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One of the mandates of local public health units in Ontario is to prevent or reduce the burden of infectious diseases of public health importance. Region of Waterloo Public Health and Emergency Services fulfills this mandate by working to prevent the transmission of infectious and other reportable diseases in the region. These diseases are important since they have the ability to cause serious illness and/or be transmitted to large numbers of individuals. Public Health’s disease-related programs are guided by the Ontario Public Health Standards (OPHS) and local needs.

In fulfilling its mandate related to infectious disease, Public Health monitors the occurrence of these diseases, associated risk factors and emerging trends. Through the provision of reports such as Local Influenza Surveillance Bulletins and previous Waterloo Region Infectious Disease Status Reports, Region of Waterloo Public Health and Emergency Services is committed to providing the public with timely and accurate information on the local status of infectious diseases.

To add to this body of knowledge, I am pleased to release the Infectious Diseases in Waterloo Region Surveillance Report for 2016. This annual report builds on previous reports and not only presents local disease trends, but also provides a provincial comparison of rates.

I hope you find the information contained in this report both interesting and useful. As always, Region of Waterloo Public Health and Emergency Services continually works to improve its programs, services and reporting related to infectious diseases in an effort to build healthy and supportive communities.

Dr. Liana Nolan
Commissioner/Medical Officer of Health
Region of Waterloo Public Health and Emergency Services
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Executive Summary

Background
Infectious diseases (IDs) are illnesses caused by microorganisms such as bacteria, viruses and parasites which may cause serious illness or be transmitted to large numbers of individuals. In accordance with the Ontario Public Health Standards (OPHS), one of the mandates of local public health units in Ontario is to work on the prevention and control of infectious diseases of public health importance. As such, the purpose of this report is to assess Waterloo Region’s rates of infectious diseases of public health importance and to monitor trends over time. This information will be used to aid in planning and evaluating evidence-based public health policies, programs, interventions, and related services so as to mitigate the frequency and impact of infectious diseases in the local community. This report presents Waterloo Region’s rates of reportable diseases for 2016, historical rates for 2006-2015, comparisons to the historical 5-year average, and comparison of local rates to those of the province of Ontario. Basic epidemiology, exposure and risk factor information are also provided where appropriate.

Key Findings

Overall
In 2016 there were 2,897 cases of reportable infectious diseases in Waterloo Region. The top five infectious diseases reported in 2016 were chlamydia, influenza, gonorrhea, salmonellosis and campylobacteriosis, which accounted for 84.4 per cent of all cases. In general, the rates of most reportable diseases in Waterloo Region were consistent with or lower than provincial rates.

Enteric Diseases
Among enteric (i.e. intestinal) disease, salmonellosis and campylobacteriosis were the most frequently reported infectious diseases. Waterloo Region rates of most enteric diseases were similar to or lower compared to those for all of Ontario. Travel outside of the province was a common risk factor for many enteric diseases, including amebiasis, cryptosporidiosis, cyclosporiasis, giardiasis, hepatitis A, salmonellosis, shigellosis and typhoid/paratyphoid fever. Travellers are reminded to follow good hand hygiene practices, avoid consumption of potentially contaminated food such as raw fruits and vegetables (unless they have been washed, peeled or cooked), consume water that is potable, and avoid risky behaviours such as swimming in contaminated water.

Region of Waterloo Public Health works to manage and control enteric diseases by following up on reported cases and their contacts, providing education regarding risk
factors and prevention, and supporting long-term care homes, hospitals and daycares in the prevention and control of enteric outbreaks. Region of Waterloo Public Health also performs routine inspections of food premises, long-term care homes and retirement facilities, residential facilities, day nurseries, personal service settings, and recreational water facilities (e.g., public pools, hot tubs and splash pads) to prevent the occurrence and transmission of infectious and foodborne illness. In addition, Region of Waterloo Public Health collaborates with federal and provincial partners to identify and remove sources of contaminated food products from the consumer marketplace. Public Health also provides free access to bacteriological testing for private well water and aids in the interpretation of such testing for well owners.

Vector-borne and Zoonotic Diseases
Vector-borne diseases (e.g., malaria, West Nile Virus, Lyme disease) and zoonotic diseases (e.g., rabies) are relatively uncommon in Waterloo Region.

There were no human cases of West Nile virus in Waterloo Region in 2016 and Waterloo Region remains an area of low risk for the acquisition of Lyme disease. There are areas in Ontario that are considered higher risk for the acquisition of Lyme disease due to the presence of black-legged ticks. It is important for residents in Waterloo Region to be aware of precautions they can take to protect themselves against Lyme disease, especially when they travel to areas of higher risk. Region of Waterloo Public Health continues to work to reduce risk of exposure to Lyme Disease and West Nile Virus through public education, investigation of suspect human cases, vector surveillance and the implementation of vector control measures.

There were no human rabies cases in 2016. While the risk for the general public of acquiring rabies remains low in Waterloo Region, wildlife in the region and surrounding areas have recently tested positive for rabies. It is important for individuals with an exposure (i.e. bite or scratch) to raccoons, skunks, other wildlife or any other animals to receive prompt assessment in order to determine the possible need for rabies post exposure prophylaxis. Public Health continues to investigate all reported animal biting incidents, provide recommendations regarding post-exposure prophylaxis, and dispense rabies vaccine.

Sexually Transmitted and Blood-borne Infections
Among all sexually transmitted and blood-borne infections, chlamydia, gonorrhea and hepatitis C contributed the greatest number of cases in Waterloo Region in 2016. As in previous years, chlamydia remains the most common infectious disease in Waterloo Region overall, with higher rates in young adults 20 to 29 years of age, and among 15 to 24 year old females. Chlamydia rates have been steadily rising throughout the province.
since 2007, including in Waterloo Region. The provincial rates have been significantly higher than those observed in Waterloo.

The rate of gonorrhea in Ontario has been increasing in recent years, and this trend has also been observed locally. Reasons for the province-wide increase in rates are unclear, and are being studied by the provincial government. The most commonly reported risk factors for local cases of gonorrhea included not using a condom and having multiple sexual partners.

The increased rates in sexually transmitted infections among youth may be attributed in part to more awareness of the need for testing, increased access to testing and new testing methods; however this does not completely explain the increase. Research also suggests that social determinants of health, in particular low socioeconomic status and limited access to health care, as well as the stigmatization and fear of being diagnosed with an STI contribute to higher incidence in young people. In order to support access to services, Region of Waterloo Public Health offers free and confidential sexual health counselling and clinics, two of which are specifically for youth. Public Health also offers supportive services including a sexual health phone line staffed by a public health nurse, as well as public health nurse availability at Waterloo Region District School Board secondary schools on a weekly basis to provide sexual health services.

There was an increase in acute hepatitis B cases in Waterloo Region in 2016 compared to previous years, although case numbers were still low and within normal fluctuations. Follow-up of local cases indicated that there were no known links between cases. Fluctuations in sporadic acute hepatitis B cases are expected as vaccination coverage continues to vary, particularly in those who were born prior to the start of routine school-based hepatitis B immunization for grade 7 students. In addition, behavioural factors and immigration from endemic countries are unpredictable and can contribute to hepatitis B disease transmission. Region of Waterloo Public Health will continue to provide school-based hepatitis B immunization clinics to grade 7 students, promote hepatitis B immunization to health care providers, promote screening in individuals travelling from countries with high hepatitis B prevalence, and participate in harm reduction activities such as needle syringe programs.

Local rates of hepatitis C, and HIV/AIDS all remained relatively stable and below those of the province in 2016. Region of Waterloo Public Health continues to engage in harm reduction strategies which include the provision of needle syringe programs, condom distribution, and other related services at several locations in the region.
Vaccine Preventable Diseases
Influenza was the most common vaccine preventable disease for the 2016-2017 season, accounting for more than three-quarters of vaccine preventable diseases reported in Waterloo Region. Influenza activity during the 2016-2017 season was similar to the historical average. In addition, the local rate of influenza was significantly lower than that for the province as a whole. Region of Waterloo Public Health continues efforts to manage influenza seasons by distributing influenza vaccines to health care providers and providing influenza immunization clinics by appointment for families to complement the many pharmacies, physicians’ offices and other providers of influenza vaccine in our region. Public Health also works with long-term care and retirement homes to increase staff and resident immunization coverage rates, and follows up on influenza cases and outbreaks in Waterloo Region.

Local rates of invasive pneumococcal disease (IPD) were higher than those of the province in 2016. Invasive pneumococcal incidence rates in Waterloo Region have historically been higher than those of the province, although rates have varied from year to year. Specific reasons for this are unknown; however, Region of Waterloo Public Health initiated an Invasive Pneumococcal Disease Prevention Campaign in the 2016-2017 respiratory season. This project aims to prevent invasive pneumococcal disease in the community by increasing pneumococcal vaccination rates among priority and high risk individuals. Promotional packages were distributed to primary care providers, specialists and specialty clinics, pharmacists and labs. Public Health plans to evaluate the effectiveness of the IPD Campaign and make recommendations for further action in the future.

Rates of pertussis, varicella, mumps, invasive meningococcal disease (IMD) and measles were either stable or decreased in 2016, and remained similar to or lower than provincial rates. Region of Waterloo Public Health supports the prevention of vaccine-preventable illnesses through the provision of vaccine delivered through health care providers and public health immunization clinics. It also works to achieve and maintain high immunization rates among children in elementary and secondary schools through the Immunization of School Pupils Act, and continues to conduct health education and promotion activities to increase immunization coverage rates.

Other Infectious Diseases
Local rates of legionellosis in 2016 were higher than the province but were not statistically different and are expected to fluctuate from year to year. Investigation of cases did not identify any common exposures or epidemiological links among cases in the region.
**Outbreaks**

Waterloo Region experienced a typical season in terms of enteric outbreaks which were most often due to norovirus-like illness, in the 2016-2017 season. As expected, enteric outbreaks were most frequently reported in child care facilities and peaked in the winter months.

The 2016-2017 non-influenza respiratory outbreak season was similar to previous seasons in Waterloo Region. Non-influenza respiratory outbreaks were most frequently reported in long-term care homes and retirement homes.

The number of influenza outbreaks was slightly higher in 2016-2017 compared to previous seasons in Waterloo Region, but still within what can be expected in a normal influenza season due to variations from year to year. Influenza outbreaks peaked in February. More than half of institutional influenza outbreaks occurred in long-term care homes, followed by retirement homes.

Region of Waterloo Public Health follows up with child care centres, hospitals, residential/group homes, long-term care homes and retirement homes that have reported an outbreak to assist with and support outbreak management efforts. In addition, Region of Waterloo Public Health hosts infection control education forums for long-term care homes, retirement homes, and child care centres, and participates on committees and networks that address infection prevention and control issues in facility settings.

**Conclusion**

Infectious diseases have the potential to cause serious illness and can have community-wide implications. As such, Region of Waterloo Public Health undertakes a number of activities to prevent or reduce the burden of infectious diseases in the community. The Infectious Diseases in Waterloo Region Surveillance Report for 2016 provides an update to the community on the local status of infectious diseases and the findings from this report will continue to be used to inform local public health programming in the prevention and transmission of reportable, infectious diseases in Waterloo Region.
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<th>Name</th>
<th>Definition</th>
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<tr>
<td>AIDS</td>
<td>Acquired immunodeficiency syndrome</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>GBS</td>
<td>Group B streptococcus</td>
</tr>
<tr>
<td>HBV</td>
<td>Hepatitis B virus</td>
</tr>
<tr>
<td>HCV</td>
<td>Hepatitis C virus</td>
</tr>
<tr>
<td>HIV</td>
<td>Human immunodeficiency virus</td>
</tr>
<tr>
<td>HPI</td>
<td>Health Protection and Investigation</td>
</tr>
<tr>
<td>HPPA</td>
<td>Health Protection and Promotion Act</td>
</tr>
<tr>
<td>IDDSH</td>
<td>Infectious Diseases, Dental and Sexual Health</td>
</tr>
<tr>
<td>iGAS</td>
<td>Invasive Group A streptococcal disease</td>
</tr>
<tr>
<td>IMD</td>
<td>Invasive meningococcal disease</td>
</tr>
<tr>
<td>IPD</td>
<td>Invasive pneumococcal disease</td>
</tr>
<tr>
<td>iPHIS</td>
<td>Integrated Public Health Information System</td>
</tr>
<tr>
<td>MOHLTC</td>
<td>Ministry of Health and Long-Term Care</td>
</tr>
<tr>
<td>MSM</td>
<td>Men who have sex with men</td>
</tr>
<tr>
<td>NACRS</td>
<td>National Ambulatory Care Reporting System</td>
</tr>
<tr>
<td>OPHS</td>
<td>Ontario Public Health Standards</td>
</tr>
<tr>
<td>PHO</td>
<td>Public Health Ontario</td>
</tr>
<tr>
<td>SRR</td>
<td>Standardized rate ratio</td>
</tr>
<tr>
<td>STI</td>
<td>Sexually transmitted infection</td>
</tr>
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<td>TB</td>
<td>Tuberculosis</td>
</tr>
<tr>
<td>VTEC</td>
<td>Verotoxin producing <em>Escherichia coli</em></td>
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<td>WNV</td>
<td>West Nile virus</td>
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Introduction

Infectious diseases are illnesses caused by microorganisms, such as bacteria, viruses and parasites, which may cause serious illness or be transmitted to large numbers of individuals. As per Ontario’s Health Protection and Promotion Act (HPPA), any case of a number of diseases must be reported to the local Medical Officer of Health (refer to Appendix C for a full list).

This technical report, Infectious Diseases in Waterloo Region: Surveillance Report 2016, presents Waterloo Region’s rates of reportable diseases for 2016, provides comparisons of rates to the previous ten years (2006 to 2015) for historical context, as well as comparisons to provincial rates. Cases of disease included in this report are for individuals who were residents of Waterloo Region at the time of the onset of their illness.

For ease of reference, the diseases in this report are categorized as follows:

- Enteric diseases
- Vector-borne and zoonotic diseases
- Sexually transmitted and blood-borne infections
- Vaccine preventable diseases
- Other infectious diseases
- Outbreaks

Disease-specific data is presented in alphabetical order within each section and follows a standard format. Diseases are described individually if five or more cases were reported during 2016 or if Public Health undertakes specific measures to prevent transmission of the disease.
## Overall Findings

Table 1. Numbers and age-standardized incidence rates per 100,000 for all reportable diseases, Waterloo Region, 2016 and 2011-2015, and 2006-2015

<table>
<thead>
<tr>
<th>Rank</th>
<th>Disease¹</th>
<th># Cases in 2016</th>
<th>2016 Age-Standardized Rate per 100,000</th>
<th>Five-year average rate per 100,000 (2011-2015)</th>
<th>Ten-year average rate per 100,000 (2006-2015)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Chlamydia</td>
<td>1,583</td>
<td>278.8</td>
<td>228.9</td>
<td>205.2</td>
</tr>
<tr>
<td>2</td>
<td>Influenza²</td>
<td>376</td>
<td>69.0</td>
<td>65.4</td>
<td>54.5</td>
</tr>
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<td>3</td>
<td>Gonorrhea</td>
<td>234</td>
<td>41.2</td>
<td>30</td>
<td>26.7</td>
</tr>
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<td>4</td>
<td>Salmonellosis</td>
<td>126</td>
<td>22.9</td>
<td>21.9</td>
<td>22</td>
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<tr>
<td>5</td>
<td>Campylobacteriosis</td>
<td>125</td>
<td>22.8</td>
<td>28.6</td>
<td>29.2</td>
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<tr>
<td>6</td>
<td>Hepatitis C</td>
<td>116</td>
<td>21.0</td>
<td>21.9</td>
<td>23.6</td>
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<td>7</td>
<td>Invasive pneumococcal disease</td>
<td>56</td>
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<td>12.7</td>
<td>12.4</td>
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<td>8</td>
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<td>10.9</td>
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<td>28</td>
<td>5.2</td>
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<td>10</td>
<td>Encephalitis/meningitis</td>
<td>26</td>
<td>4.7</td>
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<td>2.7</td>
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<td>11</td>
<td>Group A streptococcal disease, invasive (iGAS)</td>
<td>22</td>
<td>4.1</td>
<td>5</td>
<td>5</td>
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<tr>
<td>12</td>
<td>Syphilis, other⁴</td>
<td>21</td>
<td>3.9</td>
<td>4.2</td>
<td>5.1</td>
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<tr>
<td>13</td>
<td>Syphilis, infectious⁵</td>
<td>19</td>
<td>3.4</td>
<td>4</td>
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<td>14</td>
<td>HIV/AIDS</td>
<td>18</td>
<td>3.3⁸</td>
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<td>2.7</td>
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<tr>
<td>15</td>
<td>Cryptosporidiosis</td>
<td>17</td>
<td>3.0⁸</td>
<td>2.8</td>
<td>3.2</td>
</tr>
<tr>
<td>16</td>
<td>Pertussis (whooping cough)³</td>
<td>13</td>
<td>2.3⁸</td>
<td>4.8</td>
<td>3.8</td>
</tr>
<tr>
<td>17</td>
<td>Tuberculosis (active)</td>
<td>11</td>
<td>2.0⁶</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>17</td>
<td>Yersiniosis</td>
<td>11</td>
<td>2.0⁶</td>
<td>1.1</td>
<td>1.7</td>
</tr>
<tr>
<td>18</td>
<td>Legionellosis</td>
<td>10</td>
<td>1.8⁸</td>
<td>2.2</td>
<td>1.3</td>
</tr>
<tr>
<td>19</td>
<td>Malaria</td>
<td>9</td>
<td>1.7⁶</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>19</td>
<td>Shigellosis</td>
<td>9</td>
<td>1.6⁶</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>20</td>
<td>Cyclosporiasis</td>
<td>8</td>
<td>1.5⁶</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>21</td>
<td>Verotoxin-producing Escherichia coli (VTEC)</td>
<td>7</td>
<td>1.3⁶</td>
<td>2.2</td>
<td>2.9</td>
</tr>
<tr>
<td>22</td>
<td>Hepatitis B</td>
<td>6</td>
<td>1.1⁶</td>
<td>0.3</td>
<td>0.7</td>
</tr>
<tr>
<td>22</td>
<td>Hepatitis A</td>
<td>6</td>
<td>1.0⁶</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>23</td>
<td>Lyme disease³</td>
<td>4</td>
<td>0.7⁶</td>
<td>0.8</td>
<td>0.6</td>
</tr>
<tr>
<td>24</td>
<td>Q Fever</td>
<td>1</td>
<td>0.2⁶</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>24</td>
<td>Typhoid/paratyphoid fever</td>
<td>1</td>
<td>0.2⁶</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>Disease</td>
<td>Cases</td>
<td>Rate (per 100,000)</td>
<td>2015</td>
<td>2016</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------</td>
<td>-------</td>
<td>------------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>24</td>
<td>Group B streptococcal disease, neonatal</td>
<td>1</td>
<td>0.26</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>24</td>
<td>Listeriosis</td>
<td>1</td>
<td>0.26</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>24</td>
<td>Mumps&lt;sup&gt;3&lt;/sup&gt;</td>
<td>1</td>
<td>0.26</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>25</td>
<td>Botulism</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25</td>
<td>Brucellosis</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td>25</td>
<td>Creutzfeldt-Jakob disease</td>
<td>0</td>
<td>0.0</td>
<td>0.1</td>
<td>0</td>
</tr>
<tr>
<td>25</td>
<td>Haemophilus influenzae B (Hib)</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25</td>
<td>Invasive meningococcal disease</td>
<td>0</td>
<td>0.0</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td>25</td>
<td>Measles</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td>25</td>
<td>Rabies</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25</td>
<td>West Nile virus (WNV)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>0</td>
<td>0.0</td>
<td>0.2</td>
<td>0.1</td>
</tr>
</tbody>
</table>


1 Disease ranking does not include latent tuberculosis or varicella infections.
2 Influenza data is reported for the 2006-7 season to the 2016-17 season which runs from September 1<sup>st</sup> through August 31<sup>st</sup> each year. Note that the 2015-16 data is not provided for the complete season and only includes data from September 1<sup>st</sup>, 2016 to April 30<sup>th</sup>, 2017.
3 Includes both confirmed and probable cases of amebiasis, mumps, Lyme disease, pertussis and WNV due to case definition changes in 2009 (see Appendix B for more information).
4 Other syphilis includes all other types of syphilis such as late latent or unspecified (the other category excludes early congenital syphilis).
5 Primary, secondary and early latent syphilis are all considered infectious (includes early latent; primary genital; primary other sites; secondary of skin and mucous membranes; secondary, other; infectious neurosyphilis and primary anal).
6 Rates are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.
Enteric Diseases

The following enteric diseases are included in this section:

- Amebiasis
- Brucellosis
- Campylobacteriosis
- Cryptosporidiosis
- Cyclosporiasis
- Giardiasis
- Hepatitis A
- Listeriosis
- Salmonellosis
- Shigellosis
- Typhoid/paratyphoid fever
- Verotoxin-producing *Escherichia coli* (VTEC)
- Yersiniosis
<table>
<thead>
<tr>
<th>Disease</th>
<th># Cases 2016</th>
<th>2016 Age-standardized rate per 100,000</th>
<th>5-year average rate per 100,000 (2011-2015)</th>
<th># Cases 2016</th>
<th>2016 Age-standardized rate per 100,000</th>
<th>5-year average rate per 100,000 (2011-2015)</th>
<th>2016 Standardized Rate Ratio (95% Confidence Interval)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmonellosis</td>
<td>126</td>
<td>22.9</td>
<td>21.9</td>
<td>3095</td>
<td>22.3</td>
<td>20.9</td>
<td>1.03 (0.86-1.23)</td>
</tr>
<tr>
<td>Campylobacteriosis</td>
<td>125</td>
<td>22.8</td>
<td>28.6</td>
<td>3440</td>
<td>24.5</td>
<td>27.2</td>
<td>0.93 (0.78-1.11)</td>
</tr>
<tr>
<td>Giardiasis</td>
<td>31</td>
<td>5.7</td>
<td>10.9</td>
<td>1188</td>
<td>8.6</td>
<td>9.9</td>
<td>0.66 (0.49-0.88)</td>
</tr>
<tr>
<td>Amebiasis²</td>
<td>28</td>
<td>5.2</td>
<td>5.3</td>
<td>814</td>
<td>5.9</td>
<td>5.9</td>
<td>0.88 (0.61-1.25)</td>
</tr>
<tr>
<td>Cryptosporidiosis</td>
<td>17</td>
<td>3³</td>
<td>2.8³</td>
<td>428</td>
<td>3.1</td>
<td>2.5</td>
<td>0.95 (0.59-1.52)</td>
</tr>
<tr>
<td>Yersiniosis</td>
<td>11</td>
<td>2³</td>
<td>1.1³</td>
<td>257</td>
<td>1.8</td>
<td>1.4</td>
<td>1.07 (0.57-2.00)</td>
</tr>
<tr>
<td>Shigellosis</td>
<td>9</td>
<td>1.6³</td>
<td>1.4³</td>
<td>364</td>
<td>2.6</td>
<td>2</td>
<td>0.61 (0.36-1.03)</td>
</tr>
<tr>
<td>Cyclosporiasis</td>
<td>8</td>
<td>1.5³</td>
<td>1.0³</td>
<td>274</td>
<td>2</td>
<td>1</td>
<td>0.74 (0.40-1.36)</td>
</tr>
<tr>
<td>VTEC</td>
<td>7</td>
<td>1.3³</td>
<td>2.2³</td>
<td>173</td>
<td>1.3</td>
<td>1.3</td>
<td>1.01 (0.47-2.15)</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>6</td>
<td>1.0³</td>
<td>1.1³</td>
<td>99</td>
<td>0.7</td>
<td>0.7</td>
<td>1.41 (0.54-3.70)</td>
</tr>
<tr>
<td>Typhoid/paratyphoid fever</td>
<td>1</td>
<td>0.2³</td>
<td>0.8³</td>
<td>101</td>
<td>0.7</td>
<td>0.9</td>
<td>0.26 (0.10-0.70)</td>
</tr>
<tr>
<td>Listeriosis</td>
<td>1</td>
<td>0.2³</td>
<td>0.4³</td>
<td>96</td>
<td>0.6</td>
<td>0.4</td>
<td>0.27 (0.10-0.75)</td>
</tr>
<tr>
<td>Brucellosis</td>
<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>3</td>
<td>0.0³</td>
<td>0.0³</td>
<td>---</td>
</tr>
</tbody>
</table>

Standardized rate ratio (SRR) refers to the ratio of the Waterloo Region age-standardized rate for 2016 compared to the Ontario age-standardized rate for 2015. The 95% confidence interval indicates the statistical significance of the SRR (if the 95% confidence interval contains 1.00, the two rates are not statistically different from one another). SRRs indicating significant differences between Ontario and Waterloo in 2016 are highlighted in yellow.

Includes both confirmed and probable amebiasis cases.

Rates are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.
Public Health Activities for Enteric Diseases

Region of Waterloo Public Health and Emergency Services:

- Receives, confirms, and investigates reports of enteric illness in the Region.
- Follows up with all cases and their contacts to adequately address and manage the infectious disease (e.g., reviews risk factors for disease acquisition and provides education for prevention; enforces work restrictions of food handlers and care providers; recommends that a case speak with their physician about treatment; provides and facilitates delivery of vaccine as indicated, etc.)
- Provides information to the public and various stakeholder groups including long-term care and child care centres on enteric diseases, transmission, risk factors and prevention strategies.
- Performs routine inspections of food premises, long-term care homes and retirement homes, residential facilities and day nurseries in order to prevent the occurrence and transmission of infectious and foodborne illness; the results of food premises and personal service settings inspections in Waterloo Region are available on Public Health’s website at http://checkit.regionofwaterloo.ca/Search.
- Performs routine inspections of recreation water facilities (e.g., pools, hot tubs, splash pads) in order to prevent the occurrence and transmission of infectious and waterborne illness; the results of public recreational water inspections in Waterloo Region are available on Public Health’s website at http://checkit.regionofwaterloo.ca/Search.
- Works in cooperation with federal and provincial partners including the Ministry of Health and Long Term Care, Ontario Ministry of Agriculture and Rural Affairs, and Canada Food Inspection Agency to identify and remove sources of contaminated food products from the consumer marketplace.
- Conducts disease surveillance and provide timely updates on local disease status to area health care providers and other stakeholders.
- Provides health education for staff of daycares, long-term care homes and retirement homes.
- Inspects and monitors water quality for small drinking water systems within the region and provides access to free bacteriological testing for private well water by offering sample pick-up and drop-off at eight locations within Waterloo Region, encouraging private well owners to sample their well water.
- Assists private well owners with understanding well water testing results, and follows up on all samples that test positive for E. coli or are overgrown with bacteria.
Amebiasis

Background

- Amebiasis is caused by a parasite called *Entamoeba histolytica*, which lives in human intestines (i.e., the gut) and is passed in the feces.
- It is spread mainly through ingestion of contaminated food and water but can also be spread through fecal-oral contact.
- Some who are infected may have no symptoms while others may have severe diarrhea and pain. It could also lead to infections involving the liver, lungs and brain.
- Although anyone can acquire amebiasis, those who are most at risk include: recent immigrants or visitors who have returned from countries with poor sanitation; persons who live in institutions; and men who have sex with men. The very young, the elderly, and pregnant women are most at risk of developing complications from this infection.
Figure 1. Age-standardized amebiasis\(^1\) incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016\(^2\)

- In 2016, there were 26 probable and two confirmed cases for a total of 28 cases of amebiasis in Waterloo Region (age-standardized incidence rate of 5.2 cases per 100,000); this is similar to the previous five-year annual average rate for 2011-2015 of 5.3 per 100,000.
- Due to changes in testing protocols from 2012 to 2013, nearly all amebiasis cases in the province since 2013 are defined as ‘probable’ cases. Previous provincial testing protocols typically yielded ‘confirmed’ amebiasis case results. This distinction in the case definition does not preclude the follow-up on cases performed by Region of Waterloo Public Health.
- Amebiasis rates in the region have fluctuated over time, ranging from a low of 3.3 cases per 100,000 in 2006 to a high of 7.0 cases per 100,000 in 2015.


\(^1\)Includes both confirmed and probable amebiasis cases.

\(^2\)The Waterloo Region rate for 2006 and 2014 is unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.
• Local amebiasis rates have consistently remained similar to or lower compared to provincial rates over the last ten years; in 2016, the local rate was not significantly different than that of the province (SRR = 0.88 [CI: 0.61-1.25]).
• In 2016, there were twice as many cases among males (N=19) than females (N=9), and the highest age-specific rates were among 25-29 year olds and 60-64 year olds (9.7 and 9.6 respectively).
• Of the 2016 Waterloo Region cases that had risk factor information available (N=13), 84.6 per cent were related to travel outside of the province.
• Due to the small number of cases in 2006 and 2014 and resulting unstable rates, caution should be used when interpreting this data.
Brucellosis

Background
- Brucellosis is an infectious disease caused by *Brucella* bacteria.
- People can get the disease when they consume infected meat or unpasteurized milk or if they come in close contact with an infected animal. Animals which are most commonly infected include sheep, cattle, goats, pigs, and dogs.
- In humans, brucellosis causes non-specific flu-like symptoms such as fever, sweating, anorexia (loss of appetite), headache, muscle pain, back pain, and physical weakness. Some severe infections of the brain or heart and long lasting symptoms (e.g., recurrent fevers, joint pain, pain in the testicles, fatigue, and depression) can also occur.
- Those at higher risk for the disease include slaughterhouse workers, meat inspectors, animal handlers, veterinarians, and laboratory workers.

Local Picture
- There were no cases of brucellosis in Waterloo Region in 2016. The last reported case in the region was in 2012.
- In 2016, there were 3 brucellosis cases in Ontario; the provincial 5-year annual average rate was of 5.4 per 100,000.
Campylobacteriosis

**Background**

- Campylobacteriosis is a disease caused by bacteria called *Campylobacter*. It is one of the most common causes of diarrhea-related illness in Canada and around the world.
- The most common way to become infected is by ingestion of undercooked meats such as poultry and/or raw or unpasteurized milk. The infection can also spread by cross-contamination (e.g., cutting meat on a cutting board, and then using the unwashed cutting board or utensil to prepare vegetables or other raw or lightly cooked foods).
- Common symptoms include mild to severe diarrhea, stomach pain, cramps, nausea, vomiting, fever, headache, and muscle pain.
- Although anyone can acquire the infection, those at higher risk of complications include infants and young children, pregnant women, the elderly, and people with weakened immune systems.

**Local Picture**

Figure 2. Age-standardized campylobacteriosis incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016

• Campylobacteriosis is the second most common enteric (intestinal-related) illness in Waterloo Region and Ontario.
• In 2016, there were 125 reported cases of campylobacteriosis in Waterloo Region (annual age-standardized incidence rate of 22.8 cases per 100,000).
• The current year’s incidence rate was lower than the previous five-year annual average for 2011-2015 (28.6 cases per 100,000).
• Over the last ten-year period, local campylobacteriosis rates have remained relatively stable, and consistent with rates at the provincial level; in 2016, the local rate was not significantly different compared to the provincial rate (SRR = 0.93 [CI: 0.78-1.11]).
• Increases in campylobacteriosis are generally seen in warmer months, with almost half (46.4 per cent) of local cases in 2016 occurring between June and September.
• In 2016, cases of campylobacteriosis were fairly evenly distributed among males (N=64) and females (N=61), and occurred in both young and older individuals; the highest age-specific rates were in the 0 to 4 year age group (51.4 cases per 100,000).
• Of the 2016 Waterloo Region cases that had risk factor information available (N=103), 30.1 per cent were related to travel outside of the province. For the remaining cases that did not report travel as a risk factor (N=72), the most common risk factors included possible consumption of undercooked poultry or meat (75.0 per cent) and contact with animals (e.g., pets, farm animals or petting zoo) (59.7 per cent).
Cryptosporidiosis

Background

- Cryptosporidiosis is a diarrheal illness caused by the parasite Cryptosporidium.
- It is transmitted through the fecal-oral route, which includes person-to-person contact, animal-to-person contact (e.g., from pets and farm animals), and food-borne transmission. Cryptosporidiosis can also be transmitted by waterborne contact, i.e., by drinking contaminated water or swallowing untreated recreational water (e.g., lakes or rivers).
- The main symptom is watery diarrhea. Other symptoms include abdominal cramps, fatigue, nausea, vomiting, and fever.
- Children under the age of two, animal handlers, travellers, men who have sex with men, and close contacts of infected people are at higher risk of infection.

Local Picture

Figure 3. Age-standardized cryptosporidiosis incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


1The Waterloo Region rates for 2008, 2012 and 2014-2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.
In 2016, there were 17 cases of cryptosporidiosis in Waterloo Region (age-standardized incidence rate of 3.0 cases per 100,000); this rate is similar to the previous five-year annual average for 2011-2015 (2.8 per 100,000).

In 2016, local and provincial rates of cryptosporidiosis were similar (SRR = 0.95 [CI: 0.59-1.52]), and have remained relatively stable over the last ten-year period.

Cryptosporidiosis cases in were higher among males (N=12) than females (N=5) in Waterloo Region in 2016, and the highest age-specific rates were among 20-24 year olds (12.4 cases per 100,000). There were very few cases among older adults.

A seasonal trend for cryptosporidiosis was observed among local cases in 2016 and in preceding years, with a pronounced peak in the number of reported cases between July and September; more than half of all local cases (59 per cent) occurred in July through September in 2016. Seasonal trends associated with cryptosporidiosis may correspond to an increase in outdoor activities, such as recreational swimming in outdoor lakes and rivers that occurs during the summer months.

Of the 16 cases in Waterloo Region in 2016 with available risk factor information, 25.0 per cent were related to travel outside of the province. Among locally-acquired cases (N=12), the most commonly reported risk factor was contact with animals (83.3 per cent) and poor hand hygiene (58.3 per cent).

Due to the small number of cases in 2008, 2012 and 2014-2016 and resulting unstable rates, caution should be used when interpreting this data.
Cyclosporiasis

Background
- Cyclosporiasis is a disease caused by a parasite called *Cyclospora cayetanensis*. The parasite infects the small intestines of humans.
- It is not very common in Waterloo Region and is usually associated with travel; cyclosporiasis is more common in tropical or subtropical countries.
- *Cyclospora* is spread when people eat or drink food or water that has been contaminated with infected feces.
- Cyclosporiasis usually causes watery diarrhea. Other common symptoms include: loss of appetite, weight loss, stomach cramps, bloating/gas, nausea, vomiting, fever, and fatigue.

Local Picture

Figure 4. Age-standardized cyclosporiasis incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


'1The Waterloo Region rates for 2006 to 2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.
• In 2016, there were eight cases of cyclosporiasis in Waterloo Region (age-standardized incidence rate of 1.5 cases per 100,000); this rate is slightly higher than the previous five-year annual average rate for 2011-2015 (1.0 per 100,000).

• While the number of cases and incidence rates fluctuate, Waterloo Region rates have remained similar to provincial rates since 2006 (SRR=0.74 [CI: 0.40-1.36] in 2016).

• There were no notable differences in case distribution by sex or age in Waterloo Region in 2016.

• Seasonal increases in cyclosporiasis are typically observed in warmer months, with the majority of cases occurring from June to September. During this period in 2016, 87.5 per cent of local cases were reported.

• In 2016, all Waterloo Region cases had risk factor information available. A majority (75.0 per cent) had travelled outside of the region during the 14-day incubation period; there were no known risk factors among locally-acquired cases.

• Cyclosporiasis is not endemic in Canada and its occurrence is most frequently associated with consumption of contaminated imported food or travel to endemic countries.

• Due to the small number of cases and resulting instability in rates, caution should be used when interpreting this data.
Giardiasis

Background
- Giardiasis is a diarrheal infection caused by a parasite called *Giardia lamblia*.
- It is one of the most common waterborne illnesses in North America. Giardiasis can be spread through ingestion of contaminated food or water, such as through swallowing untreated recreational water (e.g., lakes or rivers), or directly from fecal-oral contact such as in child care settings or through sexual contact.
- Giardiasis can cause watery diarrhea, foul smelling bowel movements, weight loss, bloating, and stomach pain/cramps.
- Travelers to countries where giardiasis is common, those who are in close contact with someone who has the illness, people who swallow contaminated drinking water (e.g., untreated water from lakes or rivers), and men who have sex with men are among those at higher risk of infection.

Local Picture

Figure 5. Age-standardized giardiasis incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016

• In Waterloo Region and Ontario, giardiasis was the third most common enteric disease reported in 2016.
• In 2016, there were 31 reported cases of giardiasis in Waterloo Region (age-standardized incidence rate of 5.7 cases per 100,000); this rate was significantly lower than that of the previous year (9.7 cases per 100,000 in 2015), and lower than that of the previous five-year annual average rate (10.9 cases per 100,000).
• In Waterloo Region, the rate of giardiasis has been gradually decreasing since 2006 (from 13.5 cases per 100,000 in 2006 to 5.7 cases per 100,000 in 2016). Although rates of giardiasis have demonstrated a decreasing trend since previous years, this change may be in part due to a case definition update in early 2015 that specified that a person must be symptomatic to meet the case definition.
• In 2016, the local age-standardized rate was significantly lower compared to the Ontario rate (SRR = 0.66 [CI: 0.49-0.88]).
• There were no notable differences in giardiasis case distribution in Waterloo Region in 2016 by sex.
• The local rate of giardiasis in 2016 was highest among adults aged 30 to 34 years (12.7 cases per 100,000).
• In 2016, most giardiasis cases occurred in the months of May through August.
• Of the 2016 Waterloo Region giardiasis cases that has risk factor information available (N=31), 38.7 per cent reported travel outside of the province. Common risk factors reported by non-travel related cases included consumption of raw/unwashed fruits and vegetables (68.4 per cent), and contact with animals (47.4 per cent).
Hepatitis A

Background
- Hepatitis refers to the inflammation of the liver which can be due to a number of causes. In a hepatitis A infection, the cause is the hepatitis A virus.
- Hepatitis A is spread when the hepatitis A virus is taken in by mouth from contact with objects, food, or drinks contaminated by the feces of an infected person. This can occur through person to person contact or ingestion of contaminated food or water.
- Symptoms are often abrupt and include tiredness, fever, abdominal pain, loss of appetite, nausea, diarrhea and jaundice (yellowing of the skin and eyes). Some people may have no symptoms, and adults are more likely to have symptoms than children.
- Those at higher risk of contracting hepatitis A include travellers to regions with poor sanitation and/or high rates of hepatitis A, sexual contacts of infected persons, men who have sex with men, and household contacts of cases.
Local Picture

Figure 6. Age-standardized hepatitis A incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016

![Graph showing age-standardized hepatitis A incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016.]


1The Waterloo Region rates for 2006 to 2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, there were six reported cases of hepatitis A in Waterloo Region (age-standardized incidence rate of 1.0 cases per 100,000).
- Since 2006, the local annual rate of hepatitis A has fluctuated but remained relatively similar over time; the current year’s incidence rate is very similar to that of the previous five-year annual average rate for 2011-2015 (1.1 cases per 100,000).
- Over the past ten years, local rates of hepatitis A have been similar to provincial rates; the rate in 2016 was not significantly higher than the provincial rate (SRR = 0.54-3.70).
- Among Waterloo Region hepatitis A cases in 2016, travel outside of the country was the most common risk factor (66.7 per cent). All travel cases were reported that they were not immunized for hepatitis A. Locally-acquired cases reported...
consumption of raw fruits and vegetables and close contact with a case as the most common risk factors.

- Due to the small number of cases and resulting instability in rates, caution should be used when interpreting this data.
Listeriosis

Background

- Listeriosis is an illness caused by eating food contaminated with bacteria called *Listeria monocytogenes*. The bacteria are commonly found in the environment (i.e., water and soil).
- Some foods are more likely to carry listeria than others. Those that present a higher risk include raw or unpasteurized milk, soft cheeses and ready-to-eat meats such as hot dogs, pâté and deli meats.
- The disease primarily affects the elderly, newborns, pregnant women, and those with weakened immune systems. These individuals should avoid eating the foods mentioned above to reduce the risk of becoming infected with listeriosis.
- Listeriosis usually causes fever and muscle aches. More severe consequences of listeriosis include septicemia (infection of blood and organs) and meningitis (infection of the lining of the brain). Infections during pregnancy can lead to complications such as miscarriage and infection of the newborn.

Local Picture

Figure 7. Age-standardized listeriosis incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


1The Waterloo Region rates for 2006 to 2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.
• In 2016, there was one reported case of listeriosis in Waterloo Region (incidence rate of 0.2 cases per 100,000); this rate is similar to the previous five-year annual average for 2011-2015 (0.4 cases per 100,000).
• The local rate of listeriosis in 2016 was significantly lower compared to the provincial rate (SRR = 0.27 [CI: 0.10-0.75]).
• Provincial incidence rates of listeriosis have remained relatively stable from 2006 to 2016, with the exception of 2008, when a large national outbreak occurred associated with ready-to-eat deli meats.
• Due to the small number of cases and resulting instability in rates, caution should be used when interpreting this data.
Salmonellosis

Background

- *Salmonella* are a group of bacteria that is commonly found in the intestines of animals and birds. The bacteria can be transmitted to people when they eat foods contaminated with animal feces.
- Eating contaminated foods is the most common cause of infection with *Salmonella* bacteria. Contaminated foods could include raw or under cooked eggs or egg products, meat, poultry, raw fruit and vegetables. It can also be spread from person-to-person (e.g., through inadequate hand washing after using the toilet).
- Symptoms of salmonellosis include fever, headache, diarrhea, nausea and stomach cramps.
- Those at higher risk of getting the infection include infants, the elderly, and persons with weakened immunity (e.g., those with HIV or taking corticosteroids). Owning a bird or reptile can also put a person at risk, since these animals can be carriers of the bacteria without having any symptoms.

Local Picture

Figure 8. Age-standardized salmonellosis incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016

• Salmonellosis was the most common enteric infection in Waterloo Region, with 126 cases reported in 2016.
• Local incidence rates of salmonellosis have remained similar to provincial rates over the previous 10-year period; in 2016, the local age-standardized incidence rate was 22.9 cases per 100,000 which was similar to that of the province (SRR = 1.03 [CI: 0.86-1.23]).
• Since 2006, the local rate has remained relatively stable; the current year’s rate is similar to the previous five-year annual average rate for 2011-2015 (21.9 cases per 100,000).
• In 2016, there were no notable differences in salmonellosis distribution by sex or age group; the highest age-specific incidence rate occurred among the 25 to 29 year age group (37.3 cases per 100,000).
• Seasonally, the highest rates in Waterloo Region are typically seen in the months of July and August, although cases occur all throughout the year.
• Among 2016 cases with risk factor information available (N=102), 39.2 per cent of cases reported a risk factor of travel outside of the province during the incubation period. Among non-travel-related cases, consumption of raw or undercooked poultry, eggs and meat, or cross-contamination of ready-to-eat foods (such as raw fruits and vegetables) with raw poultry or meat were common risk factors for salmonellosis cases.
Shigellosis

Background

- Shigellosis is an enteric infection that is caused by a group of bacteria called *Shigella*.
- These bacteria live in the intestines of infected persons.
- *Shigella* is passed from person to person by the fecal-oral route. It can spread if hands are not properly washed, especially after going to the toilet or changing diapers, through certain sexual activities (e.g., anal-oral sex), and by eating food or drinking water that has been contaminated with the bacteria.
- Shigellosis commonly causes diarrhea (even bloody diarrhea), fever, nausea, stomach cramps, and sometimes vomiting.
- Those at higher risk of infection include children, men who have sex with men, persons with weakened immune systems, and the elderly.

Local Picture

Figure 9. Age-standardized shigellosis incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


The Waterloo Region rates for 2006 to 2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.
• In 2016, there were nine reported cases of shigellosis in Waterloo Region for an age-standardized incidence rate of 1.6 cases per 100,000, which is similar to the average annual rate for the previous five years (1.4 cases per 100,000).
• Local rates have generally remained similar to or lower than provincial rates over the past 10-year period; in 2016, the local rate of shigellosis was not significantly different from that of the province (SRR = 0.61 [CI: 0.36-1.03]).
• The majority of cases in 2016 were among males (77.8 per cent), and due to the small number of cases there were no discernible trends across age groups or by season.
• Of the nine Waterloo Region cases reported in 2016 with risk factor information, 44.4 per cent were associated with travel outside the province during the incubation period. Locally acquired cases largely reported risk factors related to consumption of raw/unwashed fruits or vegetables and anal-oral contact.
• Due to small numbers and resulting instability in rates, caution should be used when interpreting this data.
Typhoid/Paratyphoid Fever

Background

- Typhoid fever is a disease caused by bacteria called *Salmonella typhi*. Paratyphoid fever is caused by bacteria called *Salmonella paratyphi*. These diseases are similar, but typhoid fever tends to be more common and severe than paratyphoid fever.
- The bacteria that cause typhoid and paratyphoid fever are found in the feces of infected people. It is commonly spread by eating food or drinking water that has been contaminated with the bacteria. It is also spread from person to person by the fecal-oral route (e.g., hands not properly washed after using the toilet or changing diapers, or through certain sexual activities such as anal-oral sex).
- The symptoms can range from mild to severe and include fever, headache, malaise (general discomfort), lack of appetite, and constipation or diarrhea.
- The greatest risk of infection for Canadians occurs while they are traveling to areas with poor sanitation. Children and people with weakened immune systems are at greater risk of getting the infection.
Local Picture

Figure 10. Age-standardized typhoid/paratyphoid fever incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


The Waterloo Region rates for 2006 to 2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, there was one case of typhoid/paratyphoid fever reported in Waterloo Region (age-standardized incidence rate of 0.2 cases per 100,000); this is lower than the previous five-year annual average rate for 2011-2015 (0.8 cases per 100,000).
- Local incidence rates have remained similar to or lower than provincial rates over the previous 10 years; in 2016, the local typhoid/paratyphoid fever rate was significantly lower than that of the province (SRR =0.26 [CI: 0.10-0.70]).
- Cases among Waterloo Region residents have been due to travel outside of the province.
- Due to the small number of cases and resulting instability in rates, caution should be used when interpreting this data.
Verotoxin producing *Escherichia Coli* (VTEC)

**Background**

- *Escherichia coli* or *E. coli* is a bacterium with many subtypes. Most subtypes of *E. coli* are harmless and live in the intestine (gut) of humans and animals. However, there are other subtypes of *E. coli* such as verotoxin-producing *Escherichia coli* (VTEC) that produce toxins and can cause severe illness. The most common strain from the VTEC group is *E. coli* O157:H7.
- *E. coli* is spread through eating contaminated food or drinking contaminated fluids (e.g., water, unpasteurized juice or milk). *E. coli* is found in feces and can also spread from person to person as a result of inadequate hand washing, and through improper food handling.
- The symptoms of *E. coli* infection include severe stomach pain/cramps, diarrhea/bloody diarrhea, nausea, vomiting, and fever. Some people may develop complications involving the kidneys (hemolytic uremic syndrome), which can be life-threatening.
- Those at higher risk of complications include: children, the elderly, and those with weakened immune systems. Eating undercooked ground beef, cheese or milk products made from raw or unpasteurized milk, and drinking unpasteurized milk and fruit juices are key risk factors for getting the infection.
Local Picture

Figure 11. Age-standardized VTEC incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


The Waterloo Region rates for 2006-2011 and 2013-2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, there were seven cases of VTEC reported in Waterloo Region, for an age-standardized incidence rate of 1.3 cases per 100,000; this is lower than the previous five-year annual average for 2011-2015 (2.2 cases per 100,000).
- From 2006 to 2016, the annual incidence rate of VTEC has generally declined in Waterloo Region by approximately 80%. This is consistent with a steady decrease in provincial rates over the same period.
- In 2016, the local incidence rate of VTEC was similar to the provincial rate (SRR = 1.01 [CI: 0.47-2.15]). The local incidence rates in 2006 and 2012 were significantly higher than the provincial rate; otherwise local rates were not statistically different from provincial rates over the last 10-year period.
- The increase in cases in 2006 was due, in part, to an outbreak in a child care centre. The increase in VTEC cases in 2012 was due to 10 cases linked to family clusters (multiple family members becoming ill from a common source and then through person to person spread).
- In 2016, more than two-thirds of cases (N=5) occurred among females, and the highest age-specific rate occurred in those aged 15 to 19 years (6.0 cases per 100,000).
- Increases in cases of VTEC are typically observed in the warmer months; locally, half of all cases (N=5) in 2016 were reported in July through September.
- Of the seven local cases with risk factor information available, common exposures included consumption of raw unwashed vegetables and fruits, consumption of ground beef (eating undercooked ground beef is a key risk factor for infection), and consumption of raw/unpasteurized juice or cider.
- Due to the small number of cases and resulting instability in rates, caution should be used when interpreting this data.
Yersiniosis

Background
- Yersiniosis is an infection caused by a bacterium of the genus *Yersinia*. Most human infections are caused by *Yersinia enterocolitica*. Yersiniosis is more common in children.
- People get infected with yersiniosis by drinking contaminated fluids and eating contaminated food, especially raw or undercooked pork products.
- If proper hand washing is not practiced after using the toilet or handling raw meat, an infected person can transfer the bacteria to food and objects. A child can become infected if they consume contaminated food made by a parent or caretaker.
- *Y. enterocolitica* can also be spread to humans by infected pets through fecal-oral transmission.
- The symptoms of yersiniosis include fever, abdominal pain and diarrhea (often bloody).
- Those who are at a higher risk of infection and severe illness include people with weakened immune system (e.g., with HIV/AIDS), those undergoing chemotherapy, young children, and the elderly.
Local Picture

Figure 12. Age-standardized yersiniosis incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


1The Waterloo Region rates for 2006 to 2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, there were 11 cases of yersiniosis in Waterloo Region (age-standardized incidence rate of 2.0 cases per 100,000); this is slightly higher than the previous five-year annual average for 2011-2015 (1.1 per 100,000).
- The local annual incidence rate of yersiniosis has shown a slight increasing trend in recent years, although current rates are still lower than they were 10 years ago; a similar trend has been observed provincially during the same time period.
- In 2016, the Waterloo Region yersiniosis age-standardized incidence rate was similar to that of the province (SRR = 1.07 [CI: 0.57-2.00]); local rates have been similar to or lower than that of the province over the past 10 years.
- In 2016, there were no discernible trends across age groups or by season.
- Yersiniosis typically occurs more frequently in colder seasons, although there were no clear seasonal trends in Waterloo Region in 2016.
• Of the 10 local cases of yersiniosis in 2016, 40.0 per cent reported travelling outside the province within the 11-day incubation period before illness onset. Other risk factors among non-travel-related cases included consumption of undercooked pork, contact with animals and having a compromised immune system.

• Due to the small number of cases and resulting instability in rates, caution should be used in interpreting this data.
Vector-Borne and Zoonotic Diseases

For the purposes of this report, diseases transmitted by vectors (e.g., mosquitoes, ticks) and animals include:

- Lyme disease
- Malaria
- Rabies
- West Nile virus (WNV)

Table 3. Numbers and age-standardized incidence rates per 100,000 for vector-borne and zoonotic diseases, Waterloo Region & Ontario, 2016 and 2011-2015 (five-year annual average)

<table>
<thead>
<tr>
<th>Disease</th>
<th>Waterloo Region</th>
<th>Ontario</th>
<th>2016 Standardized rate ratio (95% confidence interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># Cases in 2016</td>
<td>2016 Age-standardized rate per 100,000</td>
<td>5-year average rate per 100,000</td>
</tr>
<tr>
<td>Malaria</td>
<td>9</td>
<td>1.72^2</td>
<td>0.92^2</td>
</tr>
<tr>
<td>Lyme disease^3</td>
<td>4</td>
<td>0.72^2</td>
<td>0.82^2</td>
</tr>
<tr>
<td>West Nile virus^3</td>
<td>0</td>
<td>0.0^2</td>
<td>0.2</td>
</tr>
<tr>
<td>Rabies</td>
<td>0</td>
<td>0.0^2</td>
<td>0.0^2</td>
</tr>
</tbody>
</table>


1 Standardized rate ratio (SRR) refers to the ratio of the Waterloo Region age-standardized rate for 2015 compared to the Ontario age-standardized rate for 2015. The 95% confidence interval indicates the statistical significance of the SRR (if the 95% confidence interval contains 1.00, the two rates are not statistically different from one another). SRRs indicating significant differences between Ontario and Waterloo in 2016 are highlighted in yellow.

2 Rates are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

3 Includes both confirmed and probable Lyme disease and West Nile virus cases.
Public Health Activities for Vector-Borne and Zoonotic Diseases

Region of Waterloo Public Health and Emergency Services:
- Reduces the risk of exposure to Lyme disease and West Nile virus through public education, investigation of suspect human cases, vector surveillance, and the implementation of vector control measures.
- Implements vector control measures for West Nile virus including larvicide treatment of municipal catch basins and storm water management ponds.
- Facilitates the identification and testing of ticks that are found on humans as a surveillance activity.
- Raises awareness about diseases through the provision of information regarding the disease, its transmission, risk factors, and prevention strategies.
- Investigates all reported animal to human biting incidents, provides recommendations regarding post-exposure prophylaxis, and dispenses rabies vaccine.
- Investigates and confirms human cases of WNV, Lyme disease and malaria identified by health care providers and laboratories.
Lyme Disease

Background

- Lyme disease is an infection caused by the bacteria *Borrelia burgdorferi*. In Ontario, the tick species responsible for transmitting Lyme disease to people is the black-legged tick, also known as the deer tick. While this tick is not currently established in Waterloo Region, areas along the north shores of Lake Erie and Lake Ontario and the east shore of Lake Huron have been identified as endemic for the black-legged tick that can transmit Lyme disease. Public Health Ontario has identified certain areas of the province which are considered higher risk for the acquisition of Lyme. A map can be found at: https://www.publichealthonario.ca/en/eRepository/Lyme_disease_risk_areas_map.pdf.
- The common symptoms of Lyme disease may include a red bull’s eye rash (also called erythema migrans), fever, headache, muscle/joint pain, and fatigue. If untreated, the disease can progress to cause infections of the heart, brain and lining surrounding the brain, and inflammation of joints.
- The risk of acquiring infection may be increased by spending time outdoors in woody or grassy areas where blacklegged ticks are present; having exposed areas of skin while visiting places where such ticks are commonly found; not using an insect repellant containing DEET or Icaridin; and not removing blacklegged ticks attached to the body within 24 hours.
Local Picture

Figure 13. Age-standardized Lyme disease$^1$ incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016$^2$

![Graph showing age-standardized Lyme disease incidence rates per 100,000 by year for Waterloo Region and Ontario, 2006-2016.]


$^1$ Includes both confirmed and probable Lyme disease cases.

$^2$ The Waterloo Region rates for 2006-2009 and 2011-2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, there were four cases of Lyme disease among Waterloo Region residents, for an age-standardized incidence rate of 0.7 cases per 100,000; this is slightly higher than the previous five-year average annual rate for 2011-2015 (0.8 cases per 100,000).
- The local rate of Lyme disease has remained similar to or lower than that of the province since 2006; in 2016, the age-standardized incidence rate was significantly lower than that of the province (SRR=0.27 [CI: 0.16-0.45]).
- Lyme disease acquisition typically occurs in the warmer summer months (i.e., June to September). The Lyme disease cases reported among Waterloo Region residents in 2016 is consistent with this seasonal trend and all cases occurred in the months of June, July and August.
- At the present time, Waterloo Region is not an endemic area for the black-legged tick. The cases reported in Waterloo Region in 2016 were not locally acquired, and were related to travel to a high-risk area in Ontario or outside of the province.
- Due to the small number of cases and resulting instability in rates, caution should be used when interpreting this data.
Malaria

Background

- Malaria is a common and life-threatening parasitic disease in many tropical and subtropical countries. The disease is transmitted by the female *Anopheles* mosquitoes.
- Malaria is currently endemic in over 100 countries, many of which are popular travel destinations. It is not endemic to Canada and cases diagnosed in Canada are acquired during travel to an endemic area.
- Infection may be marked by an acute fever and other clinical symptoms. Some forms of malaria may remain dormant in the liver and cause relapses in illness for up to five years after initial exposure.
- Travellers to endemic areas and persons returning to visit their country of origin in such areas are at increased risk for infection if anti-malarial medication and precautions to reduce mosquito bites are not taken.
- Young children, pregnant women and persons with human immunodeficiency virus (HIV) are most at risk from malaria and its complications.
Local Picture

Figure 14. Age-standardized malaria incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016.


The Waterloo Region rates for 2006 to 2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, there were nine cases of malaria reported among residents of Waterloo Region. The age-standardized incidence rate for 2016 was 1.7 cases per 100,000 which is higher than the previous five-year average annual rate for 2011-2015 (0.9 cases per 100,000).
- The local malaria rate in 2016 was similar to the provincial rate (SRR = 1.10 [CI: 0.55-2.21]). Local rates have remained similar or lower compared to provincial rates over the previous 10-year period.
- Due to the small number of cases and resulting instability in rates, caution should be used in interpreting this data.
Rabies

Background
- Rabies is a disease of the central nervous system that can affect humans and other mammals.
- Infection can occur when an infected animal bites a person, or when the saliva from an infected animal gets into persons eyes, nose, mouth or an open wound.
- Rabies infection in humans is almost always fatal, making prevention extremely important.
- Risk factors include being bit by animals, especially animals that are common rabies carriers, and travel to a country where rabies is endemic in animals.

Local Picture
- There have been no reports of human cases of rabies in the Waterloo Region from 2006 to 2016.
- Although rare, the possibility of human rabies acquired from animal bites continues to exist, as rabies in animals can be found on occasion in Waterloo Region.
- While the risk for the general public of acquiring rabies remains low in Waterloo region, wildlife in the region and surrounding areas have recently tested positive for rabies. It is important for individuals with an exposure (i.e., bite or scratch) to raccoons, skunks and other wildlife or animals to receive prompt assessment in order to determine the possible need for rabies post exposure prophylaxis.
- The last case of (fatal) human rabies reported by the province occurred in 2012, however this case contracted the disease outside of Canada.
West Nile Virus (WNV)

Background
- West Nile virus (WNV) is a virus transmitted to humans through the bite of an infected mosquito. Mosquitoes can transmit the virus after feeding on an infected bird.
- The risk of infection is low with less than one per cent of people infected becoming ill enough to be hospitalized. Around one in five people will experience symptoms. Symptoms can include fever, headache, nausea/vomiting, body ache, skin rash and swollen glands. While most cases are asymptomatic or present with mild illness, WNV can cause neurological symptoms (i.e. encephalitis) as well.
- Anyone can be infected with WNV, but the elderly and those with a weakened immune system (e.g., having HIV/AIDS, undergoing chemotherapy, taking corticosteroids) are at greater risk.
Local Picture

Figure 15. Age-standardized West Nile virus\(^1\) incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016\(^2\)

<table>
<thead>
<tr>
<th>Year</th>
<th>Waterloo probable cases</th>
<th>Waterloo confirmed cases</th>
<th>Waterloo rate</th>
<th>Ontario rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
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<td>0</td>
<td>0.4</td>
</tr>
<tr>
<td>2007</td>
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</tr>
<tr>
<td>2008</td>
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<td>0.1</td>
</tr>
<tr>
<td>2009</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>2010</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>2011</td>
<td>1</td>
<td>3</td>
<td>0.6</td>
<td>2.0</td>
</tr>
<tr>
<td>2012</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.4</td>
</tr>
<tr>
<td>2013</td>
<td>0</td>
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</tr>
<tr>
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<td>0</td>
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</tr>
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</tr>
<tr>
<td>2016</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.4</td>
</tr>
</tbody>
</table>


\(^1\) Includes both confirmed and probable West Nile virus cases.

\(^2\) The Waterloo Region rates for 2011-2012 and 2015, and the Ontario rates for 2007-2010 and 2014 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- There were no cases of West Nile virus in Waterloo Region in 2016; there were 55 cases of West Nile virus reported in Ontario during the same year at an age-standardized incidence rate of 0.5 cases per 100,000.
- There was a spike in West Nile virus activity across the province in 2012, but the incidence has decreased since that time; local incidence rates have remained similar to or lower than provincial rates since 2006.
- Due to the small number of cases locally and resulting instability in rates, caution should be used when interpreting the data.
Sexually Transmitted and Blood-borne Infections

For the purposes of this report, sexually transmitted and blood-borne infections include:

- Chlamydia
- Gonorrhea
- Hepatitis B
- Hepatitis C
- HIV/AIDS
- Syphilis (infectious and other)

Table 4. Numbers and age-standardized incidence rates per 100,000 for sexually transmitted and blood-borne infections, Waterloo Region & Ontario, 2016 and 2011-2015 (five-year annual average)

| Disease                  | Waterloo Region | Ontario      | Waterlo Region
|--------------------------|-----------------|--------------|--------------------------|
|                          | # Cases in 2016 | # Cases in 2016 | 2016 Age-standardized rate per 100,000 (2011-2015) | 2016 Age-standardized rate per 100,000 (2011-2015) | 5-year average rate per 100,000 (2011-2015) | 5-year average rate per 100,000 (2011-2015) | 2016 Standardized rate ratio (95% confidence interval)
| Chlamydia                | 1583            | 41,833       | 278.8          | 228.9          | 303.5          | 269.1          | 0.92 (0.88-0.96)
| Gonorrhea                | 234             | 6,780        | 41.2           | 30            | 49.2           | 36.4           | 0.84 (0.74-0.94)
| Hepatitis C              | 116             | 4,343        | 21             | 21.9          | 31.1           | 31.3           | 0.68 (0.58-0.79)
| Syphilis, other          | 21              | 694          | 3.9            | 4.2           | 4.9            | 4.9            | 0.79 (0.53-1.16)
| Syphilis, infectious      | 19              | 1,392        | 3.4            | 4             | 10.2           | 6.4            | 0.34 (0.26-0.44)
| HIV/AIDS                 | 18              | 893          | 3.34           | 2.04          | 6.5            | 6.5            | 0.5 (0.36-0.70)
| Hepatitis B              | 6               | 115          | 1.14           | 0.34          | 0.8            | 0.8            | 1.34 (0.52-3.43)


Standardized rate ratio (SRR) refers to the ratio of the Waterloo Region age-standardized rate for 2015 compared to the Ontario age-standardized rate for 2015. The 95% confidence interval indicates the
statistical significance of the SRR (if the 95% confidence interval contains 1.00, the two rates are not
statistically different from one another). SRRs indicating significant differences between Ontario and
Waterloo in 2016 are highlighted in yellow.

2 Other syphilis includes all other types of syphilis such as late latent or unspecified (the other category
excludes early congenital syphilis).

3 Primary, secondary and early latent syphilis are all considered infectious (includes early latent; primary
genital; primary other sites; secondary of skin and mucous membranes; secondary, other; infectious
neurosyphilis and primary anal).

4 Rates are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be
interpreted with caution.
Public Health Activities for Sexually Transmitted and Blood-Borne Infections

Region of Waterloo Public Health and Emergency Services:

- Provides sexual health clinics at Public Health offices and other community locations which offer free testing, treatment and counselling for sexually transmitted and blood-borne infections; two of these clinics are specifically for youth.
- Receives and investigates positive laboratory reports of sexually transmitted and blood-borne infections in the Region.
- Offers supportive services including a sexual health phone line and actively promotes healthy sexuality through general preventive counselling, including risk reduction counselling, and the promotion and distribution of free condoms.
- Provides free and confidential testing for HIV, provides counselling (pre- and post test) regarding exposure, HIV disclosure requirements, risk reduction and safer/safe sex practices.
- Distributes free medication for sexually transmitted infections (STIs) to health care providers for the treatment of chlamydia, gonorrhea and syphilis.
- Works with health care providers to support them in following current provincial treatment guidelines.
- Developed and is implementing the Waterloo Region Sexual Health Youth Strategy in partnership with community stakeholders. The strategy outlines a multi-year action plan to promote healthy sexuality among youth in Waterloo Region, and to provide strategic direction for youth sexual health education, programs, and services for implementation. It focuses on three key focus areas: access to programs and services, education and parents.
- Supports students and educators (i.e., public health nurse availability onsite on a weekly basis to provide sexual health services, curriculum support, staff consultation, one-on-one counselling with students) in Waterloo Region District School Board secondary schools, and provides support to educators (i.e., curriculum support, consultations with staff) in Waterloo Catholic District School Board schools.
- Collaborates with community partners to improve harm reduction programs and services. Harm reduction strategies are most effective against blood-borne infections such as hepatitis B, C and HIV/AIDS.
- Provides needle syringe programs both directly and in partnership with several community agencies in Waterloo Region.
- Performs routine inspections of personal service settings (i.e., beauty and body art businesses) in order to prevent the occurrence and transmission of blood-borne infections, and provide education to staff.
- Investigates infection prevention and control complaints in regulated health care settings to determine the risk of transmission of infectious diseases and provides recommendations and practice requirements to reduce the risk.
- Provides free hepatitis B vaccine to students in Grade 7 through the Region of Waterloo Public Health school immunization program as per the Immunization of School Pupils Act; also provides the vaccine to those at higher risk of acquiring hepatitis B.
- Provides presentations about healthy sexuality to parents, community professionals, and community groups.
- Provides support and consultation to designated officers (i.e., first responders) after occupational exposures to facilitate assessment, source testing and results.
Chlamydia

Background

- Chlamydia is one of the most common sexually transmitted infections (STIs). It is caused by a bacterium called *Chlamydia trachomatis*, and is both preventable and curable.
- Chlamydia is spread through unprotected anal, oral or vaginal sex with an infected person. It can also be passed from an infected mother to her baby during delivery. A person remains infectious until properly treated.
- Chlamydia can occur in both men and women. Some infected persons, usually women, may not show symptoms. Women who have symptoms experience increased vaginal discharge and/or irritation, bleeding during or after sexual intercourse, pain during sex, and painful or burning urination. Untreated chlamydia can lead to infertility and complicated (ectopic) pregnancy in women. Men who have symptoms experience discharge and/or itching from the penis, pain or swelling in the testicles, and painful or burning urination.
- Those at risk of acquiring chlamydia include any sexually active person, particularly individuals who:
  - do not use condoms
  - had more than one sexual partner in the last six months
  - had a new sexual partner in the last two months
Local Picture

Figure 16. Age-standardized chlamydia incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


- Chlamydia is the most commonly reported infectious disease in Waterloo Region and constitutes the vast majority of STI cases both locally (79.3 per cent) and provincially (74.6 per cent).
- In 2016, there were 1,583 chlamydia cases reported in Waterloo Region, with an age-standardized incidence rate of 278.8 cases per 100,000. This rate is slightly higher than the previous five-year annual average for 2011-2015 (228.9 cases per 100,000).
- Chlamydia rates have been steadily increasing over the last 10 years, both locally and provincially (70.4 per cent increase and 74.5 per cent increase between 2006 and 2016, respectively). The cause of the increasing trend in the incidence of chlamydia, both locally and in Ontario, has not been fully explained; although, there has been an annual increase (10 to 15 per cent) in the number of Chlamydia tests conducted in Ontario each year.
- The local rate of chlamydia in 2016 was significantly lower than the provincial rate (SRR = 0.92 [CI: 0.88-0.96]), and has remained significantly lower since 2006.
Figure 17. Chlamydia cases and age-specific incidence rates per 100,000 among 15 to 24 year olds, by sex and year, Waterloo Region, 2006-2016


- Rates of chlamydia are particularly high among females in the 15 to 24 year age group; in 2016, females aged 20 to 24 years had the highest age-specific incidence rate (2,032.4 cases per 100,000), followed by females aged 15 to 19 years (1386.7 cases per 100,000).
- Among males in 2016, those aged 20 to 24 years had the highest age-specific incidence rate (1129.4 cases per 100,000), followed by males aged 25 to 29 years (826.7 cases per 100,000).
- In 2016, 98 cases of chlamydia were concurrently infected with gonorrhea; co-infections were highest in the 25 to 29 year age group (N=28), followed by the 20 to 24 year (N=26). Cases with co-infections were evenly distributed among males and females.
• Among chlamydia cases in Waterloo Region with self-reported risk factor information in 2016 (N= 1,407), the most common risk factors included not using a condom (91.6 per cent), having a new sexual partner in the last two months (42.9 per cent), and having more than one sexual partner in the last six months (37.3 per cent).

• Increased rates in sexually transmitted infections in youth may be attributed in part to more awareness of the need for testing, increased access to testing and new testing methods. Research also suggests that social determinants of health, in particular low socioeconomic status and limited access to health care, as well as the stigmatization and fear of being diagnosed with an STI contribute to higher incidence in young people.
Gonorrhea

Background

- Gonorrhea is one of the most common sexually transmitted infections (STIs). It is caused by a bacterium called Neisseria gonorrhoeae, and is both preventable and curable.
- Gonorrhea is spread through unprotected anal, oral or vaginal sex with an infected person. It can also be passed from an infected mother to her baby during birth.
- Gonorrhea can occur in both men and women. Many may not have any symptoms. The common symptoms that may occur for women include pain during urination, bleeding during or after sex, and white or yellow vaginal discharge. Symptoms that may be seen in men include discharge from the penis, itching around the penis, frequent or painful urination and pain or swelling in the testicles.
- If untreated, gonorrhoea can lead to serious and permanent complications such as pelvic inflammatory disease in women and epididymitis (inflammation of the tubes of the testicles) in men. Gonorrhea can also spread to the blood and joints. Untreated gonorrhea can increase a person’s risk of acquiring or transmitting HIV.
- Those at risk of acquiring gonorrhea include any sexually active person, particularly individuals:
  - Who do not use condoms
  - Had more than one sexual partner in the last six months
  - Had a new sexual partner in the last two months
Local Picture

Figure 18. Age-standardized gonorrhea incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016

- In 2016, the age-standardized incidence rate of gonorrhea was 41.2 cases per 100,000 (N=234), making it the second most common reportable STI/blood-borne infection in Waterloo Region; this rate was higher than the previous five-year average annual rate for 2011-2015 (30.0 cases per 100,000).
- Since 2009, the rate of gonorrhea has been increasing locally (162.4 per cent increase) and provincially (81.5 per cent increase), with a peak in 2014. Reasons for the increases are not known and are being studied by the provincial government.
- Waterloo Region rates have remained similar to or lower than provincial rates over the past 10 years; In 2016, the local rate was significantly lower than the provincial rate (SRR = 0.84 [CI: 0.74-0.74]).
• Gonorrhea cases were distributed fairly evenly among males and females in 2016. Age-specific incidence rates were highest among 20 to 24 year-olds (161.8 cases per 100,000) followed by 25 to 29 year olds (128.8 cases per 100,000) and 30 to 24 year-olds (104.0 cases per 100,000).

• Of the 2016 Waterloo Region gonorrhea cases that reported risk factor information (N=197), the most commonly reported risk factors included not using a condom (85.2 per cent), having a new sexual partner in the past two months (51.8 per cent), and having more than one sexual partner in the last six months (43.1 per cent).

• Changes were made to the provincial gonorrhea treatment guidelines in 2013 in order to tackle the problem of multi-resistant strains of the infection. In 2016, 56.2 per cent of primary care providers treated confirmed cases according to these new provincial guidelines.

• Increased rates in sexually transmitted infections in youth may be attributed in part to more awareness of the need for testing, increases access to testing and new testing methods. Research also suggests that social determinants of health, in particular low socioeconomic status and limited access to health care, as well as the stigmatization and fear of being diagnosed with an STI contribute to higher incidence in young people.
Hepatitis B

Background

- Hepatitis B infection is an infection of the liver caused by the hepatitis B virus (HBV). About six to ten per cent of all those infected in adulthood will carry the virus for life and can infect others. Chronic hepatitis can lead to cirrhosis and liver cancer. HBV is 100 times more infectious than HIV.
- Hepatitis B is spread through contact with infected blood, semen, and other body fluids, mainly through sexual contact with an infected person; sharing of contaminated needles, syringes or other injection drug equipment; needle stick/sharp instrument injuries; and transmission at birth. Babies born to hepatitis B carriers have a 90 per cent chance of developing the disease unless they are vaccinated immediately after birth.
- Symptoms may include weakness, nausea, vomiting, dark urine, and jaundice (yellowing of the skin and eyes).
- Those at risk of getting hepatitis B include unimmunized people with multiple sexual partners; men who have sex with men; sexual partners of those infected; people who use injection drugs; those who received a tattoo or body piercing using unsterilized equipment or; occupations with a high risk of exposure to blood and body fluids (e.g., healthcare workers, police officers, etc.); and those who have come from countries with high rates of HBV.
- There is a vaccine for hepatitis B which is an effective way to help prevent the infection. In Ontario, a universal vaccination program is administered by public health units through a school-based program to students in grade 7. In addition, publicly funded hepatitis B vaccines are provided for specific populations including those at higher risk due to lifestyle, or due to being a contact of an infected person, being a carrier, or having been diagnosed with acute liver disease.
Local Picture

Figure 19. Age-standardized hepatitis B incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


The Waterloo Region rates for 2006 to 2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, there were six acute hepatitis B case reported in Waterloo Region for an age-standardized incidence rate of 1.1 cases per 100,000; there were 115 cases in Ontario the same year (age-adjusted incidence rate of 0.8 cases per 100,000).
- Since 2006 to 2011, the local hepatitis B incidence rates have fluctuated around the provincial rate. In 2016, the local rate was not significantly different from the province (SRR = 1.34 [CI: 0.52-3.43]).
- Follow-up of local cases indicated that there were no known links between cases and fluctuations in sporadic acute hepatitis cases are expected as vaccination coverage continue to vary, particularly in those who were born prior to the start of routine school-based hepatitis B immunization for grade 7 students. In addition, behavioural factors and immigration from endemic countries are unpredictable and can contribute to hepatitis B disease transmission.
• Due to the small number of cases and the resulting instability in rates, caution should be used when interpreting this data.
Hepatitis C

Background

- Hepatitis C infection is an infection of the liver caused by the hepatitis C virus (HCV). Up to 80 per cent of people with HCV become chronically infected. HCV is a slowly progressive disease that may lead to liver cirrhosis (scarring) or liver cancer.

- HCV spreads through contact with the blood of an infected person, mainly through: sharing of contaminated needles, syringes or other drug equipment; blood transfusions prior to 1992 before screening became available; use of unsterile tattoo or body piercing equipment; sexual contact with an infected person; and/or, being born to an infected mother.

- The early symptoms may include fatigue, loss of appetite, nausea, or jaundice (yellowing of the skin and/or eyes). Many infected people do not initially have symptoms and may look and feel well for many years.

- Those at risk of getting HCV include: current or past injection drug users; those who received blood or blood products or an organ transplant before 1992; those who received a tattoo or body piercing using unsterilized equipment; occupations with a high risk of exposure to blood and body fluids (e.g., healthcare workers, police officers, etc.); people with multiple sexual partners; sexual partners of those infected; and those born to an infected mother.

- There is no vaccine to prevent HCV infection. Newer treatments, which are now available in Canada, can be effective in curing hepatitis C.
Local Picture

Figure 20. Age-standardized hepatitis C incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


- In Waterloo Region in 2016, the age-adjusted incidence rate of HCV was 21.0 cases per 100,000 (N=116), making it the third most common reportable STI/blood-borne infection in Waterloo Region.
- Local incidence rates of HCV have fluctuated over the past five years, but the rate in 2016 was similar to that of the previous five-year average annual rate for 2011-2015 (21.9 cases per 100,000).
- Local rates have been consistently and significantly lower than those of the province since 2006 (in 2016, SRR = 0.68 [CI: 0.58-0.79]).
- In 2016, the rate of HCV was higher among males compared to females in Waterloo Region (26.8 cases per 100,000 versus 15.6 cases per 100,000, respectively).
• In 2016, the age-specific rate was highest among 60 to 64 year-olds (44.7 cases per 100,000), followed by 30 to 34 year-olds (44.7 cases per 100,000). Age-specific rates were lowest in children and adolescents less than 15 years of age.

• Among HCV cases in Waterloo Region that had risk factor information available in 2016 (N=112), the most common risk factors reported included injection drug use (58.9 per cent), inhalation drug use (49.1 per cent), receiving a tattoo or piercing (30.4 per cent), and being under-housed or homeless (20.5 per cent).
HIV/AIDS

Background

- Human immunodeficiency virus (HIV) infection is a blood-borne infection that attacks the immune system (the body’s internal defence system). HIV can lead to acquired immunodeficiency syndrome (AIDS) which is a disease of the immune system that makes the person at risk of getting other infections and diseases.
- HIV is spread through direct blood-to-blood contact and direct contact with certain infected body fluids such as semen, and vaginal or rectal fluids.
- People at risk of getting HIV/AIDS include: people who have unprotected anal or vaginal sex; those who have multiple sex partners; people who use injection drugs; people who received blood transfusions before 1985; and those born to an infected mother. Effective treatment of an HIV positive mother can lower the risk of her child becoming infected to less than two per cent.
- People infected with HIV may initially experience fever, fatigue, night sweats, headaches, diarrhea, sore throat and/or rash. They can then be symptom free for years. Over time, the immune system continues to weaken and leads to the person becoming vulnerable to other infections.
Local Picture

Figure 21. Age-standardized HIV/AIDS incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016

The Waterloo Region rates for 2009-2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, there were 18 HIV/AIDS cases in Waterloo Region for an age-adjusted incidence rate of 3.3 cases per 100,000.
- In 2014, Public Health adjusted how it defined Waterloo Region cases. Individuals who were previously diagnosed with HIV (outside of Ontario or Canada) were not included in Waterloo Region case counts as they were in previous years. This may affect comparability to data from previous years.
- Since 2006, local incidence rates have remained significantly lower than provincial rates (SRR = 0.50 [CI: 0.36-0.70] in 2016).
- Of the cases in 2016 in Waterloo Region, four also had AIDS.
- In 2016, the rate among males (5.5 cases per 100,000) was higher than that among females (0.7 cases per 100,000), and all cases were 15 years of age or older; the highest age-specific incidence rate occurred in adults 45 to 49 years of age (10.5 cases per 100,000).
• Of the HIV/AIDS cases in 2016 in Waterloo Region with risk factor information (N=15), 686.7 per cent reported not using a condom and 66.7 per cent reported having sex with the same sex.
• Due to the small number of cases and resulting instability in rates, caution should be used in interpreting this data.
Syphilis

Background

- Syphilis is a sexually transmitted infection (STI) caused by the *Treponema pallidum* bacterium.
- Syphilis is spread by unprotected vaginal, anal or oral sex. Syphilis can be transmitted during pregnancy from a mother to her unborn baby, and cause fetal deformity or stillbirth.
- Syphilis can be infectious or non-infectious and is further classified based on the progression of the infection. Syphilis is considered infectious in the primary, secondary or early latent stages; otherwise, syphilis is generally considered to be non-infectious.
- Symptoms also vary according to the progression of the infection. Initially, a painless sore or ulcer (called chancre) appears in the mouth, anus, penis, cervix or vagina. Other symptoms such as rash, hair loss, fatigue and warts found in the anus or genital area could appear. Later stages of syphilis, which can be many years after the initial infection, can cause irreversible damage to the brain and spinal cord (neurosyphilis), heart, eyes and bones.
- Those at risk of getting syphilis include any sexually active person, particularly those with multiple partners, individuals infected with HIV, those who do not use condoms, men who have sex with men, people who use injection drugs, and babies born to infected mothers.
Local Picture

Figure 22. Age-standardized infectious syphilis\(^1\) incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016\(^2\)


\(^1\)Primary, secondary and early latent syphilis are all considered infectious (includes early latent; primary genital; primary other sites; secondary of skin and mucous membranes; secondary, other; infectious neurosyphilis and primary anal)

\(^2\)The Waterloo Region rates for 2006-2011 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, the age-standardized incidence rate of infectious syphilis in Waterloo Region was 3.4 cases per 100,000 (N=19); this is higher than the previous five-year annual average rate for 2011-2015 (4.0 cases per 100,000).
- While local rates have fluctuated in the last few years, provincial infectious syphilis rates have continued to increase.
- Waterloo Region rates have consistently remained lower than provincial rates over the last 10 years. In 2016, the local rate was significantly lower than that of the province (SRR = 0.67 [CI: 0.48-0.92]).
- Almost all infectious syphilis cases in 2016 were among males (94.7 per cent), and the age-specific rate was highest among 40-44 year-olds (10.8 cases per
Infectious Diseases in Waterloo Region – Surveillance Report 2016

100,000), followed by 50-54 year-olds (9.8 cases per 100,000). Age-specific rates were lowest in children and adolescents less than 15 years of age.

- Among Waterloo Region cases in 2016 with risk factor information (N=9), the most common self-reported risk factors included having sex with the same sex (100.0 per cent), not using a condom (89.0 per cent), and having more than one sexual partner in the last six months (67.0 per cent).
- Due to the small number of cases and resulting instability in rates, caution should be used in interpreting the data.

Figure 23. Age-standardized other syphilis\(^1\) incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016\(^2\)

- In Waterloo Region in 2016, there were 21 cases of non-infectious and unspecified syphilis with an age-standardized incidence rate of 3.9 cases per 100,000. This rate is slightly lower than the previous five-year annual average rate for 2011-2015 (4.2 per 100,000).
- Between 2006 and 2016, local rates have generally been lower or similar compared to those of Ontario; in 2016, the local rate was not significantly different from the provincial rate (SRR = 0.79 [CI: 0.53-1.16]).

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\(^1\)Other syphilis includes all other types of syphilis such as late latent or unspecified (the other category excludes early congenital syphilis)

\(^2\)The Waterloo Region rates for 2010 and 2012 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.
- There were more non-infectious and unspecified syphilis cases among males (N=15) than females (N=6), and all cases occurred among individuals aged 20 years or older.
- Among Waterloo Region cases in 2016 with risk factor information (N=6), the most frequently reported risk factors were not using a condom (67.0 per cent), having more than one sexual partner in the last 6 months (33.0 per cent), and having sex with the same sex (33.0 per cent).
- Due to the small number of cases and the resulting instability in rates, caution should be used in interpreting this data.
Vaccine Preventable Diseases

Vaccine preventable diseases presented in this section of the report include:

- Influenza
- Invasive meningococcal disease (IMD)
- Invasive pneumococcal disease (IPD)
- Measles
- Mumps
- Pertussis
- Varicella

Table 5. Numbers and age-standardized incidence rates per 100,000 for vaccine preventable diseases, Waterloo Region & Ontario, 2016 and 2011-2015 (five-year annual average)

<table>
<thead>
<tr>
<th>Disease¹</th>
<th>Waterloo Region</th>
<th>Ontario</th>
<th>2016 Standardized rate ratio (95% confidence interval)²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># Cases in 2016</td>
<td>2016 Age-standardized rate per 100,000</td>
<td>5-year average rate per 100,000 (2011-2015)</td>
</tr>
<tr>
<td>Influenza²</td>
<td>376</td>
<td>69</td>
<td>65.4</td>
</tr>
<tr>
<td>Invasive pneumococcal disease</td>
<td>56</td>
<td>10.6</td>
<td>12.7</td>
</tr>
<tr>
<td>Pertussis (whooping cough)</td>
<td>32</td>
<td>6.7</td>
<td>4.3</td>
</tr>
<tr>
<td>Invasive meningococcal disease</td>
<td>2</td>
<td>0.3⁴</td>
<td>0.3⁴</td>
</tr>
<tr>
<td>Mumps</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Measles</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>


¹ Disease list does not include varicella. Reporting of individual cases of varicella is incomplete. As such, ambulatory care visits (visits to emergency departments and hospital outpatient visits) were used as a proxy measure to determine severity of the disease.

² Standardized rate ratio (SRR) refers to the ratio of the Waterloo Region age-standardized rate for 2015 compared to the Ontario age-standardized rate for 2015. The 95% confidence interval indicates the statistical significance of the SRR (if the 95% confidence interval contains 1.00, the two rates are not
statistically different from one another). SRRs indicating significant differences between Ontario and Waterloo in 2016 are highlighted in yellow.

3 Influenza data is reported for the 2011-2012 season to the 2016-2017 season which runs from September 1st through August 31st each year. Note that the 2015-2016 data is not provided for the complete season and only includes data from September 1, 2016 to April 30th, 2017.

4 Rates are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

**Public Health Activities for Vaccine Preventable Diseases**

Region of Waterloo Public Health and Emergency Services:

- Offers immunization at public health clinics by appointment for families to complement the many pharmacies, physicians’ offices and other providers of influenza vaccine in Waterloo Region to protect individuals against vaccine preventable diseases.
- Distributes vaccine to health care providers, including family physicians, hospitals, long-term care homes, retirement homes, and pharmacies.
- Provides immunization clinics in schools and enforces the Immunization of School Pupils Act (ISPA) to ensure all students attending school are immunized as per the Act. The ISPA requires children and adolescents to provide proof of immunization against meningococcal disease, pertussis (whooping cough), varicella (chicken pox), tetanus, diphtheria, poliomyelitis, measles, mumps and rubella. Students who are not up-to-date with ISPA mandated immunizations, or do not have a valid exemption on file, are suspended from school.
- Collects and maintains the immunization records of children enrolled in licensed child care centres.
- Provides health education (e.g., via website, written resources, site visits, educational forums) for health care providers, including family physicians, long-term care homes, pharmacies, etc.
- Provides health promotion activities to increase immunization coverage rates, especially among priority and/or high risk populations.
- Receives and investigates reports of vaccine preventable diseases from health providers, laboratories, and members of the community.
- Investigates contacts of confirmed cases of vaccine preventable diseases and recommends post-exposure prophylaxis or immunization as required.
- Receives and investigates reports of adverse events following immunization, and reports them to the Ministry of Health and Long-Term Care.
- Conducts disease surveillance and provides timely updates on local disease status to area health care providers and other stakeholders as needed.
- Initiated the Invasive Pneumococcal Prevention Campaign in the 2016-2017 respiratory season to prevent IPD in the community by increasing pneumococcal vaccinations among priority and high risk individuals. Promotional packages were distributed to primary care providers, specialists and specialty clinics, pharmacists and labs. Public Health plans to evaluate the effectiveness of the IPD Campaign and make recommendations for further promotion.
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Influenza

Background

- Influenza (commonly known as the “flu”) is a viral infection that circulates on a yearly basis causing seasonal outbreaks (usually October to April in Canada) of respiratory illness. The severity of the influenza season varies each year and can be mild to severe.
- The flu is spread by breathing in droplets that an infected person coughs or sneezes into the air. The influenza virus can also survive outside the body on unwashed hands, tissues or clothing, and on surfaces.
- Influenza symptoms can include headache, runny nose, sneezing, chills, cough, fever, loss of appetite, muscle aches and fatigue (feeling weak). Nausea, vomiting and diarrhea may also occur, particularly in children.
- Influenza vaccine is produced every year to provide protection against the strains of influenza that are expected to circulate that year.
- All individuals are at risk for contracting the influenza virus. Individuals who receive the seasonal vaccine are offered protection against the anticipated circulating strains. Certain segments of the population, such as older people, young children and those with underlying health conditions, are more susceptible to acquiring influenza and may experience further complications.
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Local Picture

Figure 24. Age-standardized influenza incidence rates per 100,000, by season, Waterloo Region & Ontario, 2011-2012 to 2016-2017

- Influenza accounts for over three-quarters of vaccine preventable diseases reported in Waterloo Region.
- 2016-2017 was a moderate year for influenza. During the 2016-2017 flu season (September 1, 2016 to April 30, 2017), there were 376 laboratory confirmed cases of influenza in Waterloo Region. The age-adjusted incidence rate was 69.0 cases per 100,000. This is similar to the previous five-year annual average rate for the 2011-2012 to 2015-2016 seasons (65.4 cases per 100,000).
- The influenza rate for the 2016-2017 season for Waterloo Region was significantly lower than that for the province (SRR=0.85 [CI: 0.77-0.93]).
- The 2016-2017 influenza season was slightly less severe compared to previous seasons based on the number of hospitalizations and deaths. A total of 104 confirmed cases of influenza in Waterloo Region were hospitalized during the 2016-2017 influenza season, for a rate of 18.9 hospitalizations per 100,000. The


1 Data is reported for the 2011-2012 season to the 2016-17 season which runs from September 1st through August 31st each year. Note that the 2016-17 data is not provided for the complete season and only includes data from September 1st, 2016 to April 30th, 2017.
average number of hospitalizations per season over the previous five influenza seasons in Waterloo Region was 117.

- During the 2016-2017 season, there was 5 deaths in Waterloo Region where influenza was a contributing cause of death, for a rate of 0.9 deaths per 100,000; this is similar to the number of deaths compared to the previous influenza five-season average (average 7 deaths per season).
- Influenza activity peaked in January and February in Waterloo Region which is typical of annual season influenza activity.
- Influenza A was the overall predominant circulating virus type for the 2016-2017 season, although influenza B became more common in the latter part of the season when there was less overall influenza activity.
Invasive Meningococcal Disease (IMD)

Background
- Meningococcal disease is caused by the *Neisseria meningitidis* bacterium. About 10 per cent of people carry the bacteria in their throat or nose without feeling sick. In a rare number of cases, the bacteria can cause serious diseases such as meningitis (inflammation of the lining surrounding the brain) and septicemia (widespread infection of the blood and organs).
- Invasive meningococcal disease (IMD) is spread from person to person, by coming in contact with infected mucus or saliva (through kissing, sharing food or drinks, etc.).
- IMD can cause high fever, neck stiffness, headache, vomiting, sensitivity to light, rash, confusion and in severe cases, coma.
- Children under one year of age and adolescents between 15 to 18 years are at a higher risk of acquiring IMD in addition to those living in crowded conditions, having medical conditions involving the spleen or cochlear implants, and travellers to areas with high rates of IMD (e.g., sub-Saharan Africa).
- In Ontario, a vaccine against the C-strain of Neisseria meningitis is funded for children after their first birthday. A vaccine to protect against strains A, C, Y and W-135 is funded for grade 7 students.
- As part of the investigation of a case of IMD, Public Health identifies close contacts at increased risk if infection and facilitates the provision of preventative antibiotics to these contacts.
Local Picture

Figure 25. Age-standardized invasive meningococcal disease (IMD) incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016

<table>
<thead>
<tr>
<th>Year</th>
<th>Waterloo cases</th>
<th>Waterloo rate</th>
<th>Ontario rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>3</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>2007</td>
<td>5</td>
<td>1.0</td>
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</tr>
<tr>
<td>2008</td>
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<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>2009</td>
<td>3</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>2010</td>
<td>4</td>
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<tr>
<td>2011</td>
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<td>2012</td>
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<td>0.3</td>
</tr>
<tr>
<td>2013</td>
<td>0</td>
<td>0.0</td>
<td>0.2</td>
</tr>
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<td>2014</td>
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</tr>
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<td>2015</td>
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<td>0.3</td>
</tr>
<tr>
<td>2016</td>
<td>0</td>
<td>0.0</td>
<td>0.2</td>
</tr>
</tbody>
</table>


1The Waterloo Region rates for 2006-2011 and 2015 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, there were no cases of IMD in Waterloo Region.
- Provincially, there has been a gradual decline in incidence rates over the past 10-year period; there were 28 cases of IMD in 2016 (age-adjusted incidence rate of 0.2 cases per 100,000).
- Due to the small number of cases and resulting instability in rates, caution should be used in interpreting this data.
Invasive Pneumococcal Disease (IPD)

Background

- Invasive pneumococcal disease (IPD) is a serious infection which is caused by the bacterium known as *Streptococcus pneumoniae*. It can cause infections such as pneumonia (lungs), meningitis (the lining of the brain), and sepsis (infection of the blood).
- IPD can cause a number of symptoms including fever, chills, headache, ear pain, cough, chest pain, neck stiffness, and breathing difficulty.
- Risk factors for IPD include being under two years of age or over 65 years of age; chronic diseases of the lung, heart, kidney, or liver; diabetes; cancer; intravenous (IV) drug use; a weakened immune system (e.g., those with HIV/AIDS); smoking; and alcoholism.
- Many strains of IPD are preventable by immunization.

Local Picture

Figure 26. Age-standardized invasive pneumococcal disease (IPD) incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016

• In Waterloo Region in 2016, there were 56 cases of IPD with an age-standardized incidence rate of 10.6 cases per 100,000.

• The IPD incidence rate has fluctuated over the past 10 years in Waterloo Region. The local incidence rate in 2016 is lower than the previous five-year annual average for 2011-2015 (12.7 cases per 100,000).

• Local rates of IPD have been generally higher than those of the province for the last 10 years; in 2016, local IPD rates were significantly higher than Ontario’s rate (SRR = 1.43 [CI: 1.04-1.97]).

• In 2016, cases of IPD in Waterloo Region were fairly equally distributed among males and females; adults 65 years and older had the highest age-specific rates (28.05 cases per 100,000).

• There were seven deaths associated with IPD in Waterloo Region in 2016; this is similar to the number of IPD-associated deaths reported in the previous five years (the average annual number of deaths for 2011-2015 was 7.4).

• Among the 2016 Waterloo Region cases with risk factor information available (N=48), the most common self-reported risk factors included having a chronic illness or underlying medical condition (81.3 per cent), being unimmunized (54.1 per cent), and being under two years of age or over 65 years of age (44.0 per cent).

• Public Health is continuing to promote immunization for IPD among priority and high-risk individuals through health care providers.
Measles

Background

- Measles is a very contagious infection caused by the measles virus. It is easily spread from person to person by direct contact with nasal or throat secretions from an infected person. The infected person can spread the droplets while talking, coughing or sneezing.
- Symptoms can include fever, cough, runny nose and a rash that initially appears on the face and then spreads to the rest of the body. Complications of measles can involve ear infection, pneumonia (lung infection), and encephalitis (infection of the brain) which could lead to brain damage.
- All persons who have not had the disease or who have not been fully immunized are susceptible to acquiring the infection, particularly individuals who travel to measles endemic areas, young children, individuals with a chronic disease, and those with weakened immunity.

Local Picture

Figure 27. Age-standardized measles incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


1The Waterloo Region rate for 2009 is unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.
- There were no cases of measles in 2016 in Waterloo Region.
- Provincially, there were seven cases of measles in 2016 for a provincial age-adjusted incidence rate of 0.1 cases per 100,000.
- In general, most cases of measles are acquired through travel, or in individuals who came to Ontario from other jurisdictions.
- The increase in 2009 was due to a small local outbreak of measles in six unimmunized or inadequately immunized persons. The disease was imported from an unimmunized child who had travelled outside of Canada. Increased immunization and isolation measures implemented by Region of Waterloo Public Health prevented further spread of this highly infectious disease.
- Due to the small number of cases and resulting instability in rates, caution should be used when interpreting this data.
Mumps

Background
- Mumps is a viral infection caused by the mumps virus.
- Mumps is spread from person to person by coming in contact with an infected person’s saliva.
- Symptoms include fever, headache and swollen glands of the face. Complications can involve meningitis (infection of the lining of the brain), deafness and swollen testicles.
- All persons who have not had the disease or who have not been fully immunized are at risk of acquiring mumps.

Local Picture

Figure 28. Age-standardized mumps\(^1\) incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016\(^2\)


\(^1\)Includes both confirmed and probable mumps cases.

\(^2\)The Waterloo Region rates for 2006-2007, 2009-2012, 2014 and 2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.
In 2016, there was one case of mumps reported in Waterloo Region for an age-adjusted incidence rate of 0.2 cases per 100,000; this is similar to the previous five-year annual average incidence rate for 2011-2015 (0.3 cases per 100,000).

In Ontario in 2016, there were 40 cases of mumps (age-adjusted incidence rate of 0.3 cases per 100,000). Provincially over the last 10 years, the age-adjusted incidence rate of mumps has ranged from a low of 0.1 cases per 100,000 in 2006 and 2014, to a high of 0.8 cases per 100,000 in 2009.

With the exception of 2009, local incidence rates have remained similar to or lower than provincial rates.

In 2009, there was an increased incidence of mumps in Ontario and throughout Canada, mainly in university and college students. There were 12 cases in Waterloo Region; the cases were primarily young male university or college students and were in the cohort of individuals who would have been given only one dose of mumps vaccine.

Due to the small number of cases and resulting instability in rates, caution should be used when interpreting this data.
Pertussis

Background
- Pertussis or whooping cough is a respiratory infection caused by the *Bordetella pertussis* bacterium. The disease can affect people of any age but it is more severe in children less than one year of age.
- It is spread from person to person through direct contact of respiratory secretions (e.g., cough of an infected person).
- It initially causes cold-like symptoms such as a runny nose and a cough. The cough then worsens progressing into coughing spells which can be severe leading to vomiting, feeling short of breath, gagging, and a ‘whoop’ like sound when the person takes a breath. Complications can include seizures, brain damage and pneumonia (lung infection).
- Pertussis is preventable through immunization and is part of the routine childhood immunization schedule. A booster dose is given to adolescents and adults.
- Anyone can get whooping cough but unimmunized or inadequately immunized individuals and those people living in the same household as someone with whooping cough are at higher risk of acquiring pertussis.
Infectious Diseases in Waterloo Region – Surveillance Report 2016

Local Picture

Figure 29. Age-standardized pertussis\(^1\) incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016\(^2\)


\(^1\)Includes both confirmed and probable pertussis cases.

\(^2\)The Waterloo Region rates for 2008-2009, 2011, 2013-2014 and 2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, there were 13 cases of pertussis in Waterloo Region (age-standardized incidence rate of 2.3 cases per 100,000). This rate is lower than the previous five-year average of 4.8 cases per 100,000.
- The local pertussis incidence rate in 2016 was lower than but not significantly different from the provincial rate (SRR = 0.67 [CI: 0.43-1.06]).
- In general, pertussis incidence declined with age. In 2016 in Waterloo Region, the youngest age groups had the highest age-specific incidence rates (19.3 cases per 100,000 among 0 to 4 year olds. There were no notable differences in the number of pertussis cases among males and females.
- There was a peak in incidence in 2012 both locally (incidence rate of 12.6 cases per 100,000) and across all of Ontario (incidence rate of 7.8 cases per 100,000). Pertussis is naturally cyclic in nature, with peaks in disease every three to five years. Local cases from 2012 were sporadic and not associated with an outbreak.
Varicella

Background

- Varicella infection (or chickenpox) is a common childhood illness caused by the varicella zoster virus. The virus can reactivate and cause a painful rash called shingles.
- Chickenpox can spread from person to person through the air by coughing or sneezing or by directly touching the rash (blisters). It is contagious from one to two days before the rash appears until the rash has scabbed over. The symptoms include fever, cough, sore throat, general aches, and a generalized itchy rash.
- Chickenpox usually gets better on its own without the use of any medication. Immunization is available for children who have not had chickenpox and there is also another vaccine for adults above the age of 50 (Zostavax), to prevent the occurrence of shingles. Beginning in the 2014-2015 school year, varicella was one of the immunizations added to the required vaccination list to attend school as per the Immunization of School Pupils Act (ISPA).
- All persons who have not had varicella or who have not been fully immunized are at risk of acquiring the virus.

Local Picture

Figure 30. Age-standardized varicella ambulatory care visit\(^1\) rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


Varicella ambulatory care visits from IntelliHEALTH are reported as a proxy measure to determine severity of disease. They include both visits to emergency departments as well as hospital outpatient visits.

- Local and provincial varicella data was sourced from the National Ambulatory Care Reporting System (NACRS) rather than the integrated Public Health Reporting System for reportable diseases (iPHIS), as individual cases of varicella are generally underreported. As such, only cases of varicella that led to ambulatory care visits are captured in the following findings.
- In 2016, there were 53 ambulatory care visits for varicella in Waterloo Region (age-standardized visit rate of 9.5 cases per 100,000).
- Since 2010, the rate of varicella ambulatory care visits has generally declined both locally and provincially; in 2016, the ambulatory visit rate for varicella was lower than the previous five-year annual average for 2011-2015 (12.1 cases per 100,000).
- Since 2006, the local rates of varicella ambulatory care visits were similar to or lower than those of the province; in 2016, the local rate remained lower than that for Ontario, but this difference was not statistically significant (SRR = 0.82 [CI: 0.64-1.06]).
- In 2016, local varicella ambulatory care visits were generally evenly distributed among males and females.
- In 2016, the younger age groups had the highest proportion of varicella ambulatory care visits (rate of 58.2 visits per 100,000); 51.0 per cent of varicella visits occurred in individuals less than 15 years of age.
Other Infectious Diseases

Reportable diseases categorized into this section include:

- Encephalitis/meningitis
- Group A streptococcal disease, invasive (iGAS)
- Group B streptococcal disease (neonatal)
- Legionellosis
- Tuberculosis (TB) – active and latent

Table 6. Numbers and age-standardized incidence rates per 100,000 for other infectious diseases, Waterloo Region & Ontario, 2016 and 2011-2015 (five-year annual average)

<table>
<thead>
<tr>
<th>Disease</th>
<th>Waterloo Region</th>
<th>Ontario</th>
<th>2016 Standardized rate ratio (95% confidence interval)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># Cases in 2016</td>
<td>2016 Age-standardized rate per 100,000</td>
<td>5-year average rate per 100,000 (2011-2015)</td>
</tr>
<tr>
<td>Tuberculosis (latent)</td>
<td>314</td>
<td>56.7</td>
<td>63.2</td>
</tr>
<tr>
<td>Group A streptococcal disease, invasive</td>
<td>22</td>
<td>4.1</td>
<td>5.0</td>
</tr>
<tr>
<td>Encephalitis/meningitis</td>
<td>26</td>
<td>4.7</td>
<td>2.5</td>
</tr>
<tr>
<td>Tuberculosis (active)</td>
<td>11</td>
<td>2.0¹</td>
<td>2.0¹</td>
</tr>
<tr>
<td>Legionellosis</td>
<td>10</td>
<td>1.8¹</td>
<td>2.2¹</td>
</tr>
<tr>
<td>Group B streptococcal disease, neonatal</td>
<td>1</td>
<td>0.2¹</td>
<td>0.3¹</td>
</tr>
</tbody>
</table>


¹ Standardized rate ratio (SRR) refers to the ratio of the Waterloo Region age-standardized rate for 2015 compared to the Ontario age-standardized rate for 2015. The 95% confidence interval indicates the statistical significance of the SRR (if the 95% confidence interval contains 1.00, the two rates are not statistically different from one another). SRRs indicating significant differences between Ontario and Waterloo in 2016 are highlighted in yellow. ² Data for Ontario LTBI cases is not available prior to 2013, thus this is a 3 year average rate (2013-2015)
Viral and bacterial cases of encephalitis and meningitis are combined since most reported cases were undifferentiated; includes encephalitis primary viral, encephalitis/meningitis, meningitis (bacterial), meningitis (viral). Bacterial meningitis from pneumococcal disease and meningococcal disease are reported separately.

Rates are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

Public Health Activities for Tuberculosis (TB)

Region of Waterloo Public Health:
- Provides accessible and effective tuberculosis (TB) clinic services in partnership with a local group of respirologists.
- Provides TB skin test clinic for medically indicated and third party testing.
- Manages all active TB cases reported to Region of Waterloo Public Health.
- Investigates and follows-up contacts of cases.
- Follows up on all immigrant notifications for medical surveillance.
- Provides early screening for populations at highest risk.
- Provides all medications for treatment of active or latent TB free of charge.
- Reports confirmed and probable cases of tuberculosis to the Ministry of Health and Long-Term Care.
- Conducts disease surveillance and provides timely updates on local disease status to area health care providers and other stakeholders.
- Provides health education (e.g., via website, brochures, site visits, forums) for health care providers, including family physicians, long-term care homes, and retirement homes.

Public Health Activities for Encephalitis/Meningitis, Group A Streptococcal Disease, Neonatal Group B Streptococcal Disease, Legionellosis

Region of Waterloo Public Health:
- Receives and investigates reports of these diseases from health care providers and laboratories.
- Investigates contacts of confirmed cases of these diseases and recommends prophylaxis (preventative medication) as required.
- Reports confirmed and probable cases of diseases to the Ministry of Health and Long-Term Care.
- Conducts disease surveillance and provide timely updates on local disease status to area health care providers and other stakeholders.
• Provides health education (e.g., via website, brochures, site visits, forums) for health care providers (physicians, hospitals, long-term care/retirement homes).
• In recent years, Region of Waterloo Public Health has distributed legionellosis information to hospitals, schools, long-term care homes, retirement homes, and other identified cooling tower operators within the Region. The information included information on the provincial and local legionellosis disease trends, and recommended best practices for cooling tower maintenance.
Encephalitis/Meningitis

Background

- Encephalitis refers to inflammation of the brain. Meningitis refers to inflammation of the meninges, which are membranes that surround the brain and spinal cord.
- These two conditions cause a range of symptoms including fever, headache, confusion, and/or muscle weakness. In severe cases, permanent brain damage or death may occur due to injury of nerve or brain cells.
- Meningitis and encephalitis may have a variety of infectious causes (viral, bacterial and fungal) and non-infectious causes (cancer, lupus, etc.). In many cases it is impossible to identify a reason for the inflammation.
- The causes and risk factors vary by case. Those at higher risk include people with a weakened immune system, the elderly, persons who recently had a neurosurgical procedure, and those in contact with an infected person.
- Bacterial meningitis due to pneumococcal and meningococcal disease are reported separately under invasive pneumococcal (IPD) and invasive meningococcal disease (IMD) respectively. All other infectious cases of bacterial, viral, or fungal meningitis or encephalitis are included here.
Local Picture

Figure 31. Age-standardized encephalitis and meningitis\(^1\) incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016\(^2\)


\(^1\)Viral and bacterial cases are combined since most reported cases were undifferentiated; includes encephalitis primary viral, encephalitis/meningitis, meningitis (bacterial), meningitis (viral).

\(^2\)The Waterloo Region rates for 2007 and 2009-2015 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016, there were 26 cases of encephalitis and meningitis in Waterloo Region with an age-standardized incidence rate of 4.7 cases per 100,000; this rate is higher than the previous five-year annual average rate for 2011-2015 (2.5 cases per 100,000).
- Local rates have fluctuated around the provincial rate over the last 10-year period; in 2016 the local rate was higher than Ontario’s rate, but this difference was not statistically significant (SRR = 1.47 [CI: 0.92-2.36]).
- In 2016, the highest age-specific rate was among children 0 to 4 years-old (32.1 cases per 100,000). There were no discernible trends in encephalitis and meningitis incidence between males and females.
- There was no marked seasonal trend in the incidence of encephalitis and meningitis in Waterloo Region in 2016.
• Variations in the incidence of encephalitis/meningitis are expected from year to year as the circulation of the causative organisms varies.
Group A Streptococcal Disease, Invasive (iGAS)

Background

- Group A streptococcal (GAS) bacteria are common causes of minor infections such as "strep throat," cellulitis (bacterial infection below the skin), skin abscesses (boils) or impetigo (skin infection). Persons may also carry these bacteria on the skin or in their throat without any symptoms or illness.
- More serious or invasive group A streptococcal infections (iGAS) occur more rarely. These infections include necrotizing fasciitis (flesh eating disease), toxic shock syndrome (failure of all body systems) or sepsis (overwhelming infection of the blood stream).
- The symptoms of iGAS vary and depend on the affected area. They can include fever, sore throat, rash, or sores on the skin. In severe infections, the skin can be red, swollen, and very painful and can progress to blisters or necrosis (tissue death).
- Those most at risk for iGAS include the elderly, people with chronic disease (such as cancer, diabetes, kidney, heart and lung disease), those with skin lesions, adults with a history of alcohol abuse, injection drug use, and those taking some specific medications such as steroids. Children with chickenpox have a higher risk of developing skin infections from group A streptococcus.
- There is no vaccine to prevent iGAS infection; iGAS infection is treated with antibiotics.
- As part of the investigation of an iGAS case, Public Health identifies close contacts of the case that are at increased risk of infection and facilitates the provision of preventative antibiotics for contacts.
Local Picture

Figure 32. Age-standardized invasive Group A streptococcal disease incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016

- In 2016 there were 22 cases of iGAS in Waterloo Region, for an age-standardized incidence rate of 4.1 cases per 100,000. This rate is slightly lower than the previous five-year average annual rate for 2011-2015 (5.0 cases per 100,000).
- Local rates of iGAS have fluctuated around the provincial rate since 2006. In 2016, the local rate was similar to that of the province (SRR = 0.80 [CI: 0.60-1.20]).
- In Waterloo Region in 2016, there were more cases among females (N=15) than males (N=7). The average age-specific iGAS incidence rate for 2016 was highest among adults 65 years of age and older (12.7 cases per 100,000) in Waterloo Region. This is consistent with what is typically seen; the average age-specific rate for the last 5 years was also highest among adults 65 years and older (10.9 cases per 100,000).


1The Waterloo Region rate for 2011 is unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.
• According to the previous five-year annual average rates, cases occur regularly throughout the year, with slight increases expected in winter and early spring (November to April).
• There were three deaths among iGAS cases in Waterloo Region in 2016 where the disease was the underlying or contributing cause.
• Among the 2016 Waterloo Region cases with risk factor information available (N=21), the most common self-reported risk factor was having a dermatological condition or wound causing a break in skin integrity (60.0 per cent), followed by having an underlying medical condition or chronic illness (40.0 per cent).
Group B Streptococcal Disease (Neonatal)

Background

- Group B Streptococcus (GBS) are common bacteria often found in the vagina, rectum or urinary bladder of women. It is estimated that 10 to 35 per cent of pregnant women will have GBS in their vagina and/or rectum at any time. The bacteria usually do not harm the mother, but it can be transmitted to the newborn during delivery.
- Prenatal screening is offered to all pregnant women by the clinician providing prenatal care. For women carrying GBS bacteria in the vagina, antibiotics are often provided at the onset and throughout labour to decrease infection of the newborn and associated complications.
- Reported cases of neonatal GBS infections have been low due to routine screening of pregnant women between the 35th and 37th weeks of pregnancy. Additionally, antibiotics given to GBS positive mothers during labour are effective in preventing transmission.
- Risk factors for having a baby with GBS infection include: having a positive GBS screening/urine test during pregnancy, delivering early (less than 37 weeks), having fever during labor, and previously having had a child with GBS infection.
Local Picture

Figure 33. Age-standardized group B streptococcal disease incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


The Waterloo Region rates for 2006-2008, 2011 and 2013-2015 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016 there was one case of neonatal GBS in Waterloo Region (age-standardized incidence rate of 0.2 cases per 100,000); this is similar to the previous five-year average rate for 2011-2015 (0.3 cases per 100,000).
- In Ontario in 2016, there were 49 cases of neonatal GBS; the provincial incidence rate has remained relatively stable over the past 10-year period around 0.4 cases per 100,000.
- Due to small numbers and the resulting instability in rates, caution should be used in interpreting this data.
Legionellosis

Background

- Legionellosis is an infection which is caused by the bacterium known as *Legionella pneumophila*. This bacterium is naturally found in the environment (in water, soil and dust). Outbreaks have often involved hot tubs, water tanks, water fountains and cooling towers. Legionellosis is comprised of two diseases caused by the same bacterium: The more severe form, known as Legionnaires’ Disease, and the milder illness known as Pontiac Fever.

- It is spread by people inhaling the bacteria when they breathe in contaminated droplets of water in air. The bacteria are not spread from person-to-person.

- Legionnaires’ disease can have symptoms related to pneumonia (lung infection) which include: fever, chills, cough, muscle aches and headache. Pontiac Fever is a milder infection which causes fever and muscle aches, but not pneumonia.

- Older adults (65 years or older), smokers, those with lung disease, weakened immune systems or kidney disease, and those with cancer are at higher risk of becoming infected.
Local Picture

Figure 34. Age-standardized legionellosis incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016

In Waterloo Region in 2016, there were 10 cases of legionellosis for an age-standardized incidence rate of 1.8 cases per 100,000. This rate is similar to the previous five-year annual average rate for 2011-2015 (2.2 cases per 100,000).

Local rates of legionellosis have been remaining relatively stable since 2013, with local rates remaining statistically comparable to provincial rates.

There were no discernible differences in rates for males and females in 2016. All cases occurred among adults 55 years of age or older; the highest age-specific rate occurred among adults 55-59 years old (10.8 cases per 100,000).

Legionellosis follows a seasonal pattern, with the majority of cases occurring between June and October every year. In Waterloo Region in 2016, more than 50 per cent of cases occurred in September and October.

There were no legionellosis outbreaks or clusters of cases with a known common exposure or epidemiological link identified in Waterloo Region or Ontario in 2016.
• Among 2016 cases with risk factor information available, one was related to travel outside of the province. The most common self-reported risk factors among non-travel related cases were being a smoker, having an underlying medical condition, and having recent exposure to aerosolized water.

• Due to small numbers and the resulting instability in rates, caution should be used in interpreting this data.
Tuberculosis

Background

- Tuberculosis (TB) is a curable infectious disease caused by the bacteria *mycobacterium tuberculosis*. TB disease usually affects the lungs (pulmonary or respiratory TB); however, the bacteria can travel through the blood and infect other parts of the body (extrapulmonary or non-respiratory TB).
- Active TB disease occurs when the body’s immune system is unable to stop the growth and spread of the bacteria after the individual becomes infected. Latent TB infection (LTBI), or inactive TB, occurs when a person is infected, but is neither ill nor contagious from the infection. Five to ten per cent of individuals with inactive TB later develop the active form of the disease.
- Risk factors for acquiring TB disease include:
  - Having lived or being born in an endemic country
  - Immunosuppression or underlying medical conditions (e.g., human immunodeficiency virus)
  - Close contact with an individual infected with respiratory TB
  - Inadequate treatment of a previous TB infection
  - Priority populations are at greater risk (e.g., person experiencing homelessness, the under-housed, persons who use substances, aboriginal persons)
- Latent TB infection (LTBI) is most likely to develop into active TB within the first two years of becoming infected. Risk factors that also increase the likelihood of LTBI developing into active TB include:
  - Immunosuppression or underlying medical conditions (e.g., human immunodeficiency virus, organ transplant)
  - Treatment with certain medications (e.g., glucocorticoids, tumour necrosis factor-alpha inhibitors)
  - Having diabetes
  - Being under weight
  - Being under five years of age when first infected
  - Smoking cigarettes daily
  - Heavy alcohol consumption
- Active and latent TB infections are treated with antibiotics; treatment of both active and latent TB infection can take six to 12 months.
Local Picture

Figure 35. Age-standardized active tuberculosis incidence rates per 100,000, by year, Waterloo Region & Ontario, 2006-2016


1The Waterloo Region rates for 2006-2016 are unstable due to small numbers (Relative Standard Error [RSE] >23%) and should be interpreted with caution.

- In 2016 there were 11 cases of active TB in Waterloo Region with an age-standardized incidence rate of 2.0 cases per 100,000. This rate is very similar to the previous five-year annual average rate for 2011-2015 (2.0 per 100,000).
- Local rates of active TB have been significantly lower than those of the province since 2010, and this trend continued in 2016 (SRR = 0.46 [CI: 0.30-0.68]).
- In Waterloo Region in 2016, active TB was most common among 65 years of age and older (age-specific rate of 7.6 cases per 100,000), and cases were fairly equally distributed among males and females.
- There was one death among active TB cases in Waterloo Region in 2016 where the disease was the underlying or contributing cause.
Of the 11 active TB cases in 2016, six had risk factor information available. Six of these cases reported living in an endemic area: three cases originated from Asia, two cases originated from Africa, and one case originated from the Middle East.

Treatment for active TB requires taking medication for six to nine months or more; to date, six cases diagnosed in 2016 have completed treatment.

All TB cases are tested for drug resistance. Of the cases with information available on drug resistance in 2016, one demonstrated resistance to one or more TB drugs.

In Waterloo Region in 2016, there were 314 cases of latent TB infection (LTBI) for an annual age-standardized incidence rate of 56.7 cases per 100,000.

In 2016, the local rate of LTBI was similar to the provincial rate (SRR = 1.01 [CI: 0.90-1.14]).

In 2016, almost three-quarters (72.3 per cent) of LTBI cases were among females in Waterloo Region, and most cases occurred in people aged 15 years or older.
Outbreaks

Public Health Activities for Outbreaks

- Region of Waterloo Public Health and Emergency Services follows up on all enteric and respiratory outbreaks reported by child care centres, hospitals, residential/group homes, long-term care homes and retirement homes.
- The health unit supports community partners in investigating the source of the outbreak and implementing appropriate infection prevention and control practices to minimize the spread of illness as per Ministry of Health and Long-Term Care guidelines.
- Other activities that contribute to outbreak management including:
  - Consultation with individual facilities (e.g., long-term care homes, retirement homes);
  - Education sessions to increase health care worker immunization rates;
  - Hosting health education forums with staff from local facilities to provide skill enhancement training regarding infection prevention and control, and outbreak management.
Enteric Outbreaks

Local Picture

Table 7. Number of enteric outbreaks by season, Waterloo Region, 2011-2012 to 2016-2017\(^1\) and previous 5-season average\(^2\)

<table>
<thead>
<tr>
<th>Season</th>
<th>Number of Enteric Outbreaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2012</td>
<td>65</td>
</tr>
<tr>
<td>2012-2013</td>
<td>42</td>
</tr>
<tr>
<td>2013-2014</td>
<td>68</td>
</tr>
<tr>
<td>2014-2015</td>
<td>75</td>
</tr>
<tr>
<td>2015-2016</td>
<td>53</td>
</tr>
<tr>
<td>2016-2017(^1)</td>
<td>51</td>
</tr>
<tr>
<td>Previous 5-season average(^2)</td>
<td>60.6</td>
</tr>
</tbody>
</table>


\(^1\) Data for the 2016-2017 season is partial (from September 1, 2016 to April 30, 2017).

\(^2\) Previous 5-season average is the number of outbreaks for the previous 5 seasons (2011-2012 to 2015-2016 combined).
Figure 36. Number of enteric outbreaks by month and year, Waterloo Region, 2011-2012 to 2016-2017* and previous 5-season average**


Data for the 2016-2017 season is partial (from September 1, 2016 to April 30, 2017).

**Previous 5-season average is the number of outbreaks for the previous 5 seasons (2011-2012 to 2015-2016 combined).
Table 8. Proportion of enteric outbreaks by exposure setting, Waterloo Region, 2016-2017\(^1\) and previous five-season average\(^2\)

<table>
<thead>
<tr>
<th>Exposure Setting</th>
<th>2016-2017(^1)</th>
<th>Previous 5-season average(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Outbreaks</td>
<td>Per cent of Total</td>
</tr>
<tr>
<td>Child Care Facility</td>
<td>33</td>
<td>64.7</td>
</tr>
<tr>
<td>Retirement Home</td>
<td>4</td>
<td>7.8</td>
</tr>
<tr>
<td>Group Home</td>
<td>4</td>
<td>7.8</td>
</tr>
<tr>
<td>Long Term Care Home</td>
<td>3</td>
<td>5.9</td>
</tr>
<tr>
<td>Hospital</td>
<td>2</td>
<td>3.9</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>9.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>51</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>


\(^1\) Data for the 2016-2017 season is partial (from September 1, 2016 to April 30, 2017).
\(^2\) Previous 5-season average is the number of outbreaks for the previous 5 seasons (2011-2012 to 2015-2016 combined).

- In the 2016-2017 season (September 1, 2016 to April 30, 2017) there were 51 enteric outbreaks in Waterloo Region; this is slightly lower compared to the previous 5-season average of 60.6.
- In the 2016-2017 season, enteric outbreaks demonstrated a peak during the winter months with most outbreaks occurring between November through February. This seasonal trend is fairly typical for enteric outbreaks and has been observed in previous years.
- In the 2016-2017 season (September 1, 2016 to April 30, 2017), most institutional enteric outbreaks occurred in child care facilities (64.7 per cent), followed by retirement homes (7.8 per cent) and group homes (7.8 per cent).
- When a responsible organism could be identified, the most frequently detected agent was Norovirus.
Respiratory Outbreaks

Local Picture

Table 9. Number of non-influenza outbreaks by year, Waterloo Region, 2011-2012 to 2016-2017\(^1\) and previous 5-season average\(^2\)

<table>
<thead>
<tr>
<th>Season</th>
<th>Number of Outbreaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2012</td>
<td>18</td>
</tr>
<tr>
<td>2012-2013</td>
<td>27</td>
</tr>
<tr>
<td>2013-2014</td>
<td>17</td>
</tr>
<tr>
<td>2014-2015</td>
<td>16</td>
</tr>
<tr>
<td>2015-2016</td>
<td>27</td>
</tr>
<tr>
<td>2016-2017(^1)</td>
<td>25</td>
</tr>
<tr>
<td>Previous 5-season Average(^2)</td>
<td>21.7</td>
</tr>
</tbody>
</table>

\(^1\) Data for the 2016-2017 season is partial (from September 1, 2016 to April 30, 2017).
\(^2\) Previous 5-season average is the number of outbreaks for the previous 5 seasons (2011-2012 to 2015-2016 combined).
Figure 37. Number of non-influenza outbreaks by month and year, Waterloo Region, 2011-2012 to 2016-2017* and previous 5-season average**

*2016-2017 data is partial from September 1, 2016 to April 30, 2017.
**Previous 5-season average is the number of outbreaks for the previous 5 seasons (2011-2012 to 2015-2016 combined).
Table 10. Proportion of non-influenza outbreaks by exposure setting, Waterloo Region, 2016-2017\(^1\) and previous five-season average\(^2\)

<table>
<thead>
<tr>
<th>Exposure Setting</th>
<th>2016-2017(^1)</th>
<th>Previous 5-Season Average(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Outbreaks</td>
<td>Per cent of Total</td>
</tr>
<tr>
<td>Long-Term Care Home</td>
<td>13</td>
<td>52.0</td>
</tr>
<tr>
<td>Retirement Home</td>
<td>9</td>
<td>36.0</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>12.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>


\(^1\) 2016-2017 data is partial from September 1, 2016 to April 30, 2017.
\(^2\) Previous five-season average is the number of outbreaks for the previous five seasons (2011-2012 to 2015-2016 combined).

- In the 2016-2017 season (September 1, 2016 to April 30, 2017), there were 25 non-influenza respiratory outbreaks caused by other respiratory pathogens (e.g., rhinovirus, RSV, coronavirus, etc.). This is slightly higher than the previous 5-season average of 21.7 outbreaks, but still within what can be expected due to normal variation in a typical season.
- There was an early peak in the number of non-influenza respiratory outbreaks in October, followed by another peak in January for the 2016-2017 season; this is consistent with previous years’ trends.
- In the 2016-2017 season (September 1, 2016 to April 30, 2017), most non-influenza institutional respiratory outbreaks occurred in long-term care homes (52.0 per cent) and retirement homes (36.0 per cent).
Table 11. Number of influenza outbreaks by year, Waterloo Region, 2011-2012 to 2016-2017\(^1\) and previous 5-season average\(^2\)

<table>
<thead>
<tr>
<th>Season</th>
<th>Number of Outbreaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2012</td>
<td>5</td>
</tr>
<tr>
<td>2012-2013</td>
<td>34</td>
</tr>
<tr>
<td>2013-2014</td>
<td>6</td>
</tr>
<tr>
<td>2014-2015</td>
<td>37</td>
</tr>
<tr>
<td>2015-2016</td>
<td>8</td>
</tr>
<tr>
<td>2016-2017</td>
<td>24</td>
</tr>
<tr>
<td>Previous 5-season Average</td>
<td>19.0</td>
</tr>
</tbody>
</table>

\(^1\) 2016-2017 data is partial from September 1, 2016 to April 30, 2017.
\(^2\) Previous five-season average is the number of outbreaks for the previous five seasons (2011-2012 to 2015-2016 combined).

Figure 38. Number of influenza outbreaks by month and year, Waterloo Region, 2011-2012 to 2016-2017\(^*\) and previous 5-season average\(^**\)

\(^*\) 2016-2017 data is partial from September 1, 2016 to April 30, 2017.
\(^**\) Previous five-season average is the number of outbreaks for the previous five seasons (2011-2012 to 2015-2016 combined).
Table 12. Proportion of influenza outbreaks by exposure setting, Waterloo Region, 2016-2017\textsuperscript{1} and previous five-season average\textsuperscript{2}

<table>
<thead>
<tr>
<th>Exposure Setting</th>
<th>2016-2017\textsuperscript{1}</th>
<th>Previous 5-Season Average\textsuperscript{2}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Outbreaks</td>
<td>Per cent of Total</td>
</tr>
<tr>
<td>Long-Term Care Home</td>
<td>13</td>
<td>54.2</td>
</tr>
<tr>
<td>Retirement Home</td>
<td>10</td>
<td>41.7</td>
</tr>
<tr>
<td>Hospital</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

\textsuperscript{1} 2016-2017 data is partial from September 1, 2016 to April 30, 2017.
\textsuperscript{2} Previous five-season average is the number of outbreaks for the previous five seasons (2011-2012 to 2015-2016 combined).

- There were 24 influenza outbreaks in the 2016-2017 season (September 1, 2016 to April 30, 2017). This is slightly higher than the previous 5-season average of 19 outbreaks but still within what is expected in a normal influenza season due to the variations from year to year.
- The influenza outbreaks peaked in February in the 2016-2017 season which demonstrates similar seasonality to previous seasons as well.
- In the 2016-2017 season (September 1, 2016 to April 30, 2017), more than half of all institutional influenza outbreaks occurred in long-term care homes (54.2 per cent), followed by retirement homes (41.7 per cent).
References


Appendix A: Glossary of Terms

**Accurate Episode Date:** Accurate Episode Date corresponds to the earliest date on record for the case according to iPHIS hierarchy: Symptom Date > Clinical Diagnosis Date > Specimen Collection Date > Lab Test Date > Reported Date.

**Active Transmission:** The spread of an infectious agent from one person to another.

**Age Standardization:** A method of adjusting rates to minimize the effects that different age compositions have on populations. This method is used when comparing two or more populations with potentially different age distributions. For example, an older population would be more likely to have higher rates of chronic diseases compared to a younger population. Standardizing controls for these differences. For the purposes of this report, the standard 1991 Canadian population was used as the standard.

**Agent of Disease:** A factor whether microorganism, chemical substance, radiation or nutrient whose presence or absence is essential for the onset of disease. A disease may require more than one agent to develop.

**Asymptomatic:** A person infected with an illness or disease who does not exhibit any symptoms.

**Average:** See “Mean”.

**Burden of Disease:** The amount of ill health from a specific cause, such as disease or injury, in a population. It can be measured by financial cost, mortality, morbidity, or lost healthy years.

**Case:** A case is an individual with an episode of a reportable disease. For each reportable disease there is a case definition which outlines the criteria to confirm that episode of disease. Case definitions are determined by the Ministry of Health and Long-Term Care.

**Carrier:** A person or animal without evident clinical disease (signs or symptoms) who harbours an infectious agent and is able to transmit the agent to others.

**Co-infection:** Having two infections at the same time. The progression of both (or either) disease(s) may be more severe as a result of the infection with the other disease. A person with a co-infection is counted as two separate cases.
Confidence Interval: A calculated range of values in which the actual value (such as mean, proportion or rate) is contained with a certain degree of confidence. For the purposes of this report 95 per cent confidence intervals were used, meaning that there is a 95 per cent probability that the actual value falls within this range.

Contact: A person who may have acquired an infection from a case.

Endemic: The constant presence of a disease or infectious agent within a geographic area or population group. It may also refer to a disease that is usually present at a relatively high prevalence and incidence rate in comparison with other areas or populations.

Immunocompromised: Incapable of developing a normal immune response, usually as a result of disease (e.g., cancer), irradiation, malnutrition, or immunosuppressive medication.

Incidence: The number of new events (such as new cases of a disease) among a population within a specific point in time.

Incidence Rate: The rate at which new events, or new cases, occur in a specified time in a defined population that is “at risk” of experiencing the condition or event.

Incubation Period: The time from the moment of exposure to an infectious agent until signs and symptoms of the disease appear.

Indirect Transmission: The transmission of an infectious agent carried from a reservoir to a susceptible host by air particles or by living (vector) or non-living (vehicle) intermediaries.

Infectious Disease: An illness that results from the transmission of an infectious agent or its toxins from an infected person, animal, or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector or inanimate objects.

Mean: The mean or average is the sum of all the individual values in a set of measurements divided by the total number of values in the set of measurements.

Non-endemic: A disease or infectious agent that is rarely observed within a geographic area or population group. It may also refer to a disease that is not usually present at a relatively high prevalence and incidence rate in comparison with other areas or populations.
**Outbreak:** When the occurrence of cases of a disease or condition is in excess of the expected number of cases in a localized area over a given period of time. There is no set number of cases required to declare an outbreak as it varies by disease and local conditions.

**Prevalence:** The number of individuals with a disease or condition in a specific population at a designated time.

**Proportion:** A proportion is a type of ratio in which the numerator is included in the denominator. A proportion is calculated by dividing the number of people with a common characteristic at a given time period by the total population that shares the same event in the same time period.

**Range:** The range describes the spread of scores. It often represents the difference between the largest and smallest items in a set of numerical values. In this report, it is used to describe the highest and lowest numerical values.

**Relative Standard Error (RSE):** A relative standard error is the standard error divided by the mean and expressed as a percentage. Rates with an RSE >23% are considered unstable and should be interpreted with caution.

**Reportable Disease:** A human disease that is required to be reported to public health authorities in Ontario according to Regulation 559/91 (Specification of Reportable Diseases) made under the *Health Protection and Promotion Act (HPPA)* (available at [https://www.ontario.ca/laws/regulation/910558](https://www.ontario.ca/laws/regulation/910558)). Under this legislation, physicians, laboratories, hospital administrators, principals of schools and superintendents of institutions must notify local health units about the occurrence or suspected occurrence of these diseases.

**Risk Factor:** An aspect of someone’s behaviour or lifestyle, a characteristic that a person was born with, or an event that s/he has been exposed to that is associated with acquiring a disease.

**Risk Setting:** The place or environment where the case may have acquired the infection. Risk settings reported by cases include: hospital, long-term care home, residential facility, retirement home, child care facility and community setting.

**Socio-demographic:** A variety of individual characteristics that may influence health status. Socio-demographic factors include age, sex, ethnicity, marital status, socioeconomic status and others.

**Sporadic:** When a disease occurs infrequently and irregularly. This term is also used to refer to non-outbreak associated cases of disease.
**Standardized Rate Ratio (SRR):** An SRR is the ratio of the age-standardized rate of cases observed in one population compared to the age-standardized rate of cases that occurred in another population. The 95 per cent confidence interval indicates the statistical significance of the SRR. If the 95 per cent confidence interval contains one, the two rates are not statistically different from one another.

**Surveillance:** The ongoing, systematic collection, collation, analysis, and interpretation of data with prompt dissemination of the results to those who need to know, particularly those who are in a position to take action.

**Trends:** Trends are changes in frequencies, proportions or rates of a disease, or an event observed over time. Trends may be irregular, flat, or move in one direction.

**Travel-associated:** In this report, travel-associated refers to cases of disease that were acquired during travel outside of Canada.

**Vector-borne disease:** A class of miscellaneous diseases which are transmitted to humans by vectors, predominately insects (e.g., mosquito-borne diseases caused by viruses, bacteria, etc.).

**Vector:** A living creature, typically an animal, which carries an infectious pathogen to a susceptible host. It is an intermediary without evident clinical disease who harbours an infectious agent and is able to transmit the agent to others.

**Zoonotic pathogen:** An agent of disease (e.g., bacteria or virus) that can be transmitted between animals and humans.
Appendix B: Data Sources and Methodology

Data Sources
All information related to cases of infectious disease for Waterloo Region included in this report was collected by Region of Waterloo Public Health and Emergency Services under the authority of the Health Protection and Promotion Act (HPPA), which mandates health care practitioners to notify the Medical Officer of Health (MOH) where the patient resides of all confirmed and probable cases of reportable disease. Case reports are investigated by Public Health staff as part of their routine activities.

Cases are entered into a provincially-mandated information and surveillance (monitoring) system, the integrated Public Health Information System (iPHIS), maintained by Public Health Ontario (PHO) and the Public Health Protection and Prevention Branch of the Ontario Ministry of Health and Long-term Care (MOHLTC). The only data included in this report that was not extracted from iPHIS was ambulatory care visits for varicella which was sourced from the National Ambulatory Care Reporting System (NACRS) and obtained through the IntelliHEALTH Ontario portal.

Sporadic Cases
All sporadic infectious disease data for Waterloo Region with accurate episode dates between January 1, 2006 and December 31, 2016 (September 1, 2011 to April 30, 2017 for influenza) were extracted from iPHIS on June 21, 2017 (except for HIV which was extracted by encounter date, tuberculosis which was extracted by diagnosis date, and varicella ambulatory care visits which were extracted from IntelliHEALTH Ontario). Accurate Episode Date corresponds to the earliest date on record for the case according to iPHIS hierarchy: Symptom Date > Clinical Diagnosis Date > Specimen Collection Date > Lab Test Date > Reported Date.

Unless otherwise noted, all cases reported in this report are confirmed as described by the Infectious Diseases Protocol of the Ontario Public Health Standards (2015). However, with revisions to case definitions of all reportable diseases in 2009, some cases that had previously met the confirmed case definition were then required to be reported as probable cases. For amebiasis, Lyme disease, mumps, pertussis, and West Nile virus, the impact of the change was substantial. Thus, for this report, both confirmed and probable cases of the above-mentioned diseases are included in the analysis to ensure valid comparisons of historical trends in incidence.

Syphilis case classifications for infectious and other categories were taken from the December 2009 Provincial Epidemiological Infectious Diseases Summary on the Ontario Public Health Portal. Primary, secondary and early latent syphilis are all
considered infectious (includes early latent; primary genital; primary other sites; secondary of skin and mucous membranes; secondary, other; infectious neurosyphilis; and primary anal). Other syphilis includes all other types of syphilis such as late latent; neurosyphilis, non-infectious; or unspecified (the other category excludes early congenital syphilis).

Provincial case summaries are compiled by Public Health Ontario. Provincial data was downloaded from the Public Health Ontario Infectious Diseases Query on June 21, 2017 and includes all infectious diseases reported in the province of Ontario with an accurate episode date between January 1, 2006 and December 31, 2016 (September 1, 2011 to April 30, 2017 for influenza).

Information on past episodes of disease can be added or updated to the provincial reporting system at any time. The information summarized in this report represents what was known to Region of Waterloo Public Health and Emergency Services and the MOHLTC at the date of data extraction recorded with the stipulation that these data are provisional and subject to change.

Outbreaks
Outbreak data is included in this report for enteric and respiratory diseases, both influenza and non-influenza respiratory outbreaks. For every confirmed outbreak, staff in Public Health complete detailed outbreak summary reports that document information pertaining to the outbreak, including the aetiologic agent, duration of the outbreak, reporting information, exposure setting, control measures and specimen information if available. An outbreak is defined as the occurrence of two or more cases of illness linked to each other in terms of time, exposure to source, and most often location. All data were reviewed by Public Health staff to ensure that final counts and outbreak information were accurate.

For this report, outbreak data for Waterloo Region was extracted from the iPHIS database. All outbreak records (outbreaks with a reportable enteric or respiratory disease identified as the aetiologic agent) that met the provincial surveillance case definition and had a reported date between September 1, 2011 and April 30, 2017 were extracted. All outbreak data was analyzed by seasonal year (September 1st of any given year to August 31st of the following year) and is partial up to April 30, 2017 for the 2016-2017 season.

Exposure and Risk Factor Data
Exposure and risk factor information were included for diseases which demonstrated consistently higher rates than the province, diseases that demonstrated increasing local
rates, as well as diseases that caused a significant burden of disease in 2016. When reporting exposure or risk factor proportions, those that were lost to follow-up and did not have exposure or risk factor information available were excluded from the denominator. In addition, more than one risk factor can be reported by a case resulting in proportions that do not sum to 100 per cent.

For every case of infectious disease reported to Region of Waterloo Public Health and Emergency Services, detailed case follow-up is conducted by Public Health staff. A pre-defined set of exposure or risk factor information is collected and input into iPHIS. However, exposure and risk factor information can be missing for individuals that were lost to follow-up.

It is also important to note that risk factors in iPHIS are self-reported and may not necessarily reflect the true exposure history of the individual. In addition, the risk factor and exposure setting variables in iPHIS provide investigators with a pre-defined set of categories of risk factors from which to choose which may not be adequate or specific enough to represent all potential risk factors and exposures for a disease.

Population Data
Incidence rates were calculated using population estimates obtained from Statistics Canada. Population estimates for 2006 to 2016 are post-censal estimates based on the 2011 census counts adjusted for net under-coverage and changes in the population between Census Day and July 1. Census subdivision post-censal estimates are extrapolated by applying the growth rates by age and sex of each census division to the adjust census counts of each census subdivision. Population data for 2006-2015 used in this report was downloaded from the Community Data Program, Statistics Canada’s Estimates of population by age and sex, 2001-2015 (CANSIM Table 109-5355) on April 26, 2016 and reflect the latest population estimates at the time of this report. Population estimates for 2016 were extracted from Statistics Canada 2016 Census data and were extracted on June 3, 2017.

Methodology
All diseases were extracted from iPHIS by accurate episode date (except for HIV which was extracted from iPHIS by encounter date, tuberculosis which was extracted from iPHIS by diagnosis date, and varicella ambulatory care visits which were extracted from IntelliHEALTH Ontario). All reportable diseases with one or more cases reported in the last ten years in Waterloo Region were included in the analysis. Cases that resided in Waterloo Region and met the provincial surveillance case definition were included. All data were reviewed by Public Health staff to ensure final case counts were accurate.
Varicella ambulatory care visits were extracted for Waterloo Region and Ontario for 2006-2016 from IntelliHEALTH’s Ambulatory All Visit All Tables which is sourced from the National Ambulatory Care Reporting System (NACRS). Ambulatory care visits include emergency visits as well as other hospital-based outpatient clinics. Visits were filtered to include only unscheduled emergency visits (Ambulatory Case Type = EMG). Ambulatory care visits were used instead of iPHIS reportable disease counts because iPHIS reports varicella as aggregated case counts rather than individual cases. Additionally, monitoring ambulatory care visits rather than reported cases helps to determine which varicella cases are more severe in nature. It must be noted that ambulatory care visit rates are not comparable to the incidence rates reported for other reportable diseases and that varicella counts presented in this report are an underestimate of the true number of cases.

For each reportable infectious disease, data on the number of cases and incidence rates were presented. Where relevant, disease case counts and rates were further broken down by:

- Sex (male and female – analysis by gender does not include those with unknown, transgender or other genders)
- Age group (0-4, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64 and 65+ years)
- Seasonality (month)

Note that latent tuberculosis infection (LTBI) was the only exception to this standard method of analysis; LTBI cases were only reported for 2013 to 2016, due to an inability to confirm case counts through normal data quality assurance processes for cases from 2006 to 2012. LTBI case counts and rates were still broken down by sex, age group and seasonality as relevant.

As age can be a factor in whether a person acquires a disease and how the disease progresses, it is necessary to control for differences in age distribution when comparing two populations. Age-standardization is a technique that minimizes the effect of differences in age between populations so that findings can be attributed to factors other than age. For this report, when comparisons between Waterloo Region and Ontario were made, rates were directly age-standardized using the July 1, 2011 Canadian Standard population from Statistics Canada. Note that this is a change from previous years that the Waterloo Region Infectious Disease Report was produced. For previous reports, the 1991 Canadian Standard Population was used for age-standardization which will result in different age-standardized rates between the current and previous reports even if the annual count remains unchanged. For each disease,
age-standardized incidence rates were presented for Waterloo Region and Ontario on an annual basis and refer to the number of new cases of disease per 100,000 population. The age groups (in years) used for direct age-standardization were: 0-4, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, and 90+. Cases that had missing age were not included in the calculation of the age-standardized rates.

Standardized Rate Ratios (SRR) with 95 per cent confidence intervals were also calculated for all reportable diseases, where possible. The SRR reported is the ratio of the age-standardized rate of cases observed in Waterloo Region compared to the age-standardized rate of cases that occurred in Ontario. The 95 per cent confidence interval indicates the statistical significance of the SRR. If the 95 per cent confidence interval contains the value ‘one’ in its range, the two rates are not statistically different from one another.

A relative standard error (RSE) was also calculated for each rate. The RSE is simply the standard error divided by the mean number of cases and expressed as a percentage. Rates with an RSE >23 per cent are considered unstable and should be interpreted with caution.

Annual average rates for 2011 to 2015 were also calculated which were defined as the average of the age-standardized rates for each year from 2011 to 2015. Age-standardized rates for 2016 were compared to the previous five-year annual average rate for 2011 to 2015 (or the previous 5-season average for the 2011-2012 to 2015-2016 seasons for outbreaks) but these differences are not implied to be statistically different.

Proportions and rates were rounded to one decimal place. As much as possible, data were presented in a consistent format with a figure highlighting the age-standardized overall rates for Waterloo Region and Ontario. Select diseases were highlighted with further in-depth analysis (e.g., mortality, risk factors). These diseases were selected for a variety of reasons including: local rates were significantly different than provincial rates, there are emerging issues related to the disease such as a provincial or local campaign, or because Region of Waterloo Public Health and Emergency Services has undertaken specific measures related to the prevention or containment of the disease.

Data Limitations
The published literature reveals variation in infectious disease reporting completeness. According to a review of the literature by Doyle (2002), reporting completeness was significantly greater for TB, AIDS and sexually transmitted diseases as a group than for all other reportable diseases combined. Other studies estimate that for each reported
case of enteric illness, there are at least several hundred undiagnosed or unreported cases in the community (Majowicz, 2005). Individuals that experience less severe manifestations of a disease may not experience symptoms, or only mild symptoms and may not seek medical assistance or be tested for the presence of a disease. Disease reports rely on a passive surveillance system, wherein laboratories, physicians, other health care providers and institution administrators are entrusted to know the regulations, recognize a disease that is on the reportable disease list, and inform public health.

In some instances, the number of reported cases may change in subsequent years due to periodic data quality assurance checks and corrections that result in the reclassification of cases (i.e., case status). In addition, there may be a lag in reporting of some cases due to the time required to collect a specimen, carry out a diagnostic test and inform the local public health department and Ontario MOHLTC which could lead to future changes in the number of reported cases. Chance, as well as statistical artifacts, may also account for some of the variation in infectious disease incidence over time and for different geographic areas (within Ontario).

While the provincial case summaries allowed for local data comparisons with Ontario rates, comparisons with other health units can be problematic due to inconsistencies in data collection and reporting across health units. Also, some cases may be double-counted among people who move to other health units. This double-counting is not an issue with the provincial data due to regular efforts to resolve inter-health unit duplicate records.

It is important to note that the number of outbreaks does not necessarily reflect the magnitude of individual outbreak investigations or burden of outbreak-related illness. Institutional outbreaks are likely well reported compared with other outbreaks because institutions often have infection control staff on-site, there are usually a large number of persons affected, and the agent, most often a virus transmitted person-to-person, is relatively easy to diagnose. However, prior to 2012, only long-term care homes were required to report outbreaks to Public Health; retirement homes were not required to report outbreaks which thereby affected the comparison between 2012 and previous years. Similarly, community outbreaks are not required to be reported to Public Health. At times Public Health will become aware of them due to (voluntary) reports if a number of people become ill (e.g., group of people who ate a common meal or attended a common event). Therefore, the data presented in this report would reflect an underestimation of the true burden of community outbreaks.

For some diseases, case definitions have changed over time. As of April 28, 2009, new provincial case definitions for reportable diseases came into effect. The Ontario
MOHLTC released the new case definitions as an appendix to the Infectious Diseases Protocol, 2009 (Ontario Ministry of Health and Long-Term Care, 2009). Ontario's new case definitions were updated to reflect the changing epidemiology of infectious diseases and the use of newer laboratory technologies. These updates impacted the classification of cases for several diseases, and may influence the incidence of some diseases during the year 2009. Both confirmed and probable cases of amebiasis, Lyme disease, mumps, pertussis, and West Nile virus were included to adjust for these changes. However, for other diseases, an observed increase or decrease in disease incidence during this period may not reflect a true change in incidence.

Due to the unavailability of case level data for varicella in iPHIS, ambulatory care visits from IntelliHEALTH were used instead. However, incidence and ambulatory care visits cannot be compared directly since ambulatory care visits represent the more severe varicella cases, thus underestimating the true number of varicella cases occurring locally and provincially.

Finally, the data presented in this report only relate to data collected on cases residing in Waterloo Region. Therefore, caution should be used when attempting to generalize these results beyond Waterloo Region.
Appendix C: List of Reportable Diseases (2016)

The following specified Reportable Diseases (Ontario Regulations 559/91 and amendments under the Health Protection and Promotion Act) are to be reported to the local Medical Officer of Health:

**Reportable Diseases 2016**

The following specified Reportable Diseases (Ontario Regulations 559/91 and amendments under the Health Protection and Promotion Act) are to be reported to the local Medical Officer of Health:

**Infectious Disease & Tuberculosis Control**

- Acute Flaccid Paralysis
- Diphtheria
- Encephalitis*, including:
  1. primary, viral
  2. post-infectious
  3. vaccine-related
- Tuberculosis, including:
- Pertussis (Whooping Cough)*
- Pneumococcal Disease, invasive
- Poliomyelitis, acute
- Respiratory infection outbreaks in institutions*
- Rubella
- Rubella, congenital syndrome
- Severe Acute Respiratory Syndrome (SARS)*
- Smallpox
- Tetanus
- Transmissible Spongiform Encephalopathy including Creutzfeldt-Jakob Disease, all types
- Tuberculosis
  1. postop infection
  2. latent infection (positive TB skin test)
- West Nile Virus Illness (WNV)*
- Yellow Fever

**Health Protection and Investigation**

- Anemia
- Anthrax*
- Botulism*
- Brucellosis*
- Campylobacter Enteritis
- Cholera*
- Clostridium difficile associated disease (CDAD) outbreaks in public hospitals
- Cryptosporidiosis
- Cyclospora*
- Food Poisoning, all causes
- Gastroenteritis, institutional outbreaks*
- Giardiasis, except asymptomatic cases*
- Hamtavirus Pulmonary Syndrome*
- Lassa Fever*
- Leptospirosis*
- Paralytic Shellfish Poisoning*
- Paratyphoid Fever*
- Plague*
- Psittacosis / Ornithosis
- Q Fever*
- Rabies*
- Salmonellosis
- Shigellosis
- Trench Fever
- Typhoid Fever*
- Vaportox — producing E. Coli infection
- Varicella (e.g., Chickenpox, Zoster)

**Sexual Health and Harm Reduction**

- Acquired Immune Deficiency Syndrome (AIDS)
- Chlamydia Trachomatis infection
- Gonorrhea
- Hepatitis B
- Hepatitis C
- Syphilis

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Note: diseases marked* (and respiratory infection and gastrointestinal outbreaks in institutions) should be immediately reported to the Medical Officer of Health. (Other diseases are to be reported by the next business day.)

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**Reporting Contact Numbers:**

- Infectious Diseases and Tuberculosis Control Program: 519-875-4440 ext. 5275
- Health Protection and Investigation: 519-875-4400, ext. 5147
- Sexual Health and Harm Reduction: 519-875-2267

Fax: 519-875-2248
Emergency on weekends/holidays: 519-875-4400