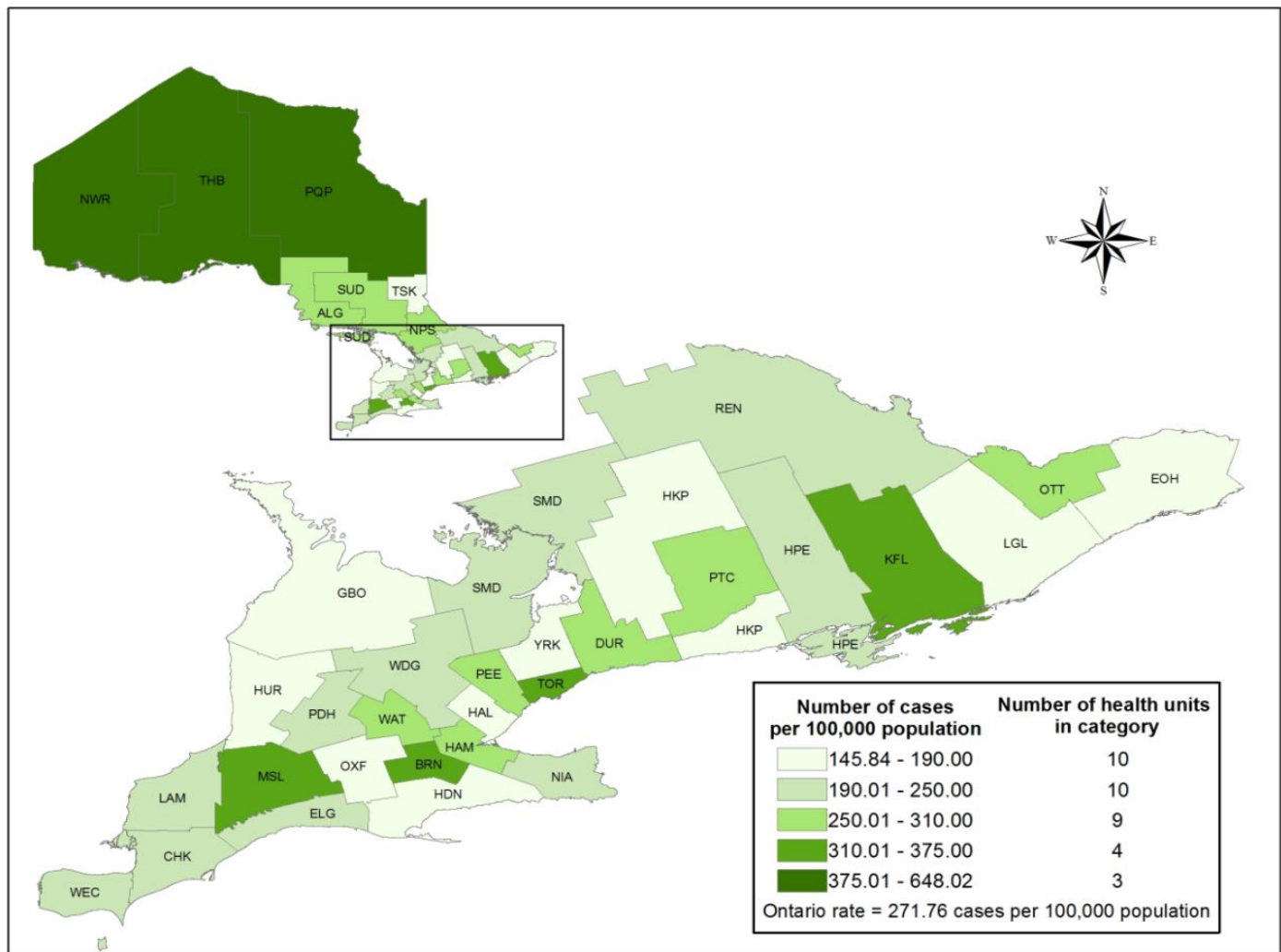
In 2011, cases of chlamydia were reported in all 36 Ontario health units (Map 3-1, Table 3-2). The highest rates of chlamydia were reported by the northern health units. Northwestern reported the highest incidence rate of chlamydia in Ontario in 2011, followed by Porcupine and Thunder Bay District. Rates in these health units were 648.02, 483.27 and 460.56 cases per 100,000 population, respectively. Toronto reported the highest number of cases (9,829 cases), accounting for 27% of chlamydia cases reported province-wide in 2011. The second and third highest number of cases were reported by Peel Region (3,671, 10%) and City of Ottawa (2,525, 7%).

Figure 3-3. Number of Chlamydia Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Map 3-1. Incidence of Chlamydia by Health Unit of Residence: Ontario, 2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 3-2. Incidence of Chlamydia by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	319	270.77	0.9%	0.9%
Brant County	522	370.70	1.4%	1.1%
Chatham-Kent	254	233.93	0.7%	0.8%
Durham Region	1,713	271.36	4.7%	4.7%
Eastern Ontario	340	169.05	0.9%	1.5%
Elgin-St. Thomas	185	202.37	0.5%	0.7%
Grey Bruce	262	158.94	0.7%	1.2%
Haldimand-Norfolk	195	176.14	0.5%	0.8%
Haliburton, Kawartha, Pine Ridge District	287	160.33	0.8%	1.3%
Halton Region	818	157.71	2.3%	3.9%
Hamilton, City of	1,640	303.57	4.5%	4.0%
Hastings & Prince Edward Counties	406	249.52	1.1%	1.2%
Huron County	88	145.84	0.2%	0.5%
Kingston-Frontenac & Lennox & Addington	680	344.59	1.9%	1.5%
Lambton County	274	208.50	0.8%	1.0%
Leeds, Grenville and Lanark District	301	176.89	0.8%	1.3%
Middlesex-London	1,487	322.66	4.1%	3.4%
Niagara Region	1,053	236.44	2.9%	3.3%
North Bay Parry Sound District	392	307.89	1.1%	1.0%
Northwestern	531	648.02	1.5%	0.6%
Ottawa, City of	2,525	277.51	6.9%	6.8%
Oxford County	189	174.63	0.5%	0.8%
Peel Region	3,671	268.77	10.1%	10.2%
Perth District	161	208.74	0.4%	0.6%
Peterborough County-City	401	285.32	1.1%	1.1%
Porcupine	419	483.27	1.2%	0.6%
Renfrew County & District	244	236.99	0.7%	0.8%
Simcoe Muskoka District	1,075	204.57	3.0%	3.9%
Sudbury & District	589	297.92	1.6%	1.5%
Thunder Bay District	721	460.56	2.0%	1.2%
Timiskaming	65	188.68	0.2%	0.3%
Toronto	9,829	358.23	27.0%	20.5%
Waterloo Region	1,375	259.31	3.8%	4.0%
Wellington-Dufferin-Guelph	626	224.81	1.7%	2.1%
Windsor-Essex County	877	217.40	2.4%	3.0%
York Region	1,829	170.97	5.0%	8.0%
Ontario	36,343	271.76	100.0%	100.0%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

In 2011, 68% (24,614/36,343) of cases reported at least one risk factor. The top three risk factors reported were no condom use at 75%, sex with opposite sex at 51% and new contact in past two months at 17% (Table 3-3).

Table 3-3. Reported Risk Factors for Chlamydia Cases: Ontario, 2011

Risk factors	Male		Female		Total	
	Cases (n=8,761)	Percent (%)	Cases (n=15,853)	Percent (%)	Cases (n=24,614)	Percent (%)
No condom used	6,600	75.3%	11,923	75.2%	18,523	75.3%
Sex with opposite sex	4,136	47.2%	8,441	53.2%	12,577	51.1%
New contact in past 2 months	1,694	19.3%	2,373	15.0%	4,067	16.5%
More than one sex contact in past 6 months	1,832	20.9%	2,089	13.2%	3,921	15.9%
Condom breakage	452	5.2%	603	3.8%	1,055	4.3%
Alcohol or drug use prior to engaging in sexual activity	412	4.7%	477	3.0%	889	3.6%
Sex with same sex	668	7.6%	199	1.3%	867	3.5%
Other	1,599	18.3%	2,675	16.9%	4,274	17.4%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Note: Cases may report more than one risk factor. "Other" includes but is not limited to: anonymous sex, travel, sex trade worker, sex with sex trade worker, shared sex toys, and born to an infected mother.

Cytomegalovirus Infection, Congenital

Cytomegalovirus (CMV) is a common infection that can affect people of all ages. During pregnancy, it may be transmitted from mother to child. Although most infections in infants (between 90% and 95%) do not result in any health problems, up to 10% of infants can develop a severe form of the disease known as congenital CMV.¹ In Ontario, only congenital cases of CMV are reportable.

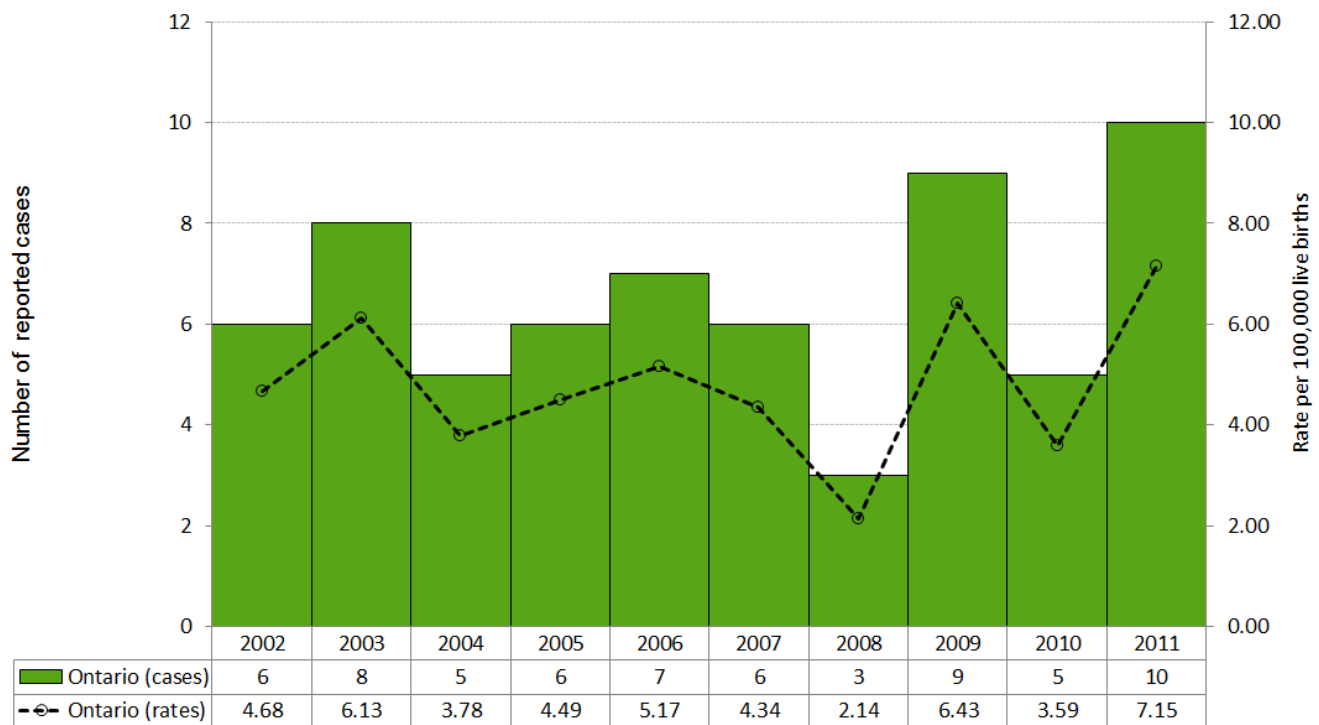
Manifestations of congenital CMV that may be present at birth include enlarged liver and spleen, lung problems, small size partly due to premature birth, and seizures. Chronic problems due to CMV infection such as hearing and vision loss, developmental disabilities, lack of coordination and seizures can develop up to two or more years after birth. The neonatal death rate is high for severely affected infants.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, ten cases of congenital CMV were reported in Ontario, corresponding to an incidence rate of 7.15 cases per 100,000 live births (Figure 3-4). The number of cases reported in 2011 also represented a 100% increase over the 2010 total of five cases. From 2002 to 2011, 65 cases of congenital CMV were reported in Ontario, with annual incidence rates ranging from 2.14 (2008) to 7.15 (2011) cases per 100,000 live births.

No comparable national data are available as congenital CMV infections are not nationally notifiable.

Figure 3-4. Incidence of Congenital Cytomegalovirus: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/05]; rates are per/100,000 live births.

Canadian Rates: Congenital CMV is not a nationally notifiable disease.

Gonorrhea

- **From 2002 to 2011, annual incidence rates of gonorrhea in Ontario increased by 23%.**
- **Rates of gonorrhea were higher among males and among those in the 20-24 years age group.**
- **The highest incidence rates of gonorrhoea in 2011 were observed in the three most northern health units and Toronto.**
- **The most commonly reported risk factor for gonorrhea infections in 2011 was no condom use.**

Gonorrhea is caused by *Neisseria gonorrhoeae* bacteria that infect mucous membranes that line the vagina, cervix, urethra, oropharynx, rectum and conjunctiva.¹ Similar to chlamydia, transmission primarily occurs through sexual activity, including vaginal, anal and oral sex. Mother-to-child transmission may also occur during childbirth.¹

Symptoms of gonorrhea infection can appear up to 14 days after initial infection.¹ Both males and females with gonorrhea infection may be symptom free,⁵⁰ though the majority of males will have symptoms.¹ The most common symptoms among men include urethral discharge, inflammation of the urethra, and pain or discomfort during urination. The most common symptoms among women are unusual vaginal discharge or bleeding, painful urination, abdominal pain, and pain during intercourse.¹ Gonorrhea infections can be transmitted even if an individual does not have any symptoms.¹ When transmitted from an infected mother during childbirth, *N. gonorrhoeae* can cause ophthalmia neonatorum, an acute infection of the eyes that can lead to blindness in newborns.¹ Data on the incidence of ophthalmia neonatorum in Ontario are presented in a separate chapter.

Individuals at higher risk of infection include sexually active youth under the age of 25 years, those who have

sex with multiple partners, men who have sex with men, and those previously diagnosed with a sexually transmitted infection (STI).⁵⁰ Gonorrhea is preventable through condom use and can be treated with antibiotics; however, resistance to certain antibiotics has been observed resulting in recent changes to treatment regimens.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Among provincially reportable diseases, gonorrhea is the second most frequently reported STI in Ontario (second to chlamydia). In 2011, there were 4,196 reported cases in Ontario (Figure 3-5), of which 1,408 (34%) were co-infected with chlamydia. The incidence rate of gonorrhea in 2011 was 31.38 cases per 100,000 population, which was five percent higher than the rate of 29.97 cases per 100,000 reported in 2010 (Figure 3-5).

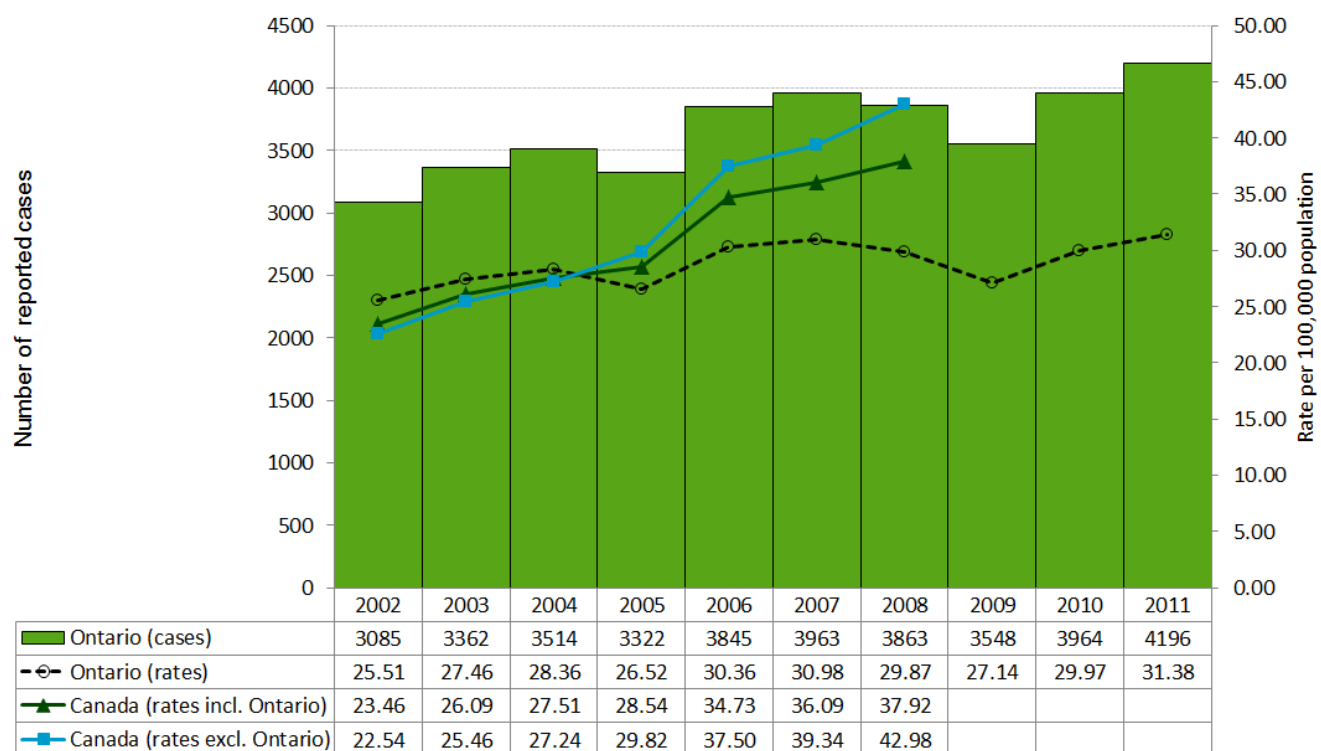
From 2002 to 2011, the incidence rate of gonorrhea increased 23%, from 25.51 cases to 31.38 cases per 100,000 population, respectively.

Ontario incidence rates for gonorrhea were higher than the overall Canadian rates from 2002 to 2004, but were consistently lower than the national rates from 2005 to 2008 (Figure 3-5). In addition, annual rates of increase at the national level were higher compared to Ontario during the latter period.

AGE AND SEX DISTRIBUTION

In 2011, the incidence rate of gonorrhea was higher for males compared to females, with 36.33 versus 26.46 cases per 100,000 population, respectively (Table 3-4, Figure 3-6). Males and females in the 20-24 age group had the highest rates of gonorrhea in 2011. The highest incidence rates for males were observed among those 25 years and older, while the highest incidence rates for females were observed among those under 25 years of age. The higher incidence of gonorrhea among males may be attributed in part to transmission among men who have sex with men.

Figure 3-5. Incidence of Gonorrhea in Ontario and Canada: 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Table 3-4. Incidence of Gonorrhea by Age and Sex: Ontario, 2011

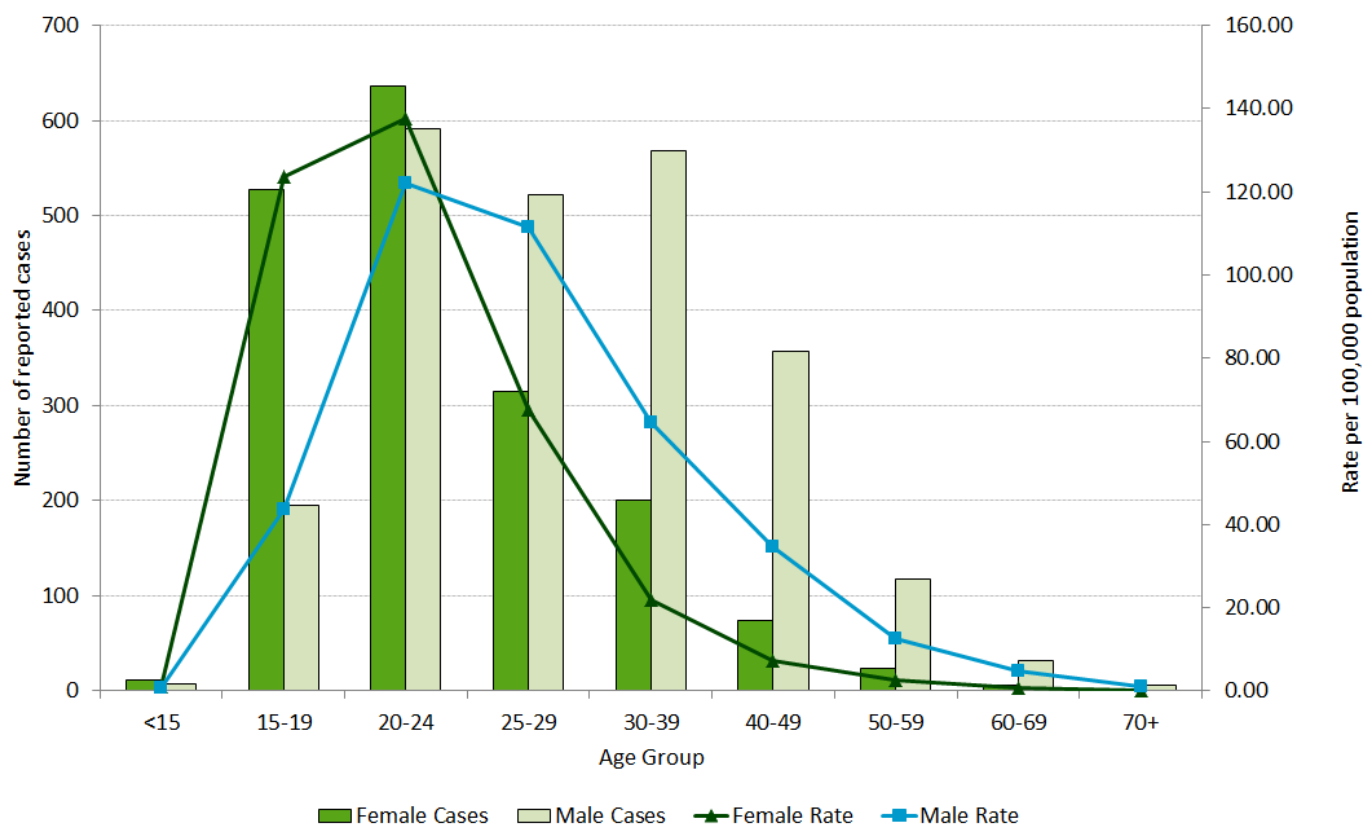
Age Group (Years)	Female		Male		Total	
	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)
<15	12	1.11	7	0.62	19	0.86
15-19	527	123.52	195	43.70	722	82.72
20-24	636	137.64	591	121.97	1,227	129.62
25-29	315	67.70	522	111.49	837	89.66
30-39	200	21.90	568	64.56	768	42.84
40-49	74	7.18	357	34.60	431	20.90
50-59	24	2.51	117	12.43	141	7.43
60-69	6	0.87	32	4.96	38	2.85
70+	0	0.00	6	1.07	6	0.45
Total	1,794	26.46	2,395	36.33	4,189	31.32

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes seven cases of unknown age and sex.

Figure 3-6. Incidence of Gonorrhea by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes seven cases of unknown age and sex.

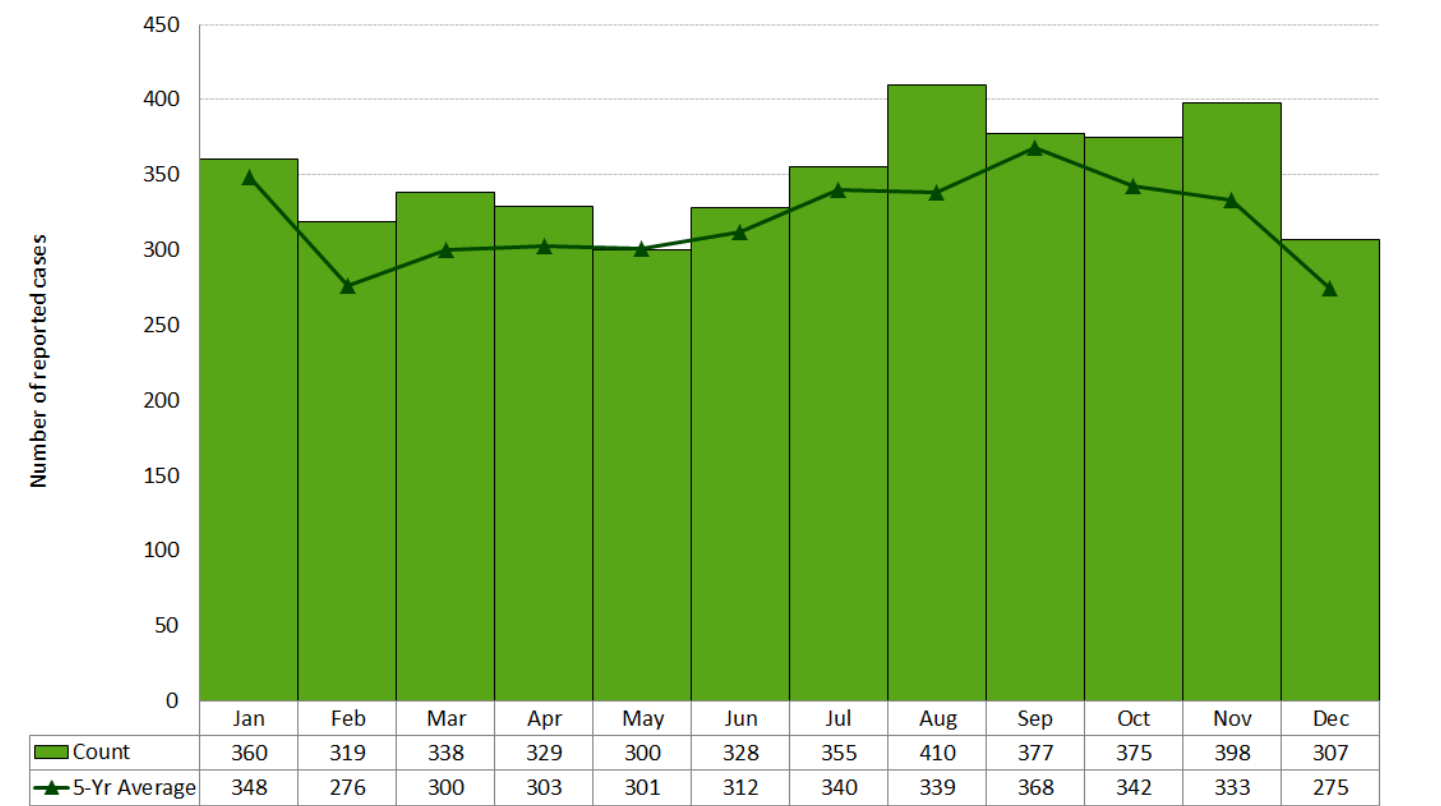
MONTHLY DISTRIBUTION

Gonorrhea does not follow a seasonal pattern and cases are reported consistently throughout the year. In 2011, the incidence rate exceeded the range of expected values for five months of the year compared to the five-year monthly average case counts from 2006 to 2010 (Figure 3-7).

GEOGRAPHIC DISTRIBUTION

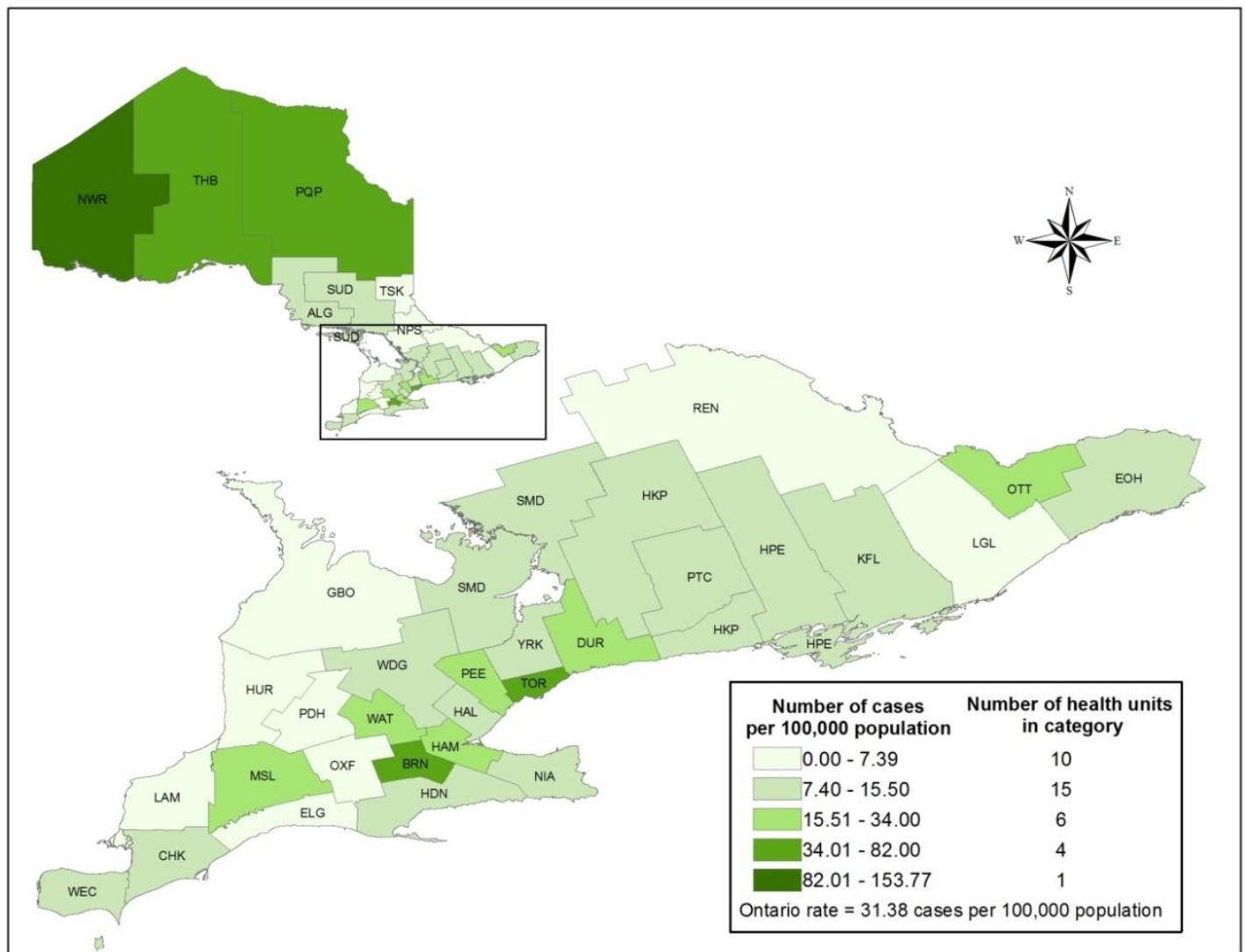
In 2011, the three highest rates of gonorrhea were reported by Northwestern, Porcupine and Toronto health units. Northwestern reported an incidence rate of 153.77 cases per 100,000, followed by Porcupine with 80.74 cases per 100,000 population and Toronto with 70.74 cases per 100,000 population. Toronto also reported the highest number of cases (1,941), accounting for 46% of gonorrhea cases in 2011 (Map 3-2, Table 3-5). Peel Region reported the second highest number of cases at 464 or 11% of all cases reported in 2011, while City of Ottawa accounted for 216 cases or five percent of all cases reported in 2011.

Figure 3-7. Number of Gonorrhea Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Map 3-2. Incidence of Gonorrhea by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 3-5. Incidence of Gonorrhea by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	16	13.58	0.4%	0.9%
Brant County	71	50.42	1.7%	1.1%
Chatham-Kent	16	14.74	0.4%	0.8%
Durham Region	170	26.93	4.1%	4.7%
Eastern Ontario	17	8.45	0.4%	1.5%
Elgin-St. Thomas	2	2.19	0.0%	0.7%
Grey Bruce	2	1.21	0.0%	1.2%
Haldimand-Norfolk	14	12.65	0.3%	0.8%
Haliburton, Kawartha, Pine Ridge District	20	11.17	0.5%	1.3%
Halton Region	73	14.07	1.7%	3.9%
Hamilton, City of	183	33.87	4.4%	4.0%
Hastings & Prince Edward Counties	17	10.45	0.4%	1.2%
Huron County	2	3.31	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	21	10.64	0.5%	1.5%
Lambton County	9	6.85	0.2%	1.0%
Leeds, Grenville and Lanark District	10	5.88	0.2%	1.3%
Middlesex-London	111	24.09	2.6%	3.4%
Niagara Region	59	13.25	1.4%	3.3%
North Bay Parry Sound District	7	5.50	0.2%	1.0%
Northwestern	126	153.77	3.0%	0.6%
Ottawa, City of	216	23.74	5.1%	6.8%
Oxford County	8	7.39	0.2%	0.8%
Peel Region	464	33.97	11.1%	10.2%
Perth District	3	3.89	0.1%	0.6%
Peterborough County-City	13	9.25	0.3%	1.1%
Porcupine	70	80.74	1.7%	0.6%
Renfrew County & District	7	6.80	0.2%	0.8%
Simcoe Muskoka District	45	8.56	1.1%	3.9%
Sudbury & District	29	14.67	0.7%	1.5%
Thunder Bay District	89	56.85	2.1%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	1,941	70.74	46.3%	20.5%
Waterloo Region	123	23.20	2.9%	4.0%
Wellington-Dufferin-Guelph	30	10.77	0.7%	2.1%
Windsor-Essex County	50	12.39	1.2%	3.0%
York Region	162	15.14	3.9%	8.0%
Ontario	4,196	31.38	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

In 2011, 75% (3,127/4,196) of gonorrhea cases reported at least one risk factor. The top three risk factors were no condom use at 74%, sex with opposite sex at 37% and having more than one sexual contact in past six months at 25% (Table 3-6). Among males, sex with same sex was the second most frequently reported risk factor at 41%.

Table 3-6. Reported Risk Factors for Gonorrhea Cases: Ontario, 2011

Risk factors	Male		Female		Total	
	Cases (n=1,848)	Percent (%)	Cases (n=1,279)	Percent (%)	Cases (n=3,127)	Percent (%)
No condom used	1,395	75.5%	919	71.9%	2314	74.0%
Sex with opposite sex	493	26.7%	652	51.0%	1145	36.6%
More than one sex contact in past 6 months	589	31.9%	199	15.6%	788	25.2%
Sex with same sex	753	40.7%	16	1.3%	769	24.6%
New contact in past 2 months	343	18.6%	195	15.2%	538	17.2%
Anonymous sex	135	7.3%	30	2.3%	165	5.3%
Condom breakage	95	5.1%	63	4.9%	158	5.1%
Judgement impaired by alcohol or drugs	74	4.0%	44	3.4%	118	3.8%
Travel outside Ontario	57	3.1%	25	2.0%	82	2.6%
Other	362	19.5%	426	23.7%	788	18.8%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Note: Cases may report more than one risk factor. "Other" includes but is not limited to: sex trade worker, sex with sex trade worker, shared sex toys, and born to an infected mother.

Group B Streptococcal Disease, Neonatal

- **The annual number of neonatal group B streptococcal disease in Ontario has been relatively stable since 2004.**
- **In 2011, sixteen health units in Ontario reported cases of neonatal group B streptococcal disease.**

Neonatal group B streptococcal disease is reportable in newborns up to 28 days old in Ontario. It is caused by infection with group B streptococci bacteria.¹ Symptoms of infection in newborns can present as early onset disease that occur within seven days of birth. Late onset disease typically occurs from seven days to months after birth. In both early and late onset disease, sepsis, and in some cases, meningitis (infection of the protective membranes of the brain and spinal cord) or pneumonia may occur.^{1,51}

Group B streptococci bacteria are transmitted from mother to child during birth or in utero, but transmission can also occur through person-to-person contact. Group B streptococci are present in the genital tract in 10-30% of pregnant women, however only about one percent of infants born to infected mothers develop symptomatic infections.⁵¹ Although all neonates are susceptible, premature babies are at higher risk of infection.⁵¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, there were 58 reported cases of neonatal group B streptococcal disease in Ontario, representing an incidence rate of 41.47 cases per 100,000 live births. This was about 12% higher than the total of 52 cases reported in 2010 (Figure 3-8).

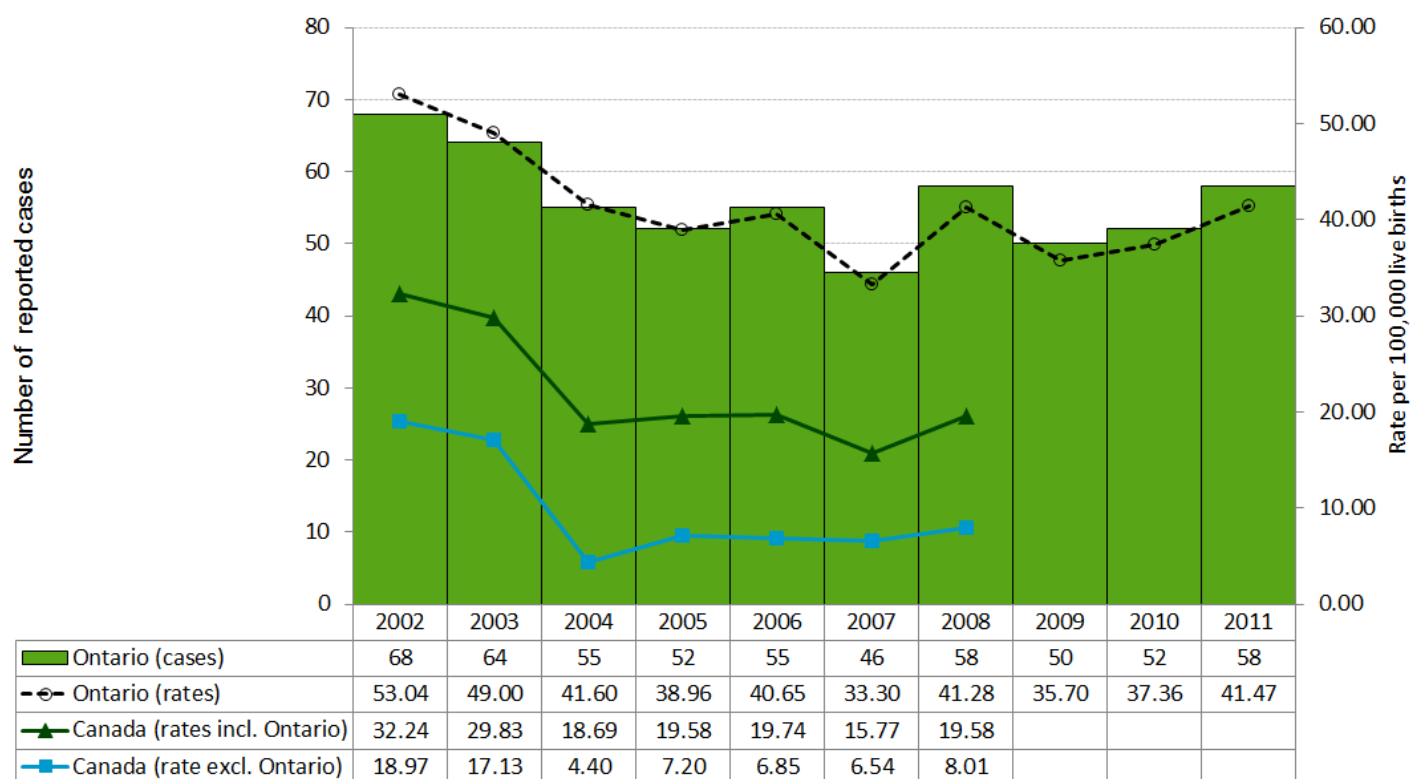
The annual incidence rate of neonatal group B streptococcal disease declined by 24% from 53.04 cases per 100,000 live births in 2002 to 41.47 cases per 100,000 live births in 2011. Following an initial decrease from 2002 to 2004, rates fluctuated, ranging from 33.30 to 41.47 cases per 100,000 live births.

In comparison, annual incidence rates of neonatal group B streptococcal disease for Canada were lower than the incidence rates in Ontario from 2002 to 2008.

AGE AND SEX DISTRIBUTION

In 2011, there were more cases of neonatal group B streptococcal disease reported among males (36) than females (21). Males had an incidence rate of 50.21 cases per 100,000 male live births, while females had an incidence rate of 30.81 cases per 100 000 female live births. Both age and sex were unknown for one neonatal group B streptococcal case reported in 2011.

Figure 3-8. Incidence of Neonatal Group B Streptococcal Disease in Ontario and Canada: 2002-2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/05]; rates are per/100,000 live births.

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]. Rates are per/100,000 live births; national data available up to 2008.

HOSPITALIZATIONS AND DEATHS

Infection with group B streptococcal disease is serious and can be fatal. In 2011, 3 (5%) deaths related to group B streptococcal disease were reported in Ontario.

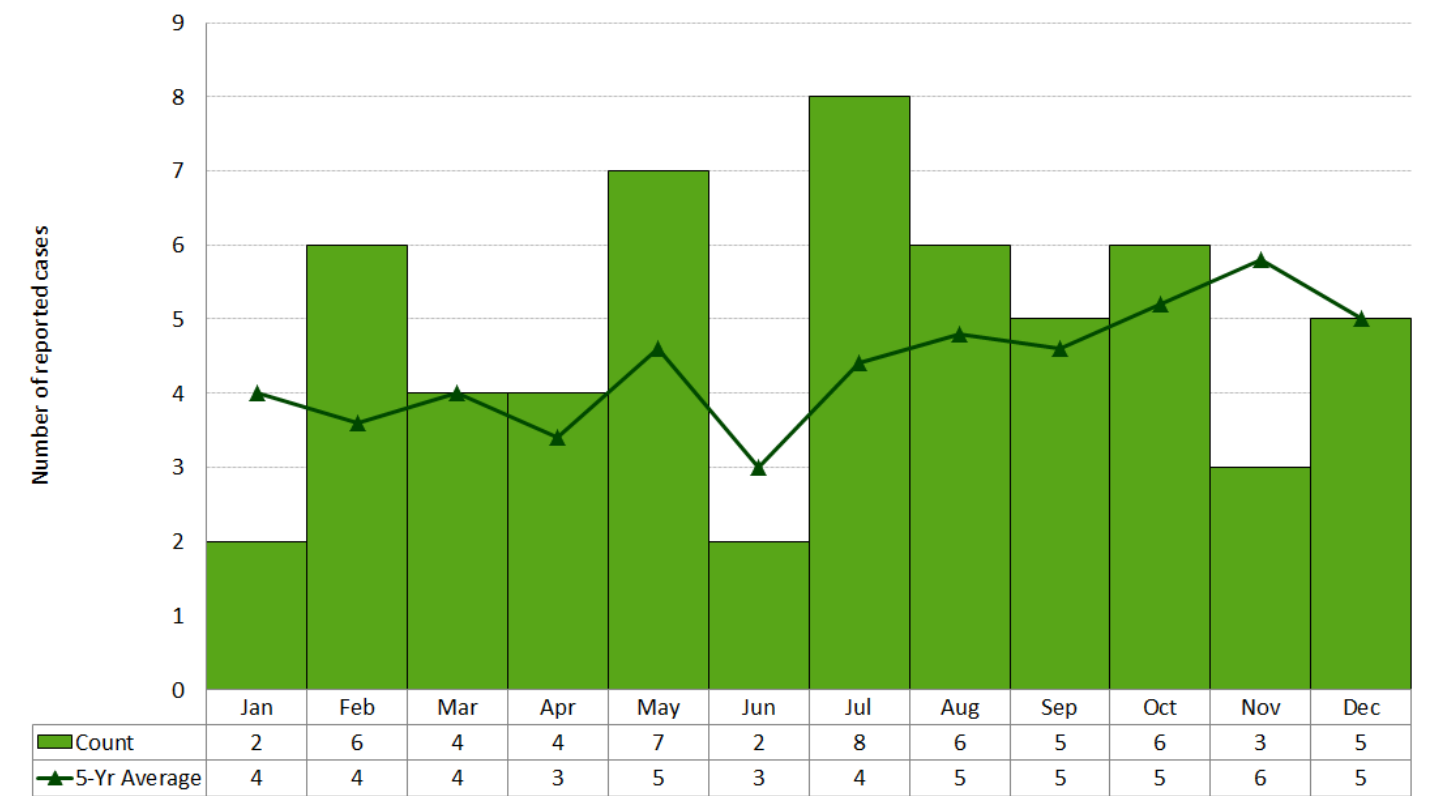
MONTHLY DISTRIBUTION

Neonatal group B streptococcal disease does not follow a seasonal pattern and cases occur throughout the year (Figure 3-9).

GEOGRAPHIC DISTRIBUTION

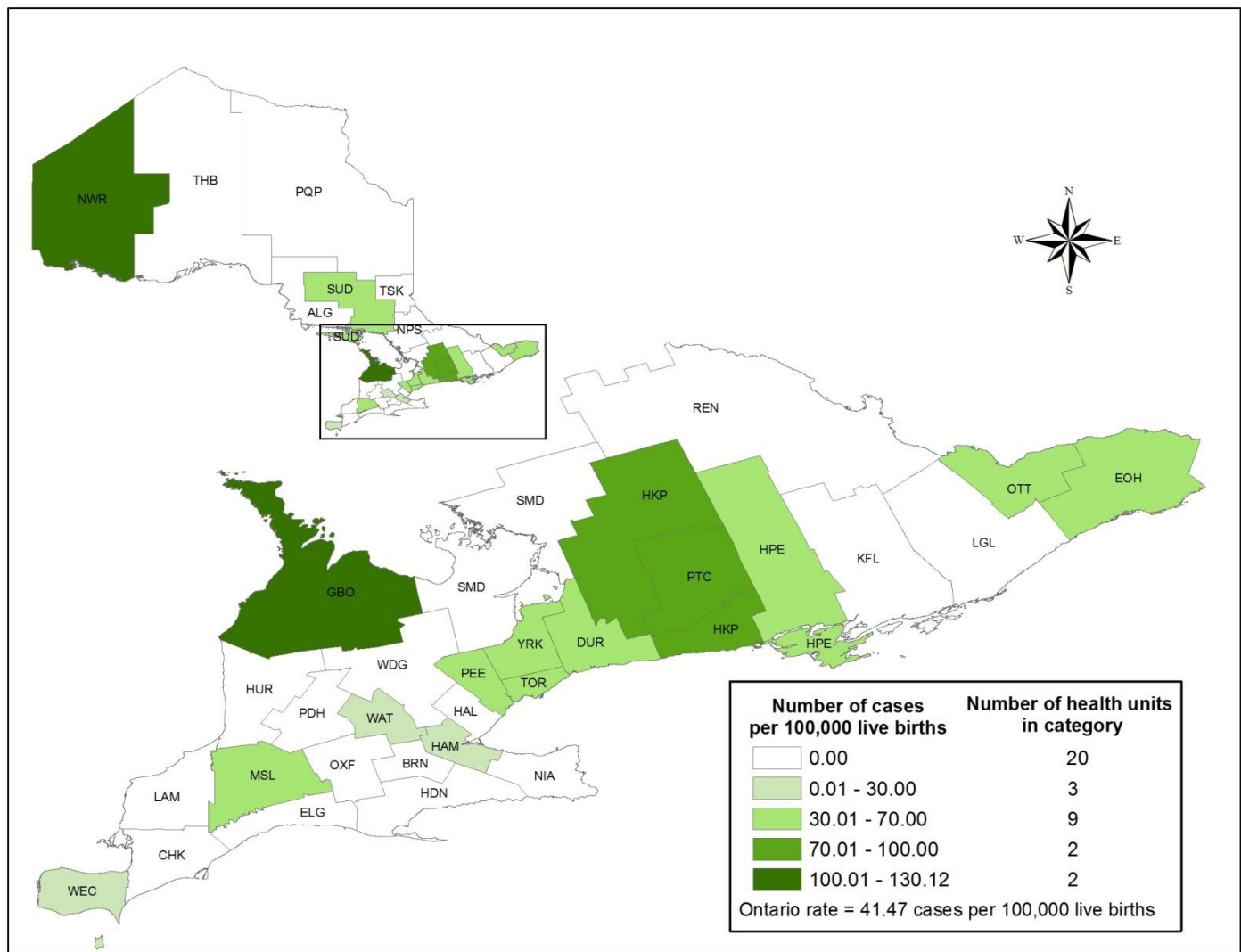
Cases of neonatal group B streptococcal disease were reported in 16 (44%) health units in 2011 (Map 3-3, Table 3-7). Grey Bruce reported the highest incidence rate in 2011, with 131.15 cases per 100,000 infants under the age of one year. Northwestern and Peterborough County-City reported the second and third highest rates at 95.33 and 81.57 cases per 100,000 infants under the age of one year, respectively. Toronto reported the highest number of cases (18) in 2011.

Figure 3-9. Number of Neonatal Group B Streptococcal Disease Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Map 3-3. Incidence of Neonatal Group B Streptococcal Disease by Health Unit of Residence: Ontario, 2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/05]; rates are per/100,000 live births.

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 3-7. Incidence of Neonatal Group B Streptococcal Disease by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Live Births)	Cases as Proportion of Total Cases (%)	Proportion of Live Births in Ontario (%)
Algoma District	0	0.00	0.0%	0.7%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	0	0.00	0.0%	0.8%
Durham Region	4	60.73	6.9%	4.7%
Eastern Ontario	1	52.22	1.7%	1.4%
Elgin-St. Thomas	0	0.00	0.0%	0.8%
Grey Bruce	2	130.12	3.4%	1.1%
Haldimand-Norfolk	0	0.00	0.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	1	75.19	1.7%	1.0%
Halton Region	0	0.00	0.0%	4.1%
Hamilton, City of	1	18.57	1.7%	3.8%
Hastings & Prince Edward Counties	1	69.35	1.7%	1.0%
Huron County	0	0.00	0.0%	0.4%
Kingston-Frontenac & Lennox & Addington	0	0.00	0.0%	1.3%
Lambton County	0	0.00	0.0%	0.9%
Leeds, Grenville and Lanark District	0	0.00	0.0%	1.0%
Middlesex-London	2	42.60	3.4%	3.4%
Niagara Region	0	0.00	0.0%	2.8%
North Bay Parry Sound District	0	0.00	0.0%	0.8%
Northwestern	1	114.03	1.7%	0.6%
Ottawa, City of	5	50.69	8.6%	7.1%
Oxford County	0	0.00	0.0%	0.9%
Peel Region	11	69.50	19.0%	11.3%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	1	82.03	1.7%	0.9%
Porcupine	0	0.00	0.0%	0.7%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	0	0.00	0.0%	3.4%
Sudbury & District	1	53.30	1.7%	1.3%
Thunder Bay District	0	0.00	0.0%	1.1%
Timiskaming	0	0.00	0.0%	0.2%
Toronto	18	58.96	31.0%	21.8%
Waterloo Region	1	16.56	1.7%	4.3%
Wellington-Dufferin-Guelph	0	0.00	0.0%	2.2%
Windsor-Essex County	1	25.50	1.7%	2.8%
York Region	7	62.44	12.1%	8.0%
Ontario	58	41.47	100.0%	100.0%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/05]; rates are per/100,000 live births.

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Hepatitis B (Acute)

- **The overall incidence rate of acute hepatitis B in Ontario declined over the past ten years.**
- **The highest incidence rates of acute hepatitis B in 2011 were reported among 30-39 year olds for both sexes.**
- **The most commonly reported risk factor among hepatitis B cases in Ontario in 2011 was exposure outside of Canada.**

Acute hepatitis B is reportable in Ontario and is caused by infection with the hepatitis B virus (HBV).¹ The virus affects and can permanently damage the liver. Hepatitis B is transmitted through blood and other bodily fluids, and as such, transmission can occur through a variety of routes. Transmission commonly occurs through injection drug use and sharing of drug use equipment, sexually, through household contact with an infected person, or vertically from mother to child during birth.^{1,52}

HBV surface antigens (HBsAg) appear in the blood within two weeks and up to six months after infection followed by antibodies to the core antigen (Anti-HBc). Anti-HBc remains indefinitely in the blood and is indicative of either a past or current infection. In contrast, HBsAg in the blood is indicative of acute or chronic infection that is transmissible to others even in the absence of symptoms.⁵² Up to 70% of those infected does not exhibit any symptoms. If present, symptoms may include anorexia, fatigue, fever, abdominal discomfort, joint pain and jaundice.^{1,52} Hepatitis B infections may resolve, but in some cases, individuals remain chronic carriers of the virus for life, with younger persons having a greater likelihood of becoming chronic carriers.¹

Hepatitis B can be prevented through vaccination. In Ontario the hepatitis B vaccine is publicly funded for grade seven students and persons at high risk of exposure such as contacts of acute cases and chronic carriers of the virus, injection drug users, and persons requiring blood products.⁵³

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, 122 cases of acute hepatitis B infections were reported in Ontario, representing an incidence rate of 0.91 cases per 100,000 population (Figure 3-10). This was slightly higher than the incidence rate of 0.88 cases per 100,000 population reported in 2010.

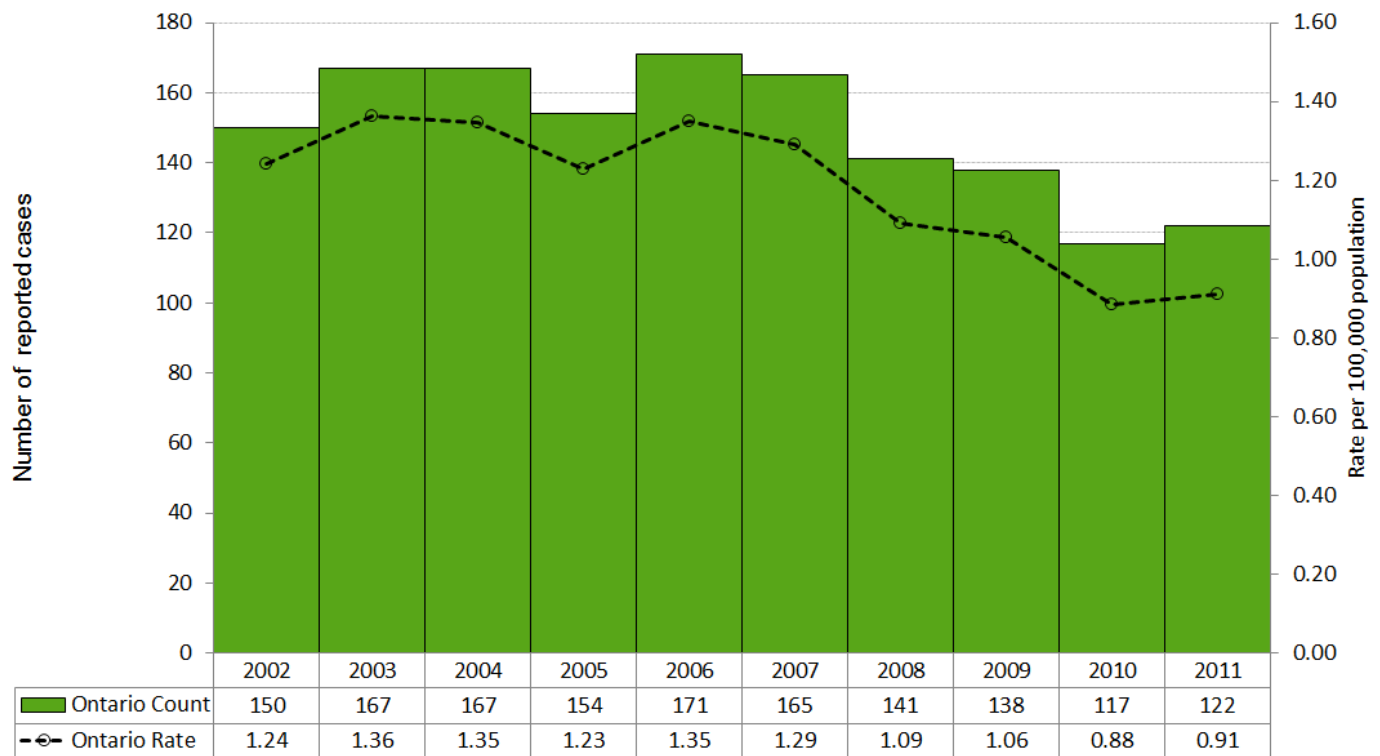
Annual incidence rates of acute hepatitis B declined by 27% from 1.24 cases per 100,000 population in 2002 to 0.91 cases per 100,000 population in 2011.

National incidence rates of hepatitis B are not presented in this report as they do not distinguish between acute and chronic cases and are therefore not directly comparable to acute case data for Ontario. Chronic hepatitis B infections reported in Ontario are not enumerated in this report.

AGE AND SEX DISTRIBUTION

The sex-specific incidence rate for acute hepatitis B in 2011 was higher for males compared to females at 1.06 and 0.74 cases per 100,000 population, respectively (Table 3-8, Figure 3-11). Males accounted for 57% of cases in 2011. The highest incidence rate among males was observed in the 30-39 year age group, which had a rate of 2.05 cases per 100,000 population. Among females, the highest incidence rate was reported in the 25-29 year age group, at 1.93 cases per 100,000 population. For both sexes, the greatest number of cases was reported in the 30-39 year age group (26% for both sexes).

Figure 3-10. Incidence of Acute Hepatitis B in Ontario: 2002-2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

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.

Table 3-8. Incidence of Acute Hepatitis B by Age and Sex: Ontario, 2011

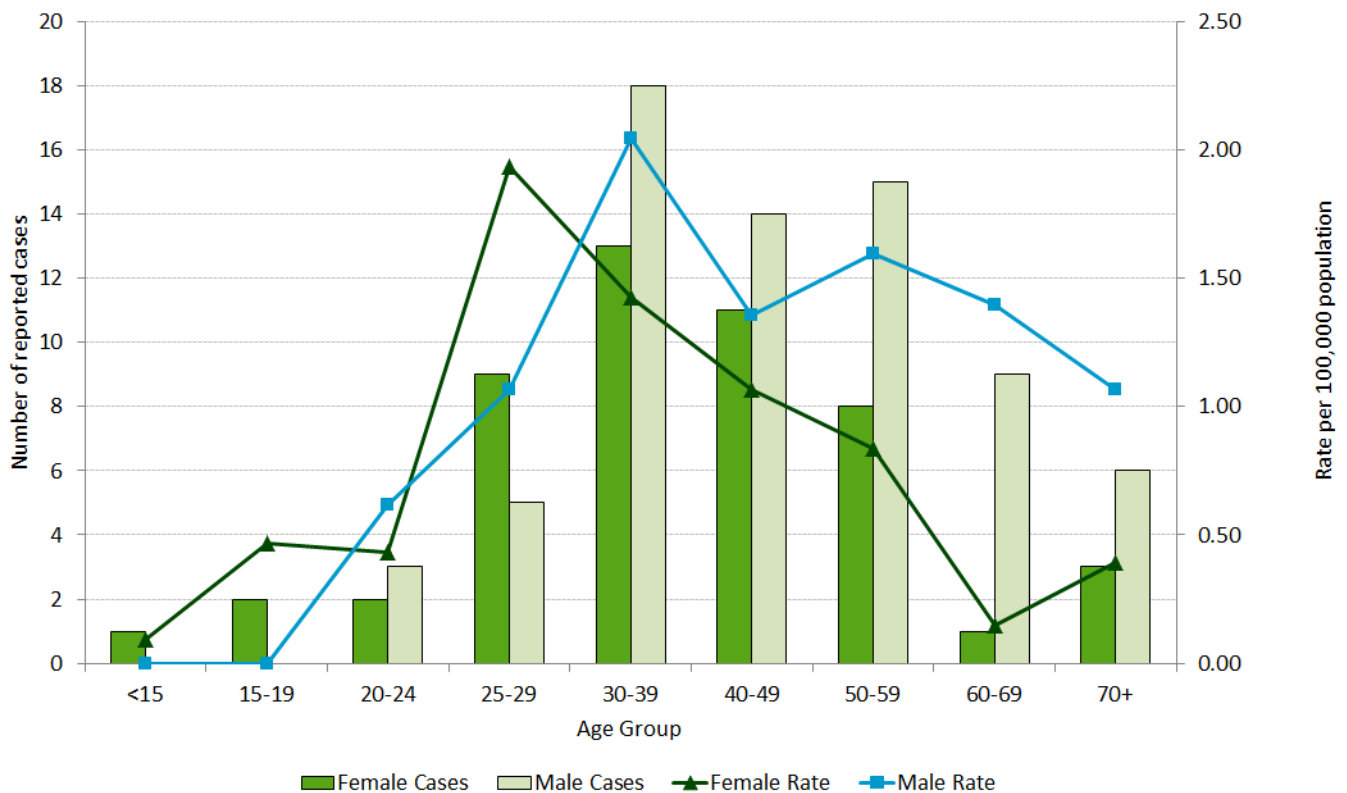
Age Group (Years)	Female		Male		Total	
	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)
<15	1	0.09	0	0.00	1	0.05
15-19	2	0.47	0	0.00	2	0.23
20-24	2	0.43	3	0.62	5	0.53
25-29	9	1.93	5	1.07	14	1.50
30-39	13	1.42	18	2.05	31	1.73
40-49	11	1.07	14	1.36	25	1.21
50-59	8	0.84	15	1.59	23	1.21
60-69	1	0.15	9	1.39	10	0.75
70+	3	0.39	6	1.07	9	0.68
Total	50	0.74	70	1.06	120	0.90

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes two cases of unknown age and sex.

Figure 3-11. Incidence of Acute Hepatitis B by Age and Sex: Ontario, 2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes two cases of unknown age and sex.

HOSPITALIZATIONS AND DEATHS

In 2011, approximately 12% (14/122) of acute hepatitis B cases were hospitalized. Infection with hepatitis B was reported as a contributing cause of death in two cases, both of whom had underlying medical conditions including one case with alcohol induced cirrhosis and the other with HIV infection.

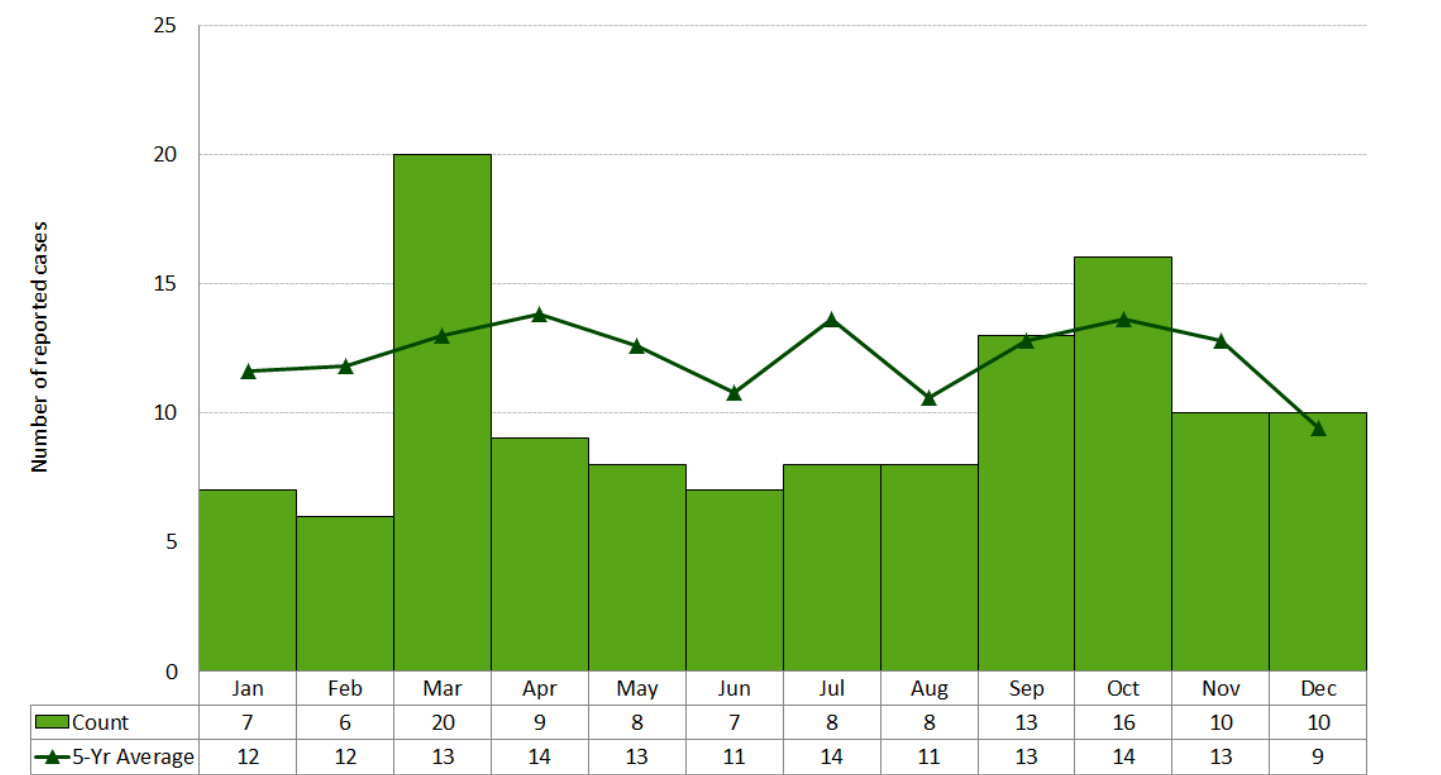
MONTHLY DISTRIBUTION

Hepatitis B infections are reported throughout the year and do not follow a seasonal pattern of occurrence (Figure 3-12).

GEOGRAPHIC DISTRIBUTION

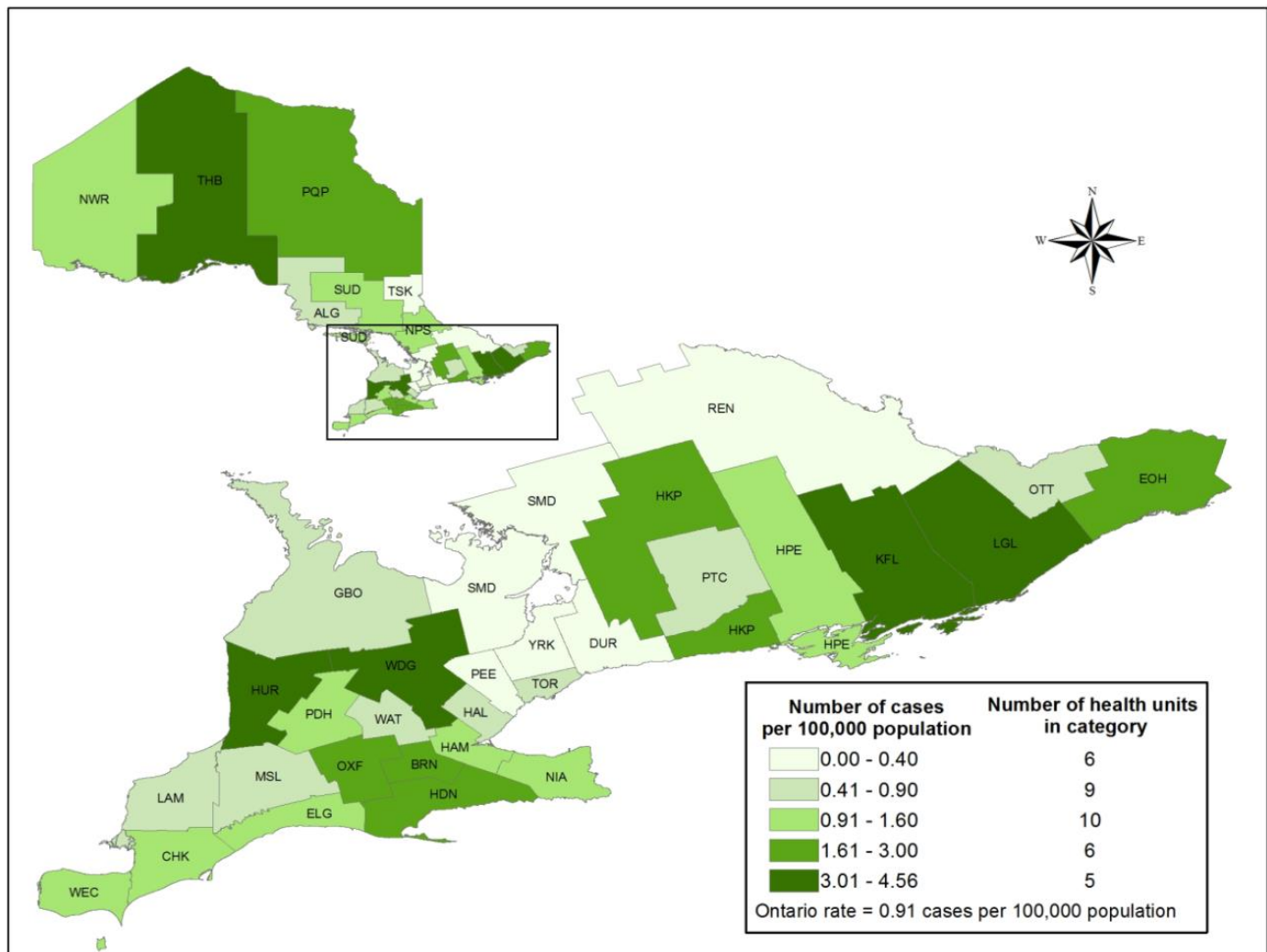
In 2011, the highest incidence rate of acute hepatitis B in Ontario was reported by Kingston-Frontenac and Lennox and Addington which had an incidence rate of 4.56 cases per 100,000 population (Map 3-4, Table 3-9). Leeds, Grenville and Lanark District and Wellington-Dufferin-Guelph reported the second and third highest incidence rates of acute hepatitis B infection at 4.11 and 3.59 cases per 100,000 population, respectively. Toronto reported the highest number of cases at 14, followed by Wellington-Dufferin-Guelph with ten cases and Kingston-Frontenac and Lennox and Addington with nine cases. Two health units did not report any cases of acute hepatitis B in 2011.

Figure 3-12. Number of Acute Hepatitis B Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Map 3-4. Incidence of Acute Hepatitis B by Health Unit of Residence: Ontario, 2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 3-9. Incidence of Acute Hepatitis B by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	1	0.85	0.8%	0.9%
Brant County	4	2.84	3.3%	1.1%
Chatham-Kent	1	0.92	0.8%	0.8%
Durham Region	2	0.32	1.6%	4.7%
Eastern Ontario	5	2.49	4.1%	1.5%
Elgin-St. Thomas	1	1.09	0.8%	0.7%
Grey Bruce	1	0.61	0.8%	1.2%
Haldimand-Norfolk	3	2.71	2.5%	0.8%
Haliburton, Kawartha, Pine Ridge District	4	2.23	3.3%	1.3%
Halton Region	4	0.77	3.3%	3.9%
Hamilton, City of	5	0.93	4.1%	4.0%
Hastings & Prince Edward Counties	2	1.23	1.6%	1.2%
Huron County	2	3.31	1.6%	0.5%
Kingston-Frontenac & Lennox & Addington	9	4.56	7.4%	1.5%
Lambton County	1	0.76	0.8%	1.0%
Leeds, Grenville and Lanark District	7	4.11	5.7%	1.3%
Middlesex-London	3	0.65	2.5%	3.4%
Niagara Region	5	1.12	4.1%	3.3%
North Bay Parry Sound District	2	1.57	1.6%	1.0%
Northwestern	1	1.22	0.8%	0.6%
Ottawa, City of	5	0.55	4.1%	6.8%
Oxford County	2	1.85	1.6%	0.8%
Peel Region	3	0.22	2.5%	10.2%
Perth District	1	1.30	0.8%	0.6%
Peterborough County-City	1	0.71	0.8%	1.1%
Porcupine	2	2.31	1.6%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	2	0.38	1.6%	3.9%
Sudbury & District	2	1.01	1.6%	1.5%
Thunder Bay District	5	3.19	4.1%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	14	0.51	11.5%	20.5%
Waterloo Region	4	0.75	3.3%	4.0%
Wellington-Dufferin-Guelph	10	3.59	8.2%	2.1%
Windsor-Essex County	4	0.99	3.3%	3.0%
York Region	4	0.37	3.3%	8.0%
Ontario	122	0.91	100.0%	100.0%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED RISK FACTORS

In 2011, 76% (93/122) of acute hepatitis B cases reported at least one risk factor (Table 3-10). Among cases reporting a risk factor, the top three risk factors reported were exposure outside of Canada (72%), illicit drug use (38%) and sexual risks as a general category (27%).

Table 3-10. Reported Risk Factors for Acute Hepatitis B Cases: Ontario 2011

Risk factor	Male		Female		Total	
	Cases (n=56)	Percent (%)	Cases (n=37)	Percent (%)	Cases (n=93)	Percent (%)
Out of Canada exposure	39	69.6%	28	75.7%	67	72.0%
Sexual risks	11	19.6%	14	37.8%	25	26.9%
Sexual risks and other non- sexual risks	11	19.6%	13	35.1%	24	25.8%
Sexual contact only	0	0.0%	1	2.7%	1	1.1%
Tattoo/acupuncture/electrolysis	13	23.2%	10	27.0%	23	24.7%
Intravenous or intra-nasal drug use	20	35.7%	15	40.5%	35	37.6%
Blood transfusion	2	3.6%	3	8.1%	5	5.4%
Dialysis	1	1.8%	0	0.0%	1	1.1%
Other	24	42.9%	30	81.1%	54	58.1%
Unknown	19	33.9%	15	40.5%	34	36.6%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor. 'Other' includes but is not limited to: household exposure, fighting, incarceration, occupational risks, mother to child transmission. "Unknown" refers to risk factors reported solely as "Unknown".

Hepatitis C

- **The incidence of hepatitis C decreased over the ten year period from 2002 to 2011.**
- **The majority of hepatitis C cases were reported among males, particularly between the ages of 40 and 59 years.**
- **The highest incidence rates of hepatitis C were observed in Kingston-Frontenac and Lennox and Addington and Thunder Bay District.**
- **Over 50% of hepatitis C cases in 2011 reported injection drug use as a risk factor.**

Hepatitis C is highly prevalent worldwide.¹ It is caused by infection with the hepatitis C virus (HCV). Infection with HCV leads to inflammation of the liver, with a high percentage (50-80%) of those infected developing chronic infections.¹ HCV can be transmitted through intravenous exposure to infected blood. This most commonly occurs through the use of contaminated equipment for injection drug use, as well as unsafe handling of multi-use equipment in health care and personal service settings.

Even though most cases of hepatitis C do not have any symptoms, transmission of the virus is possible and can occur for years after becoming infected. Once an individual is infected, symptoms can take from two weeks to six months to develop, and years before more serious complications such as cirrhosis (scarring of the liver) are observed.¹ Early symptoms of hepatitis C infection tend to be mild and progress slowly with anorexia, abdominal discomfort, fatigue and nausea being the most frequently observed symptoms.⁵⁴

Unlike hepatitis B, no vaccine is currently available for the prevention of hepatitis C. The most effective means of prevention include harm reduction measures for injection drug users and regular screening of blood products.¹ For those who develop chronic HCV infection, intensive treatment options are available based on the HCV subtype.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, there were 4,143 cases of hepatitis C reported in Ontario, representing an incidence rate of 30.98 cases per 100,000 population and a nine percent decrease in incidence compared to the 2010 rate of 34.21 cases per 100,000 (Figure 3-13).

Over the ten-year period from 2002 to 2011, the incidence rate of hepatitis C declined by 30% from 44.04 cases per 100,000 population in 2002 to 30.98 cases per 100,000 population in 2011. The decrease in incidence from 2002 to 2006 was relatively faster and was followed by a slight increase that lasted until 2008, after which the provincial rate began to decrease (Figure 3-13).

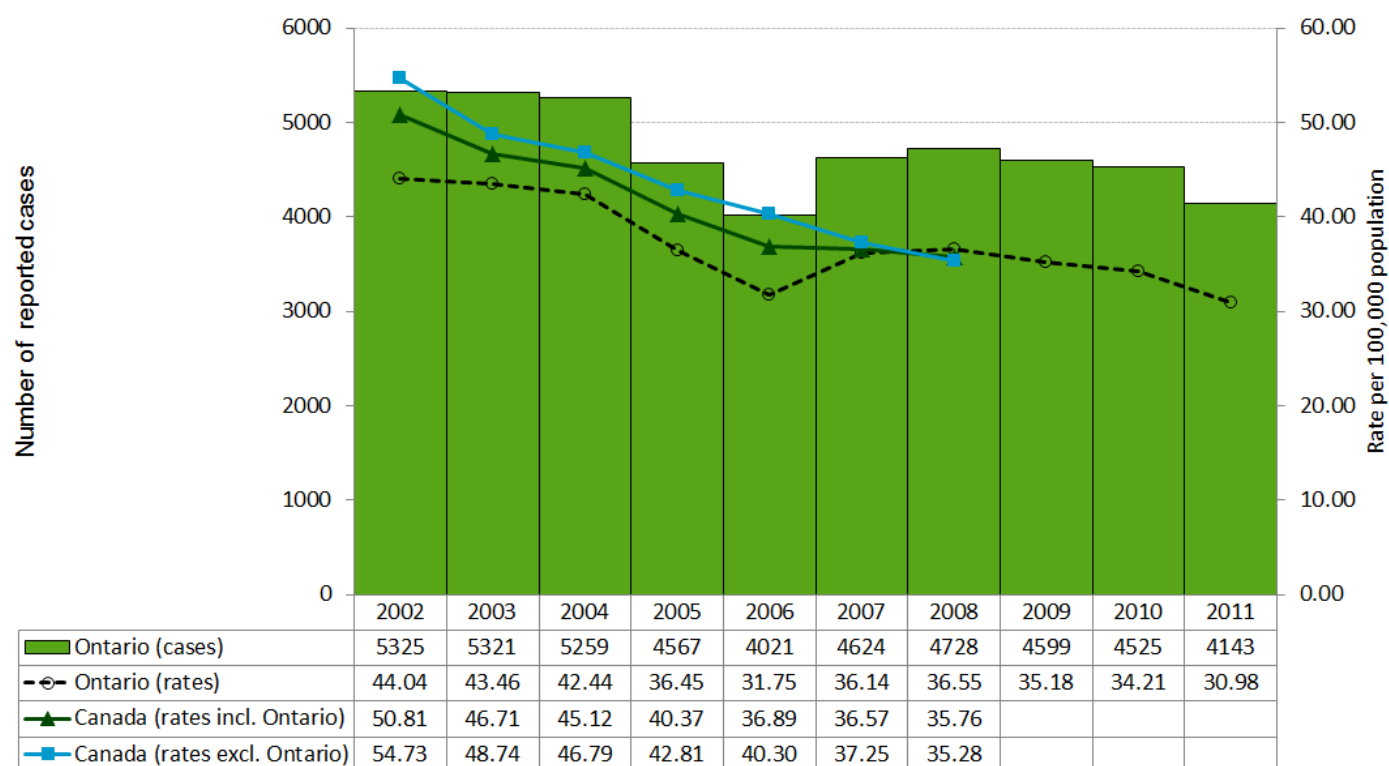
The Canadian incidence rate also demonstrated a decreasing trend from 2002 to 2008, the years for which national data were available. The provincial annual incidence rates of hepatitis C were lower than the corresponding national rates until 2006, after which there were no substantial differences between the two (Figure 3-13).

AGE AND SEX DISTRIBUTION

In 2011, almost two-thirds (61%) of hepatitis C cases in Ontario were reported among males. The incidence rate was higher for males at 38.15 cases per 100,000 population compared to 23.72 cases per 100,000 population for females (Table 3-11, Figure 3-14). Females under 25 years of age had higher rates compared to males, whereas males 25 years and older had higher rates compared to females.

For both males and females and overall, the highest incidence rate of hepatitis C occurred among the 50-59 year age group. The incidence rate among males demonstrated an increasing trend with age up to 59 years. The trend for females was similar but not as pronounced.

Figure 3-13. Incidence of Hepatitis C in Ontario and Canada: 2002-2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Table 3-11. Incidence of Hepatitis C by Age and Sex: Ontario, 2011

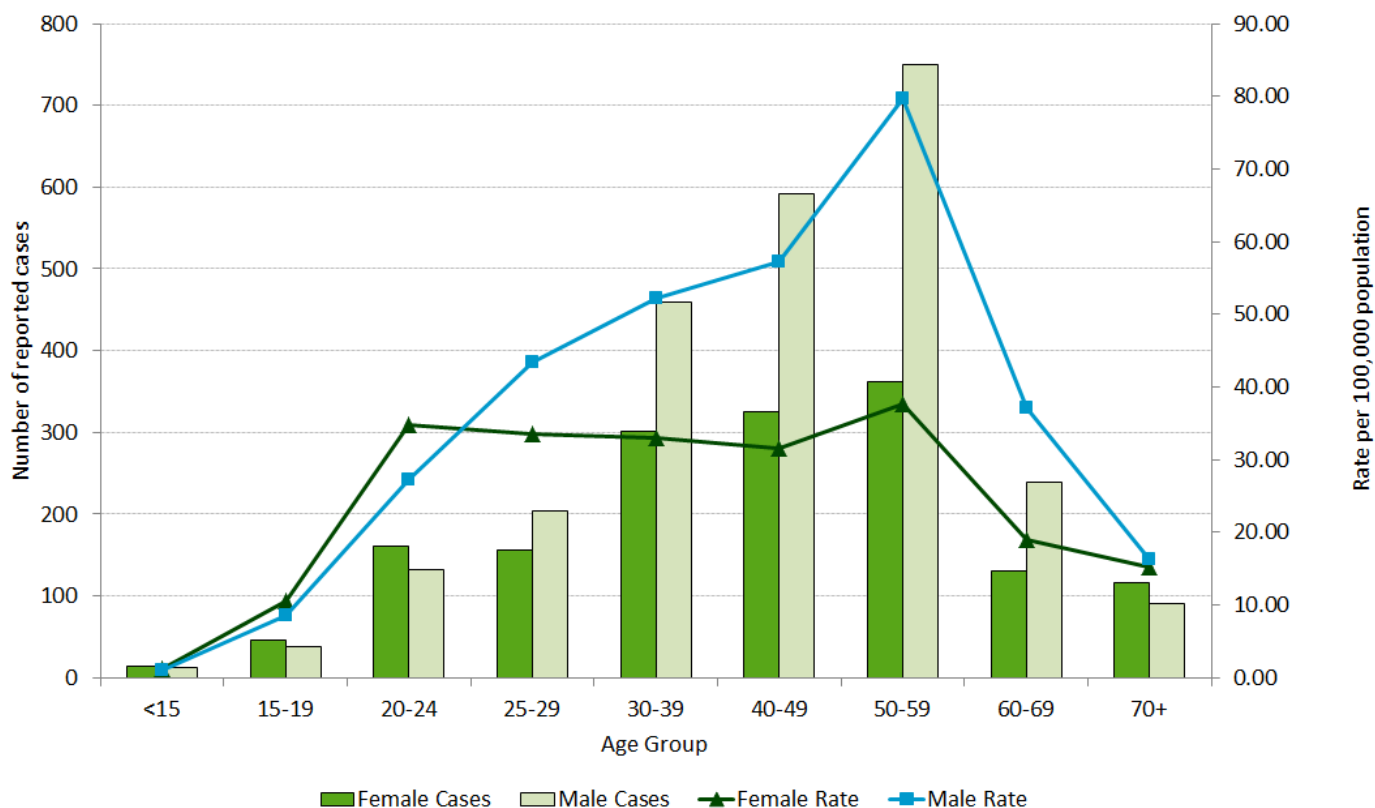
Age Group (Years)	Female		Male		Total	
	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)
<15	13	1.21	12	1.06	25	1.13
15-19	45	10.55	38	8.52	83	9.51
20-24	161	34.84	132	27.24	293	30.95
25-29	156	33.53	203	43.36	359	38.46
30-39	301	32.97	459	52.17	760	42.39
40-49	325	31.55	591	57.28	916	44.42
50-59	361	37.70	750	79.68	1,111	58.51
60-69	130	18.91	239	37.02	369	27.68
70+	116	15.23	91	16.19	207	15.64
Total	1,608	23.72	2,515	38.15	4,123	30.83

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes 20 cases of unknown age and sex.

Figure 3-14. Incidence of Hepatitis C by Age and Sex: Ontario, 2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes 20 cases of unknown age and sex.

HOSPITALIZATIONS AND DEATHS

Approximately one percent (40/4,143) of hepatitis C cases reported in 2011 was reported as hospitalized. A similar proportion (39/4,143) of cases was also reported as fatal.

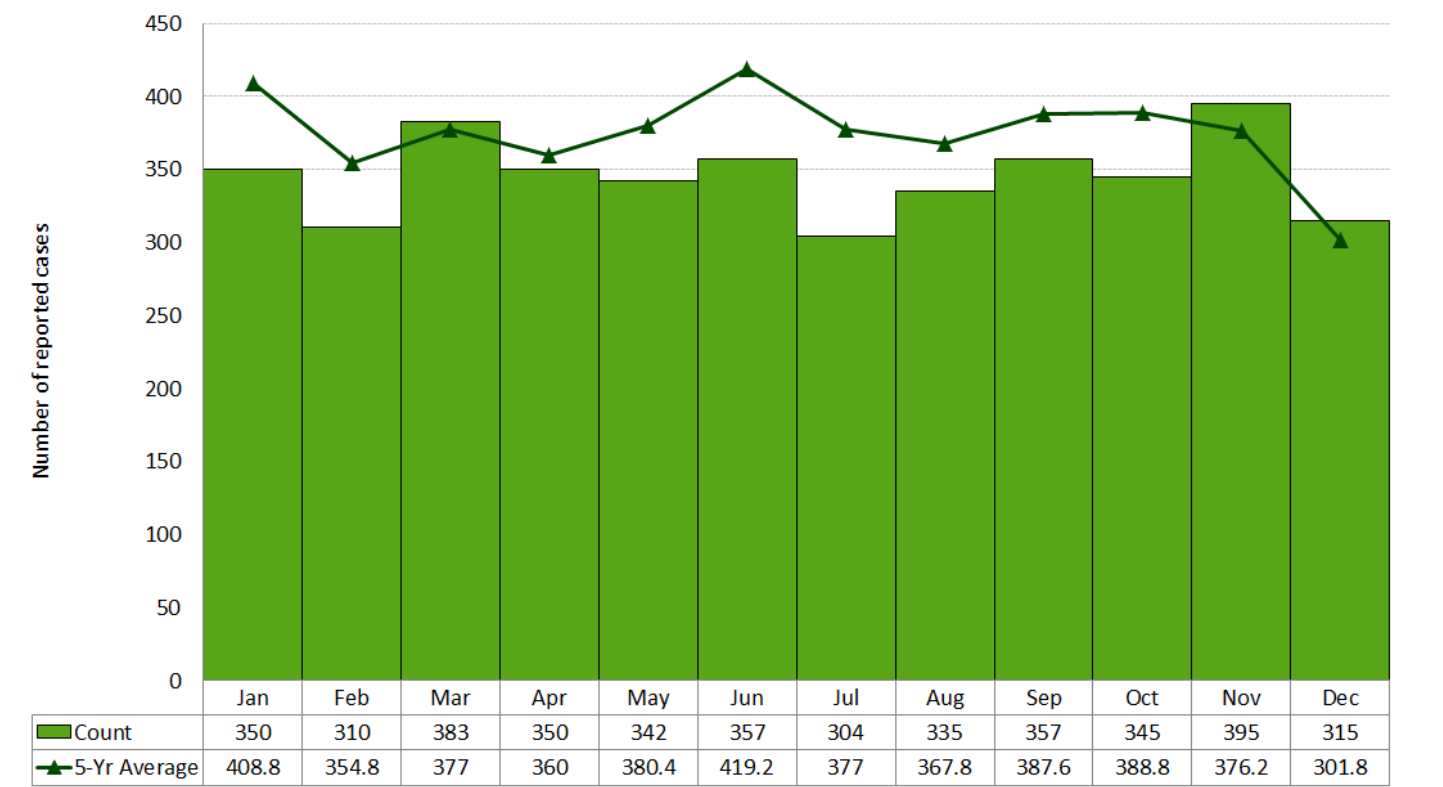
MONTHLY DISTRIBUTION

As with other sexually transmitted and blood-borne infections, hepatitis C occurs and is reported throughout the year (Figure 3-15).

GEOGRAPHIC DISTRIBUTION

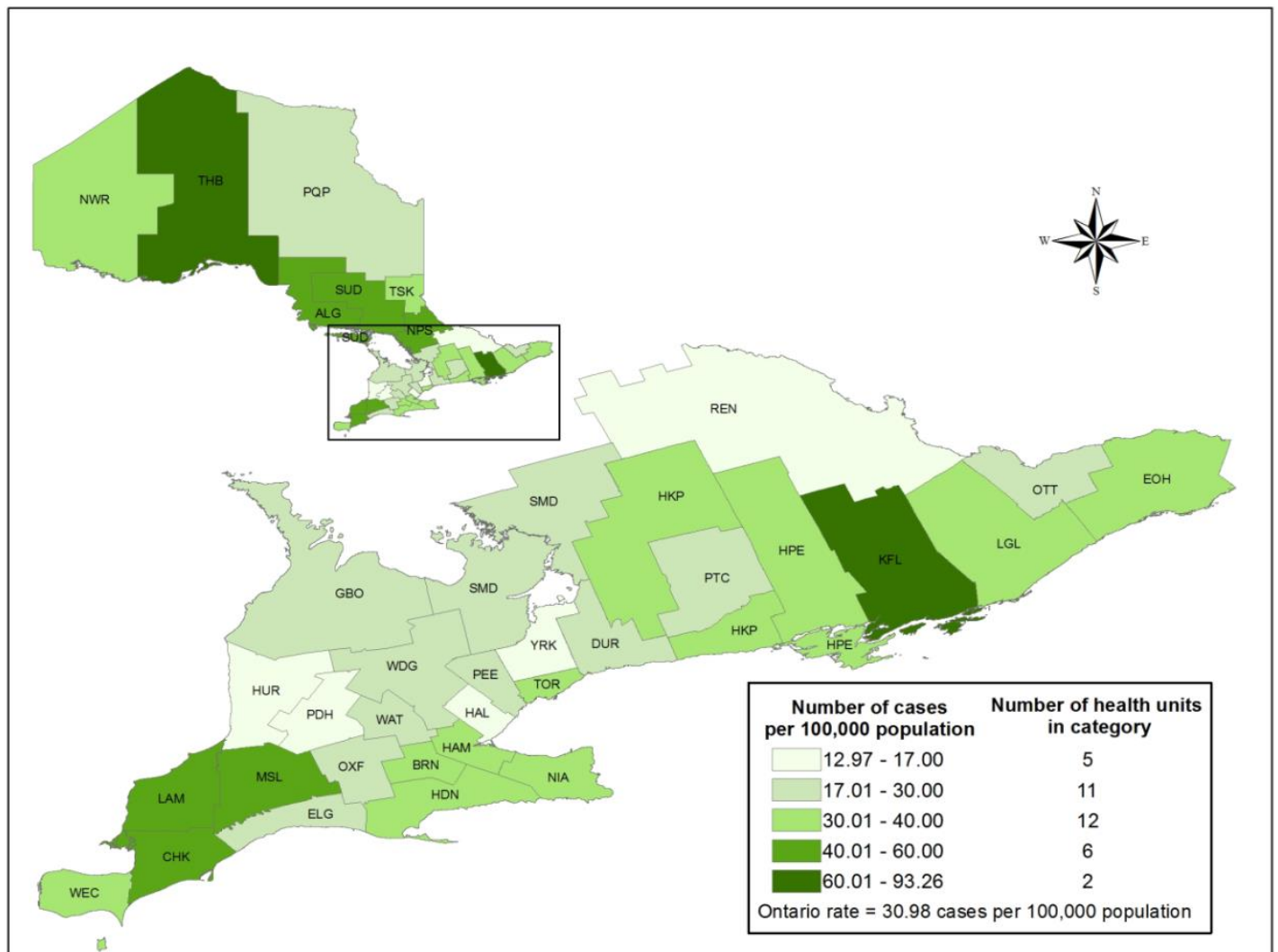
In 2011, the highest incidence rate of hepatitis C in Ontario was reported by Thunder Bay District, with 93.26 cases per 100,000, followed by Kingston-Frontenac Lennox and Addington with 76.01 cases per 100,000 population, and Lambton County with 57.07 cases per 100,000 population. Toronto reported the highest number of cases (886), accounting for 21% of hepatitis C cases in 2011 (Map 3-5, Table 3-12).

Figure 3-15. Number of Hepatitis C Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Map 3-5. Incidence of Hepatitis C by Health Unit of Residence: Ontario, 2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 3-12. Incidence of Hepatitis C by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	56	47.53	1.4%	0.9%
Brant County	49	34.80	1.2%	1.1%
Chatham-Kent	46	42.37	1.1%	0.8%
Durham Region	177	28.04	4.3%	4.7%
Eastern Ontario	64	31.82	1.5%	1.5%
Elgin-St. Thomas	26	28.44	0.6%	0.7%
Grey Bruce	35	21.23	0.8%	1.2%
Haldimand-Norfolk	36	32.52	0.9%	0.8%
Haliburton, Kawartha, Pine Ridge District	63	35.19	1.5%	1.3%
Halton Region	72	13.88	1.7%	3.9%
Hamilton, City of	174	32.21	4.2%	4.0%
Hastings & Prince Edward Counties	55	33.80	1.3%	1.2%
Huron County	10	16.57	0.2%	0.5%
Kingston-Frontenac & Lennox & Addington	150	76.01	3.6%	1.5%
Lambton County	75	57.07	1.8%	1.0%
Leeds, Grenville and Lanark District	53	31.15	1.3%	1.3%
Middlesex-London	261	56.63	6.3%	3.4%
Niagara Region	161	36.15	3.9%	3.3%
North Bay Parry Sound District	59	46.34	1.4%	1.0%
Northwestern	32	39.05	0.8%	0.6%
Ottawa, City of	229	25.17	5.5%	6.8%
Oxford County	32	29.57	0.8%	0.8%
Peel Region	344	25.19	8.3%	10.2%
Perth District	10	12.97	0.2%	0.6%
Peterborough County-City	40	28.46	1.0%	1.1%
Porcupine	25	28.83	0.6%	0.6%
Renfrew County & District	15	14.57	0.4%	0.8%
Simcoe Muskoka District	148	28.16	3.6%	3.9%
Sudbury & District	91	46.03	2.2%	1.5%
Thunder Bay District	146	93.26	3.5%	1.2%
Timiskaming	12	34.83	0.3%	0.3%
Toronto	886	32.29	21.4%	20.5%
Waterloo Region	125	23.57	3.0%	4.0%
Wellington-Dufferin-Guelph	69	24.78	1.7%	2.1%
Windsor-Essex County	147	36.44	3.5%	3.0%
York Region	170	15.89	4.1%	8.0%
Ontario	4,143	30.98	100.0%	100.0%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

RISK FACTORS

In 2011, 70% (2,889/4,143) of hepatitis C cases reported at least one risk factor or exposure. The top risk factor reported overall was injection drug use at 55% (Table 3-13). There were 17 hepatitis C cases in 2011 where mother to child transmission was reported as a risk factor.

Table 3-13. Reported Risk Factors for Hepatitis C: Ontario 2011

Risk factor	Male		Female		Total	
	Cases (n=1,774)	Percent (%)	Cases (n=1,103)	Percent (%)	Cases (n=2,877)	Percent (%)
Injection drug use (IDU)	1,060	59.8%	535	48.5%	1,595	55.4%
Blood transfusion	58	3.3%	81	7.3%	139	4.8%
Mother to child	9	0.5%	8	0.7%	17	0.6%
High risk sexual	152	8.6%	140	12.7%	292	10.1%
Miscellaneous	779	43.9%	457	41.4%	1,236	43.0%
Other	1,310	73.8%	867	78.6%	2,177	75.7%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Notes: Excludes 12 cases of unknown sex. 'High risk sexual' includes partner is HCV+ (includes spouse HCV+), sex trade worker or sex with sex trade worker, MSM. 'Miscellaneous' includes occupational, born in an HCV-endemic country, inhalation drug use, organ/tissue transplant, and dialysis. 'Other' includes but is not limited to other sexual risks (e.g. multiple partners), fighting/biting, homeless, tattoo/piercing/acupuncture/electrolysis, lived/travelled to endemic country, immunocompromised, invasive procedure (medical/dental/surgical), and shared personal items (e.g. razors), household contact.

Hepatitis D

Hepatitis D, also known as delta hepatitis, is a viral disease that causes inflammation of the liver. It occurs concurrently with hepatitis B infection and is characterized by abrupt onset of anorexia, fatigue, abdominal discomfort, fever, joint pain and jaundice. Similar to hepatitis B infection, infection with hepatitis D can be transmitted through exposure to infected blood and blood products, with spread occurring mostly through shared needles and syringes and unprotected sexual contact.¹ Symptoms of hepatitis D develop between two to four weeks after exposure.^{1,55}

Hepatitis D is uncommon in North America. It is more prevalent in African, South American and Eastern European countries, where hepatitis B is endemic. Rates of infection are highest among hemophiliacs, injection drug users, men who have sex with men and residents of institutions for the developmentally disabled. Preventive measures for hepatitis D are the same as for

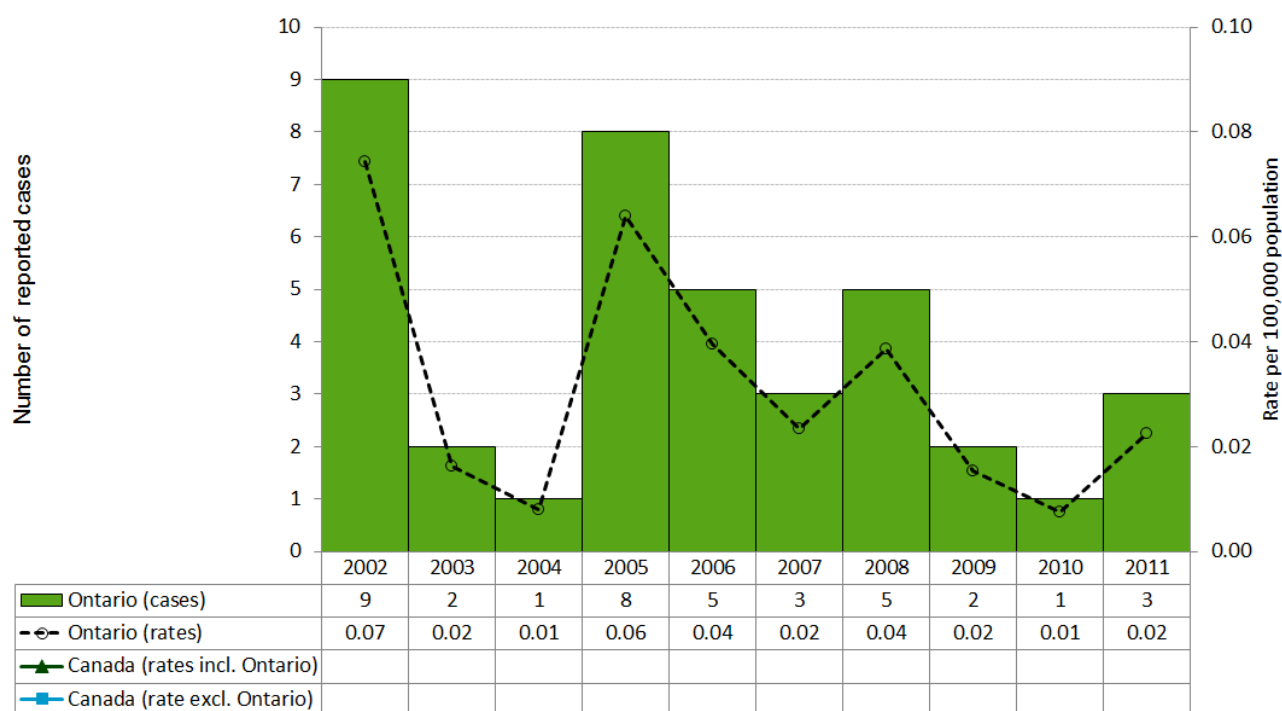
hepatitis B. Although there is no vaccine against hepatitis D, vaccination against hepatitis B is an effective prevention measure because hepatitis D infections occur only as co-infections in persons with existing hepatitis B infections.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, three cases of hepatitis D were reported in Ontario, representing an incidence rate of 0.02 cases per 100,000 population. From 2002 to 2011, a total of 39 cases of hepatitis D were reported in Ontario with an average of four cases per year. A high of nine cases was reported in 2002 (Figure 3-16).

No comparable national data are available because hepatitis D infections are not nationally notifiable.

Figure 3-16. Incidence of Hepatitis D: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, Integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Hepatitis D is not a nationally notifiable disease.

Herpes, Neonatal

Infection with herpes simplex virus (HSV) (types 1 and 2) affects people of all age ages, causing symptoms that are either localized or systemic in nature. Infection in newborns is called neonatal herpes, and it is this form of the disease that is reportable in Ontario.¹ Neonatal herpes is most commonly transmitted during passage through the birth canal and less commonly *in utero*.¹ In newborns, symptoms of infection may be present at birth but can occur up to four weeks after.⁵⁵ Infections may involve the central nervous system, or manifest as systemic disease affecting multiple organs including the liver and lungs, or as localized lesions of the skin, mouth or eyes. HSV infection in newborns is often fatal when the organs and central nervous system are involved.^{1,55}

Neonatal herpes virus infection can be prevented through an assessment to determine if there is any history of genital herpes episodes, followed by

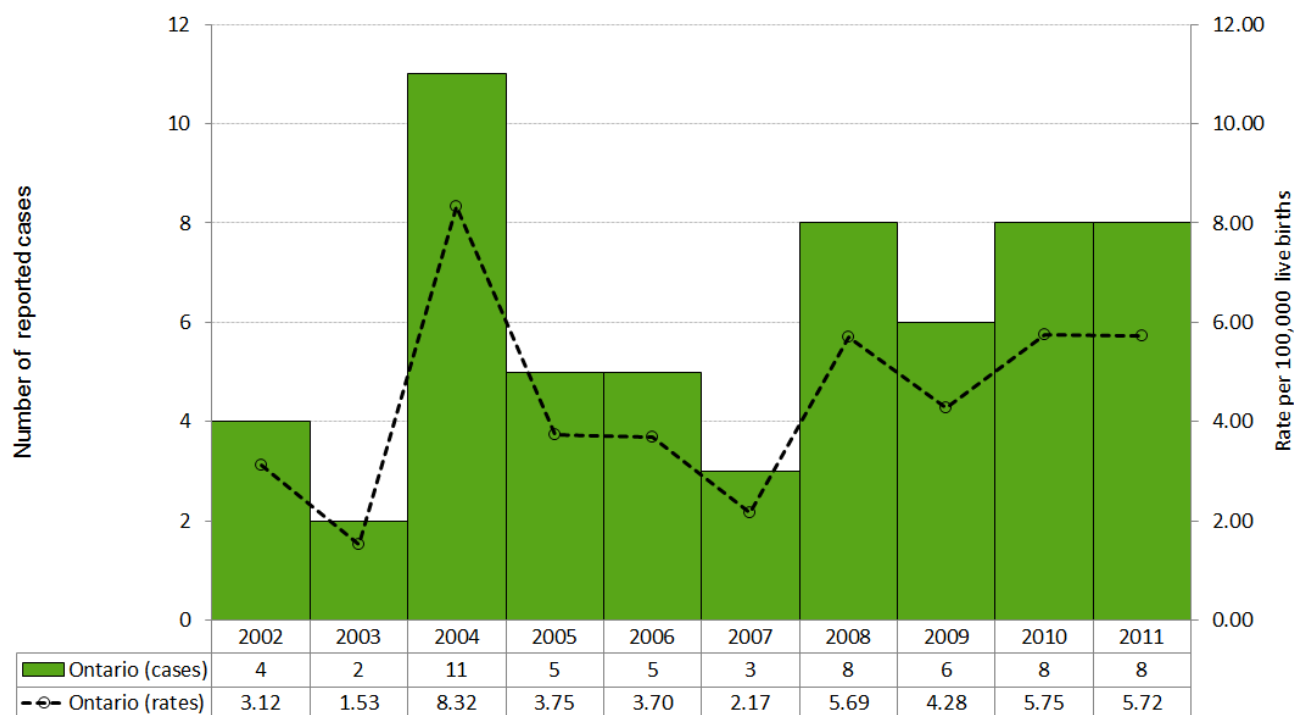
appropriate interventions to reduce the risk of transmission *in utero* and during birth, with the option of cesarean delivery if symptoms are present at the time of delivery.⁵⁶

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Eight cases of neonatal herpes were reported in Ontario in 2011, representing an incidence rate of 5.72 cases per 100,000 live births (Figure 3-17). From 2002 to 2011, a total of 60 cases were reported in Ontario with annual incidence rates ranging from 1.53 to 8.32 cases per 100,000 live births. A high of 11 cases was reported in 2004.

No comparable national data are available as neonatal herpes infections are not nationally notifiable.

Figure 3-17. Incidence of Neonatal Herpes: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/05]; rates are per/100,000 live births.

Canadian Rates: Neonatal herpes is not a nationally notifiable disease.

HIV and AIDS

- **The reported incidence of HIV was relatively stable from 2002 to 2008, with lower rates from 2009 to 2011.**
- **The incidence of HIV is highest among males 25 to 49 years of age; the incidence of AIDS is highest among males 30 to 59 years of age.**
- **The most frequently reported risk factor in 2011 among male HIV cases was 'sex with same sex'.**

Acquired Immunodeficiency Syndrome (AIDS) is an advanced disease of the immune system caused by infection with the human immunodeficiency virus (HIV). It was first reported in 1981 and is considered endemic in 71 countries worldwide.¹ A diagnosis of AIDS occurs when HIV weakens the immune system such that those infected become susceptible to other opportunistic infections and certain types of cancer.¹

HIV is transmitted from person-to-person through unprotected sexual intercourse; contact with certain bodily fluids, such as semen, blood, and vaginal fluids; exposure to cerebrospinal fluid; the use of contaminated needles and/or other drug use equipment; transfusion of infected blood or its components; and transplants with infected organs or tissues.¹ Mother-to-child transmission can also occur during childbirth and breast feeding.¹ Symptoms of acute HIV infection are non-specific and can include fever, myalgia, swollen lymph nodes, and weight loss.

Antibodies for the detection of HIV can take from one to three months to appear after infection. Transmission can occur early after initial infection with HIV and continues throughout life. The risk of transmission is reduced with low amounts of virus in the blood achieved through compliance with treatment regimens, improved clinical status, and absence of other sexually transmitted infections. Compliance with current treatment regimens such as Highly Active

Anti-Retroviral Therapy (HAART) now allow people infected with HIV to live longer and lead relatively healthy lives. The time from HIV infection to diagnosis of AIDS can be less than a year to over 15 years.¹ In Ontario, those at greatest risk for HIV include men who have sex with men, injection drug users, those of African and/or Caribbean descent, and Aboriginal peoples.^{57,58}

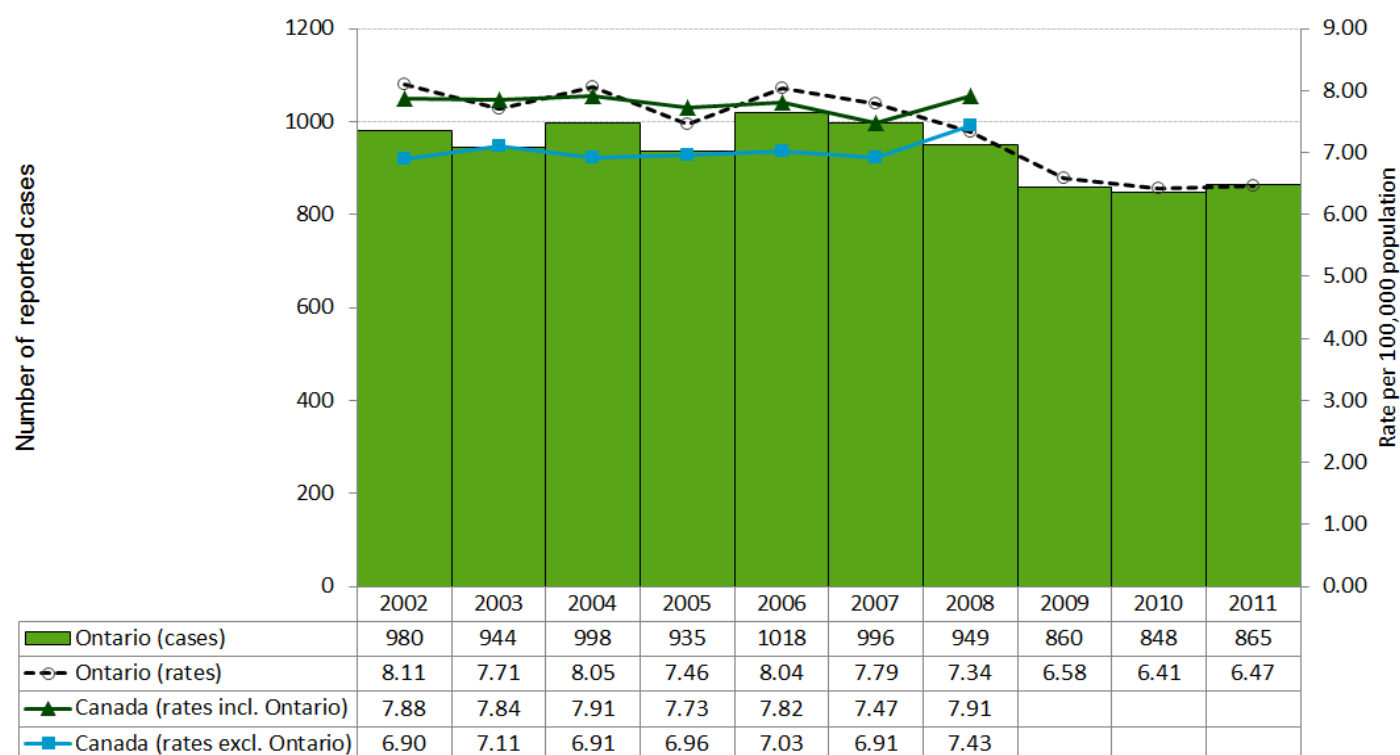
2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, there were 865 reported cases of HIV in Ontario, representing an incidence rate of 6.47 cases per 100,000 population (Figure 3-18). There were 100 newly diagnosed AIDS cases in 2011, resulting in an incidence rate of 0.75 cases per 100,000 population (Figure 3-19). The reported incidence rates of both HIV and AIDS in 2011 were similar to the rates reported in 2010. Of newly diagnosed AIDS cases in 2011, 80% (80/100) were reported for the first time as having HIV in 2011, indicating late detection of the infection.

The reported incidence of HIV was relatively stable in Ontario from 2002 to 2008, with an average annual incidence rate of 7.78 cases per 100,000. The annual average incidence rate of HIV from 2009 to 2011 was 17% lower at 6.49 cases per 100,000 population. Starting in 2003, the reported incidence rate of AIDS in Ontario decreased by 59%, from 1.81 cases per 100,000 population to 0.75 cases per 100,000 population in 2011. The decrease in AIDS diagnoses over the past decade is likely due in large part to improved access and treatment for HIV infection, which has slowed down the progression to AIDS.⁵⁸

From 2002 to 2008, annual incidence rates of HIV in Ontario were similar to those of Canada. However, the Ontario rates for AIDS were consistently higher than the overall Canadian rates during this period (Figures 3-18 and 3-19).

Figure 3-18. Incidence of HIV in Ontario and Canada: 2002-2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

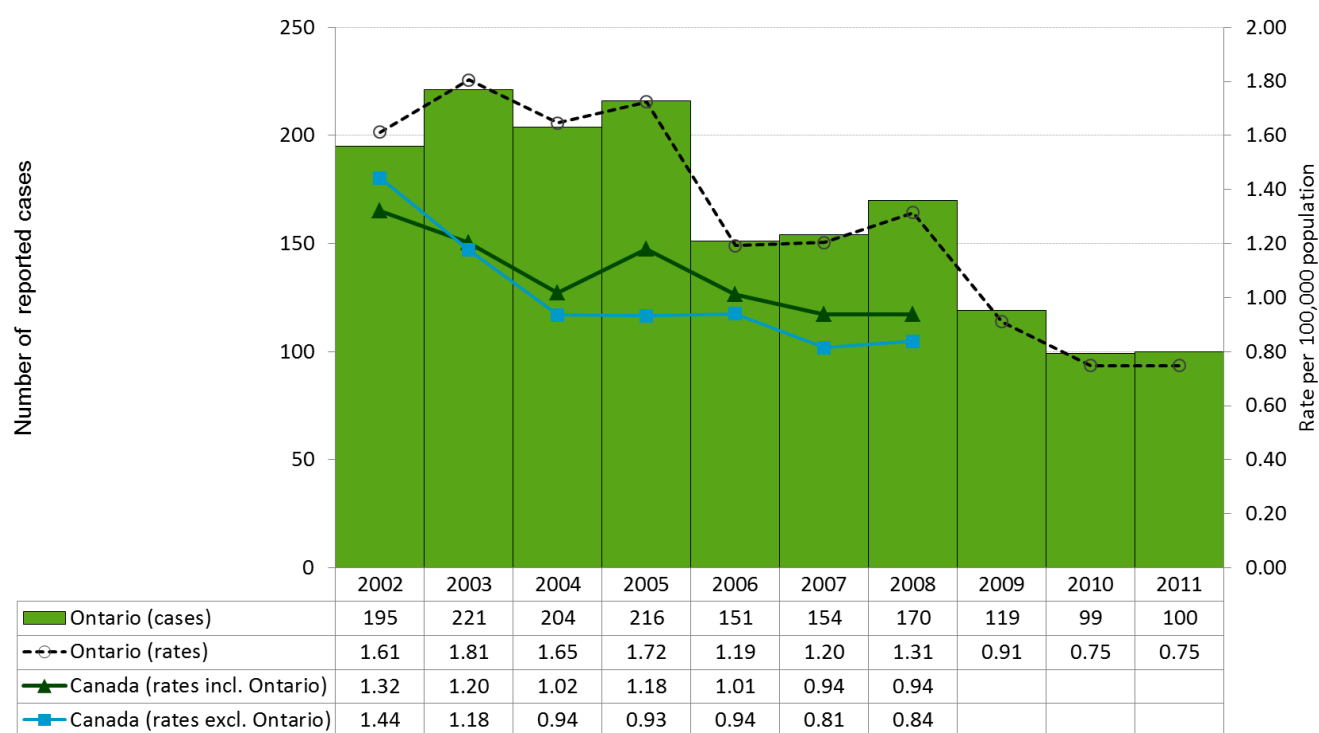
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

AGE AND SEX DISTRIBUTION

Males accounted for 80% of reported cases of HIV and 86% of newly diagnosed cases of AIDS in 2011. The incidence rate for HIV among males in 2011 was more than four times higher than females at 10.60 and 2.42 cases per 100,000 population, respectively (Table 3-14, Figure 3-20). HIV cases reported in 2011 ranged from less than one year to 76 years of age, with the highest incidence rates reported among those 25 to 39 years of age. The overall incidence of HIV decreased after 39 years of age, particularly among males.

The incidence rate of AIDS among males in 2011 was more than six times higher than females at 1.30 and 0.21 cases per 100,000 population, respectively (Table 3-15, Figure 3-21). AIDS cases diagnosed in 2011 ranged from 21 to 76 years of age, with the highest incidence rate reported in the 40-49 age group.

Figure 3-19. Incidence of AIDS in Ontario and Canada: 2002-2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Table 3-14. Incidence of HIV by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
<15	3	0.28	1	0.09	4	0.18
15-19	2	0.47	6	1.34	8	0.92
20-24	22	4.76	81	16.72	103	10.88
25-29	15	3.22	116	24.78	131	14.03
30-39	65	7.12	193	21.94	258	14.39
40-49	37	3.59	188	18.22	225	10.91
50-59	14	1.46	83	8.82	97	5.11
60-69	6	0.87	23	3.56	29	2.18
70+	0	0.00	8	1.42	8	0.60
Total	164	2.42	699	10.60	863	6.45

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes two cases of unknown age and sex.

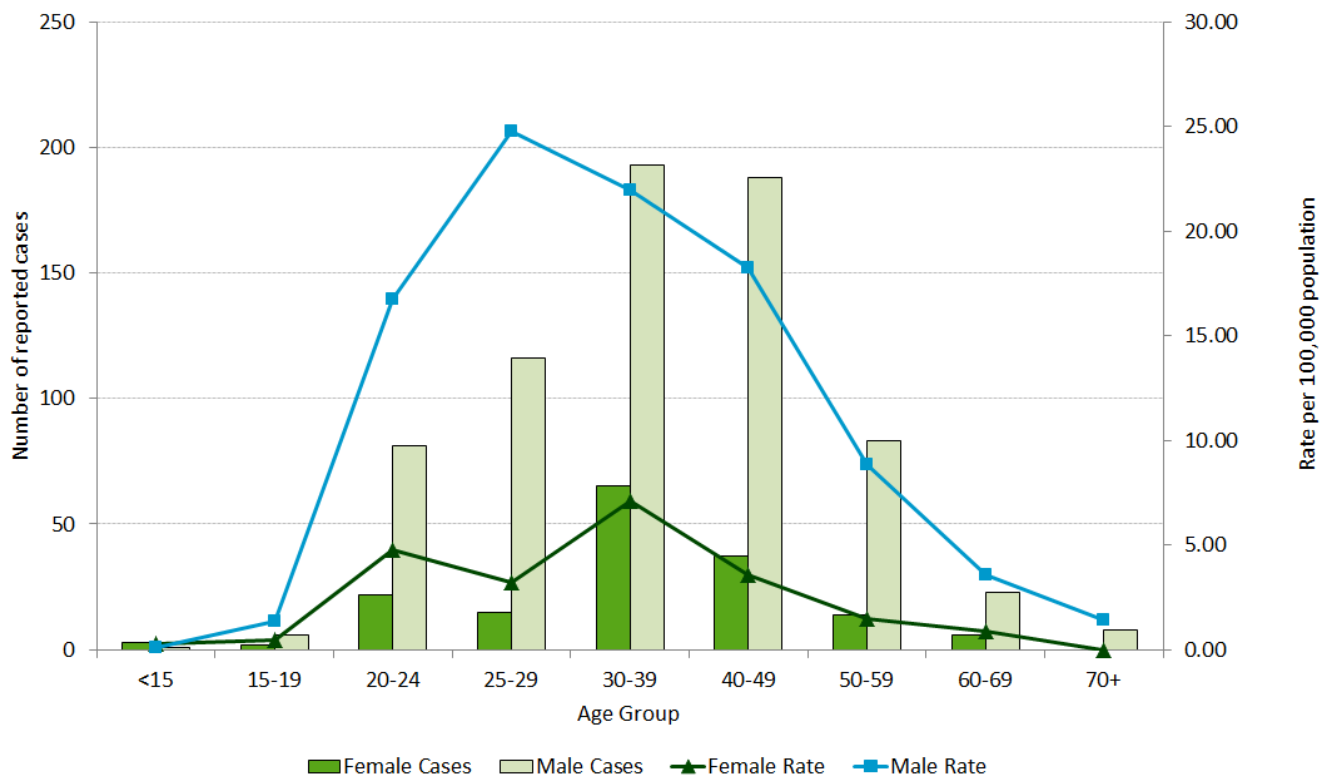
Table 3-15. Incidence of AIDS by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
<15	0	0.00	0	0.00	0	0.00
15-19	0	0.00	0	0.00	0	0.00
20-24	2	0.43	1	0.21	3	0.32
25-29	1	0.21	3	0.64	4	0.43
30-39	6	0.66	16	1.82	22	1.23
40-49	4	0.39	37	3.59	41	1.99
50-59	0	0.00	17	1.81	17	0.90
60-69	0	0.00	6	0.93	6	0.45
70+	1	0.13	6	1.07	7	0.53
Total	14	0.21	86	1.30	100	0.75

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Figure 3-20. Incidence of HIV by Age and Sex: Ontario, 2011

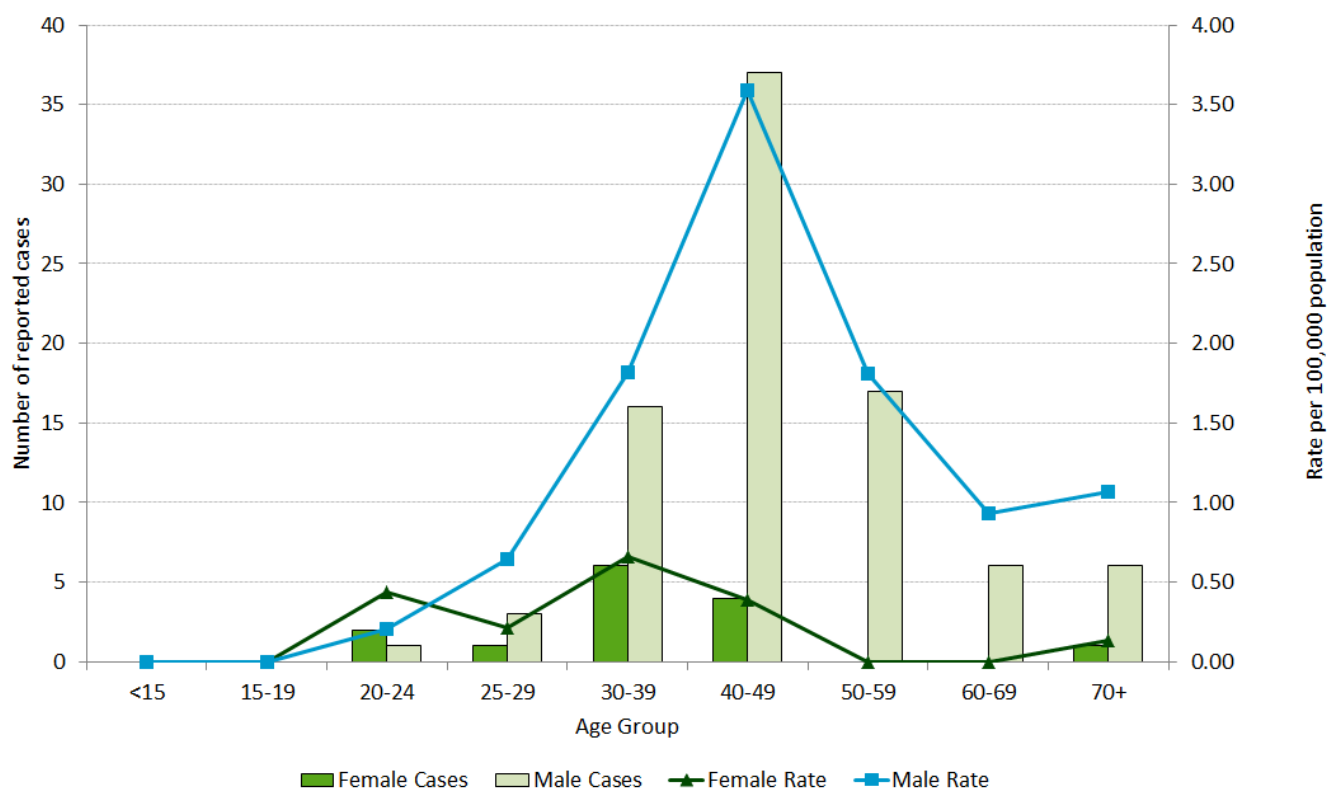


Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes two cases of unknown age and sex.

Figure 3-21. Incidence of AIDS by Age and Sex: Ontario, 2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

HOSPITALIZATIONS AND DEATHS

Of AIDS cases diagnosed in 2011, 11% (11 cases) were fatal. AIDS was reported as the underlying cause of death for seven of these cases, and as a contributing cause of death for two cases. The cause of death was unknown for the remaining two cases.

MONTHLY DISTRIBUTION

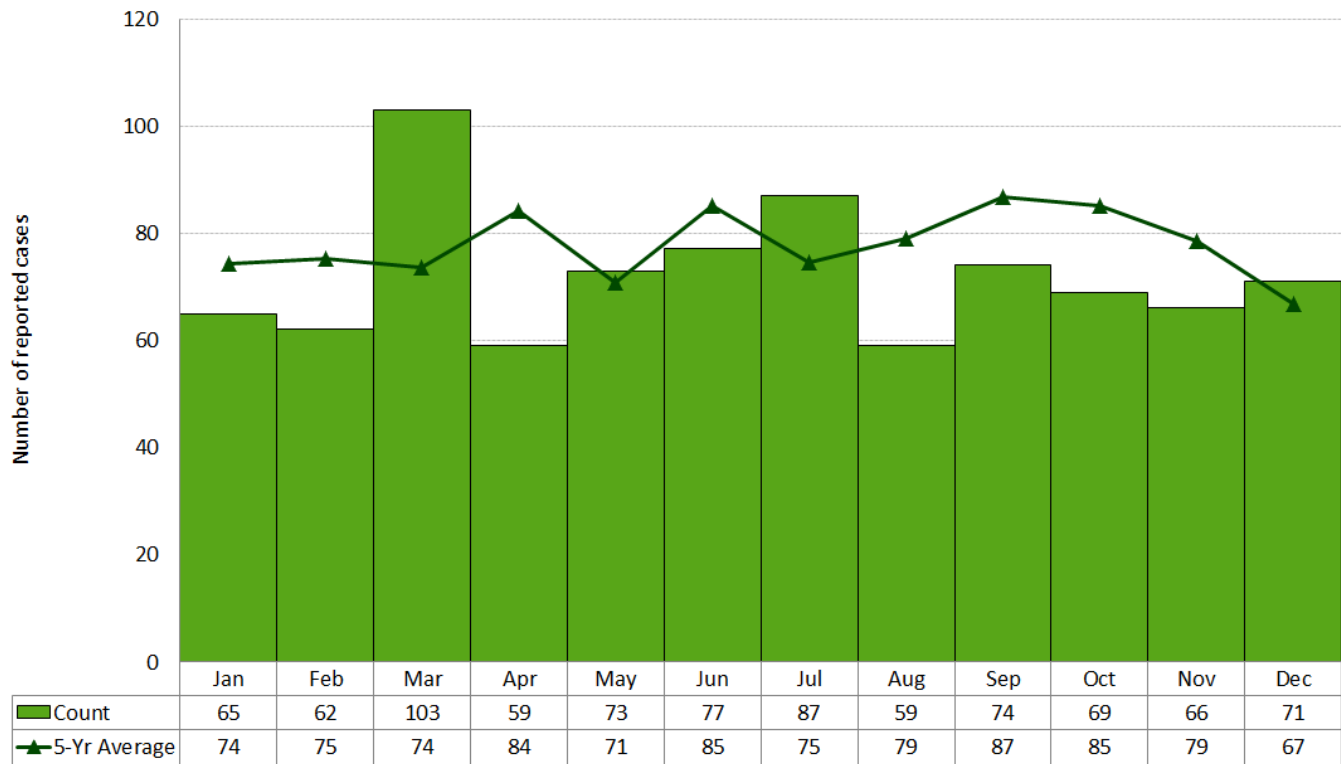
There are no apparent monthly or seasonal trends observed in the incidence of HIV and AIDS in Ontario (Figures 3-22 and 3-23).

GEOGRAPHIC DISTRIBUTION

In 2011, 63% (544/865) of all HIV cases in Ontario were reported from Toronto, which had the highest incidence rate at 19.8 cases per 100,000 population (Map 3-6, Table 3-16). This rate was more than double those in Sudbury and District and City of Ottawa, which had the next highest rates at 9.61 cases and 7.91 cases per 100,000 population, respectively.

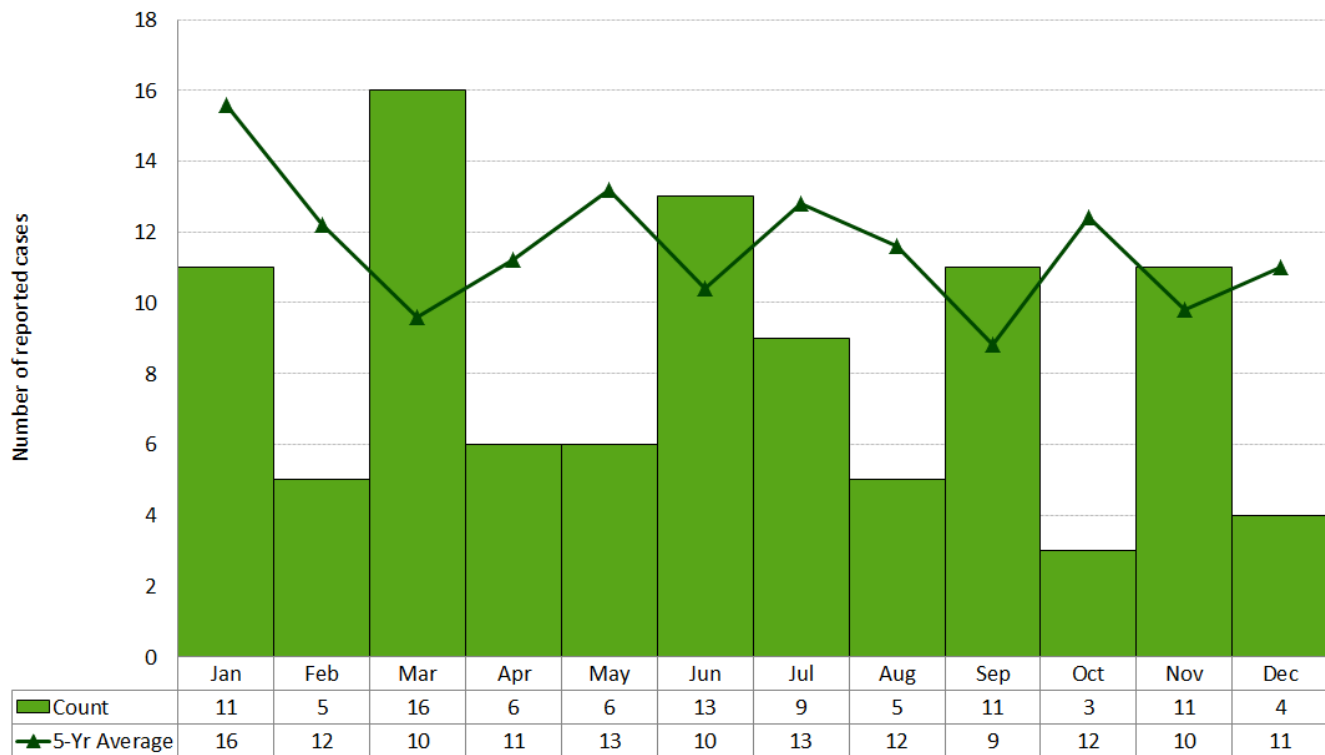
Toronto reported the majority of AIDS cases (54%, 54/100) in Ontario in 2011 with an annual incidence rate of 1.97 cases per 100,000 population (Map 3-7, Table 3-17). However, the incidence rate of AIDS was higher in Northwestern and Elgin-St. Thomas, with 3.66 and 2.19 cases per 100,000 population, respectively. Seventeen health units reported no cases of AIDS in 2011.

Figure 3-22. Number of HIV Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



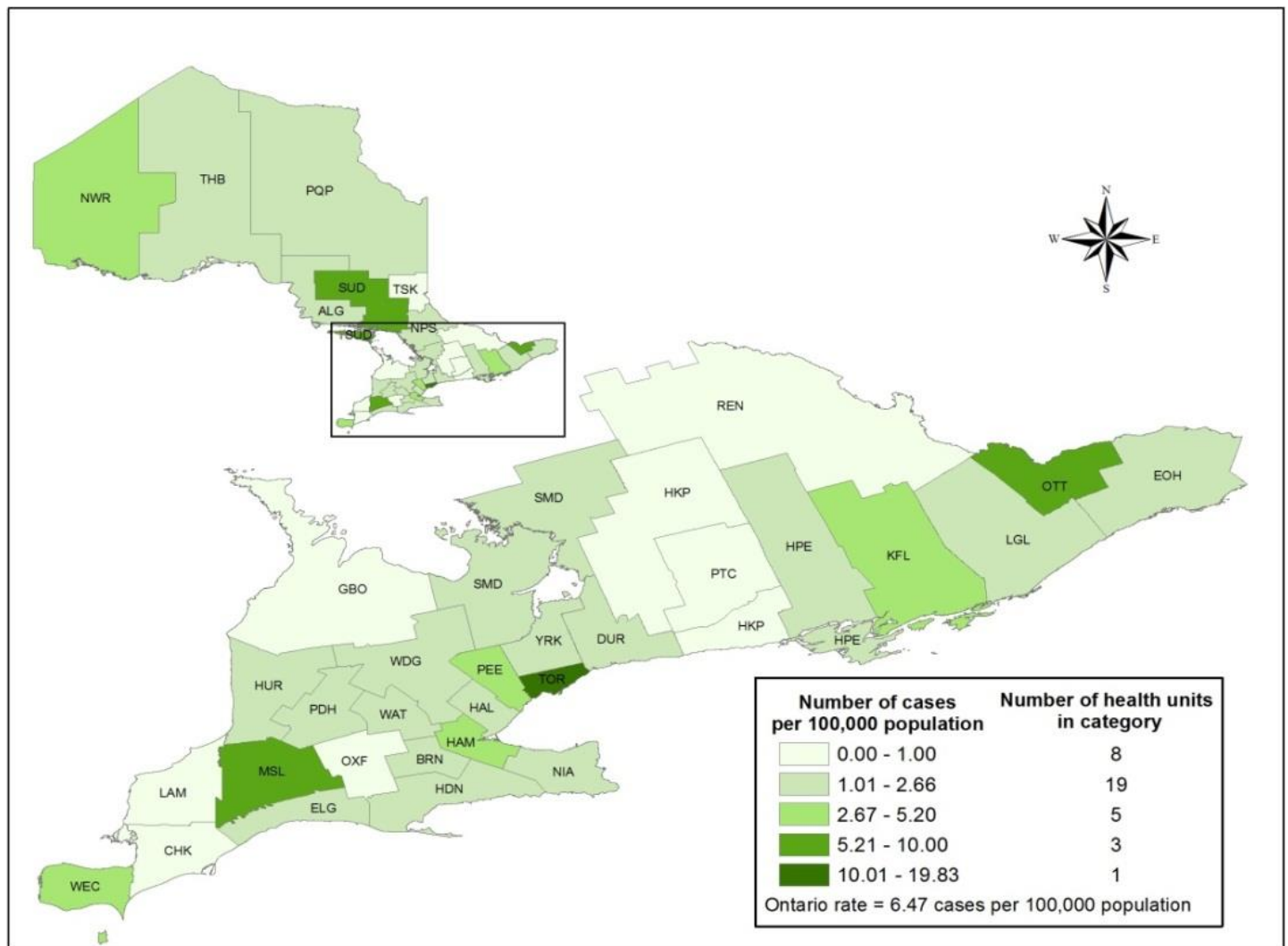
Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Figure 3-23. Number of AIDS Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Map 3-6. Incidence rates of HIV by Health Unit of Residence: Ontario, 2011

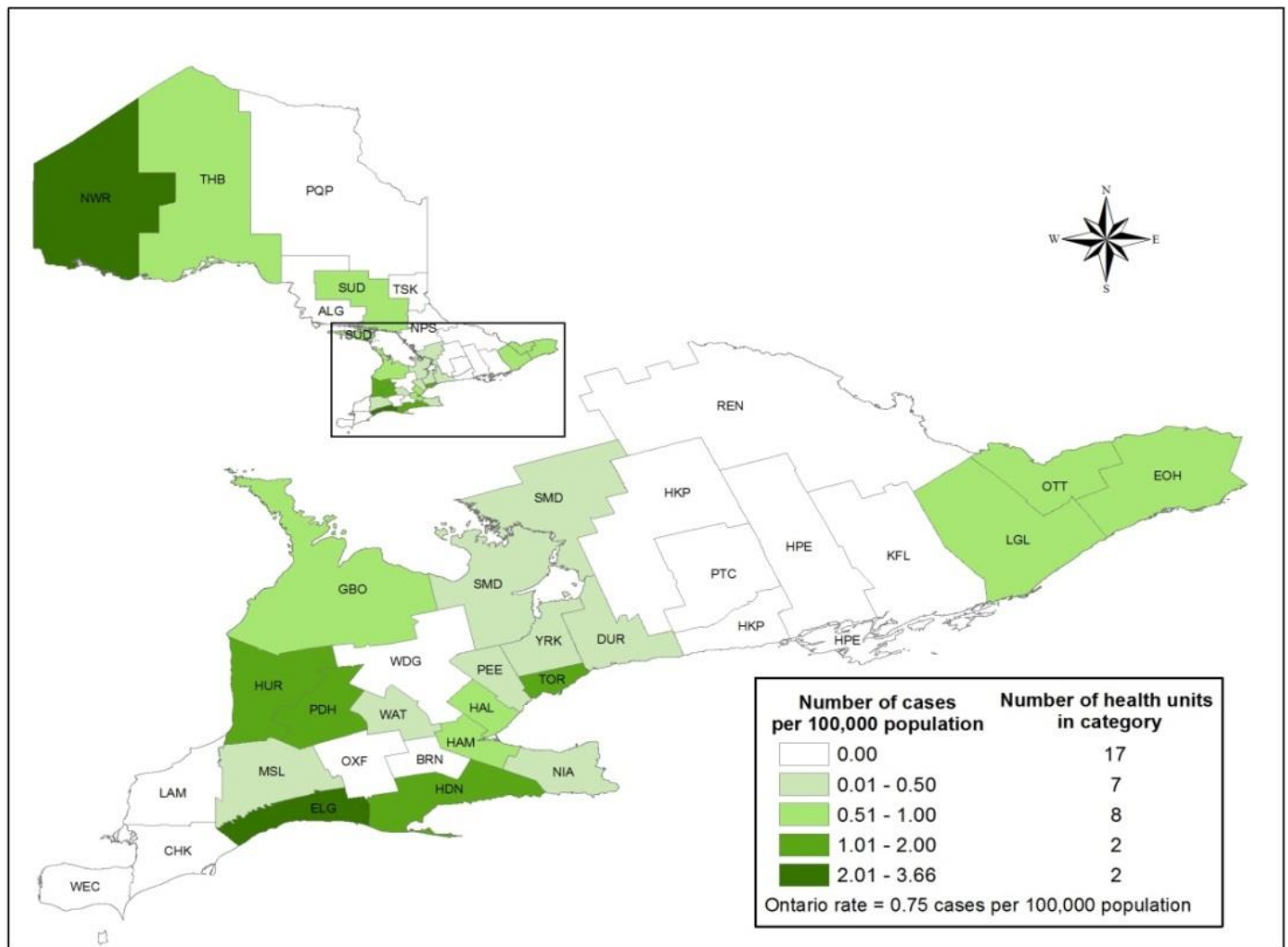


Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Map 3-7. Incidence rates of AIDS by Health Unit of Residence: Ontario, 2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 3-16. Incidence of HIV by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	2	1.70	0.2%	0.9%
Brant County	2	1.42	0.2%	1.1%
Chatham-Kent	1	0.92	0.1%	0.8%
Durham Region	8	1.27	0.9%	4.7%
Eastern Ontario	3	1.49	0.3%	1.5%
Elgin-St. Thomas	2	2.19	0.2%	0.7%
Grey Bruce	1	0.61	0.1%	1.2%
Haldimand-Norfolk	2	1.81	0.2%	0.8%
Haliburton, Kawartha, Pine Ridge District	0	0.00	0.0%	1.3%
Halton Region	6	1.16	0.7%	3.9%
Hamilton, City of	26	4.81	3.0%	4.0%
Hastings & Prince Edward Counties	2	1.23	0.2%	1.2%
Huron County	1	1.66	0.1%	0.5%
Kingston-Frontenac & Lennox & Addington	8	4.05	0.9%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	2	1.18	0.2%	1.3%
Middlesex-London	24	5.21	2.8%	3.4%
Niagara Region	10	2.25	1.2%	3.3%
North Bay Parry Sound District	3	2.36	0.3%	1.0%
Northwestern	3	3.66	0.3%	0.6%
Ottawa, City of	72	7.91	8.3%	6.8%
Oxford County	0	0.00	0.0%	0.8%
Peel Region	43	3.15	5.0%	10.2%
Perth District	1	1.30	0.1%	0.6%
Peterborough County-City	1	0.71	0.1%	1.1%
Porcupine	2	2.31	0.2%	0.6%
Renfrew County & District	1	0.97	0.1%	0.8%
Simcoe Muskoka District	14	2.66	1.6%	3.9%
Sudbury & District	19	9.61	2.2%	1.5%
Thunder Bay District	3	1.92	0.3%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	544	19.83	62.9%	20.5%
Waterloo Region	12	2.26	1.4%	4.0%
Wellington-Dufferin-Guelph	5	1.80	0.6%	2.1%
Windsor-Essex County	16	3.97	1.8%	3.0%
York Region	26	2.43	3.0%	8.0%
Ontario	865	6.47	100.0%	100.0%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 3-17. Incidence of AIDS by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	0	0.00	0.0%	0.8%
Durham Region	3	0.48	3.0%	4.7%
Eastern Ontario	2	0.99	2.0%	1.5%
Elgin-St. Thomas	2	2.19	2.0%	0.7%
Grey Bruce	1	0.61	1.0%	1.2%
Haldimand-Norfolk	2	1.81	2.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	0	0.00	0.0%	1.3%
Halton Region	3	0.58	3.0%	3.9%
Hamilton, City of	4	0.74	4.0%	4.0%
Hastings & Prince Edward Counties	0	0.00	0.0%	1.2%
Huron County	1	1.66	1.0%	0.5%
Kingston-Frontenac & Lennox & Addington	0	0.00	0.0%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	1	0.59	1.0%	1.3%
Middlesex-London	1	0.22	1.0%	3.4%
Niagara Region	2	0.45	2.0%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	3	3.66	3.0%	0.6%
Ottawa, City of	7	0.77	7.0%	6.8%
Oxford County	0	0.00	0.0%	0.8%
Peel Region	4	0.29	4.0%	10.2%
Perth District	1	1.30	1.0%	0.6%
Peterborough County-City	0	0.00	0.0%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	2	0.38	2.0%	3.9%
Sudbury & District	1	0.51	1.0%	1.5%
Thunder Bay District	1	0.64	1.0%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	54	1.97	54.0%	20.5%
Waterloo Region	1	0.19	1.0%	4.0%
Wellington-Dufferin-Guelph	0	0.00	0.0%	2.1%
Windsor-Essex County	0	0.00	0.0%	3.0%
York Region	4	0.37	4.0%	8.0%
Ontario	100	0.75	100.0%	100.0%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED EXPOSURES

Sixty-two percent of male HIV cases self-identified as 'men who have sex with men' (MSM), making this exposure category the most frequently reported among all HIV cases reported in 2011 (50%) (Table 3-18). Among all cases, exposure to an HIV endemic country was the second most common exposure category at 20%, followed by heterosexual transmission at nine percent (Tables 3-18). For females, exposure to an HIV endemic country was the most frequently reported exposure category at 57%. There were four HIV cases in 2011 where mother to child transmission was reported as a risk factor.

Table 3-18. Reported Exposure for HIV Cases: Ontario 2011

Exposures	Male		Female		Total	
	Cases (n=699)	Percent (%)	Cases (n=164)	Percent (%)	Cases (n=863)	Percent (%)
Men who have sex with men (MSM)	431	61.7%	0	0.0%	431	49.9%
HIV endemic country	81	11.6%	93	56.7%	174	20.2%
No indicated risk factor	97	13.9%	25	15.2%	122	14.1%
Heterosexual transmission	48	6.9%	27	16.5%	75	8.7%
Injecting drug use (IDU)	24	3.4%	16	9.8%	40	4.6%
MSM and IDU	14	2.0%	0	0.0%	14	1.6%
Mother to child transmission	1	0.1%	3	1.8%	4	0.5%
Transfusion	3	0.4%	0	0.0%	3	0.3%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/02/04].

Note: One exposure category was determined for each case based on a hierarchy of most likely risk. Does not include two cases of unknown age and gender.

Ophthalmia Neonatorum

Ophthalmia neonatorum is an acute infection of the eyes of a newborn that occurs within the first three to four weeks of life.^{1,55} The infection is acquired during birth and occurs subsequent to maternal chlamydial or gonorrheal infections.¹ The most common symptoms of ophthalmia neonatorum are red eyes and swollen eyelids with a discharge.¹ Gonorrheal ophthalmia neonatorum is more serious but occurs less frequently than chlamydial ophthalmia neonatorum.^{1,55} Data on the incidence of chlamydia and gonorrhea in Ontario are presented in separate chapters in this section.

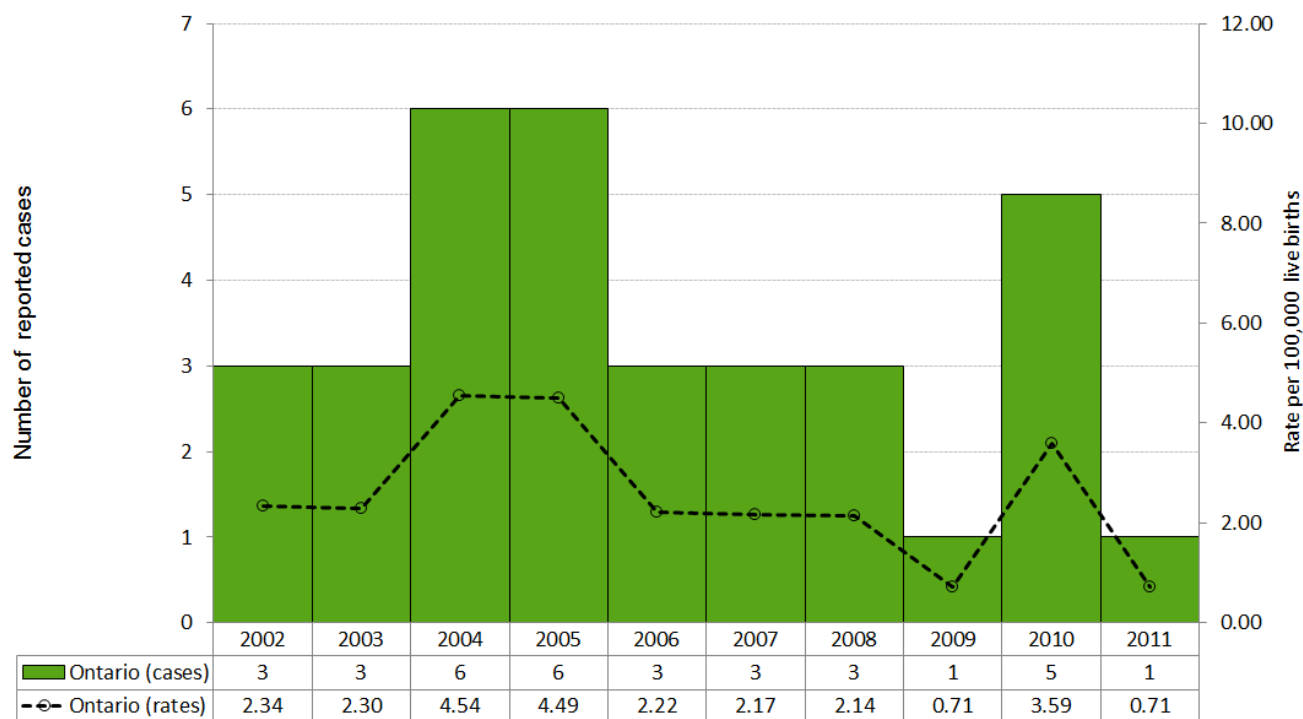
The first line of defense against ophthalmia neonatorum is maternal screening and treatment for chlamydia and gonorrhea and prophylactic treatment of the eyes of all newborns. In Ontario, as in most jurisdictions in Canada, the eyes of every newborn are treated prophylactically to reduce the risk of ophthalmia neonatorum and the resultant scarring that can lead to blindness.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

One case of ophthalmia neonatorum due to *Chlamydia trachomatis* was reported in Ontario in 2011, representing an incidence rate of 0.71 cases per 100,000 live births (Figure 3-24). This was lower than the five cases reported in 2010. Over the period 2002 to 2011, 35 cases of ophthalmia neonatorum were reported in Ontario, with annual incidence rates ranging from 0.71 to 4.54 cases per 100,000 live births.

No comparable national data are available because ophthalmia neonatorum infections are not nationally notifiable.

Figure 3-24. Incidence of Ophthalmia Neonatorum: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15]; rates are per/100,000 live births.

Canadian Rates: Ophthalmia neonatorum is not a nationally notifiable disease.

Syphilis, Infectious

- **The incidence of infectious syphilis increased from 2002 to 2011, with peaks in 2004 and 2009.**
- **Males accounted for 96% of infectious syphilis cases reported in Ontario in 2011.**
- **The majority of infectious syphilis cases were reported in Toronto and Ottawa.**
- **'Sex with same sex' is the most commonly reported risk factor among male cases for infectious syphilis in Ontario.**

Infectious syphilis is caused by infection with the bacteria *Treponema pallidum*.¹ Syphilis can result in acute or chronic disease, with four possible stages of infection: primary, secondary, latent, and tertiary. Primary syphilis involves the appearance of a painless ulcer or chancre and swollen lymph nodes. Secondary stage syphilis occurs after resolution of the chancre and often includes a rash on the palms and soles along with swollen lymph nodes. Latent syphilis occurs after the symptoms of secondary syphilis have resolved, and can be classified as early latent infection (within the first year of infection) or late latent infection (after the first year of infection). Untreated latent syphilis can progress after many years to tertiary syphilis, which affects the skeletal, cardiovascular, and neurological systems (e.g. neurosyphilis).¹

Individuals infected with syphilis can transmit the bacteria during primary, secondary, and early latent infection; however, in some cases, neurosyphilis may also be infectious. Syphilis is typically transmitted through sexual contact, including vaginal, anal and oral sex. It can also be passed from an infected mother to her child before (i.e. across the placenta) or during birth, resulting in congenital syphilis.¹ Generally, the appearance of symptoms can take anywhere from ten days to three months to appear, but usually occurs in about three weeks.

All cases of syphilis are reportable in Ontario, regardless of stage of disease, however only stages considered infectious are included in this report. Although susceptibility is universal, syphilis has been more prevalent in urban areas and among men who have sex with men (MSM) in Ontario.^{59,60}

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In Ontario, there were 767 cases of infectious syphilis reported in 2011, which includes primary, secondary and early latent syphilis, as well as infectious neurosyphilis (Figure 3-25). This yielded an incidence rate of 5.74 cases per 100,000 population in 2011, which was three percent lower than the incidence rate of 5.9 cases per 100,000 population reported in 2010. There was one case of congenital syphilis reported in 2011.

From 2002 to 2011, the annual incidence rate of infectious syphilis in Ontario increased nearly three-folds, from 2.0 cases per 100,000 population in 2002 to 5.7 cases per 100,000 population in 2011.

Two notable increases in the incidence of infectious syphilis in Ontario were observed from 2002 to 2004, and again from 2008 to 2009 (Figure 3-25). Both of these increases are primarily attributable to outbreaks in Toronto and Ottawa among MSM.^{59,60} Since 2009, incidence rates have decreased only gradually.

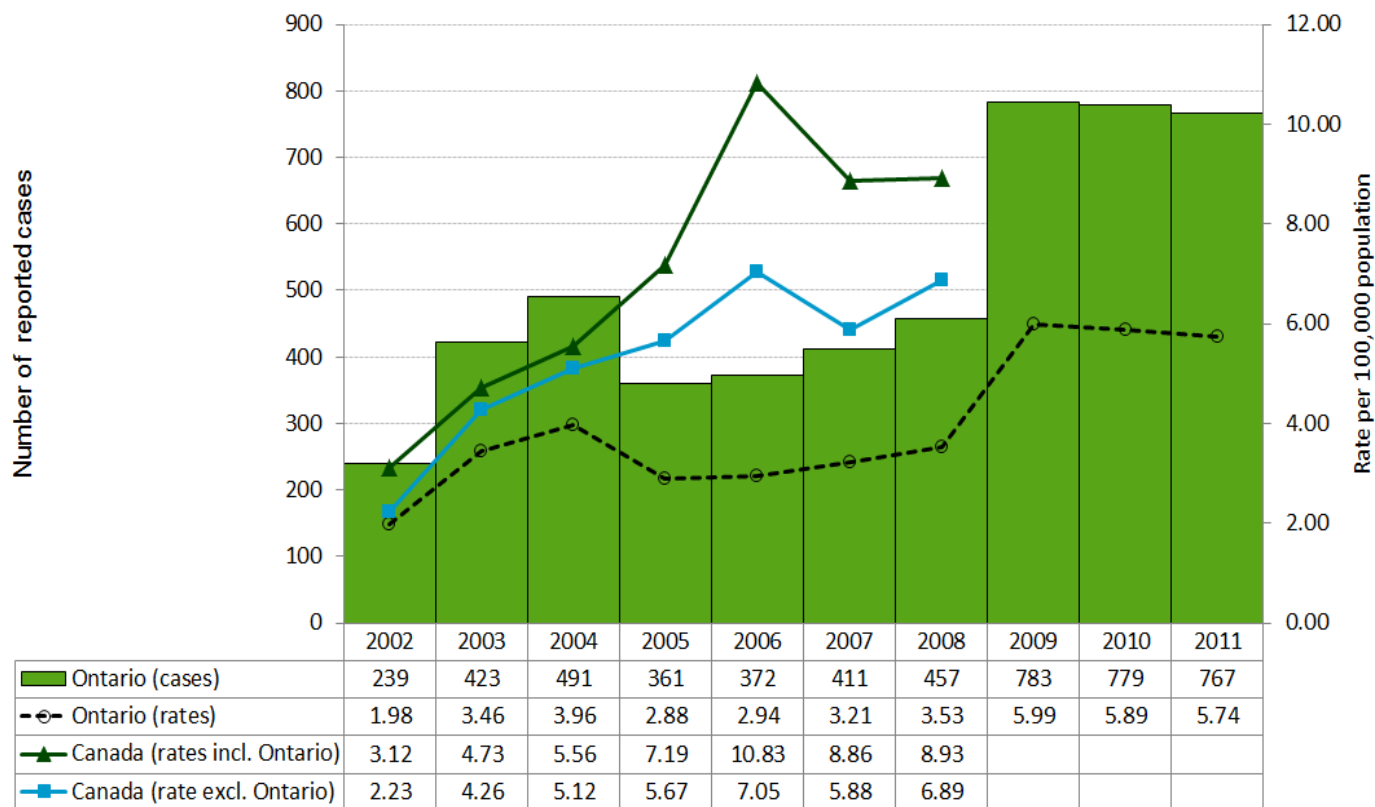
Annual incidence rates of infectious syphilis in Ontario were consistently lower than the Canadian rates from 2002 to 2011 (Figure 3-25). Both provincial and national rates increased during this period; however, the increase in Ontario was more gradual. There was also a decrease in the incidence rate of infectious syphilis in Ontario from 2005 to 2008, a period when the Canadian rate was approaching its peak.

AGE AND SEX DISTRIBUTION

In 2011, the incidence rate of infectious syphilis among males was 11.16 cases per 100,000 population, which was over 24 times higher than the incidence among females at 0.46 cases per 100,000 population (Table 3-19, Figure 3-26). Over 95% of cases of infectious syphilis reported in Ontario in 2011 occurred among males.

Among males, the highest annual incidence rates were observed among those in the age range from 25 to 49 years of age; among females, the highest incidence rate was observed in the 20-24 year age group.

Figure 3-25. Incidence of Infectious Syphilis in Ontario and Canada: 2002-2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

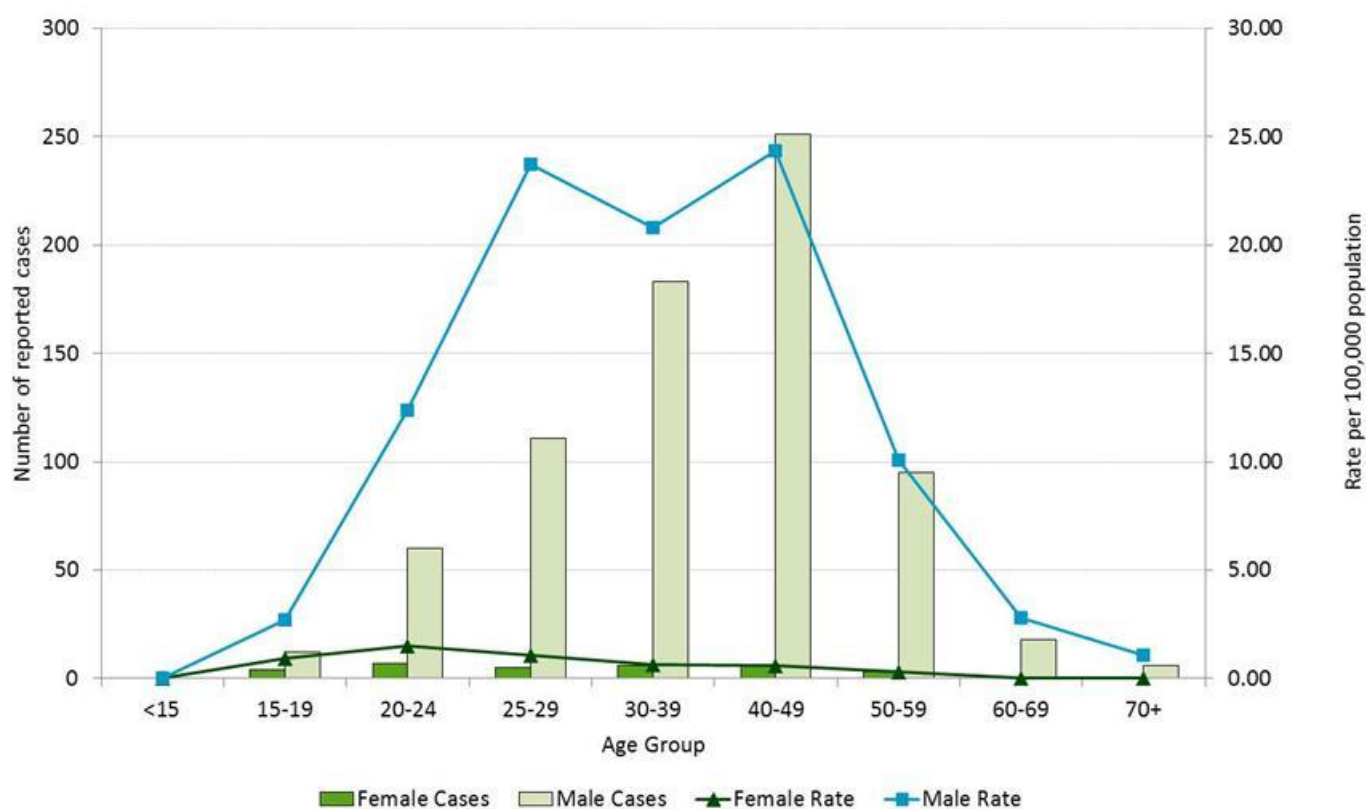
Table 3-19. Incidence of Infectious Syphilis by Age and Sex: Ontario, 2011

Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
<15	0	0.00	0	0.00	0	0.00
15-19	4	0.94	12	2.69	16	1.83
20-24	7	1.51	60	12.38	67	7.08
25-29	5	1.07	111	23.71	116	12.43
30-39	6	0.66	183	20.80	189	10.54
40-49	6	0.58	251	24.33	257	12.46
50-59	3	0.31	95	10.09	98	5.16
60-69	0	0.00	18	2.79	18	1.35
70+	0	0.00	6	1.07	6	0.45
Total	31	0.46	736	11.16	767	5.74

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Figure 3-26. Incidence of Infectious Syphilis by Age and Sex: Ontario, 2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

HOSPITALIZATIONS AND DEATHS

In 2011, hospitalization was reported for four infectious syphilis cases. No cases were fatal.

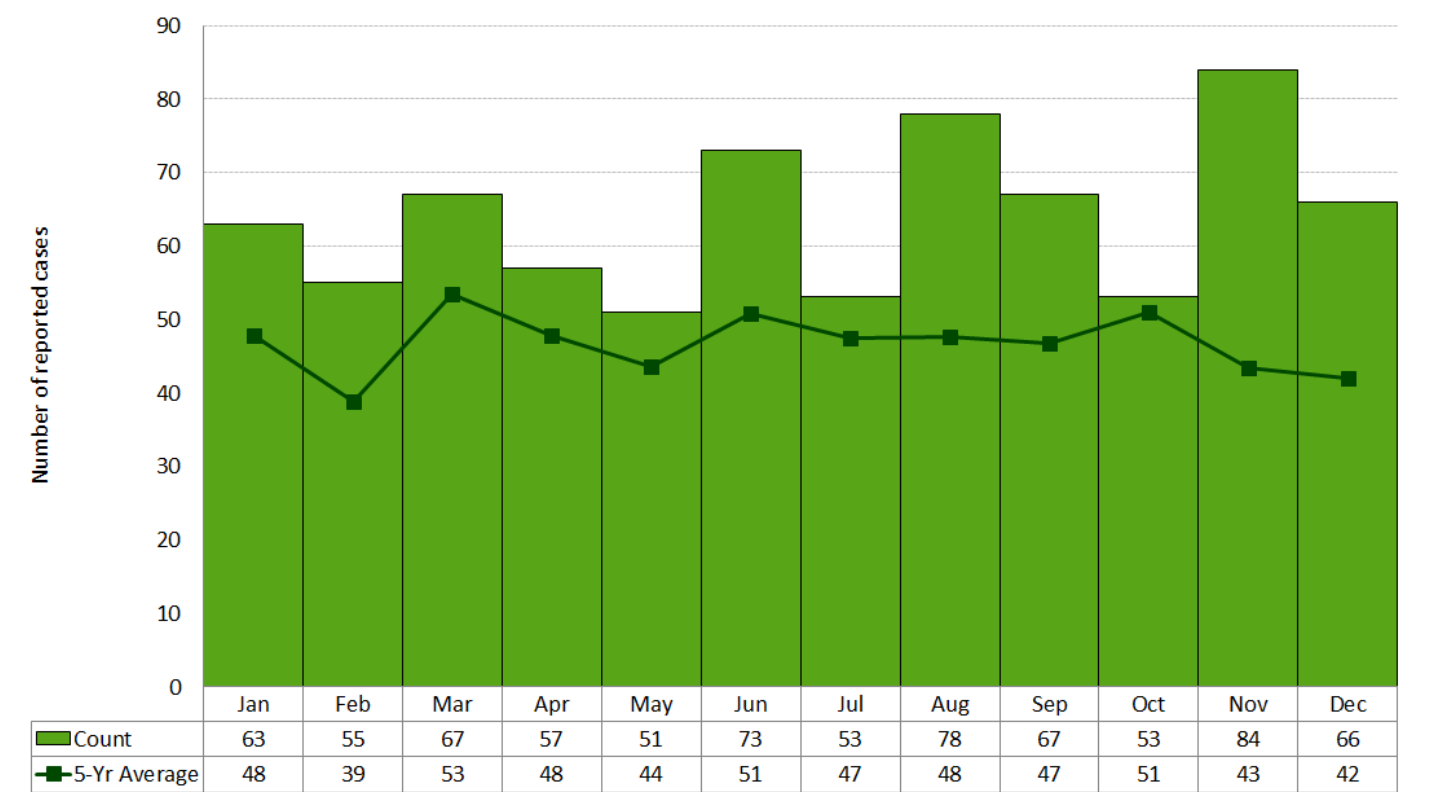
SEASONALITY

Similar to other sexually transmitted infections, infectious syphilis does not follow a seasonal pattern of occurrence (Figure 3-27).

GEOGRAPHIC DISTRIBUTION

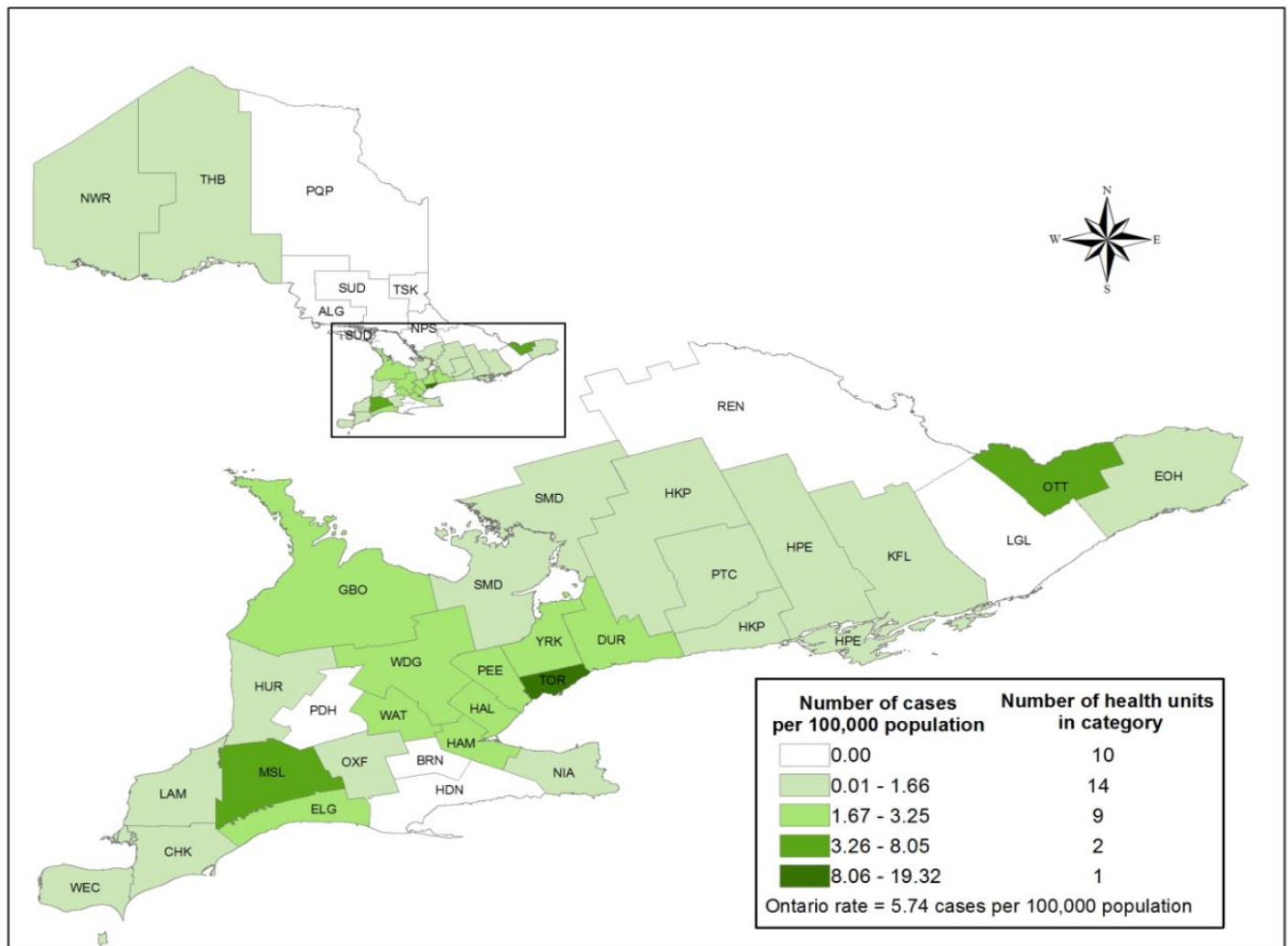
In 2011, cases of infectious syphilis were reported in 26 health units. The highest incidence rate of infectious syphilis was observed in Toronto, with 19.31 cases per 100,000 population. This was followed by Middlesex-London and the City of Ottawa with incidence rates of 8.03 and 5.39 cases per 100,000 population, respectively. The highest number of cases were reported in Toronto (530) and Ottawa (49), which combined accounted for 76% of infectious syphilis cases in Ontario in 2011 (Map 3-8, Table 3-20).

Figure 3-27. Number of Infectious Syphilis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Map 3-8. Incidence of Infectious Syphilis by Health Unit of Residence: Ontario, 2011



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 3-20. Incidence of Infectious Syphilis by Public Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	1	0.92	0.1%	0.8%
Durham Region	12	1.90	1.6%	4.7%
Eastern Ontario	3	1.49	0.4%	1.5%
Elgin-St. Thomas	2	2.19	0.3%	0.7%
Grey Bruce	4	2.43	0.5%	1.2%
Haldimand-Norfolk	0	0.00	0.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	1	0.56	0.1%	1.3%
Halton Region	9	1.74	1.2%	3.9%
Hamilton, City of	17	3.15	2.2%	4.0%
Hastings & Prince Edward Counties	1	0.61	0.1%	1.2%
Huron County	1	1.66	0.1%	0.5%
Kingston-Frontenac & Lennox & Addington	2	1.01	0.3%	1.5%
Lambton County	1	0.76	0.1%	1.0%
Leeds, Grenville and Lanark District	0	0.00	0.0%	1.3%
Middlesex-London	37	8.03	4.8%	3.4%
Niagara Region	5	1.12	0.7%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	1	1.22	0.1%	0.6%
Ottawa, City of	49	5.39	6.4%	6.8%
Oxford County	1	0.92	0.1%	0.8%
Peel Region	30	2.20	3.9%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	1	0.71	0.1%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	4	0.76	0.5%	3.9%
Sudbury & District	0	0.00	0.0%	1.5%
Thunder Bay District	2	1.28	0.3%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	530	19.32	69.1%	20.5%
Waterloo Region	10	1.89	1.3%	4.0%
Wellington-Dufferin-Guelph	9	3.23	1.2%	2.1%
Windsor-Essex County	5	1.24	0.7%	3.0%
York Region	29	2.71	3.8%	8.0%
Ontario	767	5.74	100.0%	100.0%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Ontario population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

RISK FACTORS

In 2011, at least one risk factor was reported for 90% (690/767) of infectious syphilis cases in Ontario (Table 3-19). Among males, the most commonly reported risk factors were 'sex with same sex' at 85%, 'no condom used' at 59% and having 'more than one sex contact in past 6 months' at 46%. Among females, the most commonly reported risk factor was 'no condom used' at 68%. 'Sex with opposite sex' accounted for 54% of risk factors reported among females.

Table 3-21. Reported Risk Factors for Infectious Syphilis Cases: Ontario 2011

Risk factor	Male		Female		Total	
	Cases (n=662)	Percent (%)	Cases (n=28)	Percent (%)	Cases (n=690)	Percent (%)
Sex with same sex	562	84.9%	3	10.7%	565	81.9%
No condom used	391	59.1%	19	67.9%	410	59.4%
More than one sex contact in past 6 months	304	45.9%	7	25.0%	311	45.1%
New contact in past 2 months	94	14.2%	3	10.7%	97	14.1%
Anonymous sex	68	10.3%	2	7.1%	70	10.1%
Travel outside Ontario	52	7.9%	4	14.3%	56	8.1%
Sex with opposite sex	51	7.7%	15	53.6%	66	9.6%
Bathhouse	48	7.3%	1	3.6%	49	7.1%
Met contact through internet	43	6.5%	0	0.0%	43	6.2%
Judgement impaired by alcohol or drugs	36	5.4%	2	7.1%	38	5.5%
Other	250	37.8%	17	60.7%	267	38.7%

Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/18].

Note: Cases may report more than one risk factor. 'Other' includes but is not limited to: condom breakage, sex trade worker, sex with sex trade worker, shared sex toys, and born to an infected mother.

Section 4

Vaccine-Preventable Diseases

Overview

Although several reportable diseases in Ontario are vaccine-preventable, only those administered as part of the routine publicly-funded schedule for Ontario are reviewed in this section, with the exception of varicella, hepatitis B and influenza. There are publicly-funded rotavirus and human papillomavirus immunization programs, however these diseases are not reportable and are also not included. While trends in the incidence of vaccine-preventable diseases (VPDs) are presented, self-reported immunization data as reported in iPHIS are not included in this report. In 2011, invasive pneumococcal disease (IPD), pertussis and mumps accounted for 96% of the VPDs described in this section. The incidence of serogroup C meningococcal disease and IPD decreased over the period from 2002 to 2011, suggesting a positive impact of these publicly funded childhood immunization programs. Notable fluctuations in the incidence of pertussis and mumps were observed over the same period, due to large provincial outbreaks and the cyclical nature of the incidence of these diseases.

No cases of diphtheria or poliomyelitis were reported in Ontario in 2011, while tetanus and *Haemophilus influenzae* type b were rarely reported. Measles and rubella are currently undergoing documentation of elimination in the Americas and remained low in Ontario in 2011. No cases of rubella or congenital rubella were reported. The eight reported cases of measles were all directly or indirectly linked to travel outside of Canada.

Several quick reference data tables for the diseases covered in this section are included in Appendix 4.

Diphtheria

Diphtheria is a bacterial disease that produces a toxin that affects the skin and mucous membranes of the nose and throat. Humans are the only reservoir of these bacteria, with transmission occurring mainly through direct contact with respiratory droplets. Symptoms of diphtheria commonly develop between two to five days after exposure with the resulting disease primarily affecting the upper respiratory system.^{1,61} The characteristic lesion is a gray, thick membrane at the back of the nose, mouth and/or throat. Complications of diphtheria can include suffocation, paralysis, heart failure, and coma.⁶¹ Even with treatment, the case-fatality ratio ranges from five to ten percent in persons with respiratory symptoms.¹

Under the publicly funded immunization program in Ontario, diphtheria toxoid containing vaccine is routinely administered to infants in combination with vaccines against tetanus, pertussis, polio and *Haemophilus influenzae* type b. Diphtheria toxoid containing vaccine is administered at two, four and six months of age, with additional boosters at 18 months, four to six years and 14 to 16 years. A booster dose is recommended every ten years for adults. The vaccine does not protect against infection but against serious illness associated with the diphtheria toxin. In Ontario, diphtheria antitoxin for the treatment of diphtheria disease is provided through the federal Special Access Program.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Diphtheria is a rare disease. No cases have been reported in Ontario since 1995. Annual incidence rates of diphtheria for the rest of Canada for the period 2002-2008 remained below 0.02 cases per 100,000 population.

Haemophilus influenzae type b disease, invasive

Haemophilus influenzae bacteria are either encapsulated (typeable) or non-encapsulated (non-typeable). *H. influenzae* type b (Hib) is an encapsulated strain that can cause both invasive and non-invasive disease. Encapsulated strains, classified from a to f, are more likely to cause invasive disease compared to non-encapsulated strains, which tend to cause mild infection.¹ Only invasive disease caused by Hib is reportable in Ontario.

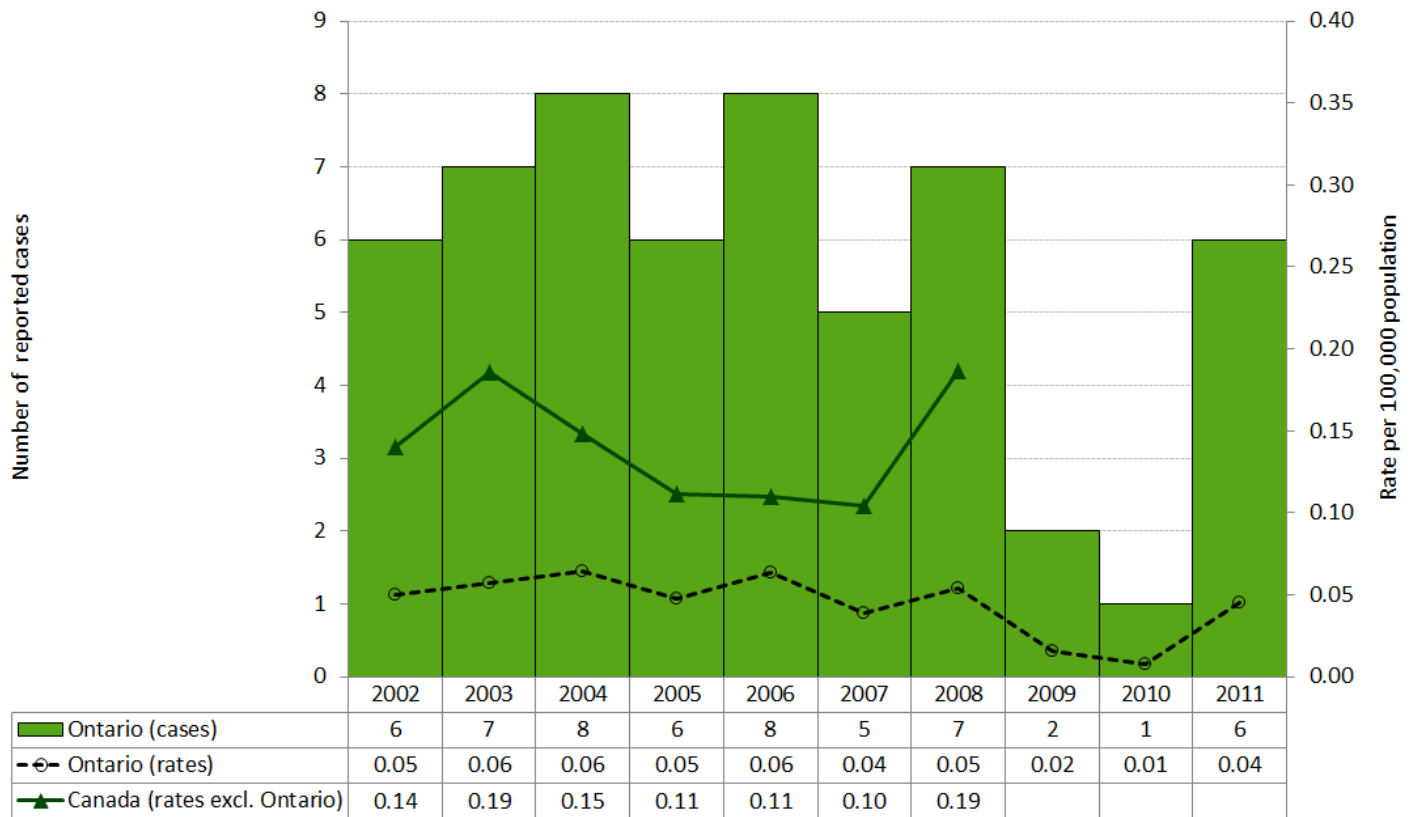
Infants and children are the main reservoir of Hib, often carrying the bacteria in their upper respiratory tract. Hib is transmitted from person-to-person through inhalation of respiratory droplets or through direct contact with respiratory secretions.^{1,13} Exposure to Hib in a susceptible person is thought to result in symptoms within two to four days. Illness ranges from the common ear infection and pneumonia to severe and/or invasive illness including meningitis (infection of the protective membranes of the brain and spinal cord), bacteremia (blood stream infection), epiglottitis (inflammation of the windpipe), cellulitis (skin infection) and infectious arthritis.¹³ The case fatality ratio for Hib meningitis is five percent, with six percent of survivors suffering permanent hearing loss and 25% developing some form of handicap.¹

Before the introduction of a vaccine against Hib in 1985, Hib was the most common cause of bacterial meningitis in children.⁶² Hib-containing vaccine provides approximately 95% protection against infection after the completion of the primary series. Under the publicly funded immunization program in Ontario, Hib vaccine is administered to infants in combination with vaccines against diphtheria, tetanus, pertussis and polio. Hib containing vaccine is routinely administered at two, four and six months of age, with additional boosters at 18 months and four to six years. A single dose of Hib vaccine is recommended for persons five years of age and older with certain chronic conditions that increase the risk of invasive Hib disease.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Six cases of invasive Hib disease were reported in Ontario in 2011, representing an annual incidence rate of 0.04 cases per 100,000 population (Figure 4-1). Over the period 2002 to 2011, the annual number of reported cases ranged from one case in 2010 to eight cases in both 2004 and 2008. Cases ranged in age from one to 72 years, with a median age of 50 years. Annual incidence rates of invasive Hib disease for the rest of Canada were consistently higher compared to Ontario for the period 2002 to 2008.

Figure 4-1. Incidence of invasive Haemophilus Influenzae type b Disease: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2013/04/22].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008. Overall annual rates for Canada (including Ontario) not shown as they do not include updated counts for Ontario.

Measles

Measles is one of the most highly communicable infectious diseases. It is caused by a virus that is spread predominantly through air by breathing, coughing or sneezing or through contact with throat or nasal discharges from an infected person.¹ The symptoms of measles usually develop approximately ten days after exposure (range seven to 18 days) and include fever, a red blotchy rash, red and watery eyes, runny nose, cough, malaise and Koplik (white) spots in the mouth.¹ An infected person can transmit the virus to others who are not immune from about four days before and after the appearance of the rash. Complications of measles infection occur in 10% of cases and one to two out of every 1,000 cases of measles are fatal.⁶³

Immunization with two doses of a measles-containing vaccine is the most effective method of preventing disease. During outbreaks, the effectiveness of vaccination with two doses of measles-containing vaccine is estimated to be between 95% and 99.5%.^{64,65} In Ontario, measles vaccine is administered in combination with vaccines for mumps and rubella (MMR) or with vaccines for mumps, rubella and varicella (MMRV). A two-dose program was introduced in 1996 and a catch-up program using a vaccine just for measles was offered to students four to 18 years of age. In 2010/2011, 86% of seven years olds in Ontario reported receiving two-doses of a measles-containing vaccine.⁶⁶

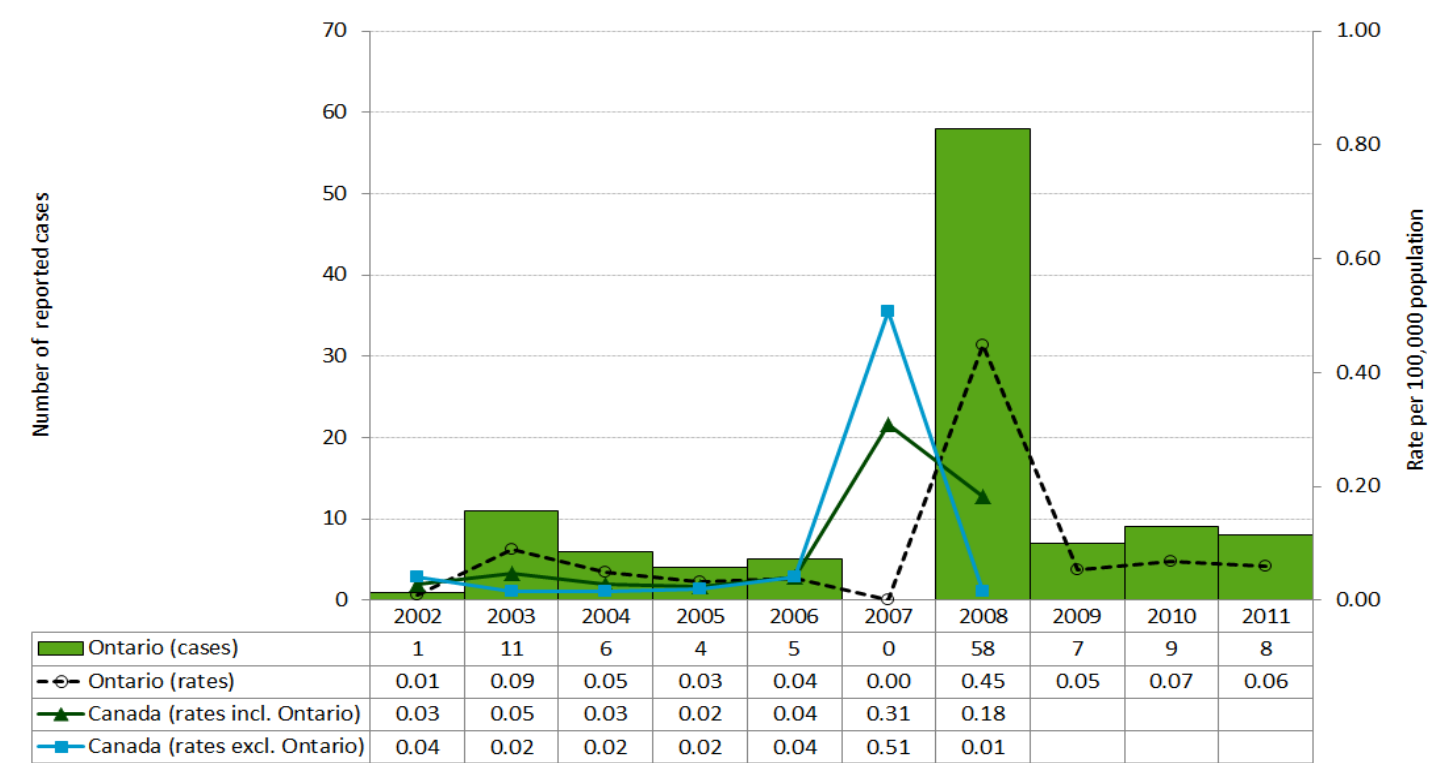
Indigenous measles has been eliminated from Canada; the last endemic case of measles was reported in 1997.⁶⁷ Under guidance of the Pan American Health Organization, countries of the Americas are currently documenting the elimination of measles and rubella.⁶⁸ As the disease remains endemic in other parts of the world, importation of cases continues to occur. Therefore, to ensure Canada's elimination status is maintained, the assessment and documentation of travel history for measles cases is vital.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, eight cases of measles were reported in Ontario, representing an incidence rate of 0.06 cases per 100,000 population (Figure 4-2). All eight cases reported in 2011 were acquired during travel to endemic countries or resulted from secondary spread from an imported case.

Excluding 2008, between zero and 11 cases of measles were reported annually in Ontario from 2002 to 2011. In 2008, an outbreak of 54 cases with links to the Ontario Science Centre was suspected to be travel-related. Other smaller outbreaks from 2009 to 2011 were directly associated with travel to the United States, Europe or South East Asia. For the rest of Canada, annual incidence rates for measles were comparably low, except in 2007 and 2011. Separate outbreaks in 2007 (96 cases)⁶⁴ and in 2011 (776 cases)⁶⁹ were reported in Quebec.

Figure 4-2. Incidence of Measles: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].
Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Meningococcal Disease, Invasive

- **The incidence of invasive meningococcal disease (IMD) attributable to serogroup C has declined since 2004, suggesting a positive impact of the meningococcal C vaccine program.**
- **Although the incidence of serogroup B IMD has not changed over time, it is now the most frequently reported IMD serogroup in Ontario.**
- **Infants under the age of one year had the highest incidence rate of IMD in 2011.**
- **More than half (57%) of IMD cases were hospitalized in 2011; seven percent were fatal.**

Invasive meningococcal disease (IMD) is an acute illness caused by the bacterium *Neisseria meningitidis*, also known as meningococcus.¹ There are at least 13 groups of meningococcus, with serogroups A, B, C, Y and W-135 implicated most frequently in invasive illness globally.^{1,70} Among the general population, up to 10% of individuals may carry this bacterium in the nose and throat without any signs of illness.¹

Meningococcus is transmitted through direct contact with respiratory secretions most commonly through kissing or living in close quarters.^{1,13} Symptoms of IMD commonly develop between three to four days after exposure (range two to 10 days) and are characterized by sudden onset of fever, headache, rash, nausea and vomiting.¹ These symptoms are most commonly followed by meningitis (infection of the protective membranes of the brain and spinal cord) and/or septicemia (bloodstream infection).¹ The case fatality ratio for IMD is between eight and 10%, however 10 to 20% of survivors have long-term sequelae such as hearing loss and limb amputations.¹

IMD is endemic in Canada, with most cases caused by serogroup B, followed by serogroups C and Y; serogroup A is rarely observed and is typically associated with

travel.⁷¹ The incidence is highest among infants, however infection can occur at any age. In Ontario, a vaccine against serogroup C has been publicly funded for children one year of age since September 2004. This was followed by a school-based program for grade seven students in January 2005, which in 2009 was replaced with a quadrivalent vaccine against serogroups A, C, Y and W-135.⁵³ This leaves serogroup B as the only major serogroup that is not yet vaccine-preventable.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, 44 cases of IMD were reported in Ontario representing an incidence rate of 0.33 cases per 100,000 population (Figure 4-3). The incidence of IMD fluctuated over the ten year period from 2002 to 2011, with rates ranging from 0.26 cases per 100,000 population in 2010 to 0.54 cases per 100,000 population in 2009. Annual incidence rates for IMD for the rest of Canada were higher in comparison to the corresponding rates for Ontario for the period from 2002 to 2008. Incidence rates at the national level ranged from 0.59 cases per 100,000 population in 2003 to 0.83 cases per 100,000 population in 2007.

SEROGROUPS

As in Canada, serogroup B was the leading cause of IMD in Ontario in 2011, accounting for 39% of cases (Table 4-1). Almost half (48%) of IMD cases in 2011 were due to vaccine-preventable meningococcus serogroups (C, Y and W-135). Serogroup Y accounted for 36% of reported cases, while serogroups W-135 and C made up smaller proportions of meningococcus serogroups at 7% and 5%, respectively; no cases of serogroup A were reported. The incidence of serogroup C disease has declined since 2004, suggesting a beneficial impact of the meningococcal C immunization program.⁷² Consequently, serogroup B has become the most frequently reported cause of IMD in Ontario even though the incidence of serogroup B itself has remained unchanged from 2002 to 2011.⁷³

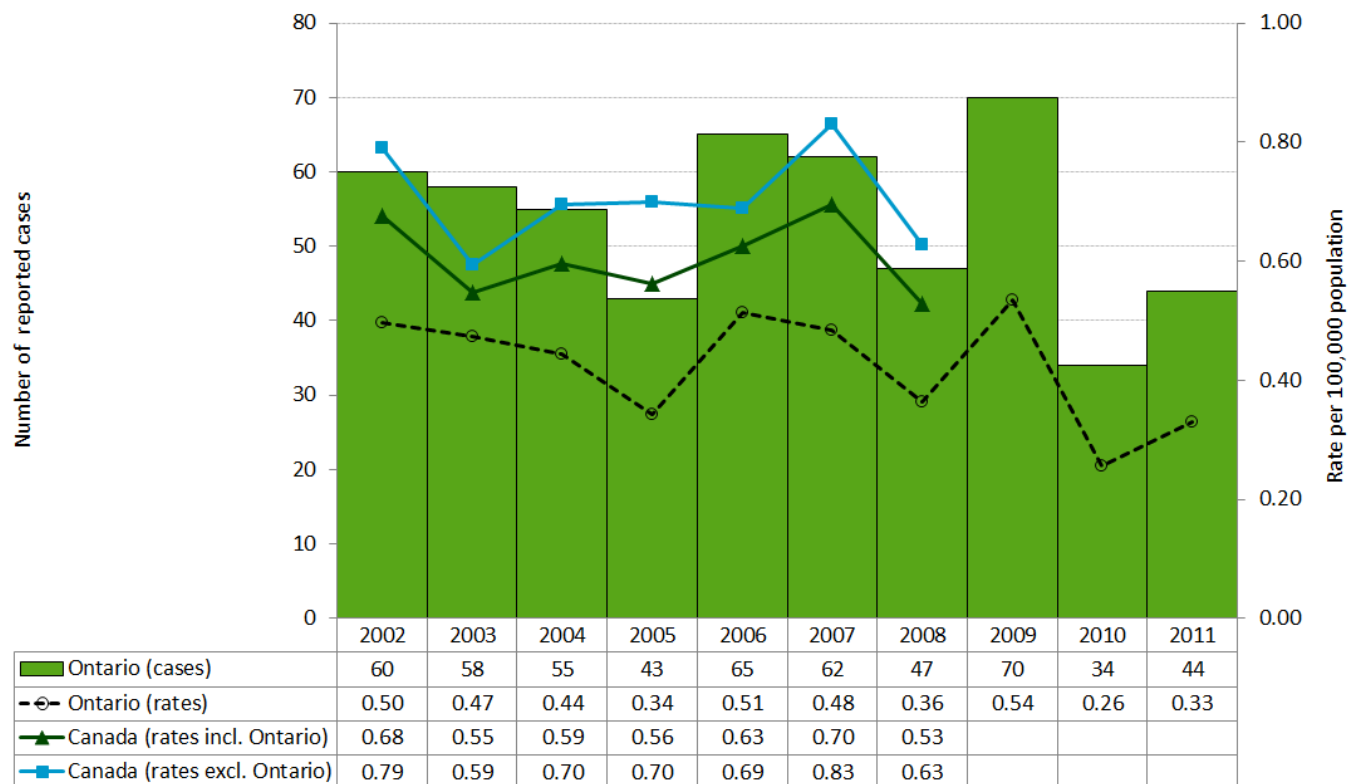
Table 4-1. Invasive Meningococcal Disease by Serogroups: Ontario, 2011

Neisseria meningitidis Serogroups	Cases	
	Number	Percent
Group B	17	38.6%
Group Y	16	36.4%
Group W-135	3	6.8%
Group C	2	4.5%
Group Z	1	2.3%
Unspecified serogroup	5	11.4%
Total	44	100%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/6/13].

Note: The “unspecified” category is the sum of cases reported as ‘unspecified’ and cases for which no serogroup was reported.

Figure 4-3. Incidence of Invasive Meningococcal Disease: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

AGE AND SEX DISTRIBUTION

Males (22 cases) and females (21 cases) each accounted for a similar proportion of IMD cases reported in Ontario in 2011 (Table 4-2, Figure 4-4). The respective sex-specific incidence rates were similar, at 0.35 and 0.32 cases per 100,000 population. Cases ranged in age from less than one year to 98 years and had a median age of 53 years. Infants less than one year of age had the highest incidence rate of IMD in 2011, followed by children in the 1-4 year age group (3.47 and 0.87 cases per 100,000 population, respectively). Half of IMD cases under the age of five years were due to serogroup B. The two cases of serogroup C disease occurred in persons in the 5-12 and 25-64 age groups.

Table 4-2. Incidence of Invasive Meningococcal Disease by Age and Sex: Ontario, 2011

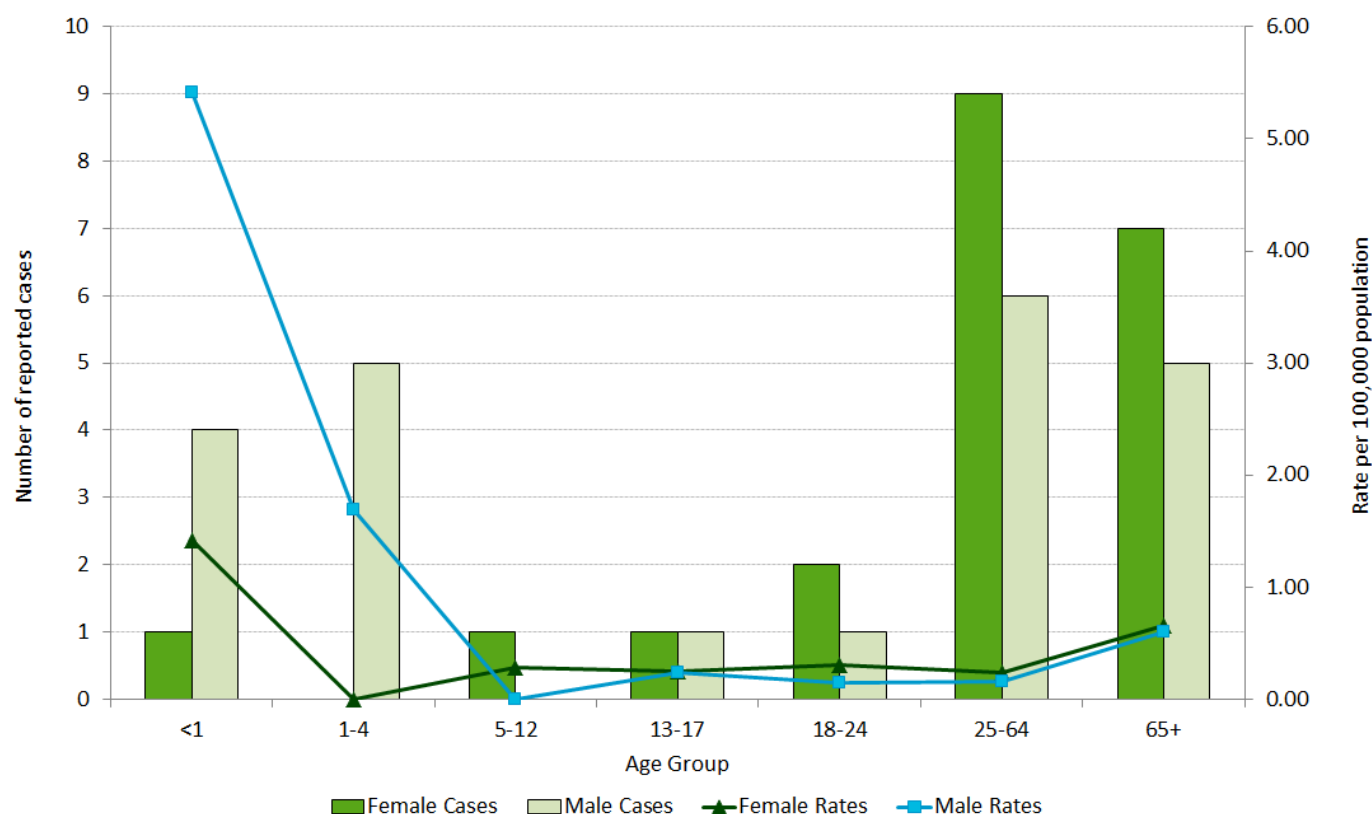
Age Group (Years)	Female		Male		Total	
	Cases	Rate per 100,000 Population	Cases	Rate per 100,000 Population	Cases	Rate per 100,000 Population
<1	1	1.42	4	5.41	5	3.47
1-4	0	0.00	5	1.69	5	0.87
5-12	1	0.28	0	0.00	1	0.14
13-17	1	0.25	1	0.24	2	0.24
18-24	2	0.31	1	0.15	3	0.23
25-64	9	0.24	6	0.16	15	0.20
65+	7	0.66	5	0.60	12	0.63
Total	21	0.32	22	0.35	43	0.33

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Does not include one case of unknown age and/or sex.

Figure 4-4. Incidence of Invasive Meningococcal Disease by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Does not include one case of unknown age and/or sex.

HOSPITALIZATIONS AND DEATHS

In 2011, 57% (25/44) of IMD cases were reported as hospitalized, with most cases diagnosed with meningococcus strains belonging to groups B (10/25) and Y (9/25). Hospitalized cases ranged in age from less than one year to 88 years (median 56 years). Three cases (7%, 3/44) were fatal, and all were attributed to meningococcus strains belonging to groups Y (one case) and B (two cases). Fatal cases ranged in age from 14 to 53 years (median 18 years).

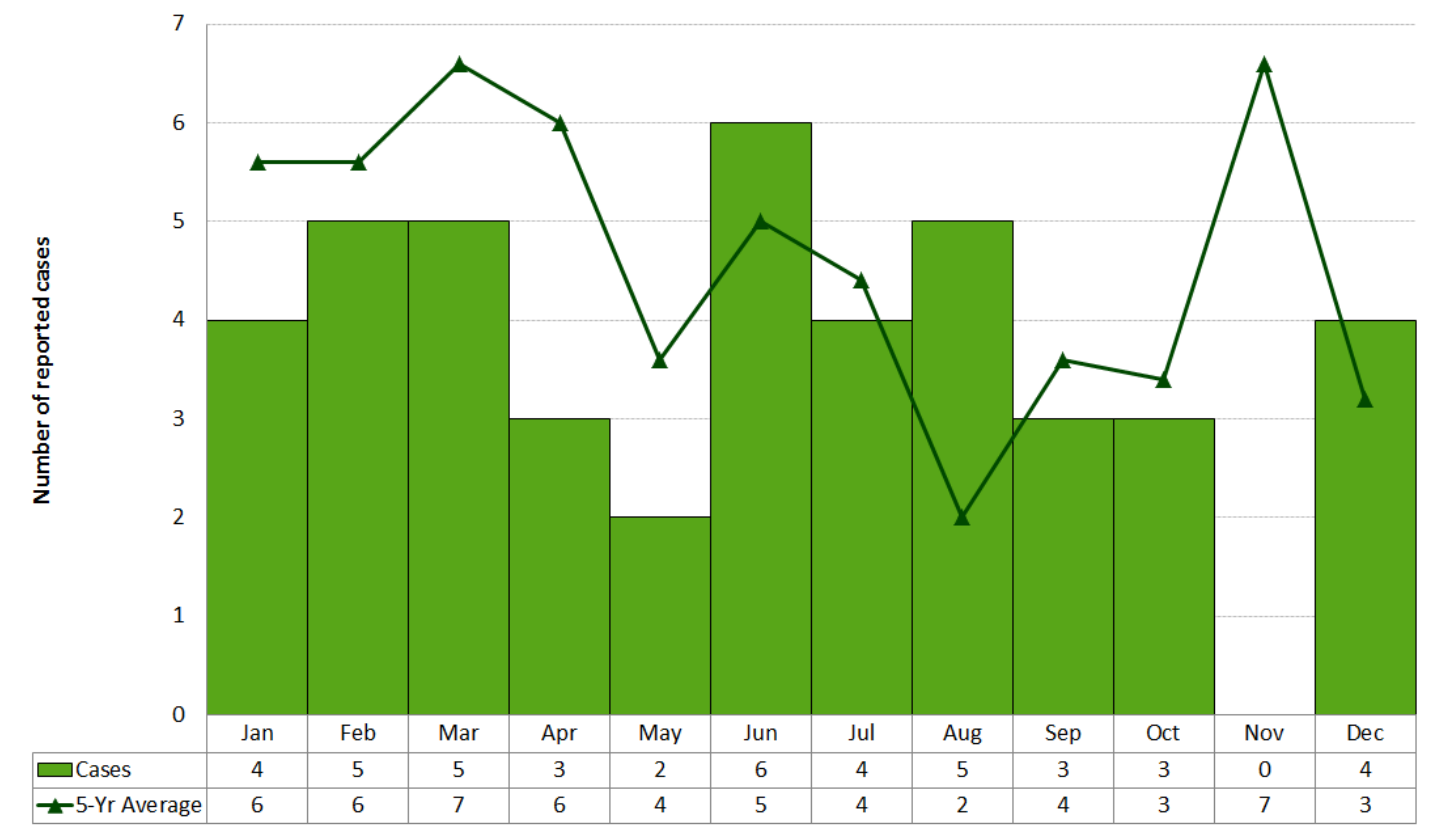
MONTHLY DISTRIBUTION

In Europe and North America, the incidence of IMD is higher during winter and spring. IMD cases reported in Ontario in 2011 were spread throughout the year with a relatively even monthly distribution of cases and no seasonal pattern (Figure 4-5).

GEOGRAPHIC DISTRIBUTION

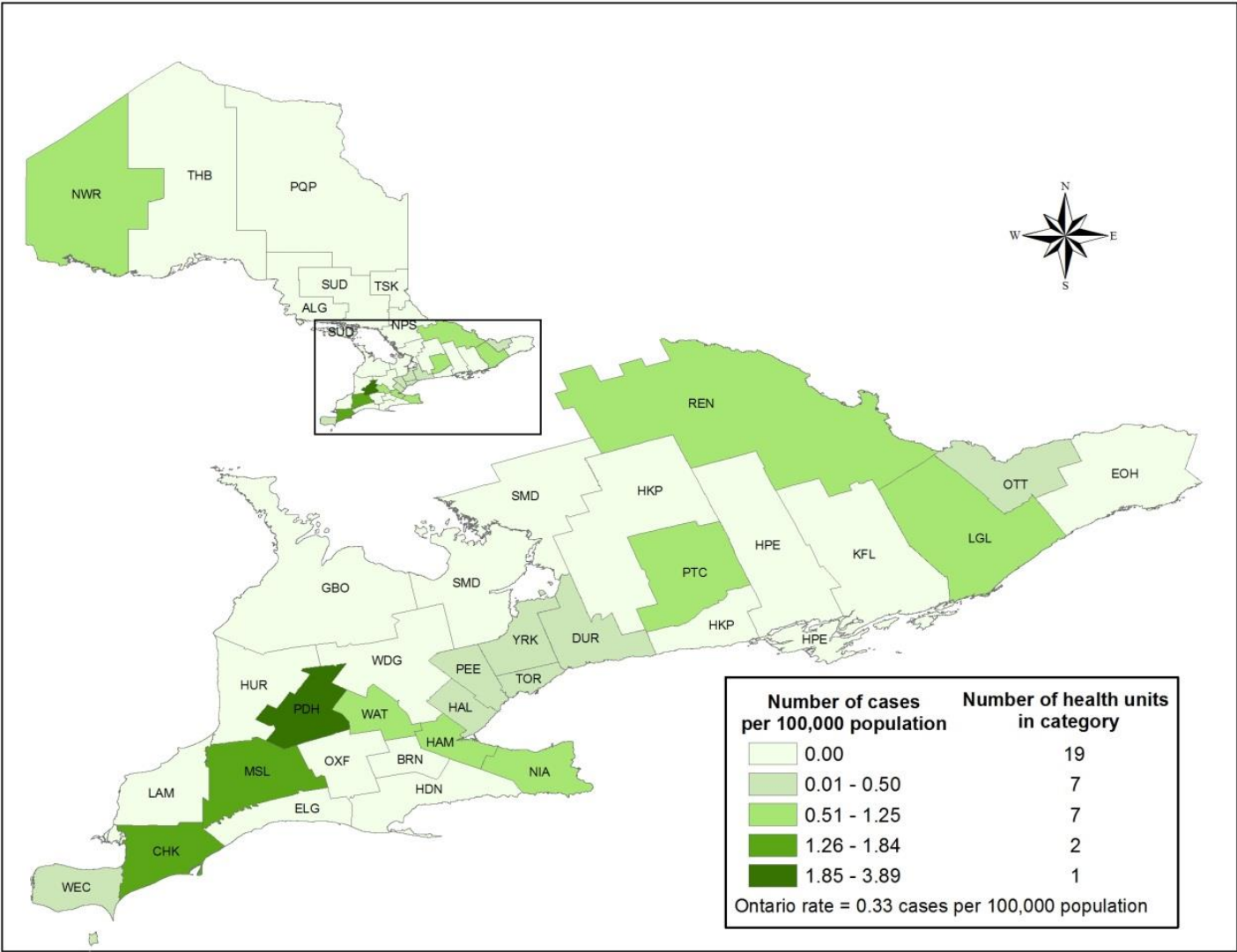
IMD is not frequently reported with 17 health units reporting cases in 2011 (Map 4-1, Table 4-3). Due to the small number of cases, health unit-specific rates should be interpreted with caution. The highest incidence rates were observed in Perth District, Chatham-Kent and Middlesex-London and together accounted for 25% of all IMD cases reported in 2011. In contrast, these three health units accounted for less than 5% of the provincial population in 2011.

Figure 4-5. Number of Invasive Meningococcal Disease Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 4-1. Incidence of Invasive Meningococcal Disease by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 4-3. Incidence of Invasive Meningococcal Disease by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	2	1.84	4.5%	0.8%
Durham Region	1	0.16	2.3%	4.7%
Eastern Ontario	0	0.00	0.0%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	0	0.00	0.0%	1.2%
Haldimand-Norfolk	0	0.00	0.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	0	0.00	0.0%	1.3%
Halton Region	2	0.39	4.5%	3.9%
Hamilton, City of	3	0.56	6.8%	4.0%
Hastings & Prince Edward Counties	0	0.00	0.0%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	0	0.00	0.0%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	2	1.18	4.5%	1.3%
Middlesex-London	6	1.30	13.6%	3.4%
Niagara Region	4	0.90	9.1%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	1	1.22	2.3%	0.6%
Ottawa, City of	2	0.22	4.5%	6.8%
Oxford County	0	0.00	0.0%	0.8%
Peel Region	1	0.07	2.3%	10.2%
Perth District	3	3.89	6.8%	0.6%
Peterborough County-City	1	0.71	2.3%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	1	0.97	2.3%	0.8%
Simcoe Muskoka District	0	0.00	0.0%	3.9%
Sudbury & District	0	0.00	0.0%	1.5%
Thunder Bay District	0	0.00	0.0%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	6	0.22	13.6%	20.5%
Waterloo Region	5	0.94	11.4%	4.0%
Wellington-Dufferin-Guelph	0	0.00	0.0%	2.1%
Windsor-Essex County	2	0.50	4.5%	3.0%
York Region	2	0.19	4.5%	8.0%
Ontario	44	0.33	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

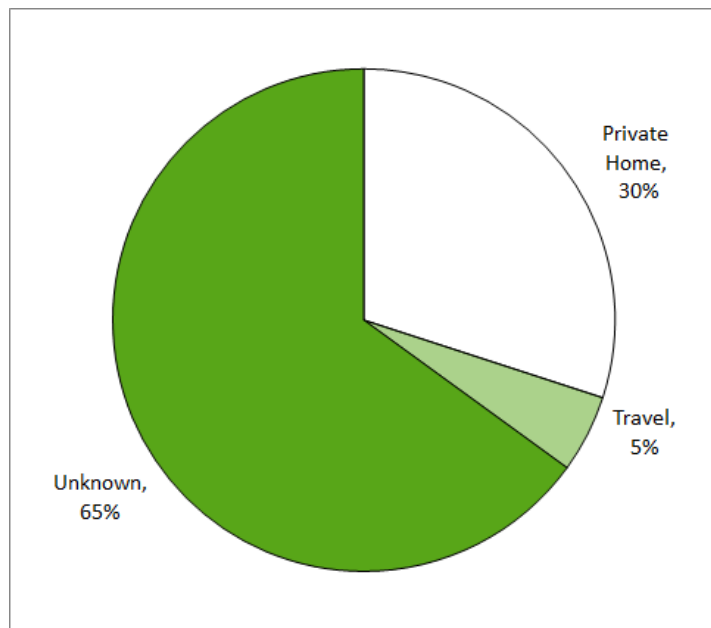
Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

EXPOSURES

While 65% of IMD cases in 2011 reported an unknown exposure, 30% reported an exposure source within their home and 5% reported travel outside of Ontario (Figure 4-6). Reported in home exposures occurred in separate households and were therefore not indicative of clustering.

Figure 4-6. Reported Exposures for Invasive Meningococcal Disease cases: Ontario, 2011 (n= 40)



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/07/18].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Notes: Interpret with caution. Exposures not reported for all cases. Exposure refers to the case's most likely exposure based on self-reported exposures during the relevant incubation period.

Mumps

- **The annual incidence of mumps in Ontario has increased since 2006 with the increase mainly driven by outbreaks.**
- **Persons born in the susceptible cohort between 1980 and 1992 accounted for 41% of mumps cases reported in Ontario in 2011.**
- **An outbreak of 39 cases of mumps occurred in 2011. The index case was traced back to an outbreak in British Columbia.**
- **The incidence of mumps was highest in the 20-24 year age group in 2011, which is consistent with the age groups most affected by the outbreaks in Ontario.**

Mumps is a viral disease that is transmitted from person-to-person via respiratory droplets or through direct contact with the saliva from an infected person. The symptoms of mumps generally appear 16 to 18 days after exposure (range from 12 to 25 days) and infected persons are most infectious from two days before and up to five days after the onset of symptoms.^{1,74,75} Infection with mumps is characterized by fever and swelling or tenderness of one or more salivary glands. Non-specific or primarily respiratory symptoms occur in about 40% to 50% of those infected. Immunity following infection is generally life-long¹.

Vaccination with two doses of mumps-containing vaccine is the most effective method of preventing infection.^{74,75} In Canada, the incidence of mumps declined following the introduction of the mumps vaccine in 1969, with further reductions following the 1996 introduction of the two-dose vaccination program.⁷⁴ 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.⁷⁴ In Ontario, this cohort includes persons 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.⁷⁶

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, 83 confirmed and probable cases of mumps were reported in Ontario, representing an incidence rate of 0.62 cases per 100,000 population. From 2002 to 2006, the number of reported cases was relatively low, with an average of 16 cases per year. Annual incidence rates during this period ranged from 0.08 to 0.19 cases per 100,000 population (Figure 4-7). From 2007 to 2011, several large outbreaks occurred in Ontario, some of which were linked to outbreaks in other Canadian jurisdictions. This resulted in a substantial increase in the provincial incidence rate between 2006 and 2011. From 2007 to 2011, 84% of cases were associated with outbreaks that occurred in either under-immunized, religious communities, or other susceptible populations, including students in the susceptible cohort with a predominance of males, as well as individuals who travelled outside of Ontario. In 2011, almost half (38 cases) of reported cases were linked to an outbreak, of which 63% were male and the overall median age was 29 years. This outbreak was traced back to Vancouver, British Columbia.

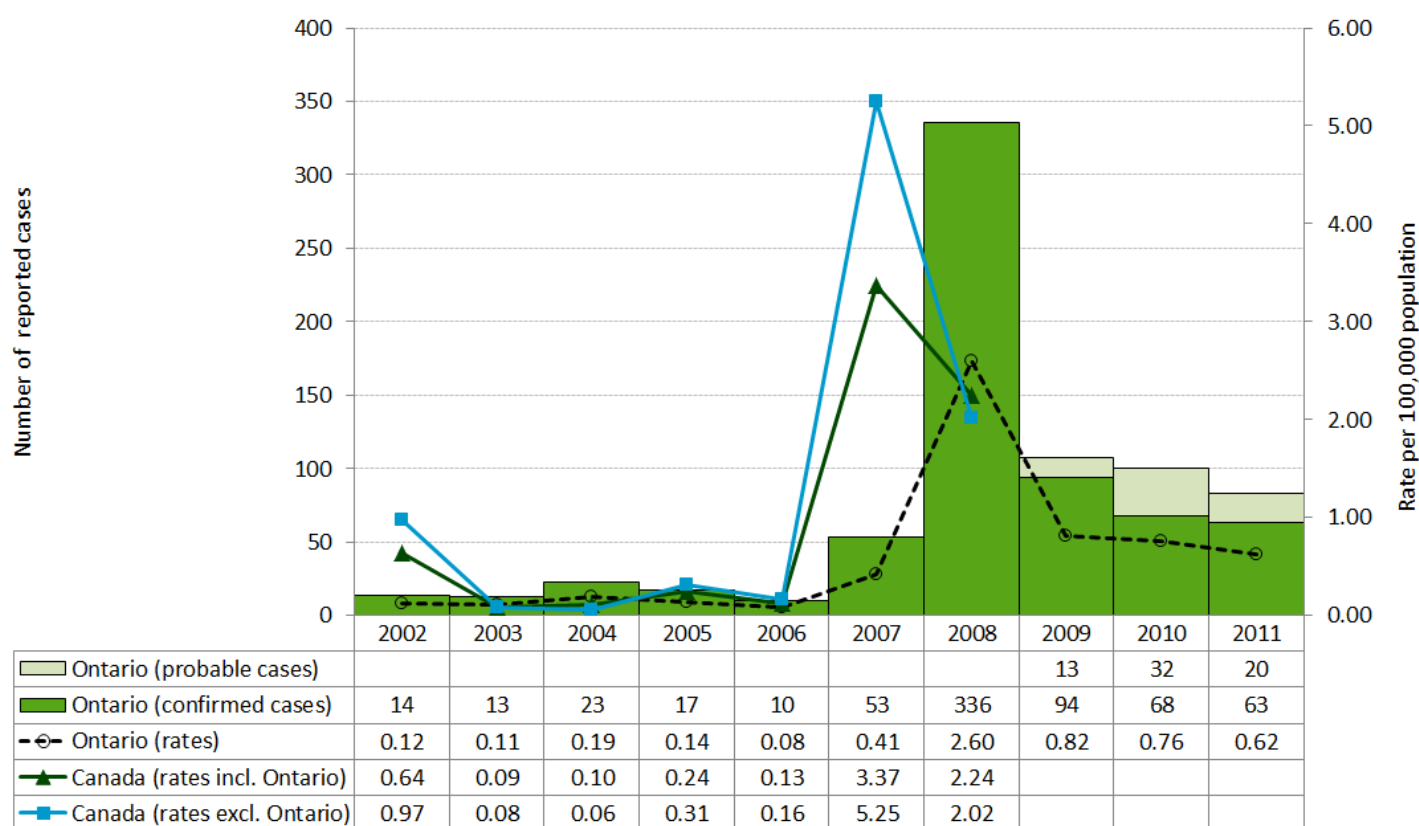
In Canada, between 2000 and 2006, an average of 81 cases were reported annually, ranging from 28 (2003) to 201 cases (2002). In 2007 there were over 1,000 cases and in 2008 there were almost 750 reported cases, mainly as a result of outbreaks in several provinces, including Ontario.⁷⁵

AGE AND SEX DISTRIBUTION

In 2011, mumps cases ranged in age from less than one to 61 years, with a median age of 29 years; males accounted for 58% of all cases reported in 2011. The incidence of mumps was also higher among males compared to females at 0.73 and 0.52 cases per 100,000 population, respectively. The age-specific incidence rate of mumps was highest in the 20-24 year age group with 2.32 cases per 100,000 population (Table 4-4, Figure 4-8).

Persons born in the susceptible cohort from 1980 to 1992 (i.e. aged 19 to 31 years) accounted for 41% (34 cases) of mumps cases reported in 2011, whereas children under the age of 15 years accounted for 11% (9) of cases in 2011. In comparison, these age cohorts comprised 18% and 17% of the Ontario population in 2011, respectively. No cases were reported among persons 65 years of age and older.

Figure 4-7. Reported cases and Incidence of Mumps: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]; probable cases included as of 2009.

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008 and include only confirmed cases.

Table 4-4. Incidence of Mumps by Age and Sex: Ontario, 2011

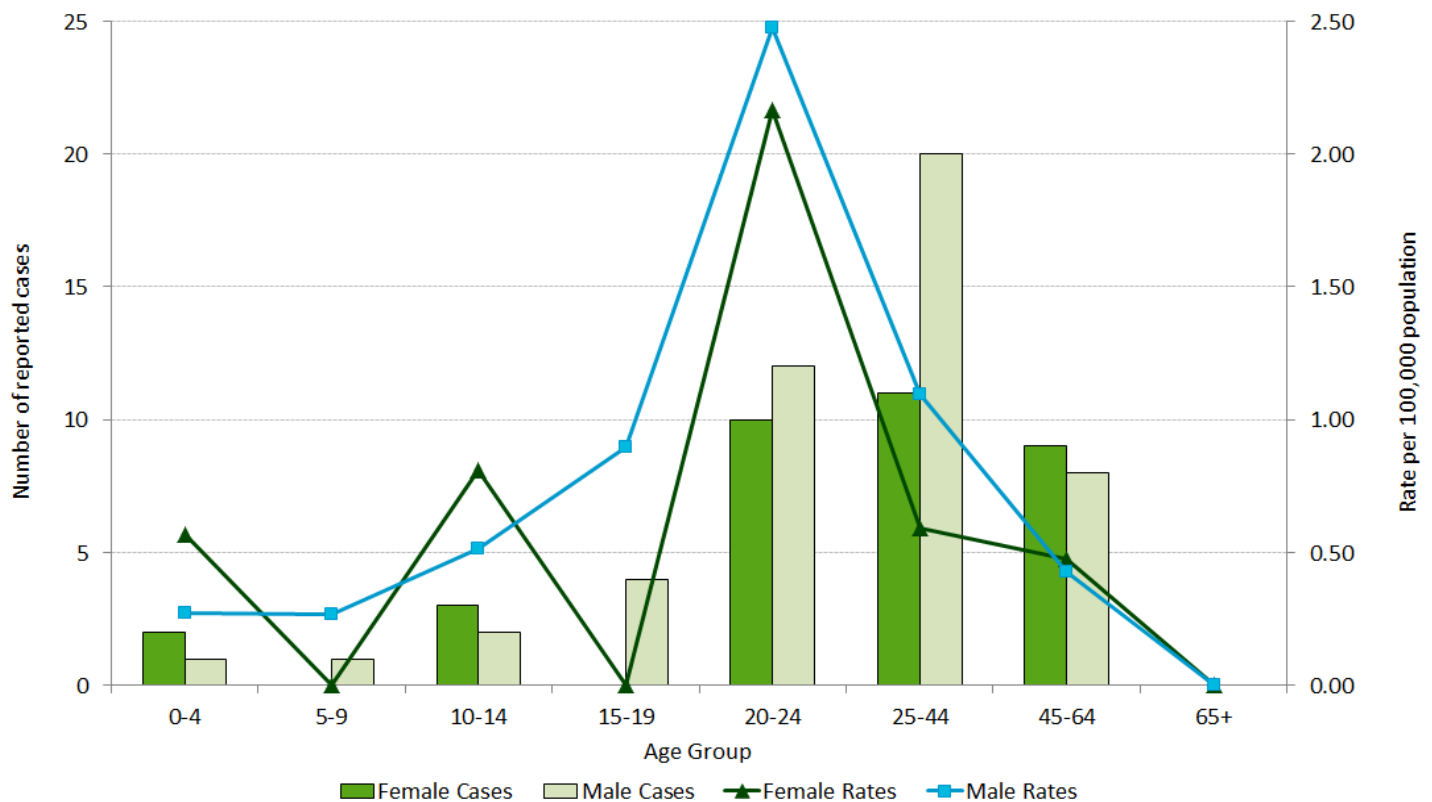
Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	2	0.57	1	0.27	3	0.42
5-9	0	0.00	1	0.27	1	0.14
10-14	3	0.81	2	0.51	5	0.66
15-19	0	0.00	4	0.90	4	0.46
20-24	10	2.16	12	2.48	22	2.32
25-44	11	0.59	20	1.09	31	0.84
45-64	9	0.47	8	0.43	17	0.45
65+	0	0.00	0	0.00	0	0.00
Total	35	0.52	48	0.73	83	0.62

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Includes both confirmed and probable cases.

Figure 4-8. Incidence of Mumps by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Includes both confirmed and probable cases.

HOSPITALIZATIONS AND DEATHS

In 2011, approximately four percent (three cases) of mumps cases were hospitalized; no deaths were reported.

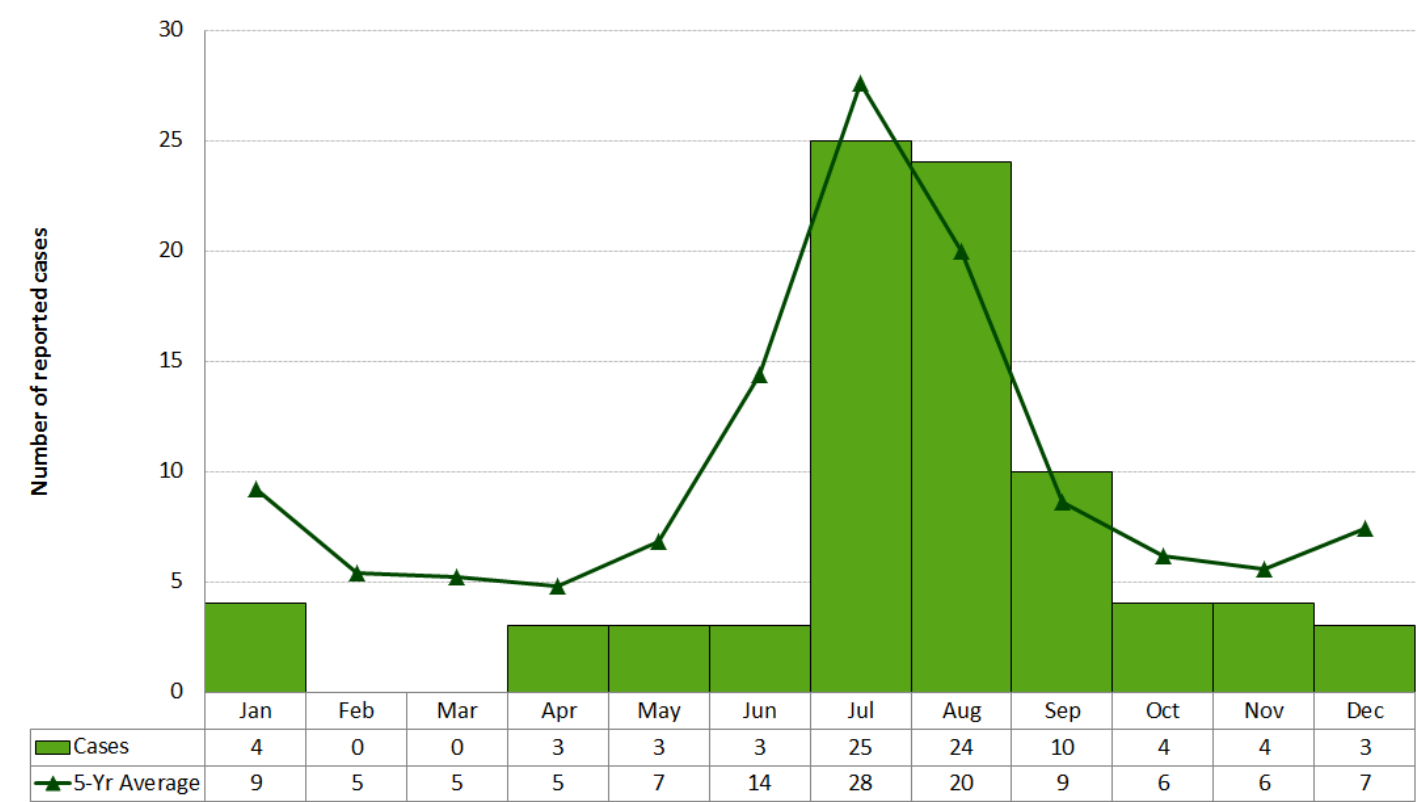
MONTHLY DISTRIBUTION

In the pre-vaccination era, the incidence of mumps in temperate regions peaked in the spring and winter months.⁷⁶ In Ontario, mumps cases reported from 2006 to 2010 demonstrated a peak in incidence in the summer months, but this increase was mainly driven by outbreaks. In 2011, 71% (59/83) of cases in Ontario were reported from July to September. (Figure 4-9).

GEOGRAPHIC DISTRIBUTION

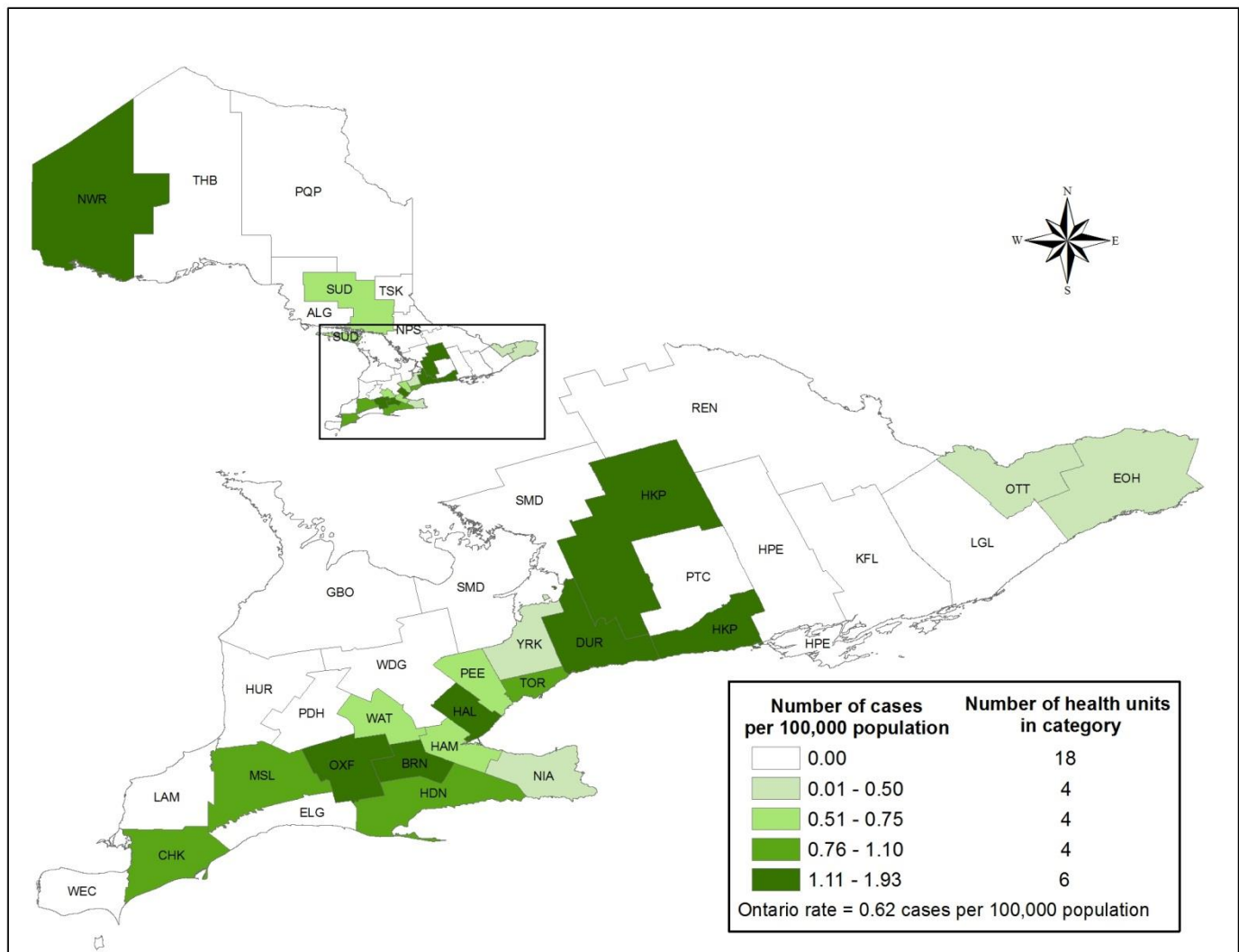
Half of Ontario’s 36 health units did not report any cases of mumps in 2011. The three highest incidence rates were reported by Halton Region (1.93 cases per 100,000), Oxford County (1.85 cases per 100,000) and Haliburton, Kawartha, Pine Ridge District (1.68 cases per 100,000 (Map 4-2 and Table 4-5). Combined, these health units accounted for 18% of all mumps cases reported in 2011, but together comprised only 6% of the Ontario population.

Figure 4-9. Number of Mumps Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].
Note: Includes both confirmed and probable cases.

Map 4-2. Incidence of Mumps by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition; includes both confirmed and probable cases.

Table 4-5. Incidence of Mumps by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rate (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	2	1.42	2.4%	1.1%
Chatham-Kent	1	0.92	1.2%	0.8%
Durham Region	7	1.11	8.4%	4.7%
Eastern Ontario	1	0.50	1.2%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	0	0.00	0.0%	1.2%
Haldimand-Norfolk	1	0.90	1.2%	0.8%
Haliburton, Kawartha, Pine Ridge District	3	1.68	3.6%	1.3%
Halton Region	10	1.93	12.0%	3.9%
Hamilton, City of	3	0.56	3.6%	4.0%
Hastings & Prince Edward Counties	0	0.00	0.0%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	0	0.00	0.0%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	0	0.00	0.0%	1.3%
Middlesex-London	5	1.08	6.0%	3.4%
Niagara Region	2	0.45	2.4%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	1	1.22	1.2%	0.6%
Ottawa, City of	4	0.44	4.8%	6.8%
Oxford County	2	1.85	2.4%	0.8%
Peel Region	9	0.66	10.8%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	0	0.00	0.0%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	0	0.00	0.0%	3.9%
Sudbury & District	1	0.51	1.2%	1.5%
Thunder Bay District	0	0.00	0.0%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	24	0.87	28.9%	20.5%
Waterloo Region	4	0.75	4.8%	4.0%
Wellington-Dufferin-Guelph	0	0.00	0.0%	2.1%
Windsor-Essex County	0	0.00	0.0%	3.0%
York Region	3	0.28	3.6%	8.0%
Ontario	83	0.62	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

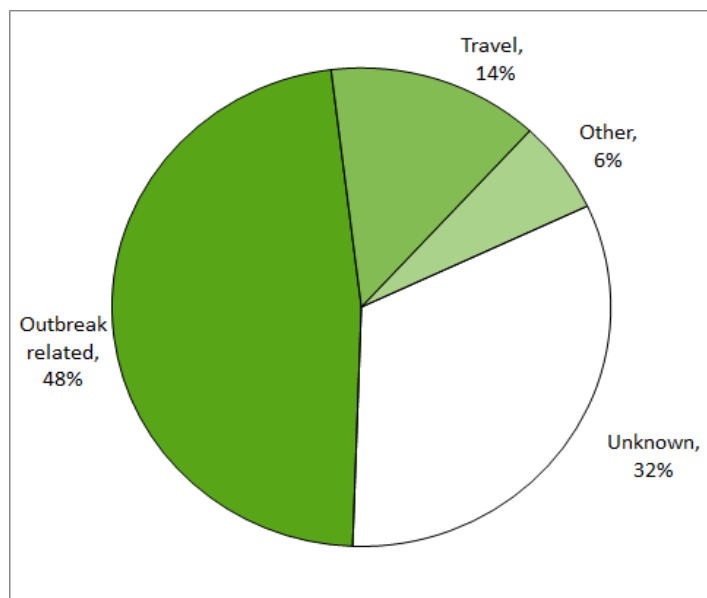
Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition; includes both confirmed and probable cases.

REPORTED EXPOSURES

Exposures were reported by 96% of mumps cases (80/83) that occurred in 2011. Almost half (48%) of these cases reported an exposure with a direct or indirect link to a provincial outbreak that was traced back to British Columbia. Of the remaining cases, 14% reported other travel outside of Ontario, and 6% reported exposures within their homes or at school; 32% of cases reported an unknown exposure (Figure 4-10).

Figure 4-10. Reported Exposures for Mumps Cases: Ontario, 2011 (n=80)



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution: exposures not reported for all cases. Exposure setting refers to the case's most likely exposure based on self-reported exposures during the relevant incubation period. Includes both confirmed and probable cases.

- **The incidence of pertussis in Ontario from 2002 to 2011 demonstrated a cyclical pattern with a notable peak in incidence in 2006.**
- **The incidence rate of pertussis was highest among infants and children under the age of five years.**
- **In 2011 the incidence of pertussis peaked in December due to an outbreak which began in an under-immunized religious community.**

Pertussis (whooping cough) is an acute infection of the respiratory tract caused by the bacterium *Bordetella pertussis*.¹ Humans are the only reservoir for the disease, with transmission occurring through direct contact with respiratory droplets expelled during coughs and sneezes.¹³ Symptoms of pertussis usually begin within nine or ten days of exposure (range six to 20 days) as a mild respiratory illness that progresses to prolonged cough episodes which can end with vomiting and the characteristic whoop.¹ Symptoms vary with age and young infants, adolescents and adults are less likely to have the classic symptoms of pertussis,^{1,13} which often leads to under-diagnosis of the disease.⁷⁷ Complications of pertussis, including pneumonia, seizures and death, occur most frequently in infants too young to have begun or completed their primary immunization series.¹

Susceptibility to pertussis is universal with vaccination being the primary method of prevention. Under the publicly funded immunization program in Ontario, pertussis vaccine is administered in combination with vaccines against diphtheria, tetanus, *Haemophilus influenzae* type b and polio. These vaccines are administered at two, four and six months of age, with additional boosters at 18 months, four to six years and 14 to 16 years.⁵³ In 2011, a booster dose was introduced for adults under 65 years of age who did not receive an adolescent dose of the vaccine.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, 276 confirmed and probable cases of pertussis were reported in Ontario for an overall incidence rate of 2.06 cases per 100,000 population. The number of cases reported in 2011 represented a 130% increase over the 2010 count of 120 cases (Figure 4-11). The increase in 2011 can be attributed in part to two provincial outbreaks in south-western Ontario that mainly affected the same under-immunized religious community.

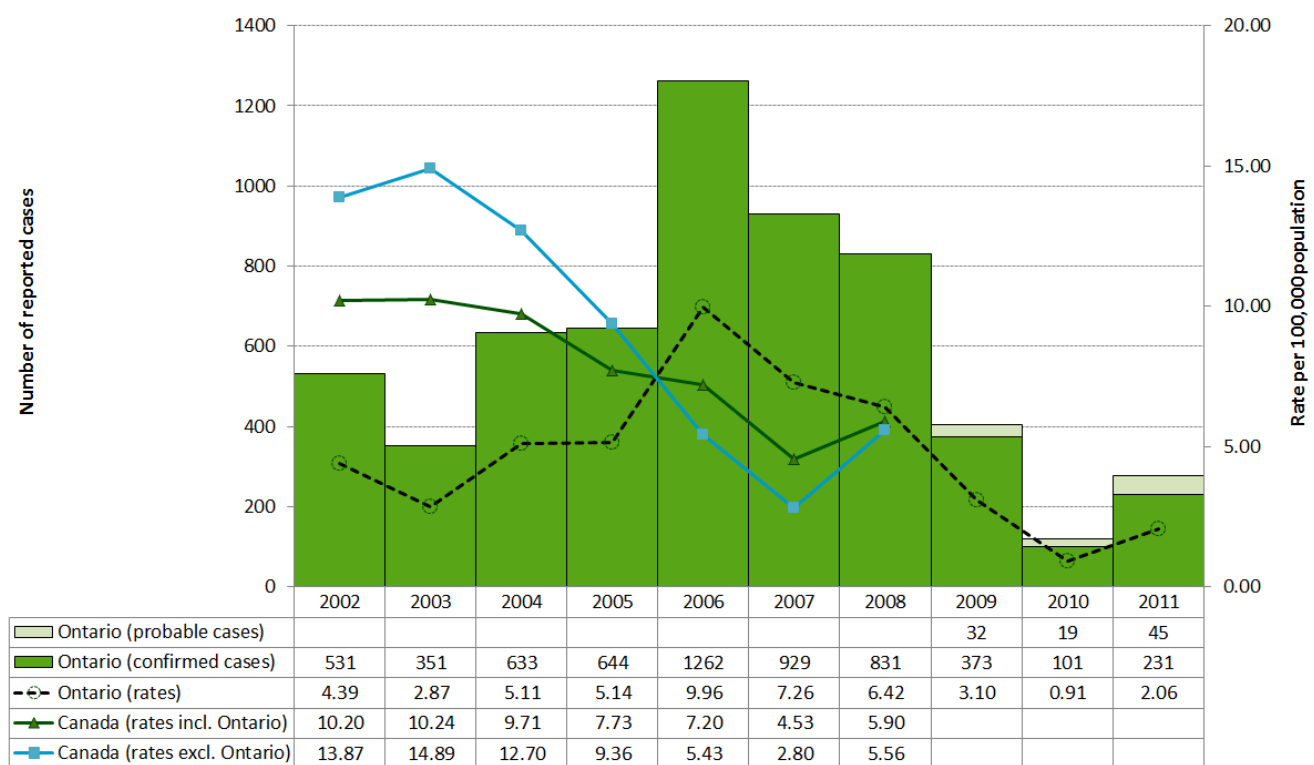
Pertussis occurs in cycles with peaks in incidence occurring every four to five years.⁷⁸ The incidence of pertussis in Ontario over the ten-year period from 2002 to 2011 demonstrated this cyclical pattern with a notable peak in incidence from 2006 to 2008. During this period of increased incidence, annual rates of pertussis ranged from 6.42 to 9.96 cases per 100,000 population. While the cyclical nature influences trends in pertussis, 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.

Annual incidence rates for pertussis in Ontario were 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.

AGE AND SEX DISTRIBUTION

Although there is typically a slight female predominance for pertussis⁷⁹, cases were equally distributed among males and females reported in Ontario in 2011. The sex-specific incidence rates for males and females were 2.06 and 2.01 cases per 100,000 population, respectively (Table 4-6, Figure 4-12). Cases ranged in age from less than one year to 84 years and had a median age of six years. Incidence rates for pertussis decreased sharply with increasing age for both males and females. Infants (less than one year) and young children in the 1-4 age group experienced the highest rates of pertussis. Combined, they accounted for 46% of pertussis cases reported in 2011. Higher incidence rates in these age groups, particularly among infants, are expected as children in these age groups are too young to have begun or completed their primary series of immunizations against pertussis.

Figure 4-11. Incidence of Pertussis: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]; probable cases included as of 2009.

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Table 4-6. Incidence of Pertussis by Age and Sex: Ontario, 2011

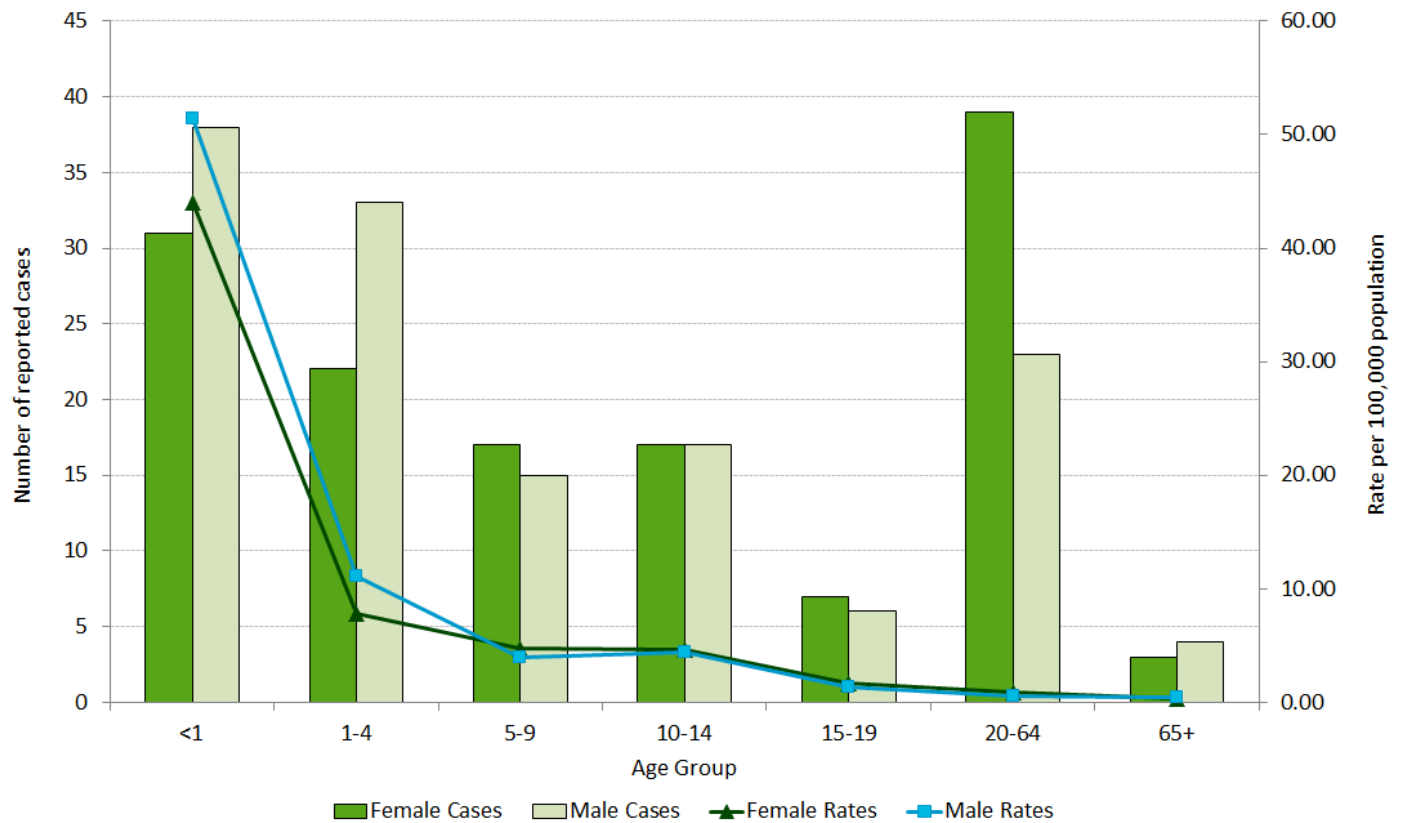
Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
<1	31	44.06	38	51.43	69	47.84
1-4	22	7.80	33	11.15	55	9.52
5-9	17	4.80	15	4.01	32	4.39
10-14	17	4.59	17	4.37	34	4.48
15-19	7	1.64	6	1.34	13	1.49
20-64	39	0.92	23	0.55	62	0.74
65+	3	0.28	4	0.48	7	0.37
Total	136	2.01	136	2.06	272	2.03

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/1510/15].

Note: Excludes four cases of unknown age and/or sex; includes both confirmed and probable cases.

Figure 4-12. Incidence of Pertussis by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/1510/15].

Note: Excludes four cases of unknown age and/or sex; includes both confirmed and probable cases.

HOSPITALIZATIONS AND DEATHS

Approximately 11% (30/276) of pertussis cases were reported as hospitalized in 2011. Of these cases, 80% (24/30) were under the age of one year. No deaths were reported among pertussis cases in 2011.

MONTHLY DISTRIBUTION

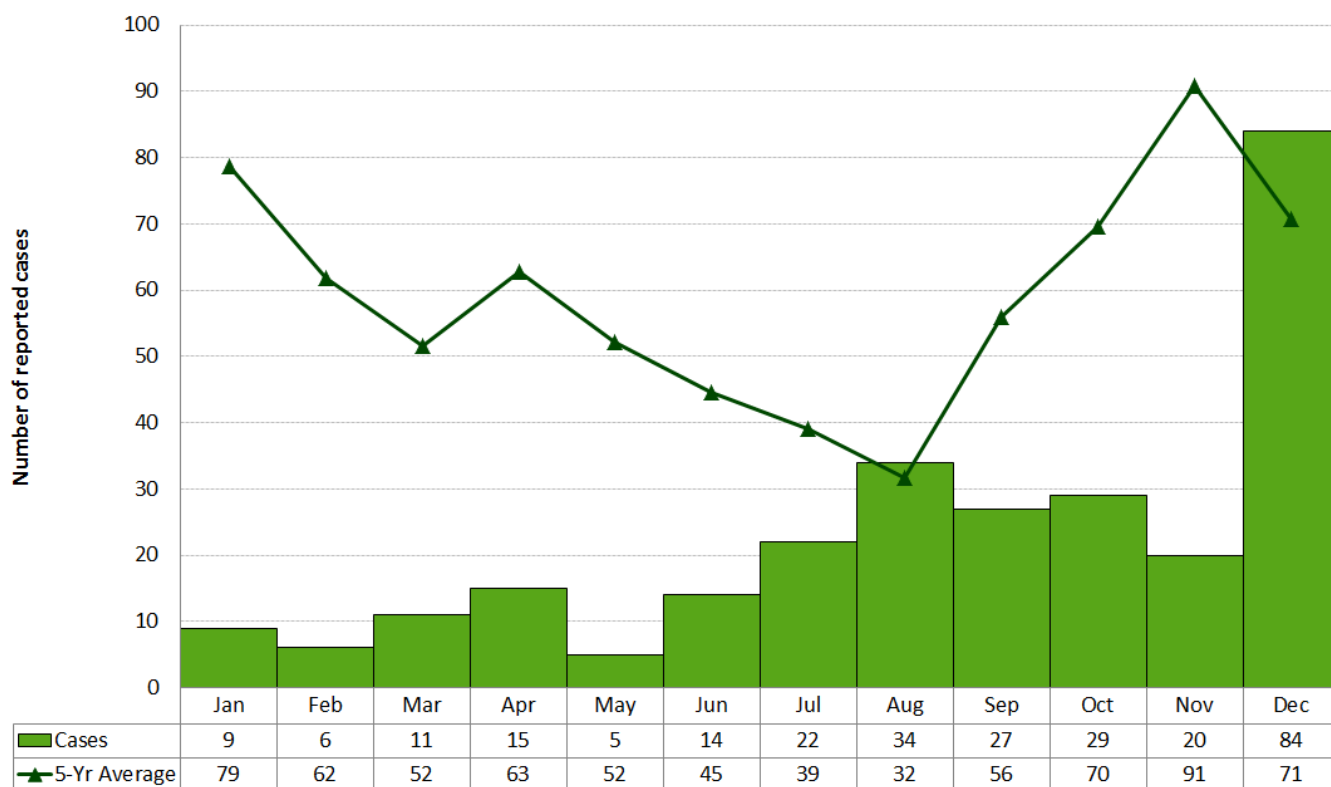
The monthly distribution of pertussis cases in 2011 does not indicate a seasonal trend. The highest number of cases of pertussis was reported in December with 84 cases (Figure 4-13), but this was mainly attributed to an outbreak in southwestern Ontario that began in November 2011 in an under-immunized religious community. Another outbreak in the same religious community was also identified in the summer months.

GEOGRAPHIC DISTRIBUTION

The two highest rates of pertussis in 2011 occurred in health units that were part of the outbreaks in southwestern Ontario. Elgin St. Thomas had a rate of 48.13 cases per 100,000 population, and Haldimand-Norfolk had a rate of 9.94 cases per 100,000 population (Map 4-3, Table 4-7). The other health units affected by the outbreak (Chatham-Kent, Perth District, Windsor-Essex, Wellington-Dufferin-Guelph and Oxford County) had varying rates, which is reflective of the outbreak as it evolved and continued into 2012.

In addition, Northwestern had a high rate of pertussis in 2011 (9.76 per 100,000). Seven health units did not report any cases, all of which were relatively small health units which together accounted for 8.2% of Ontario's population in 2011.

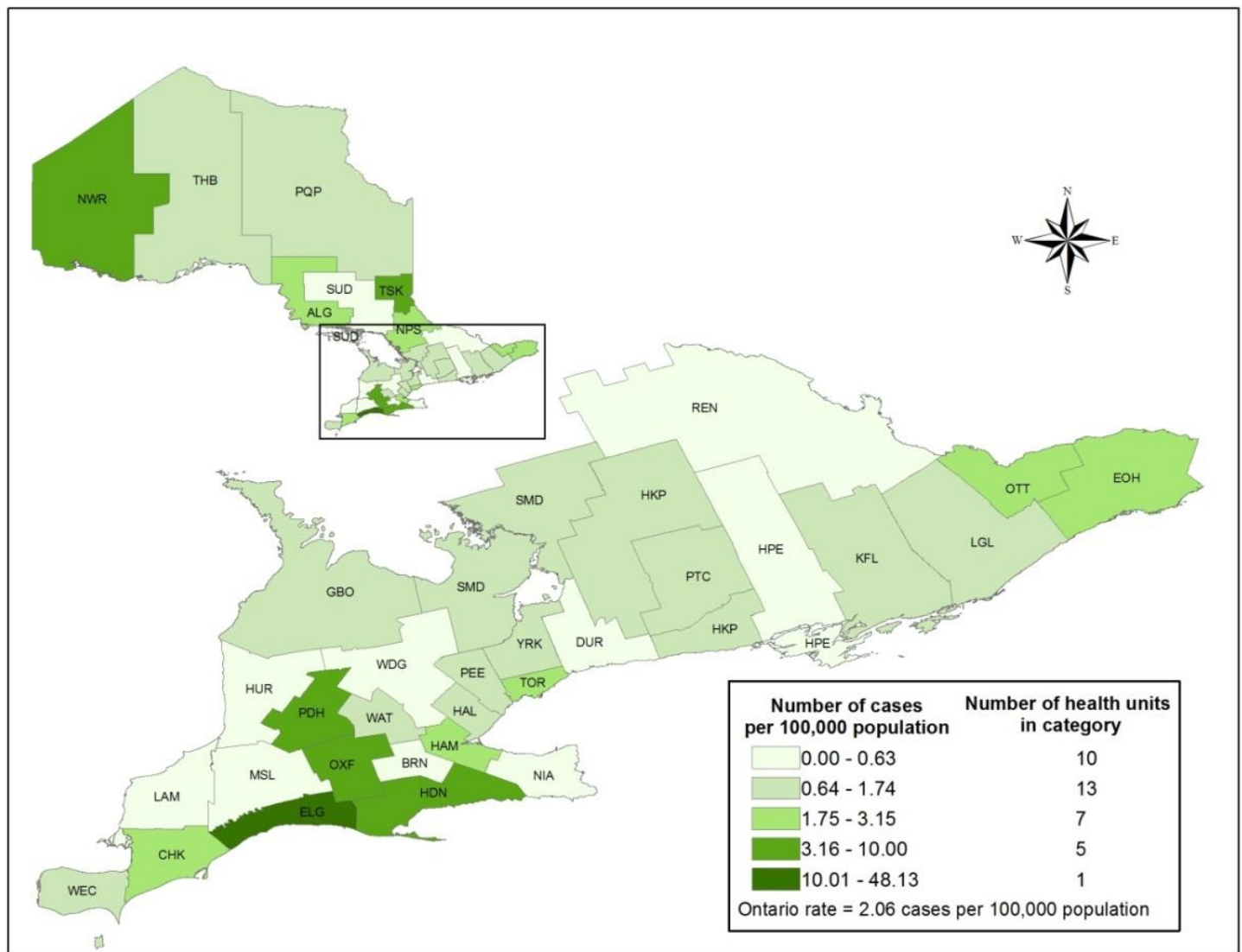
Figure 4-13. Number of Pertussis Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Note: Includes both confirmed and probable cases.

Map 4-3. Incidence of Pertussis by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition; includes both confirmed and probable cases.

Table 4-7. Incidence of Pertussis by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	3	2.55	1.1%	0.9%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	3	2.76	1.1%	0.8%
Durham Region	4	0.63	1.4%	4.7%
Eastern Ontario	6	2.98	2.2%	1.5%
Elgin-St. Thomas	44	48.13	15.9%	0.7%
Grey Bruce	2	1.21	0.7%	1.2%
Haldimand-Norfolk	11	9.94	4.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	2	1.12	0.7%	1.3%
Halton Region	4	0.77	1.4%	3.9%
Hamilton, City of	17	3.15	6.2%	4.0%
Hastings & Prince Edward Counties	0	0.00	0.0%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	2	1.01	0.7%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	2	1.18	0.7%	1.3%
Middlesex-London	1	0.22	0.4%	3.4%
Niagara Region	2	0.45	0.7%	3.3%
North Bay Parry Sound District	4	3.14	1.4%	1.0%
Northwestern	8	9.76	2.9%	0.6%
Ottawa, City of	22	2.42	8.0%	6.8%
Oxford County	8	7.39	2.9%	0.8%
Peel Region	16	1.17	5.8%	10.2%
Perth District	5	6.48	1.8%	0.6%
Peterborough County-City	1	0.71	0.4%	1.1%
Porcupine	1	1.15	0.4%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	8	1.52	2.9%	3.9%
Sudbury & District	0	0.00	0.0%	1.5%
Thunder Bay District	2	1.28	0.7%	1.2%
Timiskaming	2	5.81	0.7%	0.3%
Toronto	64	2.33	23.2%	20.5%
Waterloo Region	7	1.32	2.5%	4.0%
Wellington-Dufferin-Guelph	0	0.00	0.0%	2.1%
Windsor-Essex County	7	1.74	2.5%	3.0%
York Region	18	1.68	6.5%	8.0%
Ontario	276	2.06	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

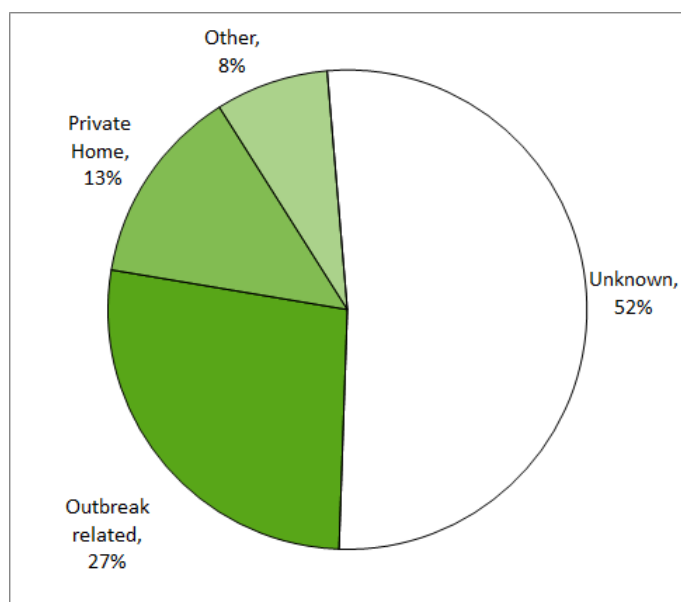
Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition; includes both confirmed and probable cases.

REPORTED EXPOSURES

Exposures were reported by 95% (262/276) of pertussis cases in 2011. Of these cases, more than half (52%) reported an unknown exposure (Figure 4-14).

Approximately 27% of cases reported an exposure linked to one of three pertussis outbreaks in the province, most of which were associated with the two provincial outbreaks in southwestern Ontario. The third outbreak was much smaller with just five cases, all of which occurred in the City of Hamilton. Other exposures that occurred in private homes (13%), at school (5%), outside of Ontario (2%) and in institutional settings (1%) accounted for the remainder of cases with known exposures.

Figure 4-14. Reported Exposure Settings for Pertussis Cases: Ontario, 2011 (n=262)



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution. Exposures not reported for all cases. Exposure refers to the case's most likely exposure based on self-reported exposures during the relevant incubation period. Includes both confirmed and probable cases.

Invasive Pneumococcal Disease

- **Invasive pneumococcal disease (IPD) is relatively common in Ontario, with a non-significant increase in overall incidence between 2003 and 2011.**
- **The highest incidence rates occurred in adults 65 years and older, followed by young children under the age of five and adults aged 50-64 years.**
- **Case fatality ratios increased with age in adults, and was 7% among persons 65 years of age and older.**

Invasive pneumococcal disease (IPD) is a leading cause of serious illness in children and adults worldwide. It is caused by the bacterium *Streptococcus pneumoniae*,^{80,1} which has more than 90 serotypes, some of which are vaccine-preventable. *S. pneumoniae* is transmitted directly or indirectly through contact with respiratory secretions from infected or colonized persons.^{80,1}

Symptoms of IPD can manifest within one to three days of exposure, although the incubation period is not well defined.⁸⁰ The spectrum of illness includes pneumonia with bacteremia (bloodstream infection), bacteremia, and/or meningitis (infection of the protective membranes of the brain and spinal cord). Invasive disease occurs most frequently in the very young, the elderly and in persons with certain underlying health conditions or risk factors.⁸⁰ The case fatality ratio varies widely from five to 35% depending on age and type of illness, but can be especially high in young infants and the elderly.^{80,1}

In January 2005, a seven-valent conjugate vaccine (serotypes 4, 6B, 9V, 14, 18C, 19F, 23F) for infants was introduced in Ontario under the publicly funded schedule. This was replaced by a ten-valent vaccine (additional serotypes 1, 5, 7F) in October 2009, followed by a 13-valent vaccine (additional serotypes 3, 6A and 19A) in November 2010. Since 1996, a 23-valent

pneumococcal polysaccharide vaccine has been available for adults 65 years and older.⁸¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, 1,238 cases of IPD were reported in Ontario, representing an incidence rate of 9.26 cases per 100,000 population. The number of reported cases of IPD in 2011 was slightly higher compared to the 2010 total of 1,205 cases (Figure 4-15). IPD became reportable in Ontario in 2001 with rates becoming more stable in 2003 as reporting became routine. As such, yearly data from 2003 to 2011 are presented. An increase in incidence of 11% was observed in 2011 in comparison to 2003. This increase was driven in part by increases occurring from 2008 to 2011 and followed a 2008 provincial directive for enhanced surveillance for IPD. Since the incidence of IPD has been shown to increase during severe influenza seasons,⁸² the increase in 2009 and 2010 may also be attributed in part to the H1N1 pandemic. Potential impacts of the H1N1 pandemic on national incidence rates for IPD could not be determined as rates for Canada for this report were provided up to 2008. However, the Canadian incidence rates for IPD over the period from 2003 to 2008 were higher than the corresponding rates for Ontario.

SEROTYPES

The reporting of serotype information in Ontario has been more complete since 2007. Serotyping results were available for 80% (985/1,238) of IPD cases reported in 2011 (Table 4-8). Of these cases, 75% (740/985) were due to the 24 serotypes covered by the various pneumococcal vaccines available in Ontario. However, as the vaccine programs target different age groups, all of these cases would not have been preventable under Ontario's programs. Serotypes not preventable through any vaccine accounted for 25% of cases. From 2007 to 2011, the proportion of cases accounted for by vaccine-preventable IPD serotypes changed. The proportion of cases caused by serotypes covered by the seven-valent vaccine decreased from 30% in 2007 to 5% in 2011.⁸³

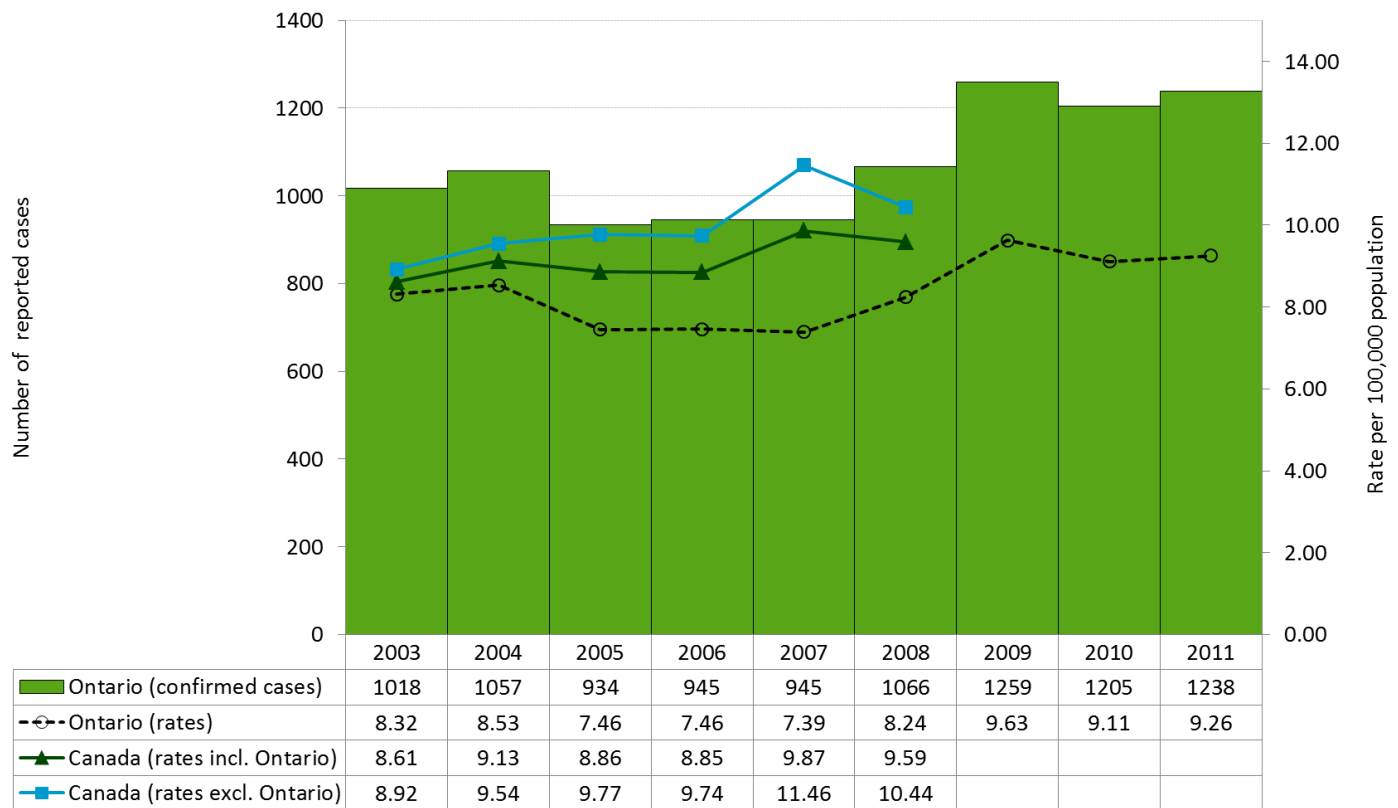
Table 4-8. Invasive Pneumococcal Disease Cases by Vaccine Serotypes: Ontario, 2011

S. Pneumoniae Serotypes	Cases	
	Number	Percent
PCV7 serotypes	59	4.8%
Additional PCV10 serotypes	182	14.7%
Additional PCV13 serotypes	257	20.8%
Unique PPV23 serotypes	242	19.6%
Non-vaccine serotypes	242	19.6%
Untypeable	3	0.2%
Unspecified serotype	253	20.4%
Total	1,238	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Note: “Unspecified” refers to serotypes reported as such or not reported at all. PCV refers to pneumococcal conjugate vaccine and PPV refers to pneumococcal polysaccharide vaccine.

Figure 4-15. Incidence of Invasive Pneumococcal Disease: Ontario and Canada, 2003-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Note: Only data from 2003 onward is shown; reporting stabilized after this point.

AGE AND SEX DISTRIBUTION

The incidence rate for IPD in 2011 was higher for males compared to females at 9.89 and 8.63 cases per 100,000 population, respectively (Table 4-9, Figure 4-16). More than half (53%) of cases occurred in males.

Cases ranged in age from less than one year to 100 years and had a median age of 59 years. Persons aged 20 years and older accounted for 87% of reported cases. The highest age-specific incidence rate occurred among adults 65 years of age and older despite the existence of a long-standing publicly-funded vaccination program for this age group.

Children under five years and adults 50 to 64 years of age had similar rates of disease. Although the annual incidence of IPD increased over the period 2002 to 2011, rates among children under five years of age decreased between 2003 and 2011. This is consistent with findings from a recent study which suggest a positive impact of Ontario's childhood pneumococcal immunization program.⁸³

Table 4-9. Incidence of Invasive Pneumococcal Disease by Age and Sex: Ontario, 2011

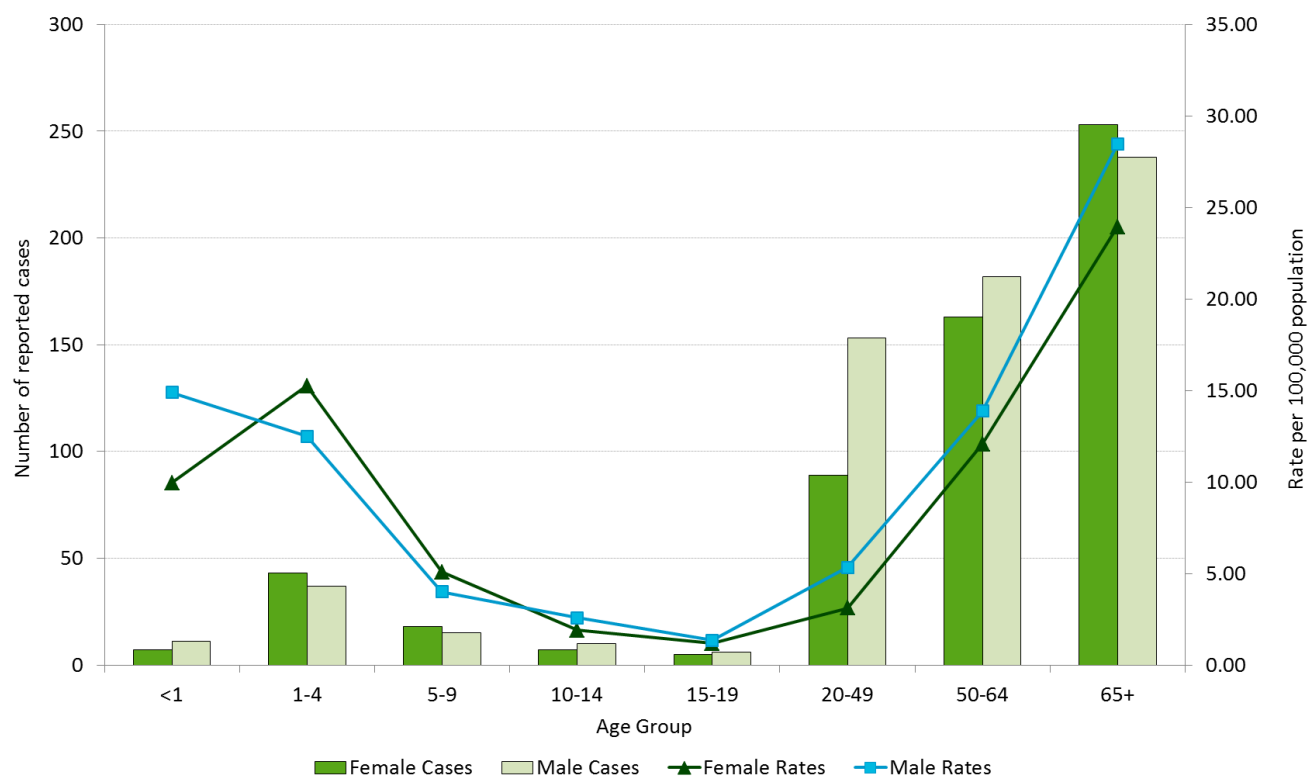
Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
<1	7	9.95	11	14.89	18	12.48
1-4	43	15.25	37	12.50	80	13.84
5-9	18	5.09	15	4.01	33	4.53
10-14	7	1.89	10	2.57	17	2.24
15-19	5	1.17	6	1.34	11	1.26
20-49	89	3.10	153	5.34	242	4.22
50-64	163	12.07	182	13.86	345	12.96
65+	253	23.95	238	28.46	491	25.94
Total	585	8.63	652	9.89	1,237	9.25

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Does not include one case of unknown age and/or sex.

Figure 4-16. Incidence of Invasive Pneumococcal Disease by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Does not include one case of unknown age and/or sex.

HOSPITALIZATIONS AND DEATHS

Hospitalizations were reported for 68% (841/1,238) of IPD cases reported in Ontario in 2011. Hospitalized cases ranged in age from less than one to 100 years, with a median age of 60 years. There were 68 (6%) reported deaths among IPD cases reported in 2011. Case fatality ratios (CFR) among IPD cases increased with increasing age among adults. The CFR was five percent among those 20-49 years, six percent among those aged 50-64 years and seven percent among cases aged 65 years and older. No deaths were reported among cases under the age of 32 years.

MONTHLY DISTRIBUTION

The incidence of IPD demonstrates a consistent seasonal trend from year to year that aligns with the influenza season, which usually peaks in the winter and spring in temperate climates.⁸⁰ In 2011, a clear seasonal distribution was shown with cases peaking in the winter months and with comparatively few cases occurring during the summer months (Figure 4-17).

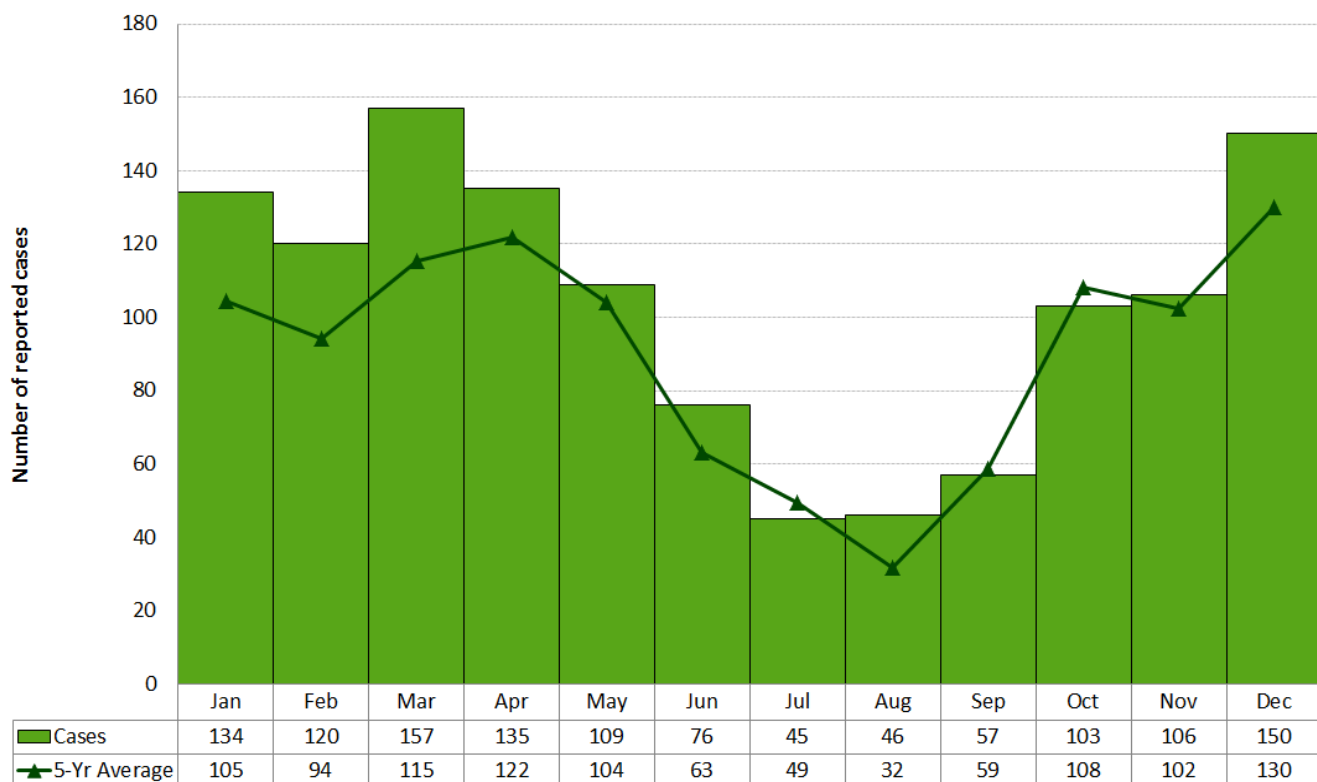
GEOGRAPHIC DISTRIBUTION

The incidence of IPD varied across the province (Map 4-4, Table 4-10). The health unit-specific rates in 2011 ranged from 1.52 (Lambton County Health Unit) to 32.95 (Northwestern Health Unit) cases per 100,000 population. Three health units in the north (Northwestern, Algoma District and Thunder Bay District) reported the highest incidence rates of IPD in 2011. Lambton County, Halton Region and York Region had the lowest disease rates in 2011.

REPORTED RISK FACTORS

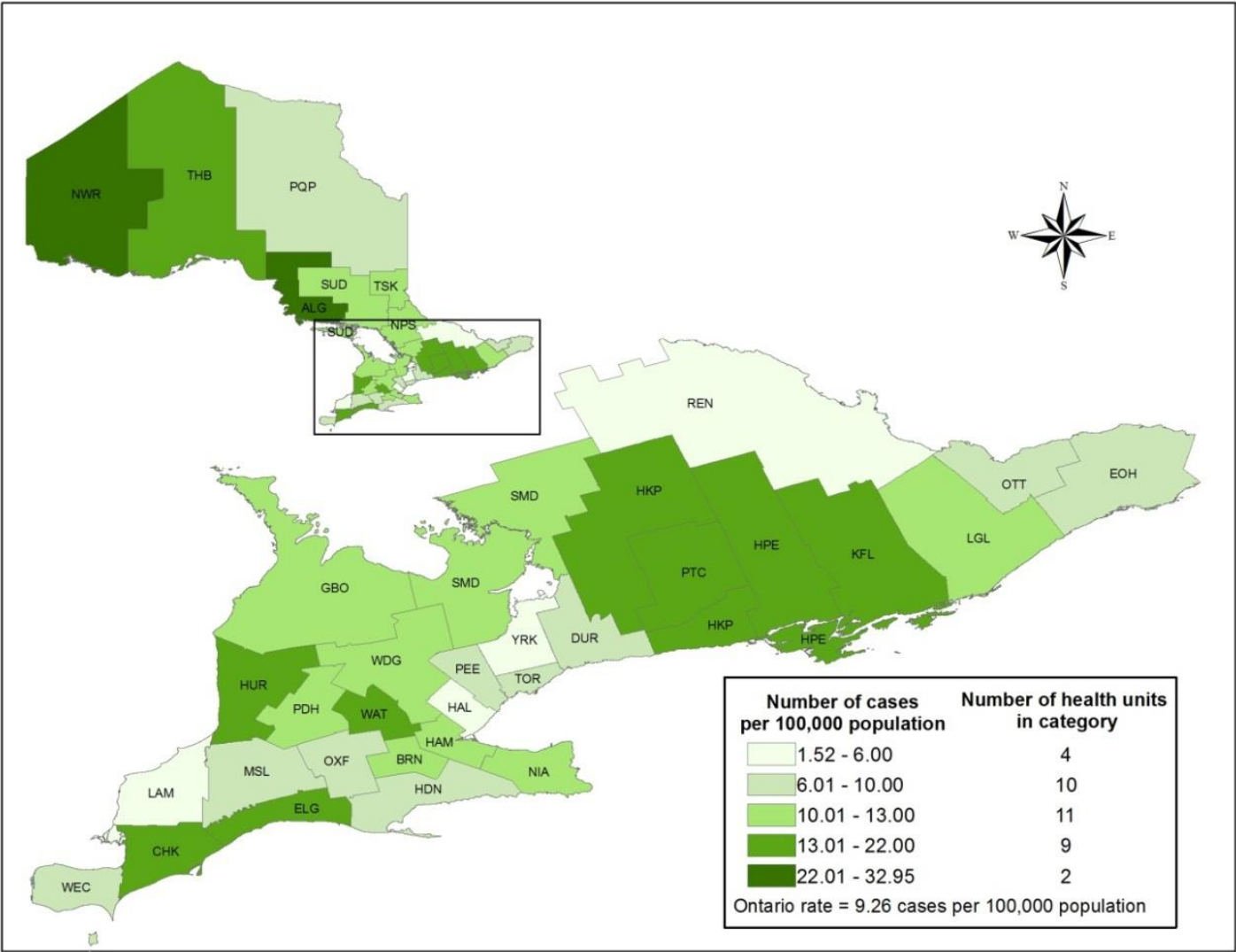
Of the 876 IPD cases reporting a medical risk factor, 77% (678) reported having a chronic illness or an underlying or immuno-suppressing medical condition.

Figure 4-17. Number of Invasive Pneumococcal Disease Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 4-4. Incidence of Invasive Pneumococcal Disease by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 4-10. Incidence of Invasive Pneumococcal Disease by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	27	22.92	2.2%	0.9%
Brant County	15	10.65	1.2%	1.1%
Chatham-Kent	18	16.58	1.5%	0.8%
Durham Region	56	8.87	4.5%	4.7%
Eastern Ontario	14	6.96	1.1%	1.5%
Elgin-St. Thomas	12	13.13	1.0%	0.7%
Grey Bruce	19	11.53	1.5%	1.2%
Haldimand-Norfolk	11	9.94	0.9%	0.8%
Haliburton, Kawartha, Pine Ridge District	27	15.08	2.2%	1.3%
Halton Region	21	4.05	1.7%	3.9%
Hamilton, City of	70	12.96	5.7%	4.0%
Hastings & Prince Edward Counties	22	13.52	1.8%	1.2%
Huron County	9	14.92	0.7%	0.5%
Kingston-Frontenac & Lennox & Addington	30	15.20	2.4%	1.5%
Lambton County	2	1.52	0.2%	1.0%
Leeds, Grenville and Lanark District	22	12.93	1.8%	1.3%
Middlesex-London	40	8.68	3.2%	3.4%
Niagara Region	56	12.57	4.5%	3.3%
North Bay Parry Sound District	15	11.78	1.2%	1.0%
Northwestern	27	32.95	2.2%	0.6%
Ottawa, City of	83	9.12	6.7%	6.8%
Oxford County	10	9.24	0.8%	0.8%
Peel Region	93	6.81	7.5%	10.2%
Perth District	9	11.67	0.7%	0.6%
Peterborough County-City	19	13.52	1.5%	1.1%
Porcupine	6	6.92	0.5%	0.6%
Renfrew County & District	6	5.83	0.5%	0.8%
Simcoe Muskoka District	56	10.66	4.5%	3.9%
Sudbury & District	25	12.64	2.0%	1.5%
Thunder Bay District	30	19.16	2.4%	1.2%
Timiskaming	4	11.61	0.3%	0.3%
Toronto	208	7.58	16.8%	20.5%
Waterloo Region	69	13.01	5.6%	4.0%
Wellington-Dufferin-Guelph	30	10.77	2.4%	2.1%
Windsor-Essex County	33	8.18	2.7%	3.0%
York Region	44	4.11	3.6%	8.0%
Ontario	1,238	9.26	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Poliomyelitis, acute

Poliomyelitis (polio) is caused by a virus which is transmitted from person-to-person primarily through the fecal-oral route.^{84,1} Most persons infected with polio (90% to 95%) do not have any symptoms. Among the remainder, symptoms usually manifest within seven to 14 days after exposure. Symptoms include fever, fatigue, headache and vomiting. Persons with serious illness may also develop severe muscle pain and stiffness of the neck and back with or without paralysis. Although paralysis is equated with polio infection, less than one percent of cases result in paralysis. For cases with paralytic polio, the case fatality ratio ranges from two to five percent in children and from 15 to 30% in adults.⁸⁴

Polio is an endemic disease in only three countries of the world – Afghanistan, Pakistan, and Nigeria.⁸⁴ Canada was declared polio-free in 1994 and has maintained its status.⁸⁴ Because polio has not been eradicated globally, there is a small risk of importation into Canada from countries where endemic transmission still occurs. Under the publicly funded immunization program in Ontario, inactivated polio vaccine (IPV) is administered to infants in combination with vaccines against diphtheria, tetanus, pertussis and *Haemophilus influenzae* type b. Polio containing vaccine is routinely administered at two, four and six months of age, with additional boosters at 18 months and four to six years. No additional booster doses of polio vaccine are required after completion of the childhood series with the exception of adults who are at increased risk of exposure to polio (e.g., those travelling to, or planning to work in areas that have wild polio or vaccine-derived polio outbreaks). A single booster dose of IPV is recommended for these adults.⁸⁴ The vaccine provides 95% protection against infection after completion of the primary series and almost 100% protection after the booster dose.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Canada was certified polio-free in 1994.⁸⁴ No cases of polio have been reported in Ontario since routine reporting of cases began in 1991.

Rubella

Rubella is a highly contagious viral disease that is spread through contact with secretions expelled through the cough or sneeze of an infected person.¹ Infection is characterized by mild illness including fever, rash, headache, malaise, red eyes and runny nose, which develops 14 to 21 days after exposure.⁸⁵ Up to 50% of infected persons do not show any signs of illness. Congenital rubella syndrome (CRS) can occur as a result of rubella infection during pregnancy. Up to 90% of infants born to women infected during the first ten weeks of pregnancy develop CRS, with risk diminishing after the 20th week of pregnancy.¹ Complications from CRS can result in stillbirth, miscarriage and fetal defects of major organ systems including deafness, cataracts, congenital heart disease and impaired intellectual development.^{1,85}

In Canada, screening is recommended for all pregnant women to determine susceptibility to rubella and to facilitate post-partum immunization of susceptible women.^{86, 87} 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 and measles (MMR) or with vaccines for mumps, measles and varicella (MMRV). Although only one dose is required to be considered immunized against rubella,⁸⁶ children in Ontario routinely receive two doses of rubella containing vaccine because the vaccine is given in combination with other antigens as per the recommended immunization schedule. In 2010/2011, 95% of seven year olds in Ontario reported receiving at least one-dose of rubella-containing vaccine, and between 2006 and 2010, approximately 90% of prenatal women in Ontario were immune to rubella.⁸⁸

As with measles, indigenous rubella has been eliminated from Canada, with the last reported case occurring in 2005. The same risk for importation of rubella cases exists as with measles as it is also endemic in other parts of the world. Again, documentation of travel history is essential to ensure Canada's elimination

status to demonstrate enhanced surveillance for both of these diseases.

Congenital rubella syndrome has also been eliminated from Canada. There have been no cases of CRS due to exposure to rubella in Canada since 2000.⁶⁷ However, sporadic cases continue to occur as a result of prenatal infections acquired in endemic areas.

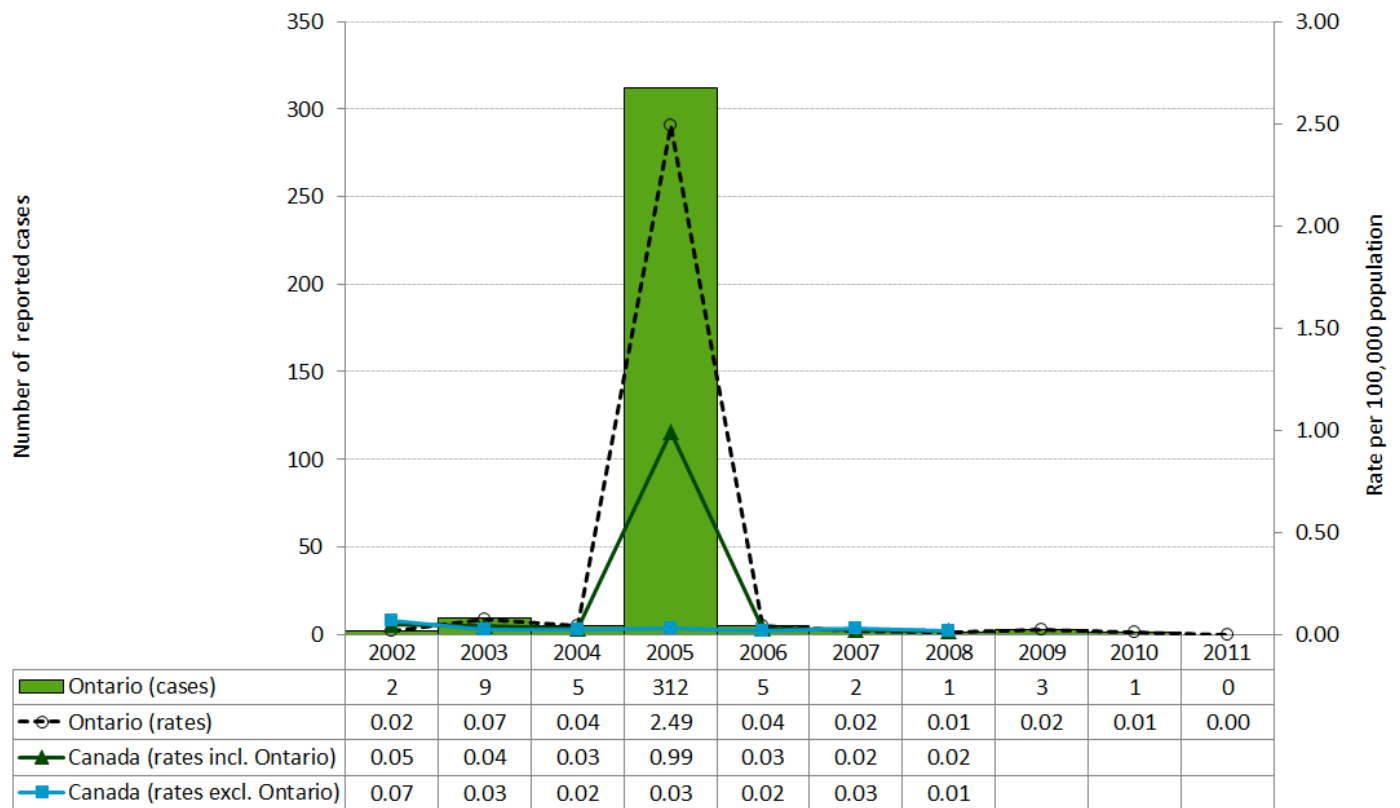
2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, no cases of rubella or CRS were reported in Ontario. Excluding 2005, the number of reported cases of rubella ranged from zero to ten per year, for a yearly average of four cases for the period from 2002 to 2011 (Figure 4-18). Over the same period, a total of five cases of CRS were reported in Ontario, with the last case occurring in 2009 (Figure 4-19). Of rubella and CRS cases reported from 2006 to 2011, 46% were directly or indirectly related to travel.

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 community philosophically opposed to immunization. Children between the ages of five and 14 years accounted for over 60% of cases, but no cases of CRS were identified. The outbreak did not spread outside the community due to high immunization rates in the general Ontario population.

In Canada, reductions in the incidence of rubella have also been achieved. From 2006 to 2011, an average of less than five cases was reported annually.⁶⁷ The highest rate and number of cases nationally was in 2005, owing to the outbreak in southwestern Ontario (Figure 4-18). For CRS, annual incidence rates for Canada were generally lower than the corresponding rates for Ontario. From 1996 to 2011, less than three cases of CRS were reported per year in Canada with the majority of cases born to foreign-born women.⁸⁹

Figure 4-18. Incidence of Rubella: Ontario and Canada, 2002-2011

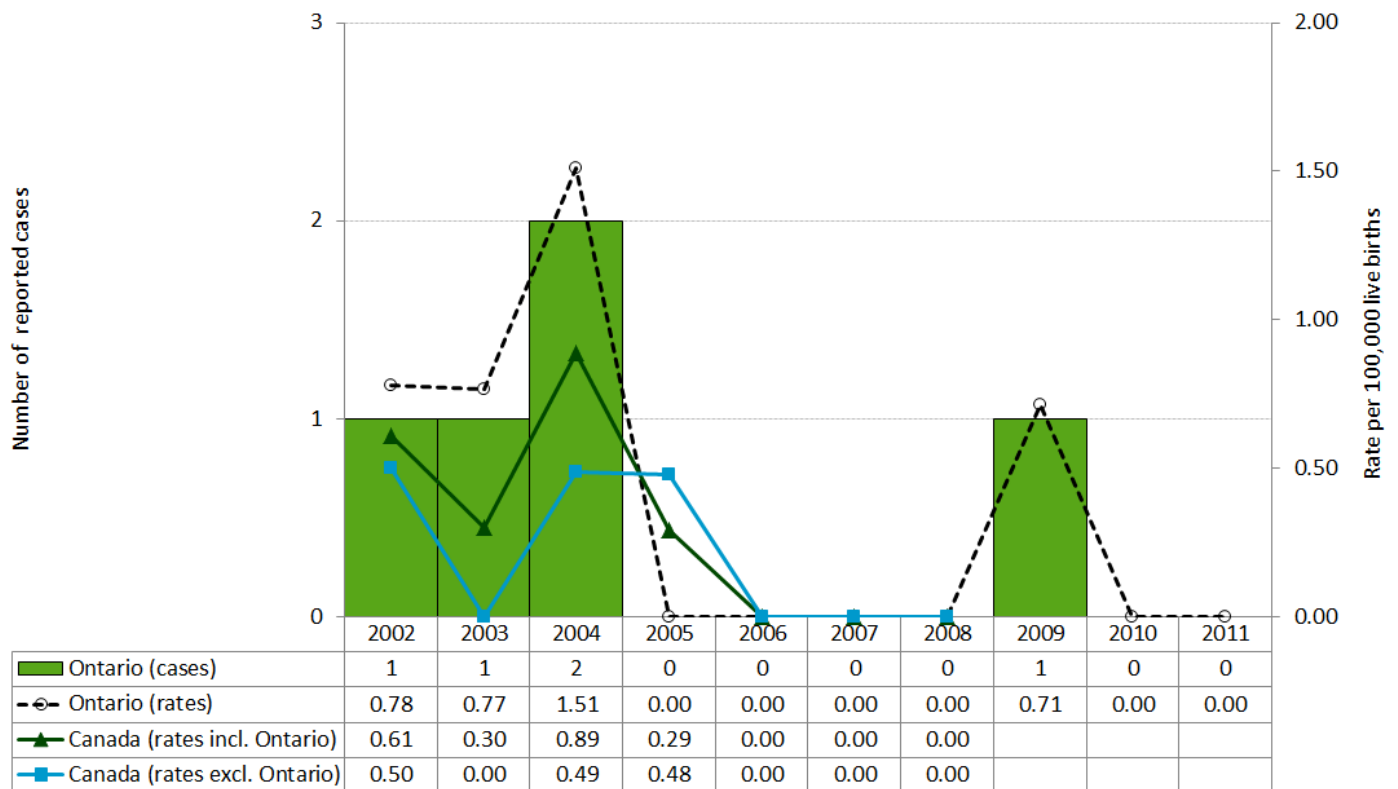


Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Figure 4-19. Incidence of Congenital Rubella Syndrome: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2013/09/05]; rates are per/100,000 live births.

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Tetanus

Tetanus (lockjaw) is a serious disease caused by toxins released by *Clostridium tetani* bacteria.^{1,13,90} These bacteria are ubiquitous and are found in soil, dust and manure.¹ Tetanus manifests in four clinical forms with the most common being generalized tetanus.^{90,91}

Transmission usually occurs through a puncture wound that has been contaminated with soil, dust or feces (animal or human). Less commonly, transmission may occur through contaminated needles or surgical equipment.¹ Symptoms of tetanus usually develop between three and 21 days (average 14 days) after exposure,¹ with the characteristic presentation of painful muscle contractions that can lead to “locking” of the jaw.¹ Case-fatality ratios (CFRs) range from 10% to over 80% in unvaccinated persons, depending on the quality of care received and age (i.e. the CFR is higher in infants and the elderly).^{1,90,91}

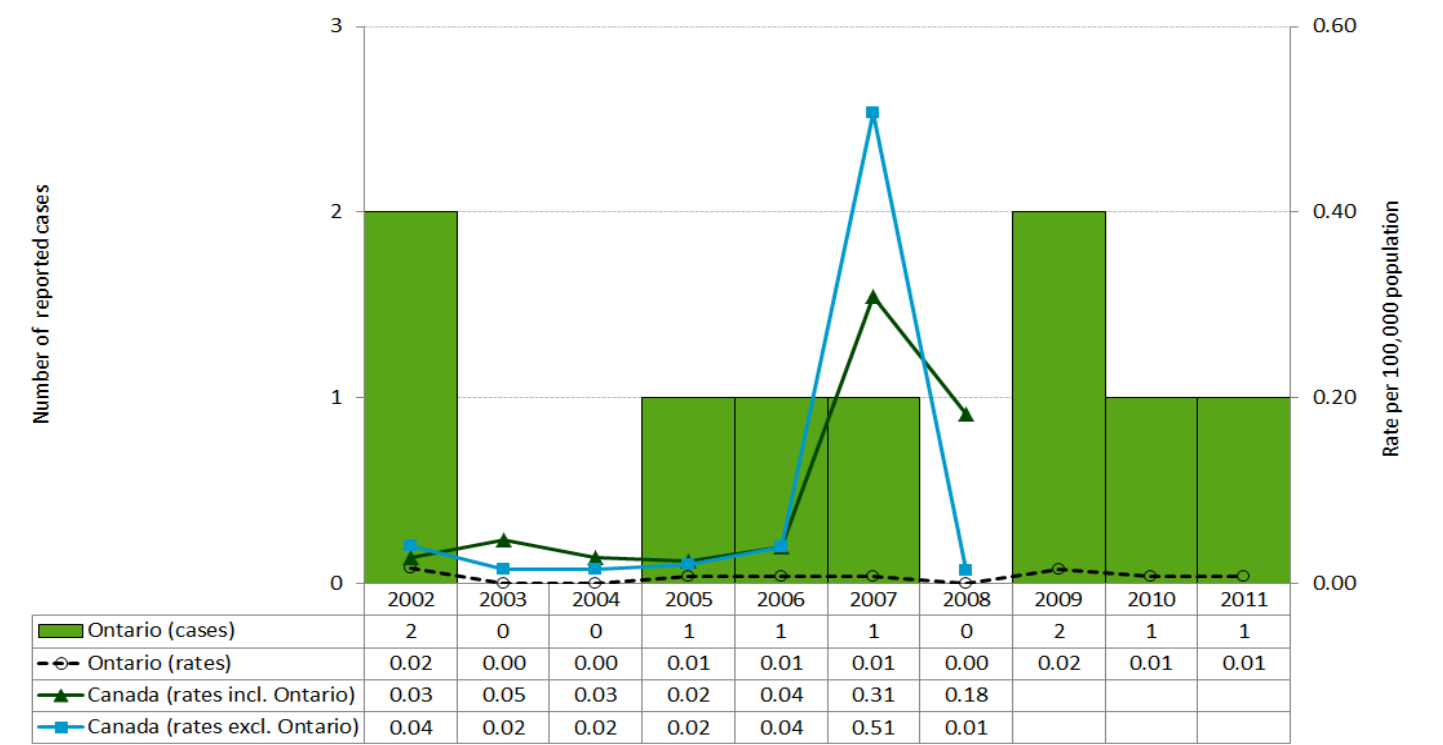
Under the publicly funded immunization program in Ontario, tetanus toxoid containing vaccine is administered to infants in combination with vaccines against diphtheria, pertussis, polio and *Haemophilus influenzae* type b infections. Tetanus toxoid containing vaccine is routinely administered at two, four and six months of age, with additional boosters at 18 months, four to six years and 14 to 16 years. A booster dose is recommended every ten years thereafter, however a prophylactic dose of vaccine may be indicated at 5 years for wound management.¹³ At risk populations are individuals who have never been vaccinated or who are not vaccinated in accordance with the recommended vaccine schedule.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Tetanus is rare in Ontario. From 2002-2011, nine cases of tetanus were reported in Ontario, including one case in 2011 (Figure 4-20).

With the exception of 2007, annual incidence rates of tetanus in Canada were comparable to the corresponding rates for Ontario over the period 2002 to 2008.

Figure 4-20. Incidence of Tetanus: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].
Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].
Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Section 5

Vector-borne Diseases

Overview

Lyme disease, West Nile Virus (WNV) illness and malaria are the three vector-borne diseases of public health significance in Ontario. Yellow fever is also reportable in Ontario, but no cases have been reported since the disease became reportable in 1991. Similar to yellow fever, malaria is not endemic in Canada, and its incidence reflects travel to or recent immigration from malaria endemic countries. The annual incidence rate of malaria remained relatively stable from 2004 to 2009 but increased substantially in 2010 and 2011 to its highest levels since the 1990s.

Both Lyme disease and WNV illness are endemic in Ontario where competent disease vectors and hosts can be found. Lyme disease has become the most important vector-borne disease that can be acquired locally within Ontario. Its incidence increased steadily over the ten-year period from 2002 to 2011, with the increase attributed to several factors including greater awareness among the public and an expansion in the geographic range of Lyme disease positive ticks and hence the risk of exposure. Annual incidence rates of WNV illness were comparatively lower from 2003 to 2011 in comparison to 2002, the year in which the disease was first reported in Ontario. Fluctuations in the incidence of WNV illness are likely influenced by the amount of rainfall and increasing temperatures, which in turn affect the growth and development of the mosquito vector.

Several quick reference data tables for the diseases covered in this section are included in Appendix 4.

Lyme Disease

- **The annual incidence rate of Lyme disease in Ontario increased steadily over the ten-year period from 2002 to 2011.**
- **The majority of Lyme disease cases occur in the warmer months from May to September.**
- **Seventy percent of Lyme diseases cases reported in 2011 were acquired within Ontario, a third of which were associated with exposures in Lyme disease endemic areas.**

Lyme disease is the most frequently reported of the vector-borne diseases that are acquired locally within Ontario. It is caused by *Borrelia burgdorferi*, a bacterium that is transmitted to humans through the bite of an infected tick.¹ In Ontario, the blacklegged tick is the main vector for Lyme disease. There are at least seven endemic or established populations of these ticks in the southern and eastern parts of the province.⁹² Infection with Lyme disease generally occurs three to 32 days after a tick bite (average seven to 10 days) and is characterized by a “bull’s eye” rash (erythema migrans) with other early symptoms such as fatigue, fever, headache, muscle and joint aches and stiff neck.¹

Susceptibility to Lyme disease is general. However, persons that spend a lot of time outdoors or have contact with animals that may carry ticks are at higher risk of infection.¹ Lyme disease is diagnosed through a combination of symptoms, history of exposure to infected ticks and/or validated laboratory test results.⁹³

Avoidance of tick bites is the best way to prevent Lyme disease. Tick bites can be prevented by using insect repellent when outdoors, removing ticks from the body as soon as possible after bites, and reducing tick habitats around the home. Tick bites can also be prevented by controlling ticks on companion animals such as cat and dogs.⁹³

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

The annual incidence rate of Lyme disease in Ontario increased over the ten-year period from 2002 to 2011. From 2008 to 2010, the number of reported cases stabilized to approximately 100 cases per year (Figure 5-1). In 2011, 134 confirmed and probable cases of Lyme disease were reported for an overall incidence rate of 1.00 case per 100,000 population. 2011 represented a 35% increase in incidence compared to the period from 2008 to 2010, and a 335% increase compared to 2002 when 28 confirmed cases were reported. Greater awareness among the public, particularly in Lyme disease-endemic areas, has resulted in increased testing for Lyme disease. From 2007 to 2011, the number of tests for Lyme disease at Public Health Ontario Laboratory increased by 50%, contributing in part to the rise in Lyme disease cases in Ontario since 2007.

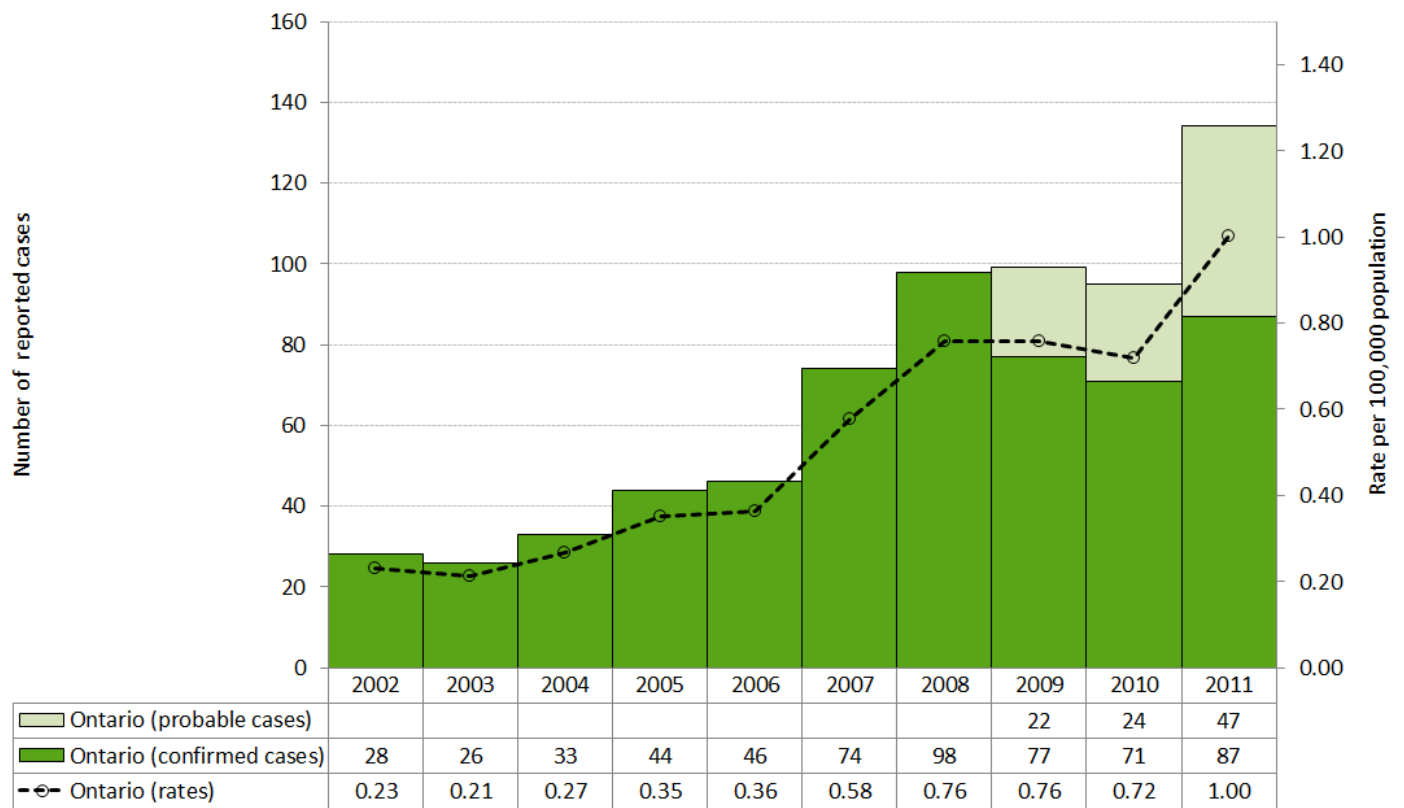
Lyme disease was not nationally notifiable until December 2009. National data for 2009 to 2011 were not available at the time of analysis.

AGE AND SEX DISTRIBUTION

In 2011, slightly more cases of Lyme disease were reported among females compared to males. Females accounted for 68 cases, representing a rate of 1.00 case per 100,000 population, while males accounted for 62 cases, representing a rate of 0.94 cases per 100,000 population (Table 5-1, Figure 5-2).

The average age of female cases was 44 years, which was higher than the average age of 38 years for males. Females in the 50-59 and 60-69 year age groups had the highest incidence rates of Lyme disease of all females. Conversely, males in the 10-19, 20-29 and 60-69 year age groups had the highest incidence rates of Lyme disease of all males (Table 5-1, Figure 5-2).

Figure 5-1. Incidence of Lyme Disease in Ontario and Canada: 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]; probable cases included as of 2009.

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Lyme disease became notifiable nationally in 2009. National data for 2009 to 2011 are preliminary and are not yet available.

Table 5-1. Incidence of Lyme Disease by Age and Sex: Ontario, 2011

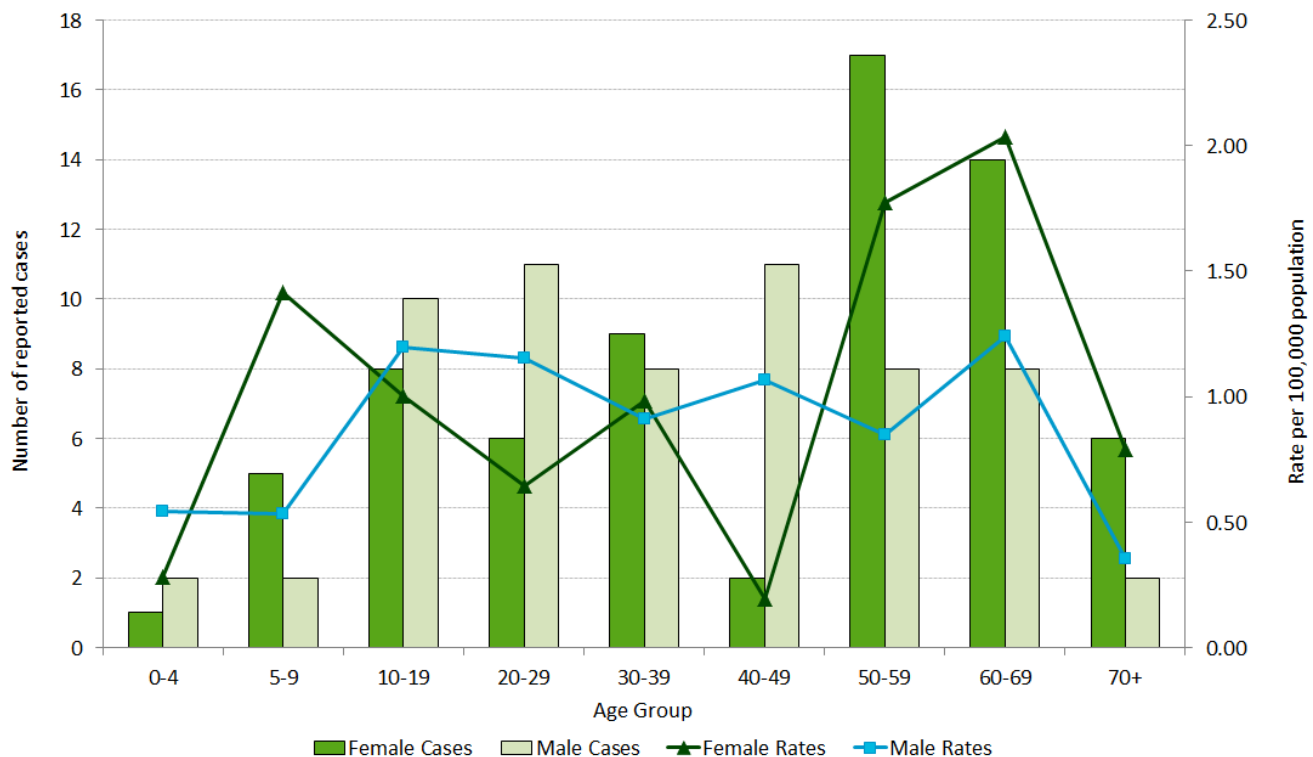
Age Group (Years)	Female		Male		Total	
	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)	Cases	Rates (per 100,000 Population)
0-4	1	0.28	2	0.54	3	0.42
5-9	5	1.41	2	0.53	7	0.96
10-19	8	1.00	10	1.20	18	1.10
20-29	6	0.65	11	1.15	17	0.90
30-39	9	0.99	8	0.91	17	0.95
40-49	2	0.19	11	1.07	13	0.63
50-59	17	1.78	8	0.85	25	1.32
60-69	14	2.04	8	1.24	22	1.65
70+	6	0.79	2	0.36	8	0.60
Total	68	1.00	62	0.94	130	0.97

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Does not include four cases for which age and/or sex is/are unknown; includes both confirmed and probable cases.

Figure 5-2. Incidence of Lyme Disease by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Does not include four cases for which age and/or sex is/are unknown; includes both confirmed and probable cases.

HOSPITALIZATIONS AND DEATHS

In 2011, seven percent (9/134) of Lyme disease cases were hospitalized. No deaths occurred among the cases reported in 2011.

MONTHLY INCIDENCE

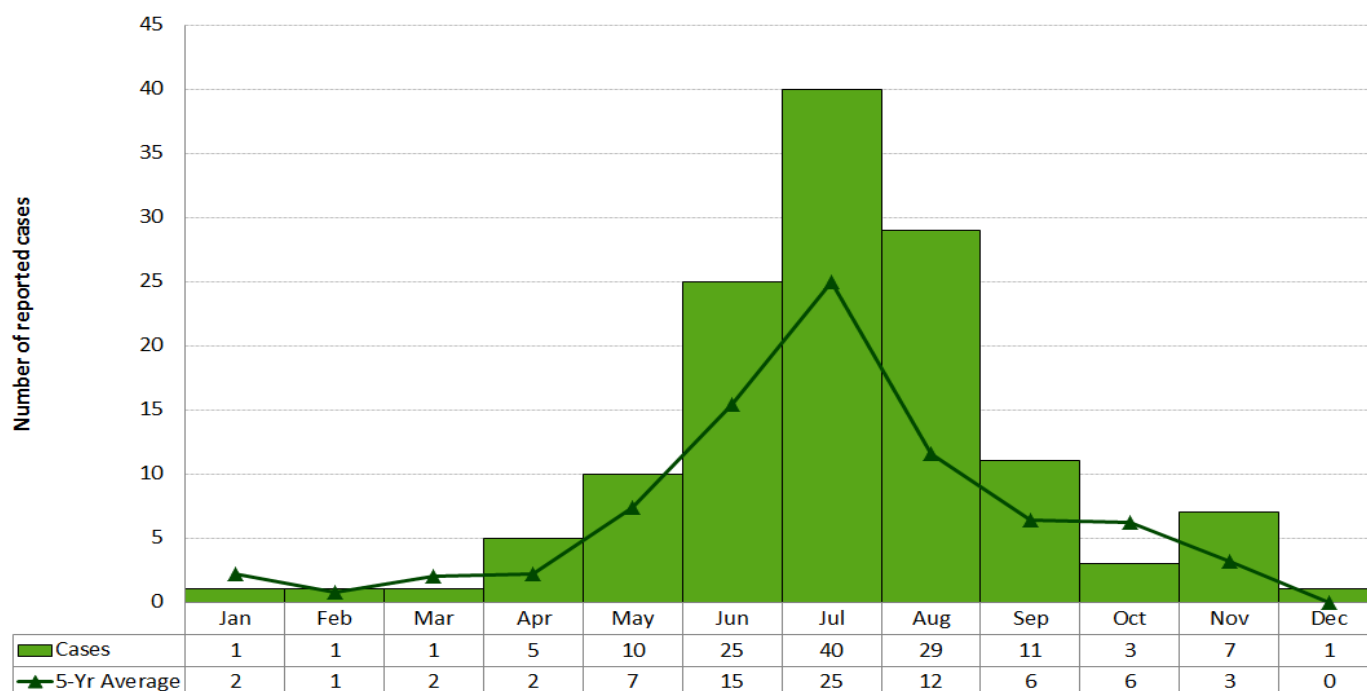
The distribution of Lyme disease cases demonstrates a clear seasonal pattern with increased incidence from May to September. Together, these five months accounted for 86% (115/134) of Lyme disease cases reported in 2011 (Figure 5-3). The peak in incidence in Ontario during the warmer months is similar to other Lyme disease-endemic regions in the United States⁹⁴ and Canada.⁹⁵ Peak incidence in Ontario also coincides with increased participation in outdoor activities and the feeding cycle of the tick vector, which increases the likelihood of human exposure to infected nymphal ticks that are smaller and harder to find once attached to the body. Lyme disease cases reported throughout the rest of 2011 are most likely related to disease acquisition during travel to endemic areas outside of Ontario or late diagnosis of locally-acquired disease.

GEOGRAPHIC DISTRIBUTION

Leeds, Grenville and Lanark District; Kingston-Frontenac and Lennox and Addington; and Renfrew County health units reported the highest incidence rates of Lyme disease in 2011 (Map 5-1, Table 5-2). Incidence rates in these three eastern Ontario health units ranged from 4.86 to 11.75 cases per 100,000 population and were approximately five to 12 times higher than the overall rate for the province. Ten other health units reported incidence rates that were higher than the overall rate for Ontario, and 11 health units reported no cases in 2011. Toronto (21/134) and Leeds, Grenville and Lanark District Health Unit (20/134) reported the highest number of cases in 2011.

Incidence rates for Lyme disease in humans tend to be higher in the eastern parts of Ontario owing to the presence of established tick populations in which tick infection rates are relatively higher. On the other hand, the high number of cases in Toronto in 2011 was attributed largely to travel outside of the province or to other areas of the province there are established tick populations (18/21).

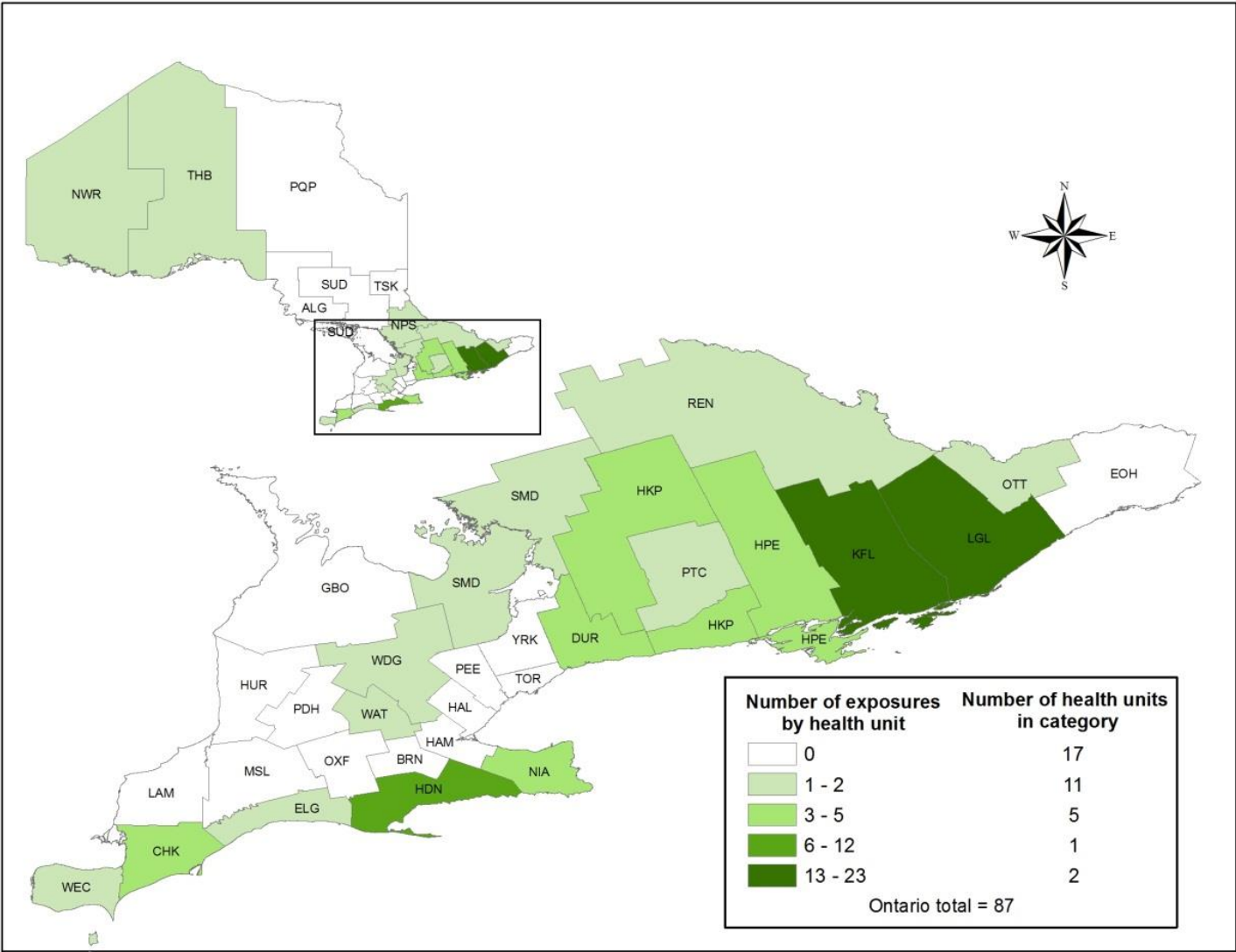
Figure 5-3. Number of Lyme Disease Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Note: Includes both confirmed and probable cases.

Map 5-1. Incidence of Lyme Disease by Health Unit of Exposure: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, intelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case was most likely exposed and is not necessarily the HU of residence at the time of identification; includes both confirmed and probable cases.

Table 5-2. Incidence of Lyme Disease by Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	1	0.92	0.7%	0.8%
Durham Region	1	0.16	0.7%	4.7%
Eastern Ontario	1	0.50	0.7%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	1	0.61	0.7%	1.2%
Haldimand-Norfolk	4	3.61	3.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	2	1.12	1.5%	1.3%
Halton Region	6	1.16	4.5%	3.9%
Hamilton, City of	2	0.37	1.5%	4.0%
Hastings & Prince Edward Counties	4	2.46	3.0%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	17	8.61	12.7%	1.5%
Lambton County	0	0.00	0.0%	1.0%
Leeds, Grenville and Lanark District	20	11.75	14.9%	1.3%
Middlesex-London	2	0.43	1.5%	3.4%
Niagara Region	6	1.35	4.5%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	0	0.00	0.0%	0.6%
Ottawa, City of	11	1.21	8.2%	6.8%
Oxford County	4	3.70	3.0%	0.8%
Peel Region	7	0.51	5.2%	10.2%
Perth District	1	1.30	0.7%	0.6%
Peterborough County-City	3	2.13	2.2%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	5	4.86	3.7%	0.8%
Simcoe Muskoka District	0	0.00	0.0%	3.9%
Sudbury & District	0	0.00	0.0%	1.5%
Thunder Bay District	1	0.64	0.7%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	21	0.77	15.7%	20.5%
Waterloo Region	4	0.75	3.0%	4.0%
Wellington-Dufferin-Guelph	3	1.08	2.2%	2.1%
Windsor-Essex County	3	0.74	2.2%	3.0%
York Region	4	0.37	3.0%	8.0%
Ontario	134	1.00	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

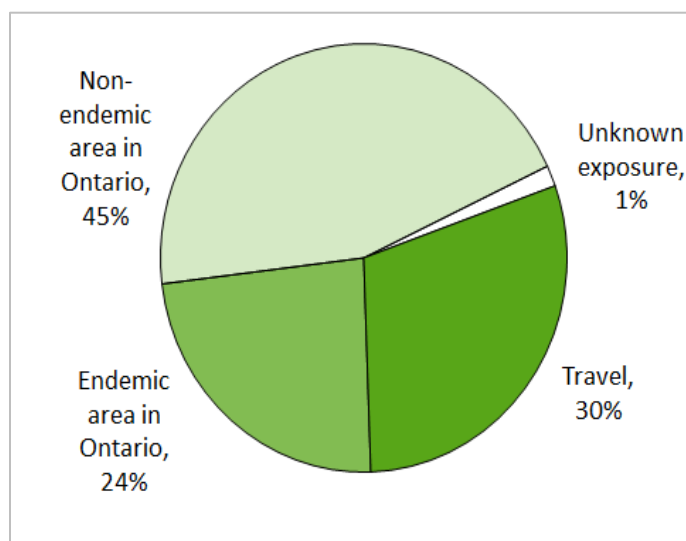
Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition; includes both confirmed and probable cases.

REPORTED EXPOSURES

In 2011, 95% (127/134) of Lyme disease cases reported an exposure, including 89 cases (70%) that were exposed within Ontario and 38 cases (30%) that were related to travel outside of Ontario (Figure 5-4). Of the locally-exposed cases, 64% (57/89) were associated with exposures in non-endemic areas in Ontario, 34% (30/89) reported exposures in established endemic areas, and 2% (2/89) had unspecified or unknown exposure locations in Ontario (Figure 5-4). Since 2008, the proportion of exposures attributed to non-endemic areas has increased, whereas the proportion of exposures attributed to travel outside of Ontario has decreased. These trends are suggestive of an increase in the range of exposure locations for the acquisition of Lyme disease in Ontario and are supported by data that shows an increase in the geographic range of Lyme disease positive ticks in Ontario.⁹⁶

Figure 5-4. Incidence of Lyme Disease by Place of Exposure: Ontario, 2011 (n=127)



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution. Exposures and thus endemicity not reported for all cases. Endemicity is based on established endemic areas as defined by the Ministry of Health and Long-Term Care.⁹² Includes both confirmed and probable cases.

Malaria

- **The incidence of malaria in Ontario increased in 2010 and remained elevated in 2011 after an eight year period of relative stability.**
- **Incidence rates of malaria for males and females were highest in the age range from 20 to 49 years.**
- **Toronto and Peel Region accounted for 68% of malaria cases reported in Ontario in 2011.**
- **Malaria is not endemic in Ontario and its incidence reflects travel to, or recent immigration from, malaria endemic countries.**

Malaria is a commonly reported and often fatal disease in many tropical and sub-tropical countries. In 2010, an estimated 219 million cases and 660,000 deaths were reported worldwide.⁹⁷ Malaria is caused by one of five parasitic species of the genus *Plasmodium*: *P. falciparum*, *P. vivax*, *P. ovale*, *P. malariae* and *P. knowlesi*. Malaria is transmitted primarily through the bite of an infected female *Anopheles* mosquito. The time from exposure to the onset of symptoms of malaria varies, ranging from nine to 40 days, depending on the *Plasmodium* species. The severity of illness with malaria also depends on the species, with *P. falciparum* resulting in the most serious health outcomes. Symptoms of malaria are mostly non-specific and include fever, headache, nausea, vomiting, diarrhea, muscle pain and malaise. Illness is often characterized by alternating chills and fever and central nervous system symptoms, especially with *P. falciparum* infections.¹

As malaria is not endemic in Canada, its incidence reflects travel to, or recent immigration from, malaria endemic countries. For Ontarians, the most effective

means of protection against malaria is pre-travel prophylaxis (antimalarial drugs) in addition to the application of other personal precautions (e.g. use of mosquito repellent and bed nets) that safeguard against mosquito bites during travel.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

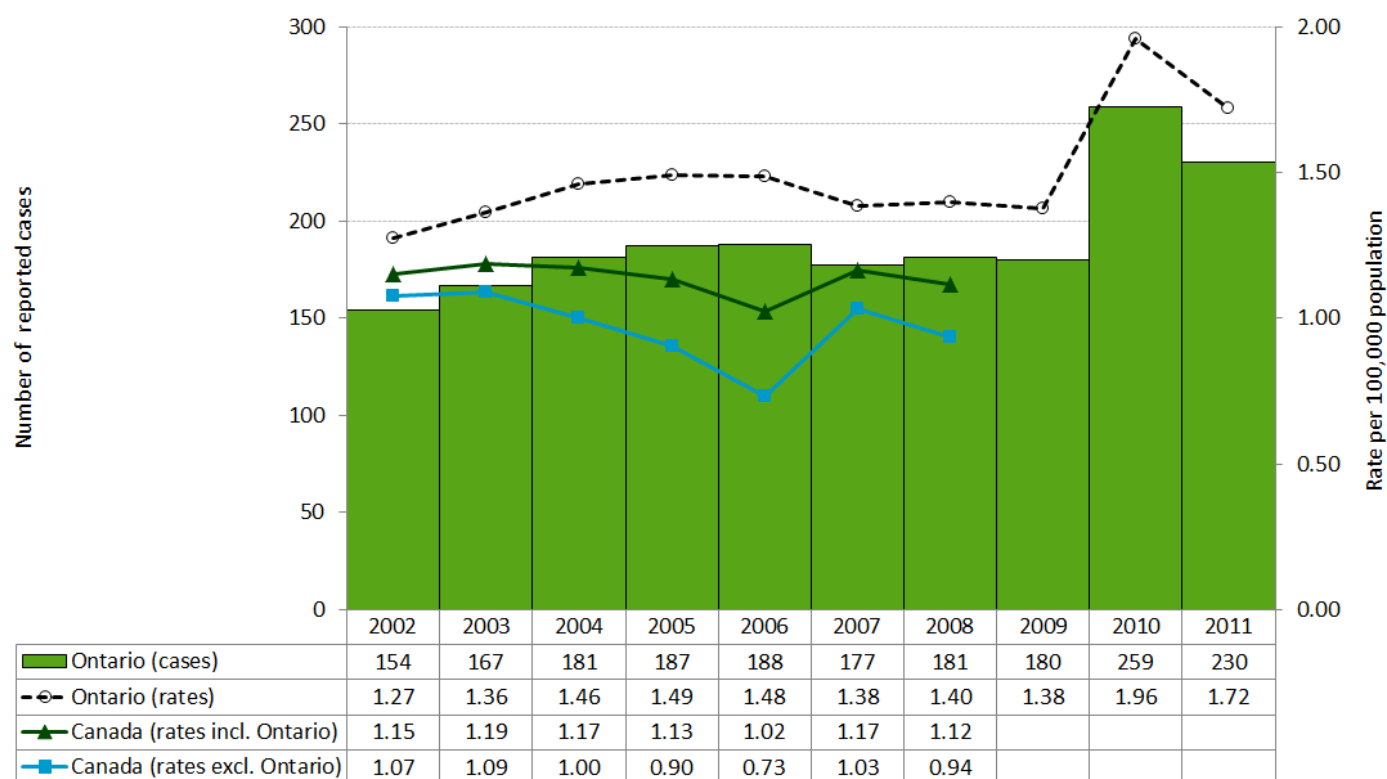
Malaria has the highest incidence of all reportable vector-borne diseases in Ontario. In 2011, malaria accounted for 52% of all vector-borne diseases reported with 230 confirmed cases, representing an incidence rate of 1.72 cases per 100,000 population. From 2002 to 2009, the number of reported cases of malaria remained relatively stable, with an average of 180 reported cases per year or 1.40 cases per 100,000 population. In 2010, the incidence of malaria increased by 40% compared to the average from 2002 to 2009, and by 23% in comparison to 2011 (Figure 5-5).

From 2002 to 2008, the annual incidence of malaria in Canada remained relatively stable and below the corresponding annual rates for Ontario. National rates over this period ranged from 1.02 to 1.19 cases per 100,000 population (Figure 5-5).

MALARIA SPECIES

In 2011, *P. falciparum* was the most commonly reported malaria species among cases reported in Ontario, accounting for 47% (107/230) of cases, followed by *P. vivax* at 39% (89/230) and *P. ovale* at 4% (9/230) (Table 5-3). The species was unspecified for 11% of cases. *P. falciparum* (82%) and *P. ovale* (100%) were most frequently associated with travel to Africa, while *P. vivax* (82%) was most frequently associated with travel to the Asian sub-continent.

Figure 5-5. Incidence of Malaria in Ontario and Canada: 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

AGE AND SEX DISTRIBUTION

Compared to females, males accounted for more cases and higher rates of malaria in 2011. The proportion of reported cases accounted for by males was 70% (161), which represents an incidence rate of 2.44 cases per 100,000 population. Females accounted for 28% (64) of malaria cases and had an incidence rate of 0.94 cases per 100,000 population (Table 5-4, Figure 5-6). Sex was unknown for five cases.

Incidence rates for both sexes were highest in the 20-29, 30-39, and 40-49 year age groups. Males in these age groups had incidence rates that were higher than the overall rate for the province as a whole. In contrast, females in these age groups had incidence rates that were lower than the overall rate for Ontario. Higher rates among the 20 to 49 year olds may be reflective of travel patterns, and the higher rates among males

relative to females in these age groups may also be reflective of sex-specific differences in the uptake of personal protective measures during travel.

Table 5-3. Malaria Cases by Species: Ontario, 2011

<i>Plasmodium</i> Species	Cases	
	Number	Percent
<i>P. falciparum</i>	107	46.5%
<i>P. vivax</i>	89	38.7%
<i>P. ovale</i>	9	3.9%
Unspecified species	25	10.9%
Total	230	100%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Table 5-4. Incidence of Malaria by Age and Sex: Ontario, 2011

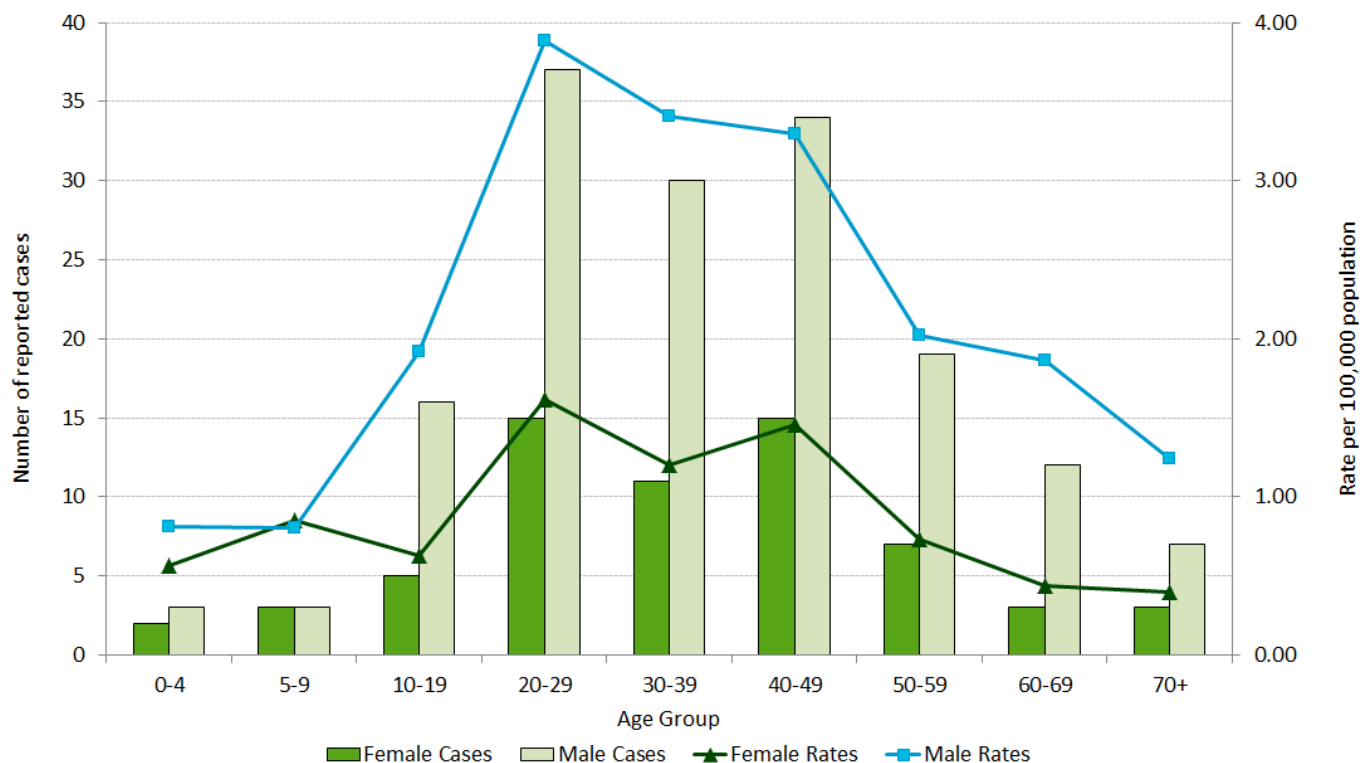
Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	2	0.57	3	0.81	5	0.69
5-9	3	0.85	3	0.80	6	0.82
10-19	5	0.63	16	1.92	21	1.29
20-29	15	1.62	37	3.88	52	2.77
30-39	11	1.20	30	3.41	41	2.29
40-49	15	1.46	34	3.30	49	2.38
50-59	7	0.73	19	2.02	26	1.37
60-69	3	0.44	12	1.86	15	1.13
70+	3	0.39	7	1.25	10	0.76
Total	64	0.94	161	2.44	225	1.68

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes five cases of unknown age and/or sex.

Figure 5-6. Incidence of Malaria by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes five cases of unknown age and/or sex.

HOSPITALIZATIONS AND DEATHS

Almost 30% (65/230) of malaria cases reported in 2011 were hospitalized. Hospitalization rates among malaria cases caused by *P. falciparum*, *P. vivax* and *P. ovale* ranged from 29% to 33%, indicating that the three main species were equally likely to result in hospitalization among travelers returning to Ontario. No fatalities related to malaria were reported in 2011.

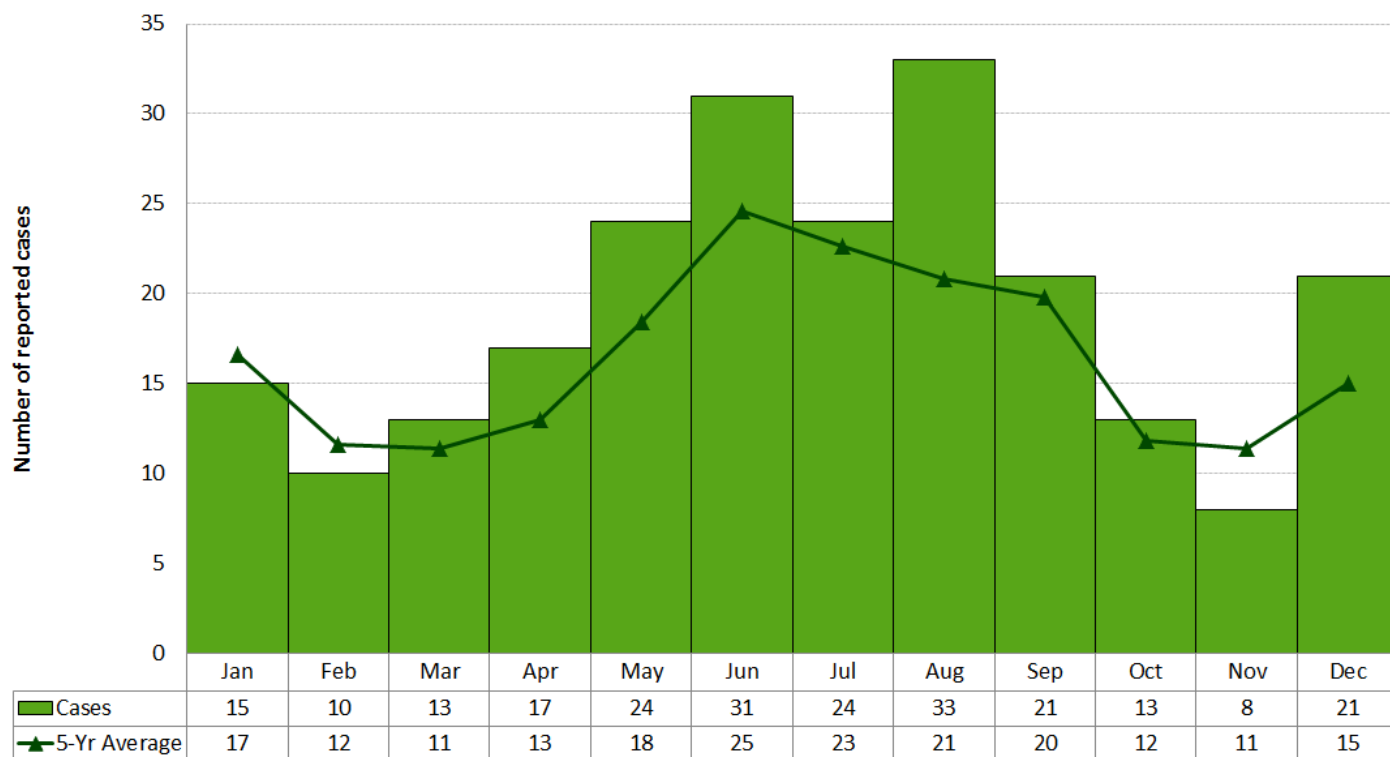
MONTHLY DISTRIBUTION

Malaria cases are reported throughout the year in Ontario with peak incidence occurring from May to September, which is peak travel time for many Ontarians. In 2011, these months accounted for 58% (133/230) of reported malaria cases (Figure 5-7). Higher incidence rates from May to September is closely associated with the rainy season which is conducive to the development of the mosquito vector for malaria. The rainy season occurs from April to September in travel destinations in West and East Africa commonly reported by malaria cases.^{98,99}

GEOGRAPHIC DISTRIBUTION

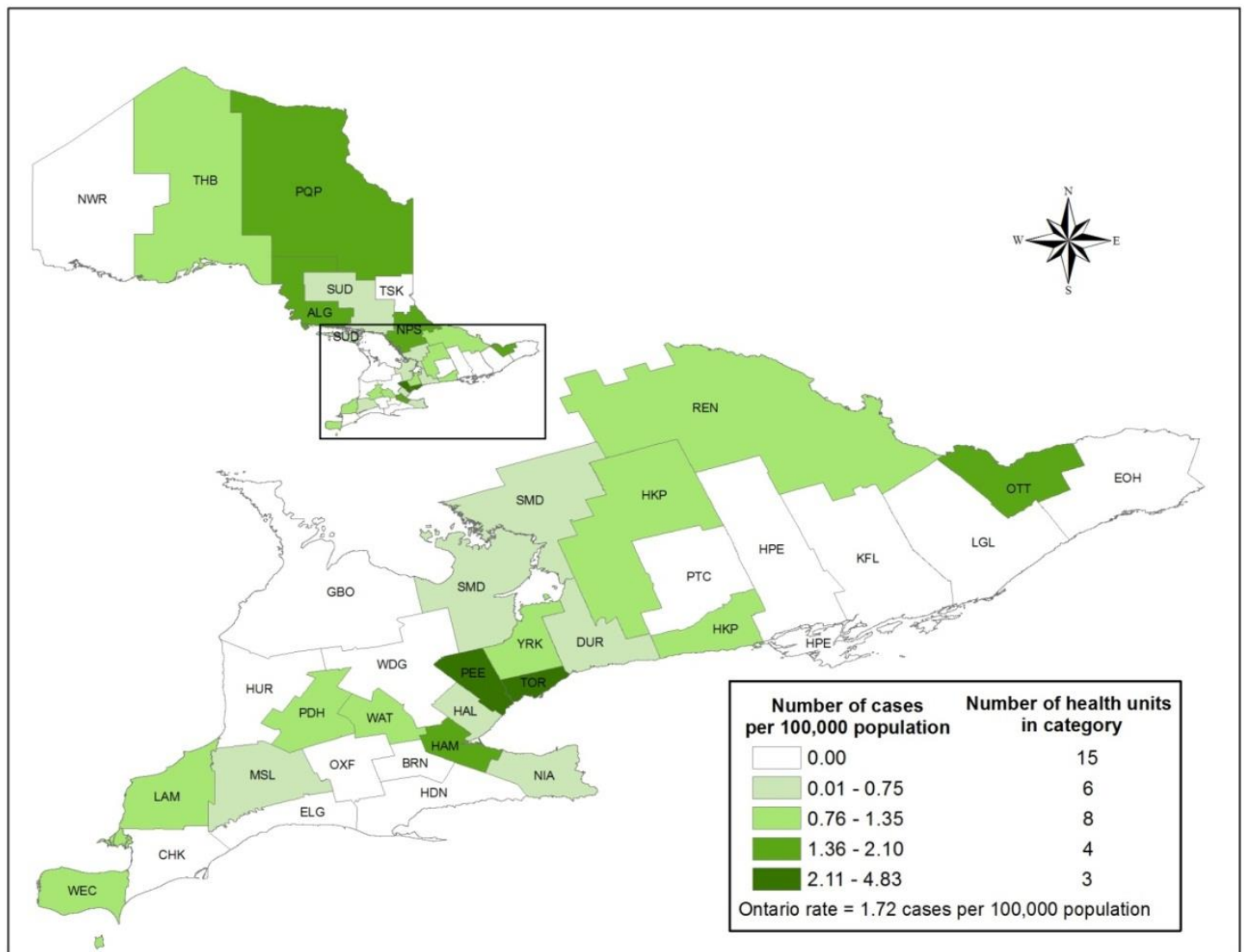
The geographical distribution of malaria cases in Ontario mirrors settlement patterns of immigrant populations and ties to their country of origin and most frequent destinations of travel.¹⁰⁰⁻¹⁰² Peel Region with 4.83 cases per 100,000 population, and Toronto with 3.28 cases per 100,000 population reported the highest rates of malaria in 2011 (Map 5-2, Table 5-5). In 2011, Peel Region and Toronto accounted for 31% of the Ontario population, but reported 156 malaria cases, which represents 68% of malaria cases reported in the province in that year.

Figure 5-7. Number of Malaria Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Map 5-2. Incidence of Malaria by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

Table 5-5. Incidence of Malaria by Health Unit: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	2	1.70	0.9%	0.9%
Brant County	0	0.00	0.0%	1.1%
Chatham-Kent	0	0.00	0.0%	0.8%
Durham Region	4	0.63	1.7%	4.7%
Eastern Ontario	0	0.00	0.0%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	0	0.00	0.0%	1.2%
Haldimand-Norfolk	0	0.00	0.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	2	1.12	0.9%	1.3%
Halton Region	3	0.58	1.3%	3.9%
Hamilton, City of	9	1.67	3.9%	4.0%
Hastings & Prince Edward Counties	0	0.00	0.0%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	0	0.00	0.0%	1.5%
Lambton County	1	0.76	0.4%	1.0%
Leeds, Grenville and Lanark District	0	0.00	0.0%	1.3%
Middlesex-London	3	0.65	1.3%	3.4%
Niagara Region	1	0.22	0.4%	3.3%
North Bay Parry Sound District	2	1.57	0.9%	1.0%
Northwestern	0	0.00	0.0%	0.6%
Ottawa, City of	18	1.98	7.8%	6.8%
Oxford County	0	0.00	0.0%	0.8%
Peel Region	66	4.83	28.7%	10.2%
Perth District	1	1.30	0.4%	0.6%
Peterborough County-City	0	0.00	0.0%	1.1%
Porcupine	2	2.31	0.9%	0.6%
Renfrew County & District	1	0.97	0.4%	0.8%
Simcoe Muskoka District	1	0.19	0.4%	3.9%
Sudbury & District	1	0.51	0.4%	1.5%
Thunder Bay District	2	1.28	0.9%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	90	3.28	39.1%	20.5%
Waterloo Region	7	1.32	3.0%	4.0%
Wellington-Dufferin-Guelph	0	0.00	0.0%	2.1%
Windsor-Essex County	4	0.99	1.7%	3.0%
York Region	10	0.93	4.3%	8.0%
Ontario	230	1.72	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition.

REPORTED EXPOSURES

Malaria is not endemic in Ontario and its incidence reflects travel to, or recent immigration from, malaria endemic countries. Travel outside of Ontario was reported for 93% (213/230) of malaria cases reported in Ontario in 2011 (Table 5-6). Exposures were unknown or not reported for 17 cases. Of travel related cases, 51% (109/213) reported exposures in Africa that included 23

different countries, mostly in West Africa. The Indian sub-continent, including India (66 cases) and Pakistan (19 cases), accounted for 40% of travel related exposures, while South and Central America, including Guyana (10 cases) and Honduras (1 case), accounted for 5% of malaria cases. The country of travel was not specified for 4% of cases that reported travel as an exposure.

Table 5-6. Incidence of Malaria by Region of Travel: Ontario, 2011

Region of Travel	Plasmodium species				Species Total	
	<i>Falciparum</i>	<i>Vivax</i>	<i>Ovale</i>	Unspecified	Cases (n)	Percent (%)
Africa	88	3	9	9	109	47.4%
Indian sub-continent	4	73	0	8	85	37.0%
South and Central America	1	8	0	2	11	4.8%
Unspecified region of travel	5	1	0	2	8	3.5%
Unknown exposure	9	4	0	4	17	7.4%
Region Total (n)	107	89	9	25	230	100.0%
Region Percent (%)	46.5%	38.7%	3.9%	10.9%	100.0%	-

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Note: Region of travel is based on the most likely exposure for the case.

West Nile Virus Illness

- **The incidence of WNV illness in 2011 was almost five times higher than the provincial average for the period from 2006 to 2010.**
- **Incidence rates of WNV illness were highest among older adults, with the highest incidence rates occurring in the 50-59 year age group for both males and females.**
- **WNV cases occurred from May to November, with August and September accounting for 85% of cases reported in 2011.**

West Nile Virus (WNV) illness is one of four vector-borne diseases of public health importance in Ontario. It is a mosquito-borne virus that belongs to the family *Flaviviridae*.¹ In Ontario, mosquitoes of the genus *Culex* are the primary vectors. Infections in birds and mosquitoes were confirmed for the first time in Ontario in 2001 and in humans in 2002 following the emergence of the disease in North America in 1999. The virus is transmitted to humans through the bite of an infected mosquito, and in rare instances through organ transplants, blood transfusions and from mother to child during pregnancy. Following exposures, symptoms usually develop within two to 14 days.¹ Approximately 80% of persons infected with WNV do not show any symptoms at all, and of the 20% that do, most experience mild illness including fever, headache, body ache, fatigue, skin rash and occasionally vomiting and nausea. Severe illness involving the central nervous system occurs less frequently, affecting less than 1% of persons infected with WNV.¹³

Susceptibility to WNV illness is general. However, the risk of severe illness and/or serious outcome is greatest among older adults, particularly those with weakened immune systems and underlying medical conditions.¹ The risk of exposure to WNV around the home can be reduced by eliminating mosquito breeding sites, including standing water in bird baths, eaves-troughs, flower pots and discarded tires; by wearing protective

clothing; always using mosquito repellent when outdoors at dawn and dusk; and by preventing mosquito entry into the home.¹

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

In 2011, 78 confirmed and probable cases of WNV illness were reported in Ontario, representing an incidence rate of 0.58 cases per 100,000 populations (Figure 5-8). The incidence of WNV illness in 2011 was higher than the annual incidence rates over the period from 2006 to 2010 when an average of 16 cases were reported annually. The higher incidence in 2011 was likely influenced by a combination of a milder winter, higher summer temperatures and lower rainfall that resulted in favourable conditions for the development of the mosquito vector and the virus itself.

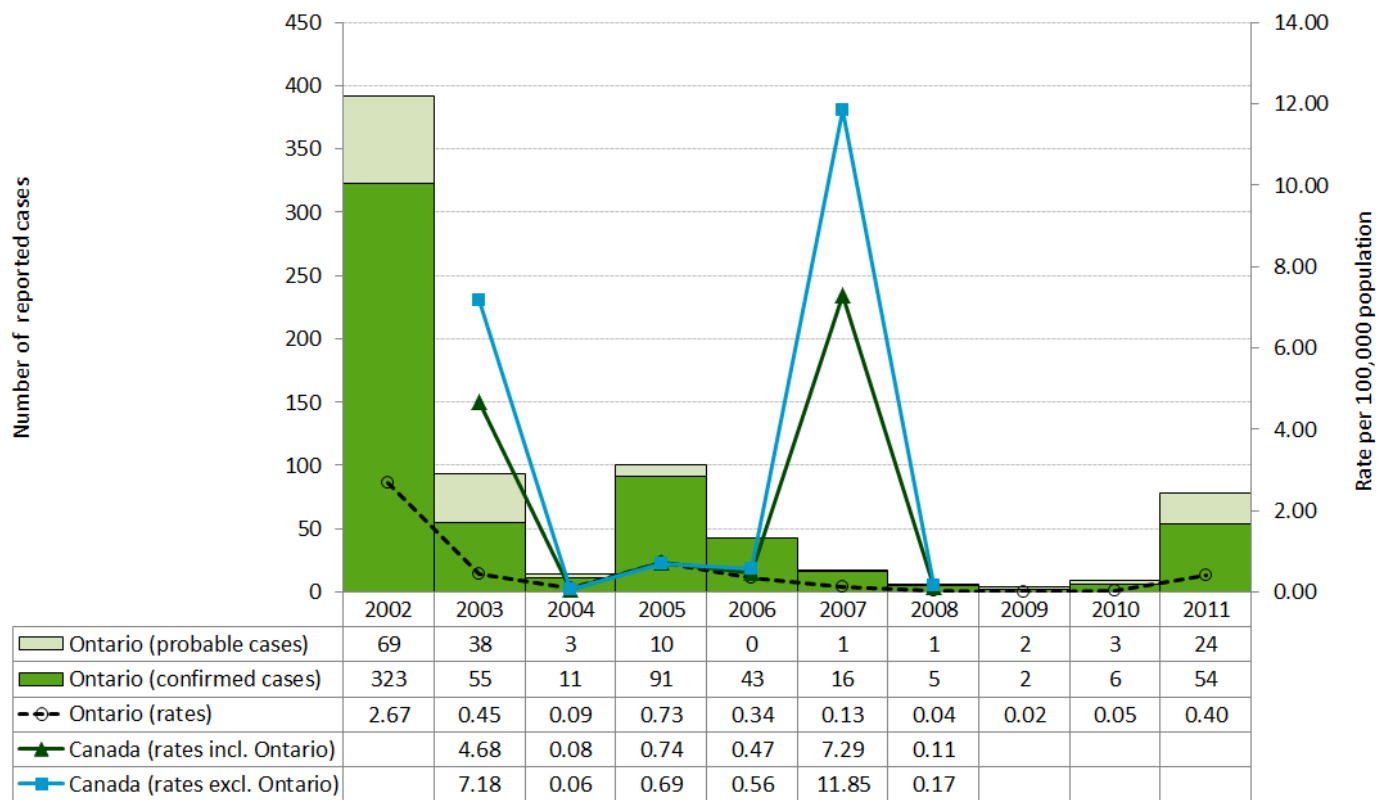
Nationally, the overall trend in the annual incidence of WNV illness from 2002 to 2011 was comparable to that of Ontario, but with higher annual incidence rates for Canada in 2003 and 2007 owing to outbreaks in western Canada.¹⁰³ In contrast, the highest number of cases in Ontario was reported in 2002, the year in which human cases were first identified in the province. This trend of higher incidence in populations in which WNV is emerging is consistent with incidence patterns in other jurisdictions where the disease is new and susceptibility is high.¹⁰⁴

AGE AND SEX DISTRIBUTION

The sex distribution of WNV cases in 2011 was approximately equal with females accounting for 46% of total cases. For both sexes, the highest incidence rates occurred among the 50-59, 60-69 and 70 years and older age groups. Incidence rates were low for age groups under 40 years (Table 5-7, Figure 5-9).

Among all cases, ages ranged from four to 89 years, with a median age of 54 years. Cases aged 50 years and older accounted for 68% of cases in 2011. This age distribution is comparable to the corresponding proportion of 55% in earlier years in Ontario from 2002 to 2010.

Figure 5-8. Incidence of WNV Illness in Ontario and Canada: 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13]; includes probable cases.

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Table 5-7. Incidence of WNV Illness by Age and Sex: Ontario, 2011

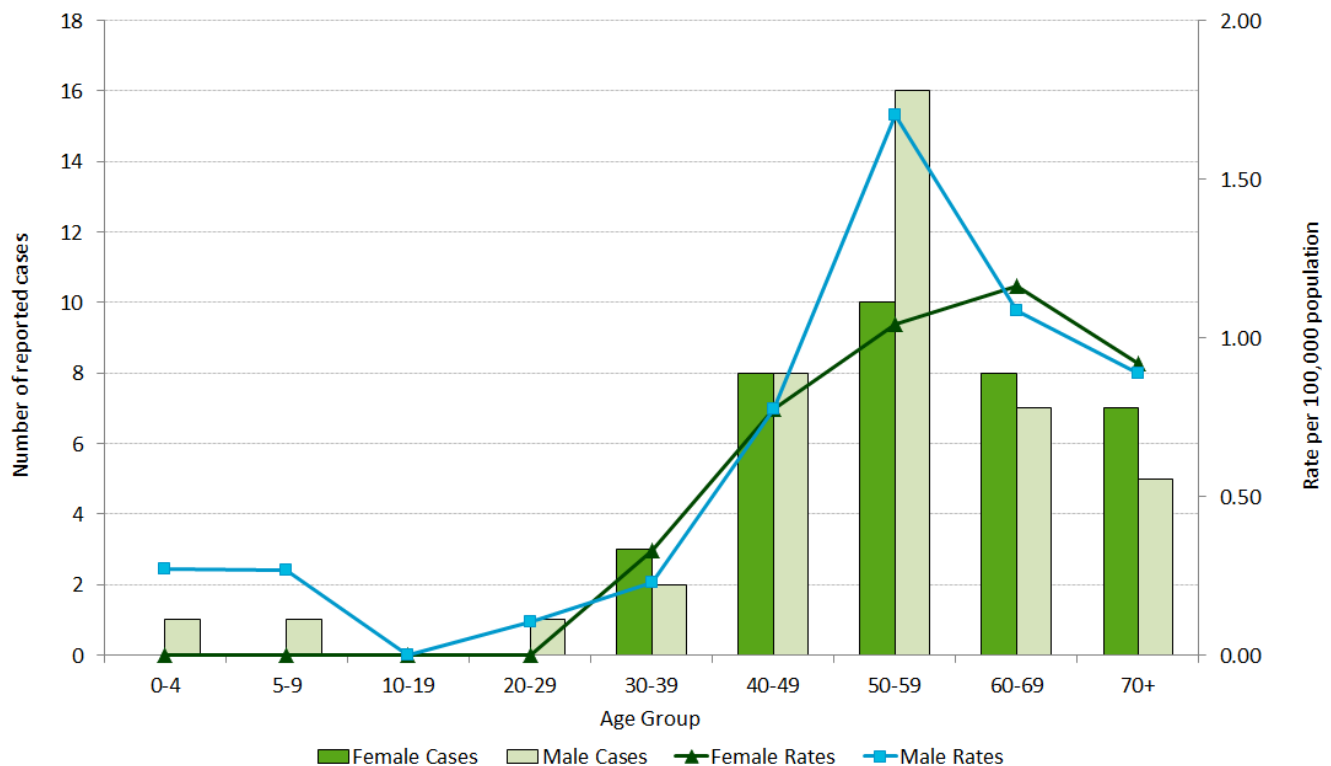
Age Group (Years)	Female		Male		Total	
	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population	Cases	Rates per 100,000 population
0-4	0	0.00	1	0.27	1	0.14
5-9	0	0.00	1	0.27	1	0.14
10-19	0	0.00	0	0.00	0	0.00
20-29	0	0.00	1	0.10	1	0.05
30-39	3	0.33	2	0.23	5	0.28
40-49	8	0.78	8	0.78	16	0.78
50-59	10	1.04	16	1.70	26	1.37
60-69	8	1.16	7	1.08	15	1.13
70+	7	0.92	5	0.89	12	0.91
Total	36	0.53	41	0.62	77	0.58

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes one case of unknown age and/or sex; includes both confirmed and probable cases.

Figure 5-9. Incidence of WNV Illness by Age and Sex: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Excludes one case of unknown age and/or sex; includes both confirmed and probable cases.

HOSPITALIZATIONS AND DEATHS

Hospitalizations were reported for 35% (27/78) of WNV cases reported in 2011. Among hospitalized cases, 74% (20/27) were classified as having severe illness involving the neurological system. Fifteen percent (4/27) of cases had milder illness and illness severity was not specified for the remaining hospitalized cases (11%, 3/27). WNV illness was reported as a contributing or underlying cause of death for four percent (3/78) of cases reported in 2011. All three deaths were classified as severe WNV illness with neurological system involvement.

In comparison to cases with milder illness, cases with severe illness involving the neurological system were more likely to have a fatal outcome or to have been hospitalized. However, this may be the result of increased identification and reporting of cases with more severe outcomes such as death and/or hospitalization compared to cases with mild illness and less severe outcomes.

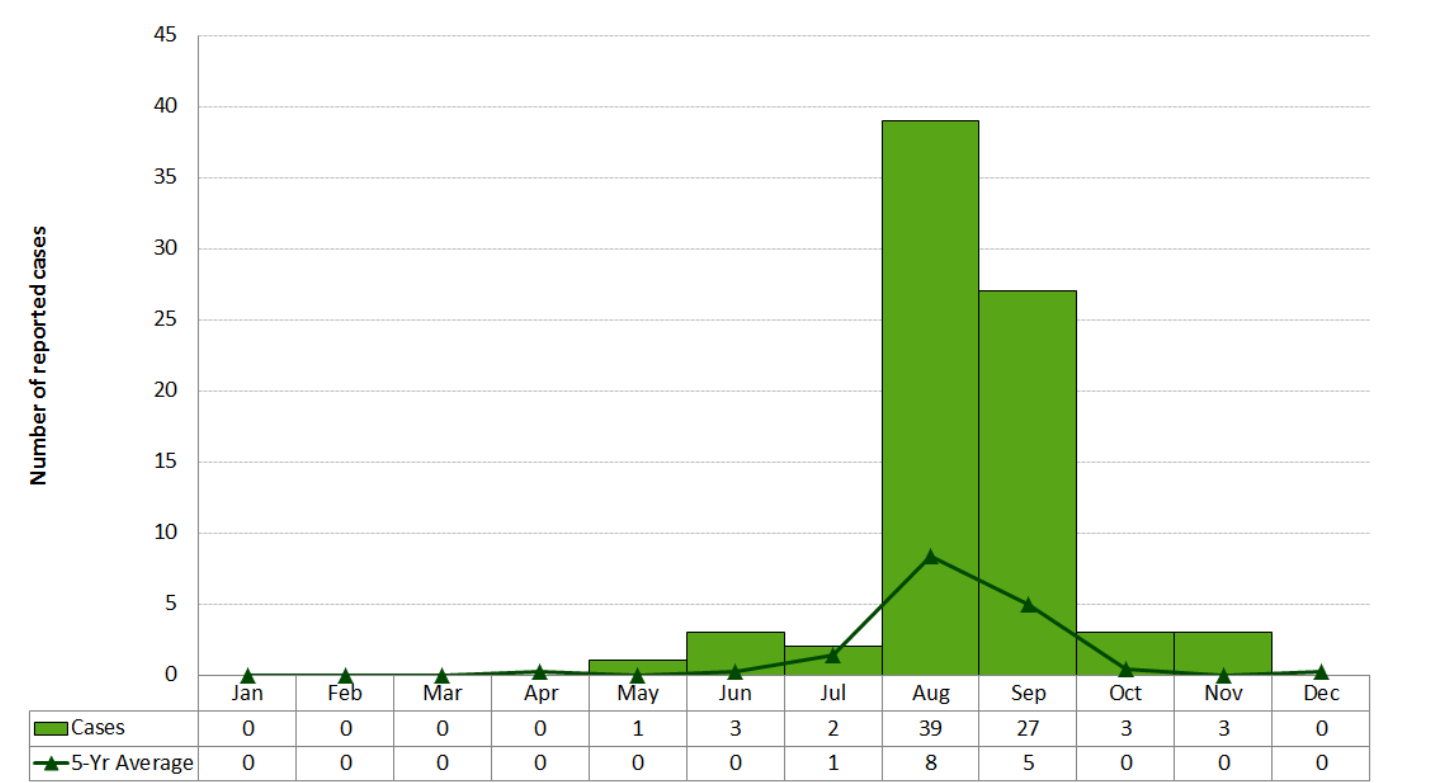
SEASONALITY

The distribution of human WNV cases with respect to the time and place of occurrence is reflective of the seasonal distribution of the *Culex* mosquito vector. *Culex pipiens/restuans* are most active in the warmer months with the highest level of mosquito activity occurring from June to August. In 2011, cases occurred from May to November, with August (39 cases) and September (27 cases) accounting for 85% of WNV cases reported in that year (Figure 5-10).

GEOGRAPHIC DISTRIBUTION

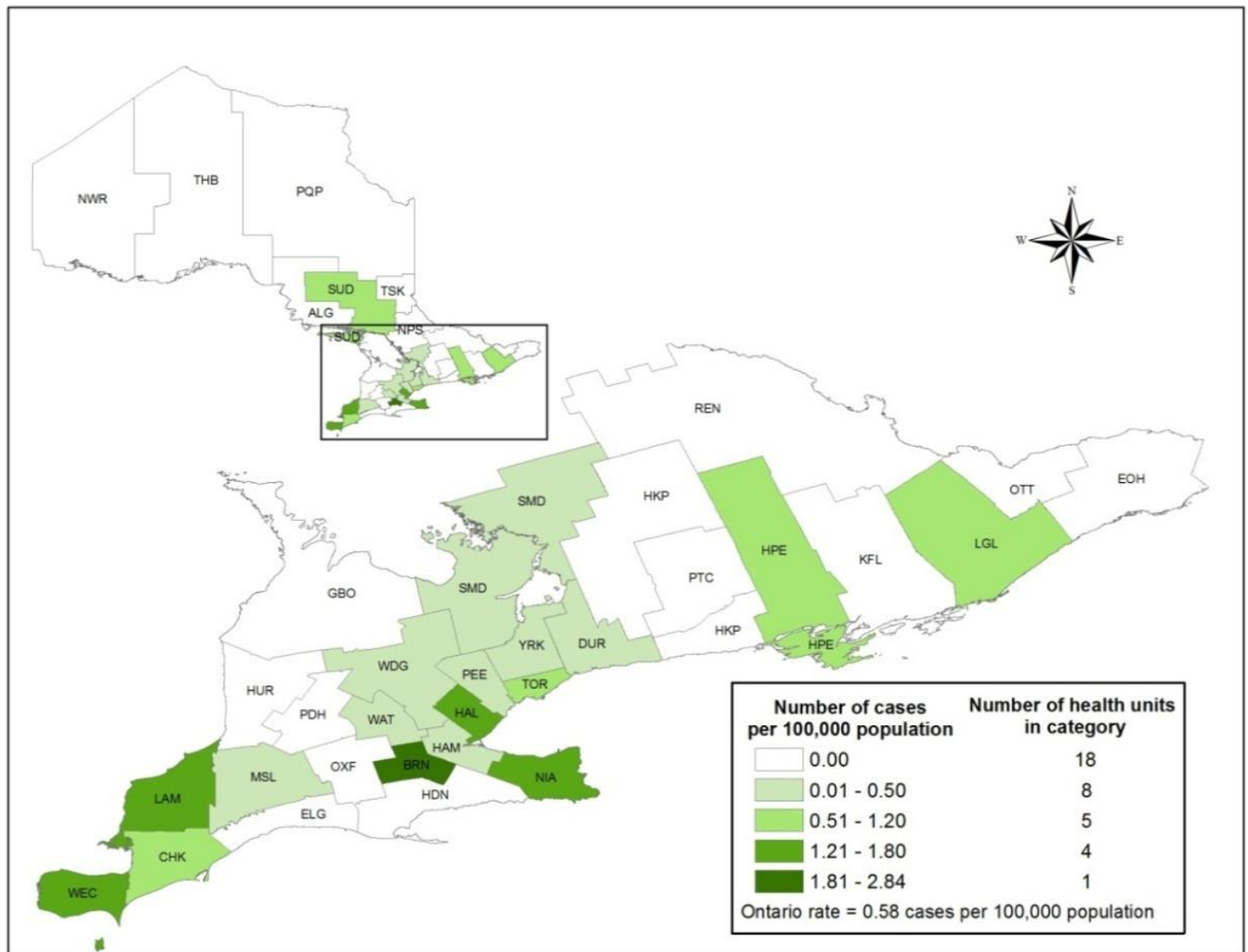
Exactly half (18/36) of Ontario health units did not report any cases of WNV illness in 2011. Health units in the south had the highest incidence rates of WNV illness in 2011, with Brant County Health Unit having the highest rate at 2.84 cases per 100,000 population (Map 5-3, Table 5-8). The highest number of cases was reported in Toronto and in three other health units in southern Ontario (Halton Region, Niagara Region and Windsor-Essex County). Approximately 65% of WNV cases (51/78) in 2011 were reported by these four health units, which together accounted for 28% of the Ontario population. The higher than expected number of cases in these health units is reflective of the preferred environment of the *Culex pipiens/restuans* mosquito vector. These mosquito vectors are found mainly in urban and built environments where water tends to stand undisturbed, especially in catch basins.

Figure 5-10. Number of WNV Illness Cases by Month in Ontario in 2011 and Average Number of Cases from 2006-2010



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].
Note: Includes both confirmed and probable cases.

Map 5-3. Incidence of WNV Illness by Health Unit of Residence: Ontario, 2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition; includes both confirmed and probable cases.

Table 5-8. Incidence of WNV Illness by Public Health Unit of Residence: Ontario, 2011

Public Health Unit	Cases (n)	Rates (per 100,000 Population)	Cases as Proportion of Total Cases (%)	Proportion of Ontario Population (%)
Algoma District	0	0.00	0.0%	0.9%
Brant County	4	2.84	5.1%	1.1%
Chatham-Kent	1	0.92	1.3%	0.8%
Durham Region	2	0.32	2.6%	4.7%
Eastern Ontario	0	0.00	0.0%	1.5%
Elgin-St. Thomas	0	0.00	0.0%	0.7%
Grey Bruce	0	0.00	0.0%	1.2%
Haldimand-Norfolk	0	0.00	0.0%	0.8%
Haliburton, Kawartha, Pine Ridge District	0	0.00	0.0%	1.3%
Halton Region	9	1.74	11.5%	3.9%
Hamilton, City of	2	0.37	2.6%	4.0%
Hastings & Prince Edward Counties	1	0.61	1.3%	1.2%
Huron County	0	0.00	0.0%	0.5%
Kingston-Frontenac & Lennox & Addington	0	0.00	0.0%	1.5%
Lambton County	2	1.52	2.6%	1.0%
Leeds, Grenville and Lanark District	2	1.18	2.6%	1.3%
Middlesex-London	2	0.43	2.6%	3.4%
Niagara Region	8	1.80	10.3%	3.3%
North Bay Parry Sound District	0	0.00	0.0%	1.0%
Northwestern	0	0.00	0.0%	0.6%
Ottawa, City of	0	0.00	0.0%	6.8%
Oxford County	0	0.00	0.0%	0.8%
Peel Region	4	0.29	5.1%	10.2%
Perth District	0	0.00	0.0%	0.6%
Peterborough County-City	0	0.00	0.0%	1.1%
Porcupine	0	0.00	0.0%	0.6%
Renfrew County & District	0	0.00	0.0%	0.8%
Simcoe Muskoka District	2	0.38	2.6%	3.9%
Sudbury & District	1	0.51	1.3%	1.5%
Thunder Bay District	0	0.00	0.0%	1.2%
Timiskaming	0	0.00	0.0%	0.3%
Toronto	28	1.02	35.9%	20.5%
Waterloo Region	2	0.38	2.6%	4.0%
Wellington-Dufferin-Guelph	1	0.36	1.3%	2.1%
Windsor-Essex County	6	1.49	7.7%	3.0%
York Region	1	0.09	1.3%	8.0%
Ontario	78	0.58	100.0%	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

Note: Health unit (HU) refers to the HU where the case resided at the time of identification and not necessarily the place of disease exposure or acquisition; includes both confirmed and probable cases.

SEVERITY OF WNV ILLNESS

Of the 78 cases of WNV illness reported in 2011, 34 cases (44%) had mild illness; 29 cases (37%) had severe illness involving the neurological system; and four cases (5%) had positive WNV tests without any symptoms. Illness severity was not specified for the 11 remaining cases (14%) (Table 5-9).

Table 5-9. WNV Illness Cases by Severity of Illness: Ontario, 2011

Illness Severity	Cases	
	Number	Percent
Mild - no neurological involvement	34	43.6%
Severe - neurological involvement	29	37.2%
Asymptomatic Infection (no symptoms)	4	5.1%
Unspecified infections	11	14.1%
Total	78	100.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Note: Includes both confirmed and probable cases.

RISK FACTORS

In 2011, 81% (63/78) of WNV cases reported at least one risk factor in the two week period before illness onset or laboratory confirmation of illness (Table 5-10). Of these cases, 59% (37/63) engaged in outdoor activities, 54% (34/63) did not always use a mosquito repellent when outdoors, 49% (31/63) did not always wear protective clothing when outdoors, and 16% (10/63) lived near a standing body of water. Nineteen percent of cases (12/63) reported "other" or "unknown" risk factors.

Table 5-10. Reported Risk Factors for WNV Cases: Ontario, 2011 (n=63)

Risk Factors	Cases	
	Number	Percent
Engaged in outdoor activities after dusk	37	58.7%
Insect repellent not used when outside	34	54.0%
Protective clothing not worn when outside	31	49.2%
Live near standing body of water	10	15.9%
Other or unknown risk factors	12	19.0%

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Notes: Interpret with caution. Risk factors not reported for all cases. Cases may report more than one risk factor; "Other" refers to the sum of other specified risk factors with frequency <1%; "Unknown" refers to risk factors reported as "Unknown". Includes both confirmed and probable cases.

Yellow Fever

Yellow fever is a viral disease found in tropical and sub-tropical South America and Africa.¹ It is transmitted through the bite of an infected mosquito with symptoms developing within three to six days.¹ The disease is acute with a short duration. Symptoms range from mild illness characterized by sudden onset of fever, chills, body aches, weakness, nausea and vomiting to severe liver disease with bleeding. The overall case fatality rate of yellow fever is 20 to 50%.¹

Yellow fever is not endemic in Canada. The risk of acquiring the disease is low for most travellers. Risk can be minimized during travel to endemic countries by getting vaccinated prior to travel, using personal protective measures against mosquito bites and limiting outdoor activities, particularly in rural or jungle areas.¹⁰⁵

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

No cases of yellow fever were reported in Ontario from 2002 to 2011 and no cases were reported in Canada from 2002 to 2008.

Section 6

Other Reportable Diseases

The reportable diseases covered in this section of the report include hemorrhagic fevers, Lassa fever, leprosy and transmissible spongiform encephalopathy (TSE). With the exception of TSE, which is not always infectious in etiology, these diseases are not endemic to Canada. Transmission of these diseases varies with all having more than one primary mode of transmission.

Overall, they are very rarely reported in Ontario. No cases of hemorrhagic fevers, Lassa fever, and TSE were reported in Ontario from 2002 to 2011. Over this period, just 26 reported cases of leprosy were reported.

Several quick reference data tables for the diseases covered in this section are included in Appendix 4.

Hemorrhagic Fevers

Hemorrhagic fevers refer to a group of illnesses caused mainly by viruses that belong to several distinct families.¹⁰⁶ Ebola, Marburg disease, dengue fever and yellow fever are causes of viral hemorrhagic fevers. In general, viral hemorrhagic fevers cause illness that affects multiple systems of the body often with hemorrhaging and other non-specific symptoms such as high fever, headache, malaise, weakness, joint and muscle pain and dizziness.¹⁰⁶ Hemorrhaging may take the form of bleeding under the skin, of internal organs or from body orifices such as the mouth, eyes or ears. Nervous system impairment, shock, coma, seizures and delirium may also occur in severely ill persons.¹⁰⁶ In the case of dengue fever, only the hemorrhagic form of the infection resulting in systemic illness is reportable in Ontario.

While some viral hemorrhagic fevers cause mild illness, the case fatality rate for others can be high, ranging from 25 to 90% for Ebola, 25 to 80% for Marburg disease and greater than 20% for hemorrhagic dengue fever when supportive therapy is not provided.¹⁰⁷⁻¹⁰⁹

Viruses that cause hemorrhagic fevers are found in animal hosts such as rodents, apes and mosquitoes.¹⁰⁶ As a result, illness is often restricted to areas where these animal hosts and vectors live, resulting in human infections when human and host activities overlap. However, once infected, humans may also serve as sources of infection through direct or indirect (e.g. vector-borne) contact with blood or other bodily fluids.¹⁰⁶

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Most viral hemorrhagic fevers are not endemic to Ontario and as of 2011, no cases of viral hemorrhagic fevers have been reported in the province. No cases were reported for the rest of Canada for the period from 2002 to 2008.

Lassa Fever

Lassa fever is an acute viral disease that occurs predominantly in West Africa. It is transmitted through direct contact with or inhalation of excreta (urine or feces) from infected rodents and through person-to-person contact with blood and other bodily fluids.¹ About 80% of persons with Lassa fever have mild illness or no symptoms at all, with the remaining 20% developing severe illness that affects multiple systems.¹ The symptoms of Lassa fever are non-specific and develop between one to three weeks after exposure to the virus. They include fever, malaise, headache, myalgia, abdominal and chest pain, sore throat, cough, nausea, vomiting, conjunctivitis, facial swelling and bleeding of the mucous membranes.¹ The most frequently reported complications of Lassa fever are deafness and fetal loss which occurs in more than 80% of pregnant women. The overall fatality rate is one percent but can be as high as 15% in severely ill persons that have been hospitalized.¹ The maternal death rate is also high.

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Lassa fever is not endemic to Ontario. As such, the risk to Ontarians is restricted to travellers to endemic countries that have had contact with infected rodents and their environment. As of 2011, no cases of Lassa fever have been reported in Ontario. The disease is not nationally notifiable, and as such, no Canadian data are available.

Leprosy

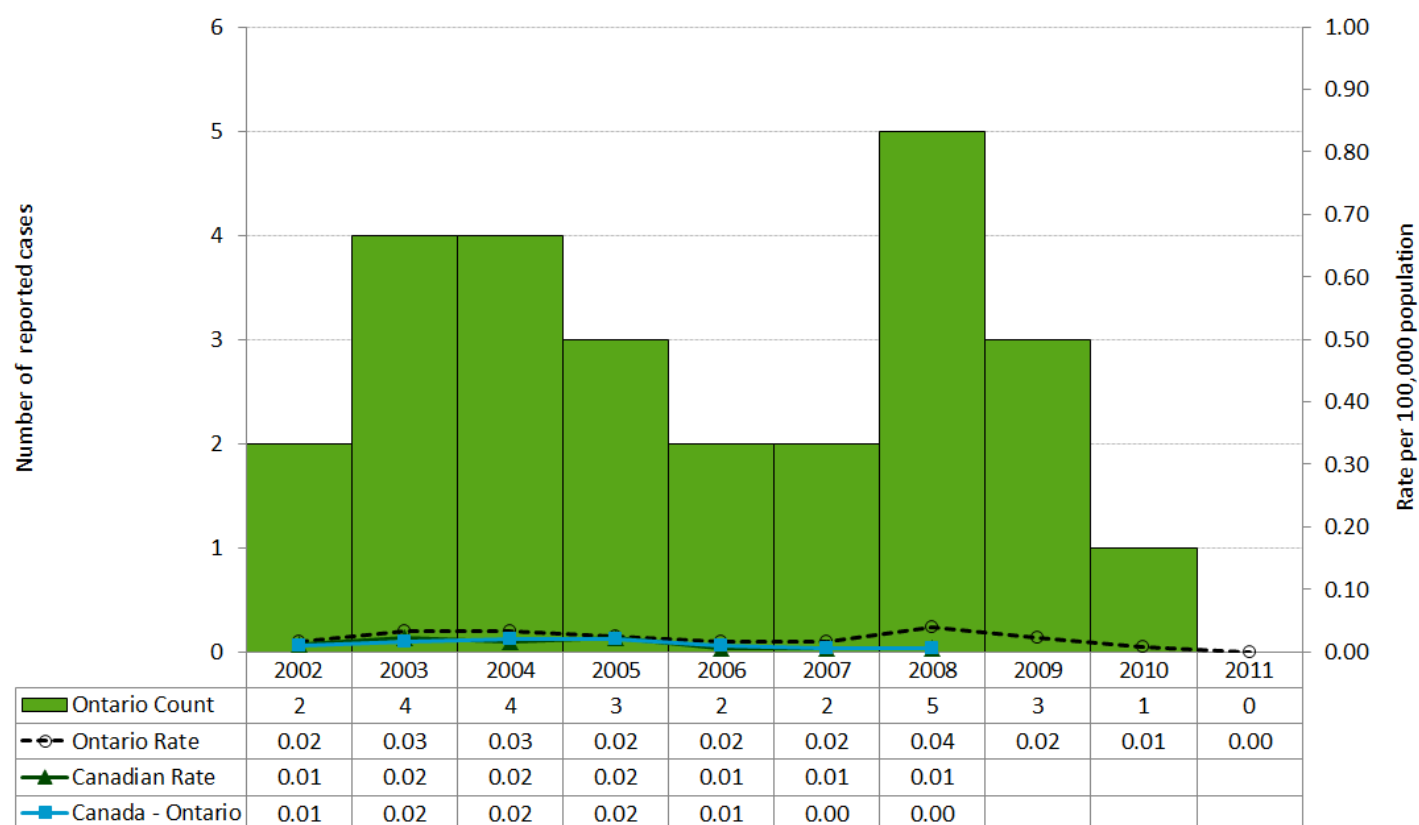
Leprosy is a chronic, but curable, disease primarily of the skin as well as the peripheral nerves and upper airways.¹ Transmission of the disease is still unclear. However, infections occur among close contacts of infected persons with transmission occurring through contact with nasal secretions.¹ The onset of symptoms following exposure to the bacteria that cause leprosy varies, ranging from nine months to 20 years (average of three to five years).^{1,13} Infection with leprosy is characterized by reddish skin lesions and thickening of the nerves that results in loss of sensation in the skin and muscle weakness.¹

In Ontario, the Ministry of Health and Long-Term Care provides medications for leprosy at no cost.¹¹⁰

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

Leprosy is rare in Ontario with a total of 26 reported cases over the ten-year period from 2002 to 2011 (range zero to five cases annually). No cases were reported in Ontario in 2011 (Figure 6-1). In Canada, the majority of cases occur in immigrants and refugees whose disease was acquired in their native countries.¹¹¹ From 2002 to 2008, the number of reported cases of leprosy in Canada ranged from two to nine cases annually.

Figure 6-1. Incidence of Leprosy: Ontario and Canada, 2002-2011



Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/03/18].

Canadian Rates: Public Health Agency of Canada, Canadian Notifiable Disease Section, received by PHO [2012/09/24]; national data available up to 2008.

Transmissible Spongiform Encephalopathies

Transmissible spongiform encephalopathies (TSEs), also known as prion diseases, are a rare group of fatal diseases that destroy the central nervous system of humans and certain animals.^{13,1} Prion diseases that affect humans include Gerstmann-Straussler-Scheinker syndrome, kuru, fatal familial insomnia and Creutzfeldt-Jakob disease (CJD). CJD is the most common of the human prion diseases.^{1,13} The average worldwide incidence of prion diseases is one case per million population per year.¹¹²

The development of prion diseases can be spontaneous, genetic or acquired. Acquisition by humans usually occurs through consumption of infectious prions in contaminated meat, transplantation of contaminated tissues and organs, or through the use of contaminated surgical instruments. Infections may be acquired early in life but illness may not develop for years depending on the exposure.¹ In humans, prion diseases manifest as a dementing illness with symptoms of confusion, cognitive and behavioural abnormalities, memory loss, loss of coordination and speech impediments.¹³ These symptoms are accompanied by the characteristic sponge-like lesions in the brain, most often diagnosed at autopsy.¹³

2011 IN FOCUS AND HISTORICAL HIGHLIGHTS

CJD is the only prion disease that is nationally notifiable. Confirmation of cases is done at the federal laboratory and therefore national CJD data are more complete. Ontario data are less complete and are not presented in this report. From 2002 to 2008, deaths from CJD in Canada ranged from 0.92 per 100,000 population in 2003 to 1.47 per 100,000 population in 2008.¹¹²

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Appendices

Appendix 1

Technical notes

Data Sources

Ontario reportable disease data:

The main source for reportable diseases data (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 the 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](#). Disease reporting through iPHIS is passive and as such, PHO is only 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 such as influenza, laboratory confirmation takes place in hospitals. In other instances, reference services and specialized testing of clinical specimens takes place at reference laboratories across Canada.

Except where noted, the 2011 data for this report were extracted from iPHIS in June 2012. The exact dates of extraction are cited below the figures and tables throughout the report. In the case of invasive *Haemophilus influenzae* type B disease (Hib) and invasive meningococcal disease (IMD), linked iPHIS and Public Health Ontario Laboratory 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 2002 to 2011. For IMD, the final case count from the data

linkage process for 2011 was reconciled in iPHIS and extracted for analysis. Case counts for the years 2002-2010 for all other diseases were extracted from iPHIS in October 2012.

Population data:

intelliHEALTH ONTARIO is a repository of health related data that describes the population and delivery of healthcare services in Ontario. Population counts for Ontario, originally sourced from Statistics Canada, were obtained from intelliHEALTH for this report. Population data for Ontario were extracted by PHO from intelliHEALTH Ontario in October 2012. These data, stratified by age, sex and health unit, were used as denominators to calculate overall, age-, sex- and geographic-specific crude incidence rates.

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, Notifiable Diseases and Field Surveillance Section website. Comparator incidence rates for Canada as a whole and for Canada excluding Ontario were provided for the years 2002 to 2008. However, 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. Incidence rates for Canada presented in this report may differ from reports published by the Public Health Agency of Canada. 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 online at: <http://www.phac-aspc.gc.ca/bid-bmi/dsd-dsm/duns-eng.php>.

Descriptive Measures

The descriptive measures used throughout the report to characterize the epidemiology of reportable infectious diseases in Ontario are listed below.

Number of reported cases:

This measure refers to the total count 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 according to the provincial case definitions. Appendix 3 provides a list of reportable diseases covered in this report and the case classifications included in the count of reported cases. The case definition section of these technical notes also provides additional information on the rationale for including probable cases for specific diseases and the years in which probable cases are included. The provincial case definitions can be accessed [online](#).

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 2010/2011 influenza season started on September 1, 2010 and ended on August 31, 2011.

For tuberculosis (TB), only active cases are included in the reporting of confirmed cases (i.e. latent TB infections are not included); for syphilis, only infectious cases (primary, secondary, early latent and infectious neurosyphilis) are included in the reporting of confirmed cases; and for hepatitis B, only acute cases are included in the reporting of confirmed cases.

Crude incidence rates (reported as rates per 100,000 population per year):

Incidence rates (crude) are calculated by dividing the total number of reported cases in a year by the total number of people at risk of acquiring the disease in that year. In this report, rates are presented per 100,000 population. The formulas for calculating overall and population-specific rates used throughout the report are noted below.

$$\left\{ \frac{\text{Number of cases in specified time period and population}}{\text{Total number of people in that population}} \times 100,000 \right\}$$

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 over a specified time period divided by the total number of live births for that time period, multiplied by 100,000.

Live births were used 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.

Throughout the report, the term “incidence rate” is used interchangeably with the term “incidence” to refer to an annualized rate (the number of cases observed for every 100,000 Ontarians per year). In general, incidence refers to new cases of disease. HIV and hepatitis C are exceptions. These two diseases often remain undiagnosed for extended periods and their detection by public health is generally not indicative of the actual time of acquisition. Therefore, some cases of TB, HIV and hepatitis C that are included in this report may be attributed to individuals who acquired their infections in earlier years, and the figures represent a new diagnosis rate rather than a rate of new infection. Reported incidence for hepatitis C includes acute cases, chronic cases and possibly resolved infections since all individuals over 18 months of age that test positive for hepatitis C antibodies are reported as confirmed in accordance with the provincial case definition. In addition, some cases of HIV may also be coincident with an AIDS diagnosis in the same year, and as such may be included in counts for both diseases in a given year.

Health unit distribution:

This measure refers to the number of new cases reported by each health unit in 2011. Incidence rates are also provided for each health unit, and are calculated as per the group-specific incidence rate

formula described above. Except where noted (Lyme disease map is by place of exposure), health unit refers to the health unit where a case resided at the time of identification which is not necessarily the place of disease exposure or acquisition.

To compare relative distributions, the number of cases in the health unit as a proportion of total cases and the population of the health unit as a proportion of the total Ontario population are provided in this report. Incidence rates by health unit are presented in maps that use natural breaks to group rates into categories for mapping. Natural breaks produce variable class widths for data that are not evenly distributed. This allows the groupings of data to minimize differences between data values in the same class and maximize differences between classes.

Age distribution:

Age was described using the median to account for the non-normal age distribution of cases. Age groups for most diseases were based on standard five and ten-year age groupings. For vaccine-preventable diseases, age groups were constructed with consideration of both the age at which funded vaccines are recommended for administration as part of the Ontario publicly funded immunization schedule and the implementation dates of these programs.

Monthly incidence:

The number of cases that occurred during each month in 2011 was compared to the monthly averages for the previous five years (2006 to 2010). For influenza, the five-year monthly averages for comparison excluded the two seasons immediately preceding the 2010/2011 season. 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 allowed for the determination of baseline monthly averages that were more in line with expected trends for non-pandemic seasons.

Risk factors and/or exposures:

The proportion of cases reporting specific risk factors, exposures, or a combination thereof is presented where applicable. The risk factor categories used are those available in iPHIS and do not necessarily denote a causal

relationship with illness. Standardized risk factors within iPHIS were developed and made available for use in 2011. As a result, historical data on risk factors are not as reliable as those reported for cases since 2011.

Hospitalization:

This measure refers to the proportion of reported cases of a reportable disease that has been hospitalized. In this report, a case is considered hospitalized if at least one hospital admission date was recorded for the case of interest.

Case fatality ratio:

The proportion of reported cases of a reportable disease that is fatal within a specified period. In this report, a case is counted as fatal if the reportable disease was recorded as an underlying or contributing cause of death.

Subtype/Serotype/Serogroup:

Where applicable, the number and proportion of cases that represents distinct variations of a specific species, subtype, serotype or serogroup of a pathogen that causes a reportable disease.

Statistical Analyses

Data analysis and presentation for this report were completed using IBM SPSS Statistics 19 and Microsoft Excel 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 of reportable diseases reported in Ontario through iPHIS with episode dates from January 1 to December 31, 2011. Historical data for trend analyses cover the period from 2002 to 2010 or shorter periods over this time range for specific analyses. 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 some situations, this results in the capture of episode dates that are later than the date of symptom onset (e.g. reported date). The episode date is determined using the following hierarchy:

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 with priority as the episode instead of the specimen collection date and so on. With the exception of HIV, AIDS and TB, the number of incident cases in this report is based on the hierarchal episode dates within the reference period. For HIV, incident case count is 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/or probable reports of reportable diseases made through iPHIS with an episode date in 2011, with the following exceptions:

1. Cases who were not residents of Ontario at the time of diagnosis.
2. Cases reported with a disposition status of 'Does not meet', 'entered in error' or 'duplicate'.

3. Cases who did not meet the provincial surveillance case definition. Appendix 3 provides a list of reportable diseases covered in this report and the case classifications included in the count of included cases.
4. Diseases for which aggregate case counts rather than individual case reports are reported, i.e. chickenpox, *Clostridium difficile* and institutional outbreaks of gastroenteritis and respiratory illness. The only exception is influenza, for which aggregate reporting was used to report influenza A(H1N1)pdm09 cases during the pandemic of 2009/2010.
5. Cases reported as encephalitis, meningitis or food poisoning.
6. Events reported as adverse events following immunization (AEFI) and related data are published in a separate report.
7. Transmissible spongiform encephalopathy cases including Creutzfeldt-Jakob disease (CJD) due to the large proportion of cases for which case ascertainment is not complete.

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 that represent an instance of re-infection or relapse are 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. 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 - Vector-borne diseases:

The most likely exposure was selected for vector-borne disease cases who reported more than one exposure. Most likely exposures cannot be definitively attributed to illness, but are assumed to be possible sources of illness. Selection of the most likely exposure was based on the following hierarchy:

1. Travel-associated exposure - at least one travel destination reported for the case. The determination of travel-associated exposures was based on exposure information entered into iPHIS and was assessed using the “exposure setting”, “exposure setting type”, “exposure name”, “exposure location” and “exposure comments” fields. It is assumed that the recording of travel as an exposure or a risk factor in iPHIS is assessed against the incubation period for the disease among other factors related to the disease. Notwithstanding, disease acquisition cannot be definitively attributed to travel or any other reported exposure. Instead, reported exposures are assumed to be possible sources of acquisition and therefore do not necessarily denote a causal relationship with illness.
2. Other specified exposure - at least one exposure is reported for the case that is not travel-related or “unknown”. The following factors influenced the selection of the most likely exposure source when multiple exposures are reported: the exposure has been previously associated with illness or outbreaks, consistency within the reported exposure fields and plausibility of the recorded mode of transmission and identified sources.
3. Unknown exposure - an “unknown” exposure is the only exposure reported for the case.
4. Not reported by health unit (missing) - no exposure information is reported for the case.

Cases with no reported exposure information (missing) are excluded from the denominator when calculating exposure proportions. Exposures reported as “unknown” were included in the denominator as it is assumed that case follow-up occurred but without determination of a specific exposure.

Exposure determination – Vaccine-preventable diseases:

For vaccine-preventable diseases, exposures were based on the outbreak status of cases as the source of illness in some cases can be directly or indirectly linked to a common source (i.e. person or place). For remaining cases not linked to an outbreak, exposures were categorized based on exposure fields as reported in iPHIS using the hierarchy described under *Exposure determination - Vector-borne diseases* (above). For measles and rubella, exposures (and in particular travel histories) were determined through a review of information entered in the exposures, risk factors, case notes and comments fields of iPHIS.

Exposure determination - HIV:

Exposure or risk factor categories for HIV cases were determined using a mutually exclusive hierarchy that assigned HIV cases to a single exposure category that best represents the true source of infection for the case when more than one risk factor or exposure was reported. Detailed information about the exposure hierarchy is available in appendices C1-3 of the Guidelines for the Surveillance of AIDS in Canada.¹ For hepatitis C, cases were similarly assigned to mutually exclusive categories based on most likely risk.

Risk Factor Determination (other diseases):

Risk factors are available in iPHIS for selection during case reporting and management. A selected risk factor indicates that the case in question was exposed to the risk factor during the relevant incubation period. In this report, reporting of these risk factors in no way indicates attribution or establishment of the risk factor in question as a universal disease risk. This report presents risk factors for enteric diseases, tuberculosis (TB) and sexually transmitted and blood-borne infections (STI/BBI), excluding HIV and hepatitis C. Multiple risk factors may be recorded for cases of these diseases; therefore, the total number of risk factors reported may be greater than the total number of reported cases or the total number of cases reporting at least one risk factor. For hepatitis B, and for non-endemic enteric diseases such as paratyphoid fever, risk was determined using a combination of reported risk factors and exposures. Risk factors no longer in use (marked as “inactive [I]” in iPHIS) were excluded from

both the numerator and denominator when calculating the proportion of cases reporting specific risk factors.

Where noted, risk factors were combined to form new categories. In some instances, cases reporting the risk factors to be combined are counted once because the combined risk factors are considered sufficiently similar such that they measure the same risk. In contrast, risk factors included in the 'Other' category measure different risks and as such each recorded risk factor contributes to the count for the 'Other' risk factor category.

Definitions

Travel-associated case – Travel-associated cases are cases for which travel was reported as an exposure or as a risk factor in iPHIS. It is assumed that the recording of travel as an exposure or a risk factor is assessed against the incubation period for the disease among other factors related to the disease or case prior to entry into iPHIS. This report includes all travel-associated cases and only excludes them from analyses that attempt to enumerate exposure sources or transmissions that occurred within Ontario. Reported travel proportions should be interpreted with caution as the selection of travel exposures for this report uses a best guess approach when multiple exposures are reported.

Diagnosing health unit – The health unit where the case resided most of the time at time of diagnosis. iPHIS Bulletin 13 provides additional detail on scenarios in which a health unit is considered the diagnosing health unit.

Case Definitions

Confirmed and probable cases are defined in Appendix B (Provincial Case Definitions) of the Infectious Diseases Protocol. The Infectious Diseases Protocol and case definitions are available online at:

http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/infdispro.aspx. From 1990 to 2009, the provincial case definitions remained virtually unchanged with exception of the addition of new definitions for diseases that were newly designated as reportable (e.g. West Nile Virus (WNV) illness, SARS).

Case counts in this report are based on the surveillance case definitions published in the Reportable Disease Information System (RDIS) manual up to 2005, and in the iPHIS manual from 2005 to 2008. In 2009, the Ministry of Health and Long-Term Care (MOHLTC) implemented revised surveillance case definitions for all reportable diseases and these definitions were used for cases from 2009 to 2011.

The 2009 revisions reflected the changing epidemiology of infectious diseases and the use of more current laboratory diagnostic practices and technology. The revised case definitions came into effect on April 28, 2009. These updates impacted the classification of several diseases with the main changes being the addition of a probable case classification for all enteric and vaccine-preventable diseases and the requirement of laboratory confirmation for most sexually transmitted diseases. These changes should be considered to ensure valid comparisons of historical trends in incidence. Detailed assessment of the major changes to the provincial case definitions and the expected and observed impacts are documented in the 2009 Ontario Annual Infectious Diseases Epidemiology Report published by the MOHLTC:

http://www.health.gov.on.ca/en/common/ministry/publications/reports/epi_reports/epi_report_2009.aspx.

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 and WNV illness. Appendix 2 provides a list of reportable diseases covered in this report and the case classifications that are reportable in Ontario.

With the changes to the case definitions 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.

For the vast majority of diseases similarly impacted by the case definition changes, the impact on overall count was negligible, and as such probable cases for these diseases are not included in this report.

Probable cases are now included in counts for amebiasis owing to the change in interpretation of laboratory test results that previously reported the causative agent as *Entamoeba 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.

WNV illness is relatively new in Ontario and both confirmed and probable cases were enumerated when the disease first became reportable in order to obtain data on the burden of the disease at the population level. 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.

Data Limitations:

Accuracy of Data:

iPHIS is a dynamic disease reporting system which allows ongoing updates to data previously entered. As a result, data extracted from iPHIS 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 previously published data may exist due to:

- enhanced data cleaning for this report prior to analysis including the linkage of iPHIS and laboratory data and subsequent reconciliation in iPHIS
- late reporting
- local and/or provincial-led data clean up initiatives, and
- differences in data extraction dates.

Where such variability exists, data provided in the most current version of this report, other PHO surveillance products such as the Monthly Infectious Diseases Surveillance Report or published research are considered definitive so long as the listed data caveats are comparable and/or relevant to 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 calculated and presented for diseases with small overall counts. Instead, counts over time are combined into larger totals to provide more stable point estimates of burden (e.g. ten-year average or ten-year total or overall rate).

Under-reporting:

Passive surveillance systems such as iPHIS that rely on physician and laboratory reports of illness are characterized by under-reporting of the true burden of illness. As a result, known case counts only represent cases reported to public health units and recorded in iPHIS. The resulting degree of under-reporting varies from disease to disease.^{2,3}

Besides non-reporting of cases, other forms of under-reporting also occur. Hospitalization and death data in iPHIS are under-reported with the degree of under-reporting influenced by the severity of illness and associated outcomes. Under-reporting of other data such as exposures and serotypes 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.

Duplicates:

The possibility of duplicates exists because duplicate sets were 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)

A high proportion of missing or incomplete data may result in conclusions or interpretations that are not representative of trends pertaining to risk factors or demographic characteristics. In this report, missing data are handled in one of four ways as specified in relevant sections of the report:

1. Reporting the proportion or number of cases with missing data to provide perspective (e.g. age, sex, exposures and risk factors).
2. Suppressing the data altogether.
3. Excluding missing counts from the denominator when determining proportions.
4. Merging data from more than one data fields to create new data fields that are more complete. For example, risk factors and exposures are merged to improve completeness for hepatitis C and various exposure fields (e.g. exposure comments, exposure setting, exposure source and exposure name) are considered in the determination of the most likely exposure for cases of vector-borne diseases.

Cases may also not be reported to health units, or reported but not entered into iPHIS. While these processes results in under-reporting, under-reporting was not accounted for in the analyses completed for this report.

References

1. Remis RS. Guidelines for the surveillance of AIDS in Canada. Ottawa, ON: Health Canada; 1995.
2. Thomas MK, Majowicz SE, Sockett PN, Fazil A, Pollari F, Doré K, et al. Estimated numbers of community cases of illness due to Salmonella, Campylobacter and Verotoxigenic Escherichia Coli: pathogen-specific community rates. *Can J Infect Dis Med Microbiol.* 2006;17(4): 229–234.
3. Thomas, MK, Majowicz, SE, Pollari, F. Sockett, P. Burden of acute gastrointestinal illness in Canada, 1999-2007: Interim summary of NSAGI activities. *CCDR.* 2008;34(5):8-15.

Appendix 2

Diseases Reportable in Ontario

Reportable Diseases as specified under Ontario Regulation 559/91 and amendments under the Health Protection and Promotion Act.

Acquired immunodeficiency syndrome (HIV/AIDS)
Amebiasis
Anthrax
Botulism
Brucellosis
Campylobacter enteritis
Chancroid
Chickenpox (Varicella)*
Chlamydia
Cholera
Clostridium difficile associated disease*
Cryptosporidiosis
Cyclosporiasis
Cytomegalovirus infection, congenital
Diphtheria
Encephalitis

- Primary, viral*
- Post-infectious*
- Vaccine-related*
- Subacute sclerosing panencephalitis*
- Unspecified*

Food poisoning, all causes*
Gastroenteritis, institutional outbreaks*
Giardiasis
Gonorrhea
Group A Streptococcal infections, invasive
Group B Streptococcal infections, neonatal
Haemophilus influenzae b disease, invasive
Hantavirus pulmonary syndrome
Hemorrhagic fevers

- Ebola virus disease
- Marburg virus disease
- Other viral causes

Hepatitis A
Hepatitis B
Hepatitis C
Hepatitis D (Delta hepatitis)
Herpes, neonatal
Influenza
Lassa fever
Legionellosis
Leprosy
Listeriosis

Lyme disease
Malaria
Measles
Meningitis, acute

- Bacterial*
- Viral*
- Other*

Meningococcal disease, invasive
Mumps
Ophthalmia neonatorum
Paratyphoid fever
Pertussis (whooping cough)
Plague
Pneumococcal disease, invasive
Poliomyelitis, acute
Psittacosis/ornithosis
Q fever
Rabies
Respiratory infection outbreaks in institutions*
Rubella
Rubella, congenital syndrome
Salmonellosis
Severe acute respiratory syndrome (SARS)
Shigellosis
Smallpox
Syphilis
Tetanus
Transmissible spongiform encephalopathy

- Creutzfeldt-Jakob disease, all types
- Gerstmann-Sträussler-Scheinker syndrome
- Fatal Familial Insomnia
- Kuru

Trichinosis
Tuberculosis
Tularemia
Typhoid fever
Verotoxin-producing *E. coli* including hemolytic uremic syndrome
West Nile virus illness
Yellow fever
Yersiniosis

* Reportable diseases not included in this report

Appendix 3

Reportable diseases and reportable classifications

Reportable Disease ¹	Reportable Case Classifications		
	Confirmed	Probable	Suspect
Enteric and Zoonotic Diseases			
Amebiasis ¹	✓	✓	✗
Anthrax	✓	✓	✓
Botulism	✓	✓	✓
Brucellosis	✓	✓	✗
Campylobacteriosis	✓	✓	✗
Cholera	✓	✓	✗
Cryptosporidiosis	✓	✓	✗
Cyclosporiasis	✓	✓	✗
Giardiasis	✓	✓	✗
Hantavirus Pulmonary Syndrome	✓		✗
Hepatitis A	✓	✓	✗
Listeriosis	✓	✓	✗
Paratyphoid fever	✓	✓	✗
Plague	✓	✓	✗
Psittacosis/Ornithosis	✓	✓	✗
Q-fever	✓	✓	✗
Rabies	✓	✓	✗
Salmonellosis	✓	✓	✗
Shigellosis	✓	✓	✗
Trichinosis	✓	✓	✗
Tularemia	✓	✓	✗
Typhoid fever	✓	✓	✗
Verotoxin producing <i>E. Coli</i>	✓	✓	✗
Yersiniosis	✓	✓	✗
Respiratory Diseases and Diseases Transmitted by Direct Contact			
Group A Streptococcal disease, invasive	✓	✓	✗
Influenza	✓	✗	✗
Legionellosis	✓	✓	✗
Severe Acute Respiratory Syndrome (SARS)	✓	✓	✗
Smallpox	✓	✓	✓
Tuberculosis	✓	✗	✗

Reportable Disease ¹	Reportable Case Classifications		
	Confirmed	Probable	Suspect
Sexually Transmitted and Blood-borne Infections			
Chancroid	✓	✓	✗
Chlamydial infections	✓	✗	✗
Cytomegalovirus infection, congenital	✓	✓	✗
Gonorrhoea, all types	✓	✗	✗
Group B Streptococcal disease, neonatal	✓	✓	✗
Hepatitis B	✓	✗	✗
Hepatitis C	✓	✗	✗
Hepatitis D	✓	✗	✗
Herpes, neonatal	✓	✗	✗
HIV/AIDS	✓	✗	✗
Syphilis, infections	✓	✗	✗
Ophthalmia Neonatorum	✓	✓	✗
Vaccine-Preventable Diseases			
Diphtheria	✓	✓	✗
Haemophilus Influenzae B disease, invasive	✓	✓	✗
Measles	✓	✓	✗
Meningococcal disease, invasive	✓	✓	✗
Mumps ¹	✓	✓	✗
Pertussis (whooping cough) ¹	✓	✓	✗
Pneumococcal Disease, invasive	✓	✗	✗
Poliomyelitis, acute	✓	✓	✗
Rubella	✓	✓	✗
Rubella, congenital syndrome	✓	✗	✗
Tetanus	✓	✗	✗
Vector-borne Diseases			
Lyme disease ¹	✓	✓	✗
Malaria	✓	✓	✗
West Nile Virus illness ¹	✓	✓	✗
Yellow Fever	✓	✓	✗
Other Reportable Diseases			
Creutzfeldt-Jakob disease, all types	✓	✓	✓
Hemorrhagic Fevers	✓	✓	✓
Lassa Fever	✓	✓	✓
Leprosy	✓	✓	✗
Transmissible Spongiform Encephalopathies	✓	✓	✓

Source: Ontario Ministry of Health and Long-Term Care. Infectious diseases protocol, 2009. Appendix B: Provincial Case Definitions.

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. Reportable classification.

✓ - Reportable classifications; ✗ - Non-reportable classifications.

Appendix 4

PHU regions and short form

Public Health Units and Regions	Short Form
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, 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	Short Form
TORONTO	
Toronto	TOR
SOUTH WEST	
Chatham-Kent	CHK
Elgin-St. Thomas	ELG
Grey Bruce	GB0
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

Appendix 5

Data tables

Data Table 1-A. Number and Incidence Rates of Enterics and Zoonotic Diseases: Ontario, 2002-2011

Reportable Diseases ¹	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number, Rate ²										
Amebiasis ¹	826, 6.8	772, 6.3	680, 5.5	778, 6.2	639, 5.1	815, 6.4	761, 5.9	823, 6.3	810, 6.1	744, 5.6
Anthrax	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
Botulism	1, 0.0	1, 0.0	2, 0.0	1, 0.0	5, 0.0	6, 0.1	2, 0.0	4, 0.0	1, 0.0	2, 0.0
Brucellosis	5, 0.0	4, 0.0	3, 0.0	6, 0.1	2, 0.0	5, 0.0	5, 0.0	4, 0.0	2, 0.0	1, 0.0
Campylobacteriosis	4611, 38.1	4132, 33.8	3995, 32.2	3812, 30.4	3869, 30.6	3886, 30.4	3800, 29.4	3245, 24.8	3358, 25.4	3500, 26.2
Cholera	1, 0.0	2, 0.0	0, 0.0	1, 0.0	1, 0.0	1, 0.0	3, 0.0	1, 0.0	0, 0.0	0, 0.0
Cryptosporidiosis	231, 1.9	277, 2.3	305, 2.5	267, 2.1	401, 3.2	406, 3.2	337, 2.6	306, 2.3	338, 2.6	301, 2.3
Cyclosporiasis	52, 0.4	39, 0.3	95, 0.8	132, 1.1	92, 0.7	95, 0.7	103, 0.8	143, 1.1	168, 1.3	105, 0.8
Giardiasis	1924, 15.9	1642, 13.4	1596, 12.9	1640, 13.1	1541, 12.2	1613, 12.6	1615, 12.5	1511, 11.6	1409, 10.7	1295, 9.7
HPS	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
Hepatitis A	151, 1.3	143, 1.2	184, 1.5	150, 1.2	206, 1.6	120, 0.9	114, 0.9	121, 0.9	136, 1.0	103, 0.8
Listeriosis	43, 0.4	43, 0.4	42, 0.3	36, 0.3	43, 0.3	39, 0.3	95, 0.7	55, 0.4	60, 0.5	57, 0.4
Paratyphoid fever	27, 0.2	21, 0.2	47, 0.4	55, 0.4	51, 0.4	46, 0.4	59, 0.5	42, 0.3	60, 0.5	62, 0.5
Plague	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
Psittacosis/Ornithosis	0, 0.0	3, 0.0	1, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.0
Q fever	1, 0.0	8, 0.1	6, 0.1	2, 0.0	4, 0.0	4, 0.0	5, 0.0	6, 0.1	7, 0.1	20, 0.2
Rabies	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
Salmonellosis	2478, 20.5	2009, 16.4	2121, 17.1	2972, 23.7	2366, 18.7	2820, 22.0	2387, 18.5	2314, 17.7	2724, 20.6	2576, 19.3
Shigellosis	847, 7.0	283, 2.3	286, 2.3	337, 2.7	204, 1.6	234, 1.8	239, 1.9	254, 1.9	252, 1.9	255, 1.9
Trichinosis	0, 0.0	0, 0.0	1, 0.0	1, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
Tularemia	0, 0.0	2, 0.0	2, 0.0	1, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 0.0	0, 0.0
Typhoid fever	60, 0.5	50, 0.4	70, 0.6	68, 0.5	92, 0.7	87, 0.7	96, 0.7	77, 0.6	92, 0.7	103, 0.8
Verotoxin-producing E. coli	393, 3.3	462, 3.8	320, 2.6	269, 2.2	343, 2.7	318, 2.5	278, 2.2	166, 1.3	153, 1.2	232, 1.7
Yersiniosis	383, 3.2	329, 2.7	297, 2.4	355, 2.8	363, 2.9	269, 2.1	260, 2.0	243, 1.9	204, 1.5	211, 1.6

Data Table 1-B. Number and Incidence Rates of Respiratory Diseases and Diseases Transmitted by Direct Contact: Ontario, 2002-2011

Reportable Diseases ¹	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number, Rate ²										
Group A Streptococcal disease, invasive	385, 3.2	409, 3.3	288, 2.3	385, 3.1	467, 3.7	505, 4.0	518, 4.0	469, 3.6	561, 4.2	678, 5.1
Influenza ³	2275, 18.8	981, 8.0	5387, 43.5	5796, 46.3	2500, 19.7	2938, 23.0	5157, 39.9	8181, 62.6	7606, 57.5	6050, 45.2
Legionellosis	24, 0.2	32, 0.3	11, 0.1	77, 0.6	69, 0.5	58, 0.5	82, 0.6	70, 0.5	116, 0.9	162, 1.2
SARS	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
Smallpox	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
Tuberculosis	713, 5.9	671, 5.5	738, 6.0	697, 5.6	669, 5.3	683, 5.3	621, 4.8	629, 4.8	646, 4.9	655, 4.9

Data Table 1-C. Number and Incidence Rates of Sexually Transmitted Diseases and Blood-borne Infections in Ontario, 2002-2011

Reportable Diseases ¹	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number, Rate ²										
AIDS	181, 1.5	195, 1.6	207, 1.7	206, 1.6	156, 1.2	162, 1.3	172, 1.3	118, 0.9	103, 0.8	100, 0.8
Chancroid	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
Chlamydia	18366, 151.9	19479, 159.1	20805, 167.9	21882, 174.7	22425, 177.1	23298, 182.1	26209, 202.6	28816, 220.4	33495, 253.2	36343, 271.8
Cytomegalovirus, congenital ²	6, 4.7	8, 6.1	5, 3.8	6, 4.5	7, 5.2	6, 4.3	3, 2.1	9, 6.4	5, 3.6	10, 7.2
Gonorrhea	3085, 25.5	3362, 27.5	3514, 28.4	3322, 26.5	3845, 30.4	3963, 31.0	3863, 29.9	3548, 27.1	3964, 30.0	4196, 31.4
Group B Streptococcal disease ²	68, 53.1	64, 49.0	55, 41.6	52, 39.0	55, 40.7	46, 33.3	58, 41.3	50, 35.7	52, 37.4	58, 41.5
Hepatitis B, acute	150, 1.2	167, 1.4	167, 1.4	154, 1.2	171, 1.4	165, 1.3	141, 1.1	138, 1.1	117, 0.9	122, 0.9
Hepatitis C	5325, 44.0	5321, 43.5	5259, 42.4	4567, 36.5	4021, 31.8	4624, 36.1	4728, 36.6	4599, 35.2	4525, 34.2	4143, 31.0
Hepatitis D	9, 0.1	2, 0.0	1, 0.0	8, 0.1	5, 0.0	3, 0.0	5, 0.0	2, 0.0	1, 0.0	3, 0.0
Herpes, neonatal ²	4, 3.1	2, 1.5	11, 8.3	5, 3.8	5, 3.7	3, 2.2	8, 5.7	6, 4.3	8, 5.8	8, 5.7
HIV	980, 8.1	944, 7.7	998, 8.1	935, 7.5	1018, 8.0	996, 7.8	949, 7.3	860, 6.6	848, 6.4	865, 6.5
Ophthalmia neonatorum ²	3, 2.3	3, 2.3	6, 4.5	6, 4.5	3, 2.2	3, 2.2	3, 2.1	1, 0.7	5, 3.6	1, 0.7
Syphilis, infectious	239, 2.0	423, 3.5	491, 4.0	361, 2.9	372, 2.9	411, 3.2	457, 3.5	783, 6.0	779, 5.9	767, 5.7

Data Table 1-D. Number and Incidence Rates of Vaccine-Preventable Diseases: Ontario, 2002-2011

Reportable Diseases ¹	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number, Rate ²										
Diphtheria	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
<i>Haemophilus influenzae</i> b	6, 0.1	7, 0.1	8, 0.1	6, 0.1	8, 0.1	5, 0.0	7, 0.1	2, 0.0	1, 0.0	6, 0.0
Measles	1, 0.0	11, 0.1	6, 0.1	4, 0.0	5, 0.0	0, 0.0	58, 0.5	7, 0.1	9, 0.1	8, 0.1
Meningococcal disease, invasive	60, 0.5	58, 0.5	55, 0.4	43, 0.3	65, 0.5	62, 0.5	47, 0.4	70, 0.5	34, 0.3	44, 0.3
Mumps ¹	14, 0.1	13, 0.1	23, 0.2	17, 0.1	10, 0.1	53, 0.4	336, 2.6	107, 0.8	100, 0.8	83, 0.6
Pertussis ¹	531, 4.4	351, 2.9	633, 5.1	644, 5.1	1262, 10.0	929, 7.3	831, 6.4	405, 3.1	120, 0.9	276, 2.1
Pneumococcal disease, invasive	662, 5.5	1018, 8.3	1057, 8.5	934, 7.5	945, 7.5	945, 7.4	1066, 8.3	1259, 9.6	1205, 9.1	1238, 9.3
Poliomyelitis	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
Rubella	2, 0.0	9, 0.1	5, 0.0	312, 2.5	5, 0.0	2, 0.0	1, 0.0	3, 0.0	1, 0.0	0, 0.0
Rubella, congenital syndrome ²	1, 0.8	1, 0.8	2, 1.5	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.7	0, 0.0	0, 0.0
Tetanus	2, 0.0	0, 0.0	0, 0.0	1, 0.0	1, 0.0	1, 0.0	0, 0.0	2, 0.0	1, 0.0	1, 0.0

Data Table 1-E. Number and Incidence Rates of Vector-borne Diseases: Ontario, 2002-2011

Reportable Diseases ¹	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number, Rate ²										
Lyme Disease ¹	28, 0.2	26, 0.2	33, 0.3	44, 0.4	46, 0.4	74, 0.6	98, 0.8	99, 0.8	95, 0.7	134, 1.0
Malaria	154, 1.3	167, 1.4	181, 1.5	187, 1.5	188, 1.5	177, 1.4	181, 1.4	180, 1.4	259, 2.0	230, 1.7
West Nile Virus ¹	392, 3.2	93, 0.8	14, 0.1	101, 0.8	43, 0.3	17, 0.1	6, 0.1	4, 0.0	9, 0.1	78, 0.6
Yellow fever	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0

Data Table 1-F. Number and Incidence Rates of Other Reportable Diseases: Ontario, 2002-2011

Reportable Diseases ¹	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number, Rate ²										
Hemorrhagic fevers	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	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, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
Leprosy	2, 0.0	4, 0.0	4, 0.0	3, 0.0	2, 0.0	2, 0.0	5, 0.0	3, 0.0	1, 0.0	0, 0.0
TSE	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0

Data tables 1 A- F

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13] for all diseases and [2013/04/22] for *Haemophilus influenzae* b.

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

1: Includes only confirmed cases with the following exceptions: both probable and confirmed cases as of 2009 for pertussis, mumps, amebiasis and Lyme disease; and both probable and confirmed West Nile Virus cases for all years.

2: Incidence rates are per 100,000 population. Rates are per 100,000 live births for group B streptococcal disease, neonatal herpes, ophthalmia neonatorum, congenital cytomegalovirus and congenital rubella syndrome.

3: Influenza data are reported by seasons. 2002 = 2001/2002, 2003 = 2002/2003, etc. The 2008/2009 and 2009/2010 seasons include pandemic H1N1 influenza cases that were reported in aggregate.

Data Table 2-A. Enteric Diseases by Health Unit of Residence: Ontario, 2011^{1,2}

Health Units	Amebiasis ²	Botulism	Campylobacteriosis	Cholera	Cryptosporidiosis	Cyclosporiasis	Giardiasis	Hepatitis A	Listeriosis	Paratyphoid Fever	Salmonellosis	Shigellosis	Typhoid Fever	VTEC	Yersiniosis
Number, Rate ¹															
ALG	0, 0.0	0, 0.0	7, 5.9	0, 0.0	0, 0.0	2, 1.7	10, 8.5	2, 1.7	0, 0.0	0, 0.0	19, 16.1	0, 0.0	0, 0.0	0, 0.0	2, 1.7
BRN	2, 1.4	0, 0.0	19, 13.5	0, 0.0	1, 0.7	0, 0.0	3, 2.1	0, 0.0	0, 0.0	0, 0.0	25, 17.8	1, 0.7	0, 0.0	2, 1.4	1, 0.7
CHK	0, 0.0	0, 0.0	20, 18.4	0, 0.0	1, 0.9	0, 0.0	3, 2.8	1, 0.9	0, 0.0	0, 0.0	14, 12.9	1, 0.9	0, 0.0	0, 0.0	1, 0.9
DUR	14, 2.2	0, 0.0	142, 22.5	0, 0.0	8, 1.3	9, 1.4	39, 6.2	2, 0.3	4, 0.6	1, 0.2	135, 21.4	7, 1.1	3, 0.5	8, 1.3	4, 0.6
EOH	6, 3.0	0, 0.0	48, 23.9	0, 0.0	13, 6.5	0, 0.0	21, 10.4	0, 0.0	0, 0.0	0, 0.0	39, 19.4	1, 0.5	0, 0.0	1, 0.5	0, 0.0
ELG	0, 0.0	0, 0.0	14, 15.3	0, 0.0	2, 2.2	0, 0.0	3, 3.3	0, 0.0	0, 0.0	0, 0.0	10, 10.9	0, 0.0	0, 0.0	0, 0.0	0, 0.0
GBO	1, 0.6	0, 0.0	98, 59.5	0, 0.0	17, 10.3	1, 0.6	15, 9.1	1, 0.6	1, 0.6	0, 0.0	51, 30.9	1, 0.6	0, 0.0	22, 13.4	2, 1.2
HDN	4, 3.6	0, 0.0	34, 30.7	0, 0.0	4, 3.6	1, 0.9	7, 6.3	1, 0.9	0, 0.0	0, 0.0	29, 26.2	2, 1.8	0, 0.0	0, 0.0	2, 1.8
HKP	1, 0.6	0, 0.0	44, 24.6	0, 0.0	6, 3.4	0, 0.0	14, 7.8	0, 0.0	0, 0.0	0, 0.0	39, 21.8	1, 0.6	0, 0.0	3, 1.7	2, 1.1
HAL	21, 4.1	0, 0.0	123, 23.7	0, 0.0	5, 1.0	5, 1.0	62, 12.0	1, 0.2	2, 0.4	5, 1.0	92, 17.7	6, 1.2	2, 0.4	8, 1.5	15, 2.9
HAM	19, 3.5	0, 0.0	124, 23.0	0, 0.0	6, 1.1	2, 0.4	35, 6.5	4, 0.7	1, 0.2	0, 0.0	96, 17.8	6, 1.1	2, 0.4	1, 0.2	4, 0.7
HPE	1, 0.6	0, 0.0	21, 12.9	0, 0.0	8, 4.9	4, 2.5	11, 6.8	1, 0.6	0, 0.0	0, 0.0	30, 18.4	1, 0.6	1, 0.6	5, 3.1	0, 0.0
HUR	0, 0.0	0, 0.0	32, 53.0	0, 0.0	10, 16.6	0, 0.0	2, 3.3	0, 0.0	0, 0.0	0, 0.0	11, 18.2	0, 0.0	0, 0.0	3, 5.0	0, 0.0
KFL	1, 0.5	0, 0.0	50, 25.3	0, 0.0	7, 3.6	1, 0.5	17, 8.6	1, 0.5	1, 0.5	0, 0.0	30, 15.2	1, 0.5	0, 0.0	2, 1.0	2, 1.0
LAM	0, 0.0	0, 0.0	16, 12.2	0, 0.0	3, 2.3	1, 0.8	2, 1.5	0, 0.0	2, 1.5	0, 0.0	15, 11.4	2, 1.5	0, 0.0	6, 4.6	0, 0.0
LGL	1, 0.6	0, 0.0	25, 14.7	0, 0.0	5, 2.9	2, 1.2	8, 4.7	0, 0.0	0, 0.0	0, 0.0	20, 11.8	3, 1.8	0, 0.0	5, 2.9	3, 1.8
MSL	10, 2.2	0, 0.0	123, 26.7	0, 0.0	8, 1.7	2, 0.4	32, 6.9	0, 0.0	2, 0.4	0, 0.0	88, 19.1	4, 0.9	1, 0.2	10, 2.2	5, 1.1
NIA	7, 1.6	0, 0.0	156, 35.0	0, 0.0	8, 1.8	7, 1.6	37, 8.3	4, 0.9	1, 0.2	2, 0.5	95, 21.3	7, 1.6	1, 0.2	2, 0.5	2, 0.5
NPS	0, 0.0	0, 0.0	21, 16.5	0, 0.0	3, 2.4	0, 0.0	13, 10.2	0, 0.0	0, 0.0	0, 0.0	29, 22.8	1, 0.8	0, 0.0	1, 0.8	1, 0.8
NWR	0, 0.0	0, 0.0	9, 11.0	0, 0.0	0, 0.0	0, 0.0	7, 8.5	1, 1.2	0, 0.0	0, 0.0	18, 22.0	3, 3.7	0, 0.0	0, 0.0	1, 1.2
OTT	45, 5.0	0, 0.0	223, 24.5	0, 0.0	26, 2.9	8, 0.9	158, 17.4	9, 1.0	4, 0.4	3, 0.3	176, 19.3	19, 2.1	4, 0.4	12, 1.3	6, 0.7
OXF	1, 0.9	0, 0.0	34, 31.4	0, 0.0	7, 6.5	1, 0.9	9, 8.3	1, 0.9	1, 0.9	0, 0.0	20, 18.5	1, 0.9	0, 0.0	5, 4.6	0, 0.0
PEE	115, 8.4	0, 0.0	326, 23.9	0, 0.0	21, 1.5	11, 0.8	160, 11.7	21, 1.5	8, 0.6	26, 1.9	266, 19.5	30, 2.2	51, 3.7	18, 1.3	29, 2.1
PDH	0, 0.0	0, 0.0	46, 59.6	0, 0.0	12, 15.6	1, 1.3	4, 5.2	0, 0.0	0, 0.0	0, 0.0	17, 22.0	0, 0.0	0, 0.0	4, 5.2	0, 0.0
PTC	2, 1.4	0, 0.0	27, 19.2	0, 0.0	3, 2.1	0, 0.0	6, 4.3	0, 0.0	1, 0.7	0, 0.0	18, 12.8	2, 1.4	0, 0.0	3, 2.1	0, 0.0
PQP	0, 0.0	0, 0.0	2, 2.3	0, 0.0	1, 1.2	2, 2.3	2, 2.3	0, 0.0	0, 0.0	0, 0.0	26, 30.0	0, 0.0	0, 0.0	2, 2.3	0, 0.0
REN	2, 1.9	0, 0.0	19, 18.5	0, 0.0	1, 1.0	1, 1.0	9, 8.7	0, 0.0	1, 1.0	0, 0.0	21, 20.4	1, 1.0	0, 0.0	3, 2.9	0, 0.0

Health Units	Amebiasis ²	Botulism	Campylobacteriosis	Cholera	Cryptosporidiosis	Cyclosporiasis	Giardiasis	Hepatitis A	Listeriosis	Paratyphoid Fever	Salmonellosis	Shigellosis	Typhoid Fever	VTEC	Yersiniosis
Number, Rate ¹															
SMD	3, 0.6	0, 0.0	88, 16.8	0, 0.0	4, 1.0	7, 1.3	33, 6.3	2, 0.4	3, 0.6	0, 0.0	104, 19.8	3, 0.6	0, 0.0	11, 2.1	2, 0.4
SUD	2, 1.0	1, 0.5	23, 11.6	0, 0.0	3, 1.5	0, 0.0	17, 8.6	0, 0.0	0, 0.0	0, 0.0	24, 12.1	0, 0.0	0, 0.0	2, 1.0	2, 1.0
THB	2, 1.3	0, 0.0	24, 15.3	0, 0.0	3, 1.9	0, 0.0	13, 8.3	0, 0.0	0, 0.0	0, 0.0	28, 17.9	0, 0.0	0, 0.0	1, 0.6	0, 0.0
TSK	0, 0.0	0, 0.0	4, 11.6	0, 0.0	1, 2.9	0, 0.0	3, 8.7	0, 0.0	0, 0.0	0, 0.0	2, 5.8	1, 2.9	0, 0.0	0, 0.0	0, 0.0
TOR	403, 14.7	0, 0.0	826, 30.1	0, 0.0	40, 1.5	24, 0.9	368, 13.4	39, 1.4	20, 0.7	19, 0.7	543, 19.8	107, 3.9	26, 1.0	44, 1.6	61, 2.2
WAT	21, 4.0	1, 0.2	158, 29.8	0, 0.0	20, 3.8	2, 0.4	60, 11.3	5, 0.9	0, 0.0	3, 0.6	104, 19.6	6, 1.1	2, 0.4	14, 2.6	9, 1.7
WDG	6, 2.2	0, 0.0	108, 38.8	0, 0.0	20, 7.2	0, 0.0	22, 7.9	0, 0.0	1, 0.4	0, 0.0	53, 19.0	4, 1.4	2, 0.7	21, 7.5	6, 2.2
WEC	15, 3.7	0, 0.0	115, 28.5	0, 0.0	7, 1.7	4, 1.0	13, 3.2	1, 0.3	0, 0.0	0, 0.0	66, 16.4	6, 1.5	2, 0.5	1, 0.3	6, 1.5
YRK	39, 3.7	0, 0.0	351, 32.8	0, 0.0	17, 1.6	7, 0.7	77, 7.2	6, 0.6	4, 0.4	3, 0.3	223, 20.9	27, 2.5	6, 0.6	12, 1.1	43, 4.0
Ontario	744, 5.6	2, 0.0	3500, 26.2	0, 0.0	301, 2.3	105, 0.8	1295, 9.7	103, 0.8	57, 0.4	62, 0.5	2576, 19.3	255, 1.9	103, 0.8	232, 1.7	211, 1.6

Data Table 2-B. Other Zoonotic and Vector-borne Diseases by Health Unit: Ontario, 2011^{1,2}

Health Units	Anthrax	Brucellosis	HPS	Lyme disease ²	Malaria	Plague	Psittacosis/Ornithosis	Q fever	Rabies	Trichinosis	Tularemia	WNV ²	Yellow Fever
ALG	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 1.7	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
BRN	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	4, 2.8	0, 0.0
CHK	0, 0.0	0, 0.0	0, 0.0	1, 0.9	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.9	0, 0.0
DUR	0, 0.0	0, 0.0	0, 0.0	1, 0.2	4, 0.6	0, 0.0	0, 0.0	1, 0.2	0, 0.0	0, 0.0	0, 0.0	2, 0.3	0, 0.0
EOH	0, 0.0	0, 0.0	0, 0.0	1, 0.5	0, 0.0	0, 0.0	0, 0.0	1, 0.5	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
ELG	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 1.1	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
GBO	0, 0.0	0, 0.0	0, 0.0	1, 0.6	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
HDN	0, 0.0	0, 0.0	0, 0.0	4, 3.6	0, 0.0	0, 0.0	0, 0.0	2, 1.8	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
HKP	0, 0.0	0, 0.0	0, 0.0	2, 1.1	2, 1.1	0, 0.0	0, 0.0	1, 0.6	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
HAL	0, 0.0	0, 0.0	0, 0.0	6, 1.2	3, 0.6	0, 0.0	0, 0.0	1, 0.2	0, 0.0	0, 0.0	0, 0.0	9, 1.7	0, 0.0
HAM	0, 0.0	0, 0.0	0, 0.0	2, 0.4	9, 1.7	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 0.4	0, 0.0
HPE	0, 0.0	0, 0.0	0, 0.0	4, 2.5	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.6	0, 0.0
HUR	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 1.7	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
KFL	0, 0.0	0, 0.0	0, 0.0	17, 8.6	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
LAM	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.8	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 1.5	0, 0.0
LGL	0, 0.0	0, 0.0	0, 0.0	20, 11.8	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 1.2	0, 0.0
MSL	0, 0.0	1, 0.2	0, 0.0	2, 0.4	3, 0.7	0, 0.0	0, 0.0	5, 1.1	0, 0.0	0, 0.0	0, 0.0	2, 0.4	0, 0.0
NIA	0, 0.0	0, 0.0	0, 0.0	6, 1.4	1, 0.2	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	8, 1.8	0, 0.0
NPS	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 1.6	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
NWR	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
OTT	0, 0.0	0, 0.0	0, 0.0	11, 1.2	18, 2.0	0, 0.0	0, 0.0	2, 0.2	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
OXF	0, 0.0	0, 0.0	0, 0.0	4, 3.7	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
PEE	0, 0.0	0, 0.0	0, 0.0	7, 0.5	66, 4.8	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	4, 0.3	0, 0.0
PDH	0, 0.0	0, 0.0	0, 0.0	1, 1.3	1, 1.3	0, 0.0	0, 0.0	1, 1.3	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
PTC	0, 0.0	0, 0.0	0, 0.0	3, 2.1	0, 0.0	0, 0.0	0, 0.0	1, 0.7	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
PQP	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 2.3	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
REN	0, 0.0	0, 0.0	0, 1.0	5, 4.9	1, 1.0	0, 0.0	1, 1.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0

Health Units	Anthrax	Brucellosis	HPS	Lyme disease ²	Malaria	Plague	Psittacosis/ Ornithosis	Q fever	Rabies	Trichinosis	Tularemia	WNV ²	Yellow Fever
SMD	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.2	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 0.4	0, 0.0
SUD	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.5	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.5	0, 0.0
THB	0, 0.0	0, 0.0	0, 0.0	1, 0.6	2, 1.3	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
TSK	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
TOR	0, 0.0	0, 0.0	0, 0.0	21, 0.8	90, 3.3	0, 0.0	0, 0.0	2, 0.1	0, 0.0	0, 0.0	0, 0.0	28, 1.0	0, 0.0
WAT	0, 0.0	0, 0.0	0, 0.0	4, 0.8	7, 1.3	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 0.4	0, 0.0
WDG	0, 0.0	0, 0.0	0, 0.0	3, 1.1	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.4	0, 0.0
WEC	0, 0.0	0, 0.0	0, 0.0	3, 0.7	4, 1.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	6, 1.5	0, 0.0
YRK	0, 0.0	0, 0.0	0, 0.0	4, 0.4	10, 0.9	0, 0.0	0, 0.0	1, 0.1	0, 0.0	0, 0.0	0, 0.0	1, 0.1	0, 0.0
Ontario	0, 0.0	1, 0.0	0, 0.0	134, 1.0	230, 1.7	0, 0.0	1, 0.0	20, 0.2	0, 0.0	0, 0.0	0, 0.0	78, 0.6	0, 0.0

Data Table 2-C. Diseases Transmitted by Respiratory Routes and Direct Contact by Health Unit: Ontario, 2011^{1,2}

Health Units	iGAS	Influenza ³	Legionellosis	SARS	Smallpox	Tuberculosis
Number, Rate ¹						
ALG	8, 6.8	60, 50.9	0, 0.0	0, 0.0	0, 0.0	0, 0.0
BRN	19, 13.5	50, 35.5	1, 0.7	0, 0.0	0, 0.0	1, 0.7
CHK	4, 3.7	20, 18.4	0, 0.0	0, 0.0	0, 0.0	1, 0.9
DUR	23, 3.6	160, 25.4	14, 2.2	0, 0.0	0, 0.0	13, 2.1
EOH	5, 2.5	82, 40.8	0, 0.0	0, 0.0	0, 0.0	0, 0.0
ELG	3, 3.3	37, 40.5	0, 0.0	0, 0.0	0, 0.0	1, 1.1
GBO	12, 7.3	88, 53.4	0, 0.0	0, 0.0	0, 0.0	1, 0.6
HDN	6, 5.4	36, 32.5	2, 1.8	0, 0.0	0, 0.0	1, 0.9
HKP	10, 5.6	97, 54.2	1, 0.6	0, 0.0	0, 0.0	3, 1.7
HAL	15, 2.9	219, 42.2	7, 1.4	0, 0.0	0, 0.0	12, 2.3
HAM	38, 7.0	469, 86.8	17, 3.2	0, 0.0	0, 0.0	18, 3.3
HPE	6, 3.7	77, 47.3	1, 0.6	0, 0.0	0, 0.0	0, 0.0
HUR	4, 6.6	52, 86.2	0, 0.0	0, 0.0	0, 0.0	1, 1.7
KFL	19, 9.6	68, 34.5	0, 0.0	0, 0.0	0, 0.0	0, 0.0
LAM	1, 0.8	54, 41.1	0, 0.0	0, 0.0	0, 0.0	1, 0.8
LGL	11, 6.5	50, 29.4	1, 0.6	0, 0.0	0, 0.0	0, 0.0
MSL	24, 5.2	278, 60.3	5, 1.1	0, 0.0	0, 0.0	7, 1.5
NIA	24, 5.4	138, 31.0	1, 0.2	0, 0.0	0, 0.0	7, 1.6
NPS	11, 8.6	73, 57.3	0, 0.0	0, 0.0	0, 0.0	0, 0.0
NWR	18, 22.0	36, 43.9	0, 0.0	0, 0.0	0, 0.0	1, 1.2
OTT	50, 5.5	200, 22.0	3, 0.3	0, 0.0	0, 0.0	47, 5.2
OXF	4, 3.7	48, 44.4	0, 0.0	0, 0.0	0, 0.0	0, 0.0
PEE	38, 2.8	596, 43.6	21, 1.5	0, 0.0	0, 0.0	141, 10.3
PDH	8, 10.4	77, 99.8	0, 0.0	0, 0.0	0, 0.0	0, 0.0
PTC	7, 5.0	148, 105.3	1, 0.7	0, 0.0	0, 0.0	1, 0.7

Health Units	iGAS	Influenza ³	Legionellosis	SARS	Smallpox	Tuberculosis
Number, Rate ¹						
PQP	4, 4.6	55, 63.4	1, 1.2	0, 0.0	0, 0.0	1, 1.2
REN	3, 2.9	22, 21.4	0, 0.0	0, 0.0	0, 0.0	0, 0.0
SMD	32, 6.1	262, 49.9	4, 0.8	0, 0.0	0, 0.0	2, 0.4
SUD	11, 5.6	65, 32.9	2, 1.0	0, 0.0	0, 0.0	1, 0.5
THB	43, 27.5	39, 24.9	1, 0.6	0, 0.0	0, 0.0	3, 1.9
TSK	1, 2.9	3, 8.7	0, 0.0	0, 0.0	0, 0.0	0, 0.0
TOR	128, 4.7	1565, 57.0	54, 2.0	0, 0.0	0, 0.0	314, 11.4
WAT	18, 3.4	274, 51.7	11, 2.1	0, 0.0	0, 0.0	12, 2.3
WDG	17, 6.1	137, 49.2	1, 0.4	0, 0.0	0, 0.0	2, 0.7
WEC	15, 3.7	117, 29.0	9, 2.2	0, 0.0	0, 0.0	10, 2.5
YRK	38, 3.6	298, 27.9	4, 0.4	0, 0.0	0, 0.0	53, 5.0
Ontario	678, 5.1	6050, 45.2	162, 1.2	0, 0.0	0, 0.0	655, 4.9

Data Table 2-D. Sexually Transmitted and Blood-borne Diseases by Health Unit: Ontario, 2011^{1,2}

Health Units	AIDS	Chancroid	Chlamydia	Cytomegalovirus, congenital ¹	Gonorrhea	Group B Streptococcal disease ¹	Hepatitis B	Hepatitis C	Hepatitis D	Herpes, neonatal ¹	HIV	Ophthalmia neonatorum ¹	Syphilis, infectious
Number, Rate ¹													
ALG	0, 0.0	0, 0.0	319, 270.8	0, 0.0	16, 13.6	0, 0.0	1, 0.9	56, 47.5	0, 0.0	0, 0.0	2, 1.7	0, 0.0	0, 0.0
BRN	0, 0.0	0, 0.0	522, 370.7	0, 0.0	71, 50.4	0, 0.0	4, 2.8	49, 34.8	0, 0.0	0, 0.0	2, 1.4	0, 0.0	0, 0.0
CHK	0, 0.0	0, 0.0	254, 233.9	0, 0.0	16, 14.7	0, 0.0	1, 0.9	46, 42.4	0, 0.0	0, 0.0	1, 0.9	0, 0.0	1, 0.9
DUR	3, 0.5	0, 0.0	1713, 271.4	0, 0.0	170, 26.9	4, 60.7	2, 0.3	177, 28.0	0, 0.0	0, 0.0	8, 1.3	0, 0.0	12, 1.9
EOH	2, 1.0	0, 0.0	340, 169.1	0, 0.0	17, 8.5	1, 52.2	5, 2.5	64, 31.8	0, 0.0	0, 0.0	3, 1.5	0, 0.0	3, 1.5
ELG	2, 2.2	0, 0.0	185, 202.4	0, 0.0	2, 2.2	0, 0.0	1, 1.1	26, 28.4	0, 0.0	0, 0.0	2, 2.2	0, 0.0	2, 2.2
GBO	1, 0.6	0, 0.0	262, 158.9	0, 0.0	2, 1.2	2, 130.1	1, 0.6	35, 21.2	0, 0.0	1, 65.6	1, 0.6	0, 0.0	4, 2.4
HDN	2, 1.8	0, 0.0	195, 176.1	0, 0.0	14, 12.7	0, 0.0	3, 2.7	36, 32.5	0, 0.0	0, 0.0	2, 1.8	0, 0.0	0, 0.0
HKP	0, 0.0	0, 0.0	287, 160.3	0, 0.0	20, 11.2	1, 75.2	4, 2.2	63, 35.2	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.6
HAL	3, 0.6	0, 0.0	818, 157.7	0, 0.0	73, 14.1	0, 0.0	4, 0.8	72, 13.9	0, 0.0	0, 0.0	6, 1.2	0, 0.0	9, 1.7
HAM	4, 0.7	0, 0.0	1640, 303.6	0, 0.0	183, 33.9	1, 18.6	5, 0.9	174, 32.2	0, 0.0	0, 0.0	26, 4.8	0, 0.0	17, 3.2
HPE	0, 0.0	0, 0.0	406, 249.5	0, 0.0	17, 10.5	1, 69.3	2, 1.2	55, 33.8	0, 0.0	0, 0.0	2, 1.2	0, 0.0	1, 0.6
HUR	1, 1.7	0, 0.0	88, 145.8	0, 0.0	2, 3.3	0, 0.0	2, 3.3	10, 16.6	0, 0.0	0, 0.0	1, 1.7	0, 0.0	1, 1.7
KFL	0, 0.0	0, 0.0	680, 344.6	0, 0.0	21, 10.6	0, 0.0	9, 4.6	150, 76.0	1, 0.5	0, 0.0	8, 4.1	0, 0.0	2, 1.0
LAM	0, 0.0	0, 0.0	274, 208.5	0, 0.0	9, 6.9	0, 0.0	1, 0.8	75, 57.1	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.8
LGL	1, 0.6	0, 0.0	301, 176.9	0, 0.0	10, 5.9	0, 0.0	7, 4.1	53, 31.2	0, 0.0	0, 0.0	2, 1.2	0, 0.0	0, 0.0
MSL	1, 0.2	0, 0.0	1487, 322.7	1, 20.6	111, 24.1	2, 42.6	3, 0.7	261, 56.6	0, 0.0	2, 41.1	24, 5.2	0, 0.0	37, 8.0
NIA	2, 0.5	0, 0.0	1053, 236.4	1, 24.4	59, 13.3	0, 0.0	5, 1.1	161, 36.2	0, 0.0	1, 24.4	10, 2.3	0, 0.0	5, 1.1
NPS	0, 0.0	0, 0.0	392, 307.9	0, 0.0	7, 5.5	0, 0.0	2, 1.6	59, 46.3	0, 0.0	0, 0.0	3, 2.4	0, 0.0	0, 0.0
NWR	3, 3.7	0, 0.0	531, 648.0	1, 95.3	126, 153.8	1, 114.0	1, 1.2	32, 39.1	0, 0.0	0, 0.0	3, 3.7	0, 0.0	1, 1.2
OTT	7, 0.8	0, 0.0	2525, 277.5	0, 0.0	216, 23.7	5, 50.7	5, 0.6	229, 25.2	0, 0.0	1, 10.3	72, 7.9	0, 0.0	49, 5.4
OXF	0, 0.0	0, 0.0	189, 174.6	0, 0.0	8, 7.4	0, 0.0	2, 1.9	32, 29.6	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.9
PEE	4, 0.3	0, 0.0	3671, 268.8	1, 5.9	464, 34.0	11, 69.5	3, 0.2	344, 25.2	0, 0.0	0, 0.0	43, 3.2	0, 0.0	30, 2.2
PDH	1, 1.3	0, 0.0	161, 208.7	0, 0.0	3, 3.9	0, 0.0	1, 1.3	10, 13.0	0, 0.0	0, 0.0	1, 1.3	0, 0.0	0, 0.0
PTC	0, 0.0	0, 0.0	401, 285.3	0, 0.0	13, 9.3	1, 82.0	1, 0.7	40, 28.5	0, 0.0	0, 0.0	1, 0.7	0, 0.0	1, 0.7
PQP	0, 0.0	0, 0.0	419, 483.3	1, 101.1	70, 80.7	0, 0.0	2, 2.3	25, 28.8	0, 0.0	1, 101.1	2, 2.3	0, 0.0	0, 0.0

Health Units	AIDS	Chancroid	Chlamydia	Cytomegalovirus, congenital ¹	Gonorrhea	Group B Streptococcal disease ¹	Hepatitis B	Hepatitis C	Hepatitis D	Herpes, neonatal ¹	HIV	Ophthalmia neonatorum ¹	Syphilis, infectious
Number, Rate ¹													
REN	0, 0.0	0, 0.0	244, 237.0	0, 0.0	7, 6.8	0, 0.0	0, 0.0	15, 14.6	0, 0.0	0, 0.0	1, 1.0	0, 0.0	0, 0.0
SMD	2, 0.4	0, 0.0	1075, 204.6	0, 0.0	45, 8.6	0, 0.0	2, 0.4	148, 28.2	0, 0.0	0, 0.0	14, 2.7	0, 0.0	4, 0.8
SUD	1, 0.5	0, 0.0	589, 297.9	0, 0.0	29, 14.7	1, 53.3	2, 1.0	91, 46.0	0, 0.0	0, 0.0	19, 9.6	0, 0.0	0, 0.0
THB	1, 0.6	0, 0.0	721, 460.7	0, 0.0	89, 56.9	0, 0.0	5, 3.2	146, 93.3	0, 0.0	1, 65.2	3, 1.9	0, 0.0	2, 1.3
TSK	0, 0.0	0, 0.0	65, 188.7	0, 0.0	0, 0.0	0, 0.0	0, 0.0	12, 34.8	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
TOR	54, 2.0	0, 0.0	9829, 358.2	4, 13.0	1941, 70.7	18, 59.0	14, 0.5	886, 32.3	1, 0.0	0, 0.0	544, 19.8	1, 3.2	530, 19.3
WAT	1, 0.2	0, 0.0	1375, 259.3	1, 16.1	123, 23.2	1, 16.6	4, 0.8	125, 23.6	0, 0.0	0, 0.0	12, 2.3	0, 0.0	10, 1.9
WDG	0, 0.0	0, 0.0	626, 224.8	0, 0.0	30, 10.8	0, 0.0	10, 3.6	69, 24.8	0, 0.0	0, 0.0	5, 1.8	0, 0.0	9, 3.2
WEC	0, 0.0	0, 0.0	877, 217.4	0, 0.0	50, 12.4	1, 25.5	4, 1.0	147, 36.4	0, 0.0	0, 0.0	16, 4.0	0, 0.0	5, 1.2
YRK	4, 0.4	0, 0.0	1829, 171.0	1, 8.8	162, 15.1	7, 62.4	4, 0.4	170, 15.9	1, 0.1	1, 8.8	26, 2.4	0, 0.0	29, 2.7
Ontario	100, 0.8	0, 0.0	36343, 271.8	11, 7.6	4196, 31.4	58, 41.5	122, 0.9	4143, 31.0	3, 0.0	8, 5.6	865, 6.5	1, 0.7	767, 5.7

Data Table 2-E. Vaccine-Preventable Diseases by Health Unit: Ontario, 2011^{1,2}

Health Units	Diphtheria	<i>Haemophilus influenzae</i> b	Measles	Meningococcal disease	Mumps ²	Pertussis ²	Pneumococcal disease, invasive	Poliomyelitis	Rubella	Rubella, congenital syndrome ¹	Tetanus
Number, Rate ¹											
ALG	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	3, 2.6	27, 22.9	0, 0.0	0, 0.0	0, 0.0	0, 0.0
BRN	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 1.4	0, 0.0	15, 10.7	0, 0.0	0, 0.0	0, 0.0	0, 0.0
CHK	0, 0.0	0, 0.0	0, 0.0	2, 1.8	1, 0.9	3, 2.8	18, 16.6	0, 0.0	0, 0.0	0, 0.0	0, 0.0
DUR	0, 0.0	0, 0.0	0, 0.0	1, 0.2	7, 1.1	4, 0.6	56, 8.9	0, 0.0	0, 0.0	0, 0.0	0, 0.0
EOH	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.5	6, 3.0	14, 7.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
ELG	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	44, 48.1	12, 13.1	0, 0.0	0, 0.0	0, 0.0	0, 0.0
GBO	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 1.2	19, 11.5	0, 0.0	0, 0.0	0, 0.0	0, 0.0
HDN	0, 0.0	1, 0.9	5, 4.5	0, 0.0	1, 0.9	11, 9.9	11, 9.9	0, 0.0	0, 0.0	0, 0.0	0, 0.0
HKP	0, 0.0	1, 0.6	0, 0.0	0, 0.0	3, 1.7	2, 1.1	27, 15.1	0, 0.0	0, 0.0	0, 0.0	0, 0.0
HAL	0, 0.0	1, 0.2	0, 0.0	2, 0.4	10, 1.9	4, 0.8	21, 4.1	0, 0.0	0, 0.0	0, 0.0	1, 0.2
HAM	0, 0.0	1, 0.2	0, 0.0	3, 0.6	3, 0.6	17, 3.2	70, 13.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
HPE	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	22, 13.5	0, 0.0	0, 0.0	0, 0.0	0, 0.0
HUR	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	9, 14.9	0, 0.0	0, 0.0	0, 0.0	0, 0.0
KFL	0, 0.0	1, 0.5	0, 0.0	0, 0.0	0, 0.0	2, 1.0	30, 15.2	0, 0.0	0, 0.0	0, 0.0	0, 0.0
LAM	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 1.5	0, 0.0	0, 0.0	0, 0.0	0, 0.0
LGL	0, 0.0	0, 0.0	0, 0.0	2, 1.2	0, 0.0	2, 1.2	22, 12.9	0, 0.0	0, 0.0	0, 0.0	0, 0.0
MSL	0, 0.0	0, 0.0	0, 0.0	6, 1.3	5, 1.1	1, 0.2	40, 8.7	0, 0.0	0, 0.0	0, 0.0	0, 0.0
NIA	0, 0.0	1, 0.2	0, 0.0	4, 0.9	2, 0.5	2, 0.5	56, 12.6	0, 0.0	0, 0.0	0, 0.0	0, 0.0
NPS	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	4, 3.1	15, 11.8	0, 0.0	0, 0.0	0, 0.0	0, 0.0
NWR	0, 0.0	0, 0.0	0, 0.0	1, 1.2	1, 1.2	8, 9.8	27, 33.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
OTT	0, 0.0	0, 0.0	1, 0.1	2, 0.2	4, 0.4	22, 2.4	83, 9.1	0, 0.0	0, 0.0	0, 0.0	0, 0.0
OXF	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 1.9	8, 7.4	10, 9.2	0, 0.0	0, 0.0	0, 0.0	0, 0.0
PEE	0, 0.0	1, 0.1	1, 0.1	1, 0.1	9, 0.7	16, 1.2	93, 6.8	0, 0.0	0, 0.0	0, 0.0	0, 0.0
PDH	0, 0.0	0, 0.0	0, 0.0	3, 3.9	0, 0.0	5, 6.5	9, 11.7	0, 0.0	0, 0.0	0, 0.0	0, 0.0
PTC	0, 0.0	0, 0.0	0, 0.0	1, 0.7	0, 0.0	1, 0.7	19, 13.5	0, 0.0	0, 0.0	0, 0.0	0, 0.0
PQP	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 1.2	6, 6.9	0, 0.0	0, 0.0	0, 0.0	0, 0.0
REN	0, 0.0	0, 0.0	0, 0.0	1, 1.0	0, 0.0	0, 0.0	6, 5.8	0, 0.0	0, 0.0	0, 0.0	0, 0.0

Health Units	Diphtheria	<i>Haemophilus influenzae</i> b	Measles	Meningococcal disease	Mumps ²	Pertussis ²	Pneumococcal disease, invasive	Poliomyelitis	Rubella	Rubella, congenital syndrome ¹	Tetanus
Number, Rate ¹											
SMD	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	8, 1.5	56, 10.7	0, 0.0	0, 0.0	0, 0.0	0, 0.0
SUD	0, 0.0	0, 0.0	0, 0.0	0, 0.0	1, 0.5	0, 0.0	25, 12.6	0, 0.0	0, 0.0	0, 0.0	0, 0.0
THB	0, 0.0	1, 0.6	0, 0.0	0, 0.0	0, 0.0	2, 1.3	30, 19.2	0, 0.0	0, 0.0	0, 0.0	0, 0.0
TSK	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	2, 5.8	4, 11.6	0, 0.0	0, 0.0	0, 0.0	0, 0.0
TOR	0, 0.0	3, 0.1	1, 0.0	6, 0.2	24, 0.9	64, 2.3	208, 7.6	0, 0.0	0, 0.0	0, 0.0	0, 0.0
WAT	0, 0.0	0, 0.0	0, 0.0	5, 0.9	4, 0.8	7, 1.3	69, 13.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0
WDG	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	0, 0.0	30, 10.8	0, 0.0	0, 0.0	0, 0.0	0, 0.0
WEC	0, 0.0	0, 0.0	0, 0.0	2, 0.5	0, 0.0	7, 1.7	33, 8.2	0, 0.0	0, 0.0	0, 0.0	0, 0.0
YRK	0, 0.0	0, 0.0	0, 0.0	2, 0.2	3, 0.3	18, 1.7	44, 4.1	0, 0.0	0, 0.0	0, 0.0	0, 0.0
Ontario	0, 0.0	11, 0.1	8, 0.1	44, 0.3	83, 0.6	276, 2.1	1238, 9.3	0, 0.0	0, 0.0	0, 0.0	1, 0.0

Data tables 2 A-E

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13] for all diseases and [2013/04/22] for *Haemophilus influenzae* b.

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

1: Incidence rates are per 100,000 population. Rates are per 100,000 live births for group B Streptococcal disease, neonatal herpes, ophthalmia neonatorum, congenital cytomegalovirus and congenital rubella syndrome.

2: Includes only confirmed cases with the following exceptions: both probable and confirmed cases for pertussis, mumps, amebiasis, Lyme disease and West Nile Virus illness.

3: Influenza data are reported by seasons. 2011 represents the 2010/2011 season.

Data Table 3-A. Case Counts for Select Reportable Diseases by Age: Ontario, 2011 – Enteric diseases^{1,2,3}

Disease	Age (years)									Total cases	Median age
	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+		
Amebiasis	14	25	30	112	165	181	100	70	47	744	41
Campylobacteriosis	292	163	313	617	443	421	495	389	362	3,495	37
Cryptosporidiosis	72	22	77	65	40	10	7	6	2	301	18
Cyclosporiasis	1	0	4	10	22	29	24	11	4	105	46
<i>E. coli</i> , verotoxin-producing	38	26	34	47	18	13	21	15	20	232	22
Giardiasis	127	101	92	227	216	197	161	113	60	1,294	34
Hepatitis A	6	12	26	27	10	6	6	4	6	103	21
Listeriosis	2	0	1	4	1	4	2	11	32	57	71
Paratyphoid fever	9	5	13	10	14	6	3	1	1	62	23
Salmonellosis	405	221	284	380	263	296	261	218	236	2,564	29
Shigellosis	35	30	19	39	35	46	26	13	10	253	31
Typhoid fever	12	13	20	26	11	11	5	4	0	102	23
Yersiniosis	50	25	29	37	23	19	11	6	11	211	20

Data Table 3-B. Case Counts for Select Reportable Diseases by Age: Ontario, 2011 – Diseases Transmitted by Respiratory Routes and Direct Contact^{1,2,3}

Disease	Age (years)										Total cases	Median age
	<1	1-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+		
Group A Streptococcal disease, invasive	11	32	22	32	44	95	98	79	99	166	678	50
Influenza ⁴	371	796	361	250	316	398	341	337	411	2,447	6,028	55
Legionellosis	0	0	0	0	2	4	22	42	46	45	161	61
Age (years)	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+	-	Total	
Tuberculosis	11	6	35	118	109	97	75	76	128	-	655	44

Data Table 3-C. Case Counts for Select Reportable Diseases by Age: Ontario, 2011 – Sexually Transmitted and Blood-borne infections^{1,2,3}

Disease	Age (years)									Total Cases	Median Age
	0-14	15-19	20-24	25-29	30-39	40-49	50-59	60-69	70+		
AIDS	0	0	3	4	22	41	17	6	7	100	44
Chlamydia	138	8,135	13,665	6,800	5,030	1,846	532	112	18	36,276	23
Gonorrhea	19	722	1,227	837	768	431	141	38	6	4,189	25
Hepatitis B, acute	1	2	5	14	31	25	23	10	9	120	43
Hepatitis C	25	83	293	359	760	916	1,111	369	207	4,123	46
HIV	4	8	103	131	258	225	97	29	8	863	36
Infectious syphilis	0	16	67	116	189	257	98	18	6	767	39
Age (years)	<1									Total	
Group B Streptococcal disease	58	-	-	-	-	-	-	-	-	58	

Data Table 3-D. Case Counts for Select Reportable Diseases by Age: Ontario, 2011 – Vaccine-Preventable Diseases^{1,2,3}

Age (years)	<1	1-4	5-12	13-17	18-24	25-64	65+	-	Total Cases	Median Age
Meningococcal disease, invasive	5	5	1	2	3	15	12	-	43	53
Age (years)	0-4	5-9	10-14	15-19	20-24	25-44	45-64	65+	Total Cases	Median Age
Mumps	3	1	5	4	22	31	17	0	83	29
Age (years)	<1	1-4	5-9	10-14	15-19	20-64	65+	-	Total Cases	Median Age
Pertussis	69	55	32	34	13	62	7	-	272	6
Age (years)	<1	1-4	5-9	10-14	15-19	20-49	50-64	65+	Total Cases	Median Age
<i>S. pneumoniae</i> , invasive	18	80	33	17	11	242	345	491	1,237	59

Data Table 3-E. Case Counts for Select Reportable Diseases by Age: Ontario, 2011 – Vector-borne Diseases^{1,2,3}

Disease	Age (years)									Total cases	Median age
	0-4	5-9	10-19	20-29	30-39	40-49	50-59	60-69	70+		
Lyme Disease	3	7	18	17	17	13	25	22	8	130	44
Malaria	5	6	21	52	41	49	26	15	10	225	36
West Nile Virus illness	1	1	0	1	5	16	26	15	12	77	55

Data tables 3 A-E

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13] for all diseases and [2013/04/22] for *Haemophilus influenzae* b.

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

1: Does not include diseases for which no cases were reported in 2011 or diseases with too few cases to stratify by age.

2: Incidence rates are per 100,000 population. Rates are per 100,000 live births for group B Streptococcus disease.

3: Includes only confirmed cases with the following exceptions: both probable and confirmed cases for pertussis, mumps, amebiasis, Lyme disease and West Nile Virus illness.

4: Influenza data are reported by seasons. 2011 represents the 2010/2011 season.

Data Table 4. Incidence, Case Counts and Outcomes for Select Reportable Diseases: Ontario, 2011

Reportable Diseases ¹	Cases		Hospitalizations		Deaths	
	#	Rate/100,000 ²	#	%	#	CFR (%) ⁵
Enteric and Zoonotic Diseases						
Amebiasis ³	744	5.6	16	2.2	0	0.0
Campylobacteriosis	3,500	26.2	178	5.1	0	0.0
Cryptosporidiosis	301	2.3	13	4.3	0	0.0
Cyclosporiasis	105	0.8	2	1.9	0	0.0
<i>E. coli</i> , verotoxin-producing	232	1.7	60	25.9	0	0.0
Giardiasis	1,295	9.7	19	1.5	0	0.0
Hepatitis A	103	0.8	32	31.1	0	0.0
Listeriosis	57	0.4	34	59.6	6	10.5
Paratyphoid fever	62	0.5	12	19.4	0	0.0
Salmonellosis	2,576	19.3	255	9.9	5	0.2
Shigellosis	255	1.9	29	11.4	0	0.0
Typhoid fever	103	0.8	32	31.1	0	0.0
Yersiniosis	211	1.6	9	4.3	0	0.0
Vaccine-Preventable Diseases						
Meningococcal disease	44	0.3	25	56.8	3	6.8
Mumps ³	83	0.6	3	3.6	0	0.0
Pertussis ³	276	2.1	30	10.9	0	0.0
<i>S. pneumoniae</i>	1,238	9.3	841	67.9	68	5.5
Respiratory Diseases and Diseases Transmitted by Direct Contact						
Group A Streptococcal disease, invasive	678	5.1	455	67.1	49	7.2
Influenza ⁴	6,050	45.2	2380	39.3	117	1.9
Legionellosis	162	1.2	122	75.3	8	4.9
Tuberculosis	655	4.9	196	29.9	38	5.8

Reportable Diseases ¹	Cases		Hospitalizations		Deaths	
	#	Rate/100,000 ²	#	%	#	CFR (%) ⁵
Vector-borne Diseases						
Lyme Disease ³	134	1.0	9	6.7	0	0.0
Malaria	230	1.7	65	28.3	0	0.0
West Nile Virus ³	78	0.6	27	34.6	3	3.8

Data table 4

Ontario Cases: MOHLTC, integrated Public Health Information System (iPHIS) database, extracted [2012/06/13].

Ontario Population: MOHLTC, IntelliHEALTH Ontario, extracted [2012/10/15].

1: Includes only diseases for which hospitalization and mortality data were reported and where the relevant proportions were presented in this report.

2: Incidence rates are per 100,000 population. Rates are per 100,000 live births for group B Streptococcus disease.

3: Includes only confirmed cases with the following exceptions: both probable and confirmed cases for pertussis, mumps, amebiasis, Lyme disease and West Nile Virus illness.

4: Influenza data are reported by seasons. 2011 represents the 2010/2011 season.

5: CFR - case fatality ratio.

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