WATERLOO REGION STATUS REPORT
ENTERIC DISEASE
2005-2009
Message from the Medical Officer of Health

The Ontario Public Health Standards (OPHS) establish requirements for the fundamental public health programs and services carried out by boards of health. As part of its mandate, Region of Waterloo Public Health works to eliminate and prevent the transmission of infectious and other reportable diseases in the region, with specific goals to (i) prevent and reduce the burden of infectious diseases of public health importance, (ii) prevent or reduce the burden of food-borne illness, and (iii) prevent or reduce the burden of water-borne illness related to drinking water and recreational water use.

Therefore, I am pleased to introduce this report entitled “Waterloo Region Enteric Disease Status Report: 2005-2009” which adds to the body of knowledge related to reportable infectious diseases transmitted by food, water and animals. These diseases are important as they have the ability to cause serious illness, and some can be transmitted to large numbers of individuals.

The report presents enteric disease rates for Waterloo Region during the period 2005 through 2009. Disease trends over time, by age group and sex are summarized, as well as information on the symptoms and causes of each disease. The report also includes information on outbreaks of enteric disease in the region over the same 5 year time period.

In addition to guiding provincially mandated public health programs (OPHS) and local needs for programs and services in the region, this report provides timely information pertaining to the region’s health status. Region of Waterloo Public Health is committed to providing this information and does so through the provision of reports and studies which will add to this body of knowledge.

I hope that you find the information in this report both interesting and useful. As always, Region of Waterloo Public Health 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,
Waterloo Region
Acknowledgements

The Waterloo Region Enteric Disease Status Report: 2005-2009 was produced under the direction of Region of Waterloo Public Health staff, including authors from the Epidemiology and Health Analytics team and the Health Protection and Investigation Division.

Additional thanks to all staff in Region of Waterloo Public Health’s Health Protection and Investigation Division for their ongoing work in infectious disease outbreak investigation, case follow-up, and data collection and reporting, including the data used to develop this report.

Region of Waterloo Public Health would also like to thank the C-EnterNet scientific team at the Public Health Agency of Canada and their collaborators for their ongoing support in monitoring trends in human enteric disease and levels of pathogen exposure from food, animal and water sources in Waterloo Region.

Authors
Amy MacArthur, Brenda Miller

Editors
Amy MacArthur, Brenda Miller, Dr. Hsiu-Li Wang

Contributors
Stephen Drew, Lindsay Blashill, Amanda Tavares, Sharmin Jaffer, Nancy Sittler, Joline McKnight-Drayton

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For more information about this report please contact:
Epidemiology and Health Analytics
Region of Waterloo Public Health
99 Regina Street South, 3rd Floor
Waterloo, Ontario  N2J 4V3
Phone: 519-883-2004 ext. 5829
Fax: 519-883-2241
Email: eha@regionofwaterloo.ca
www.region.waterloo.on.ca/ph
# Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>C-EnterNet</td>
<td>National Enteric Pathogen Surveillance System</td>
</tr>
<tr>
<td>CFIA</td>
<td>Canadian Food Inspection Agency</td>
</tr>
<tr>
<td>HPPA</td>
<td><em>Health Protection and Promotion Act</em></td>
</tr>
<tr>
<td>Hep A</td>
<td>Hepatitis A</td>
</tr>
<tr>
<td>HPI</td>
<td>Health Protection and Investigation</td>
</tr>
<tr>
<td>HUS</td>
<td>Haemolytic Uremic Syndrome</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 report having sex with men</td>
</tr>
<tr>
<td>OPHS</td>
<td>Ontario Public Health Standards</td>
</tr>
<tr>
<td>PHAC</td>
<td>Public Health Agency of Canada</td>
</tr>
<tr>
<td>PHPDB</td>
<td>Provincial Health Planning Database</td>
</tr>
<tr>
<td>RDIS</td>
<td>Reportable Disease Information System</td>
</tr>
<tr>
<td>ROWPH</td>
<td>Region of Waterloo Public Health</td>
</tr>
<tr>
<td>S. <em>typhi</em></td>
<td><em>Salmonella typhi</em></td>
</tr>
<tr>
<td>S. <em>paratyphi</em></td>
<td><em>Salmonella paratyphi</em></td>
</tr>
<tr>
<td>VTEC</td>
<td>Verotoxin producing <em>Escherichia coli</em></td>
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</table>
Executive Summary

Infectious diseases are illnesses caused by a specific infectious agent or its toxic products. Infectious diseases transmitted by food, water and animals are commonly referred to as enteric illnesses. Since these diseases may cause serious illness and can be transmitted to large numbers of individuals, they are of great importance to public health authorities.

This report provides a series of briefs on a selected list of enteric diseases in Waterloo Region reported to Public Health from 2005 to 2009. The briefs in this report are specifically related to the reportable enteric diseases as designated in Ontario’s Health Protection and Promotion Act (HPPA) and its associated regulations (refer to Appendix A for a complete list of reportable diseases under the HPPA). Under provincial law, all cases of such diseases in Waterloo Region must be reported to Public Health.

The briefs were completed for enteric diseases where ten or more cases were reported during the study period (2005 to 2009), or if Public Health undertook significant measures to prevent transmission of the disease. Diseases are presented in alphabetical order and follow a standard format. Rare diseases for which there were fewer than five reported cases to Waterloo Region Public Health during the study period are not included in the list of selected briefs. However, they are summarized in Appendix C.

Key Findings of the Report

During the 2005 to 2009 period, the most notable enteric disease story involved a national outbreak of listeriosis in 2008 linked to deli meats produced at a Maple Leaf plant (Maple Leaf Est. 97B) (Health Canada, 2009). During this outbreak, there were 41 confirmed cases and 16 deaths where listeriosis was the underlying or contributing cause in Ontario. Nationally, there were 57 confirmed cases and 23 deaths (Public Health Agency of Canada, 2010). There were also an increased number of listeriosis cases reported in Waterloo Region in 2008 due to this outbreak.

The following local outbreaks also contributed to increases in enteric disease rates in Waterloo Region between 2005 and 2009:

- A community outbreak of Hepatitis A at a restaurant with an ill food handler in 2005
- Outbreaks of Verotoxin producing Escherichia coli (VTEC) in local child care facilities (both licensed and home-based) in 2005 and 2006

The three most frequently reported diseases from 2005 to 2009 in Waterloo Region were campylobacteriosis, salmonellosis and giardiasis which represented over 75 per cent of all reported enteric diseases. This is similar to the ranking and proportion of enteric diseases provincially. There were no cases in Waterloo Region between 2005 and 2009 for several rare reportable diseases, including botulism, cholera, psittacosis and trichinosis.

The incidence rates of enteric diseases were consistent with or lower than provincial rates between 2005 and 2009, with the exception of cryptosporidiosis, salmonellosis, and VTEC. Rates of giardiasis were also higher than provincial rates in 2008 and 2009.

The data show that enteric illnesses often occur most frequently among young children. There is greater ease of transmission among diapered children for enteric illnesses, such as in child care centres. The elderly, especially those who are institutionalized, are more susceptible to serious complications of enteric illness. Public Health investigates outbreaks and supports infection prevention and control practices in long-term care homes and child care centres where these vulnerable populations often reside.

Travel to or recent immigration from endemic areas emerged as a theme in terms of a significant risk setting for several enteric diseases reported in Waterloo Region. Illness associated with travel represented the vast majority of typhoid/paratyphoid fever, cyclosporiasis and shigellosis cases. Overall, approximately 70 per cent of all reported and laboratory-confirmed enteric diseases were acquired locally (endemic), about one-quarter were associated with travel outside of Canada, and less than 5 per cent were associated with an outbreak.
From 2005 to 2009, there were a total of 335 enteric disease outbreaks reported to Region of Waterloo Public Health. There was a seasonal trend in reported outbreaks, with approximately 60 per cent of all outbreaks occurring during the winter months from December to March. The majority of outbreaks were in institutional settings (hospitals, long-term care homes, residential facilities and retirement homes) and child care centres, while only a small proportion were community outbreaks. However, it is important to note that community outbreaks are not required to be reported to Public Health. The average duration of enteric disease outbreaks have decreased from a high of 15 days in 2006 to 10 days in 2009.

Conclusions

The report presents enteric disease rates for Waterloo Region during the period 2005 through 2009. Disease trends over time are illustrated. The report also includes information on outbreaks of enteric disease in the region over the same 5 year time period.

In addition to illustrating the burden of enteric illnesses in Waterloo Region, this information will serve to guide the review and planning of Public Health enteric disease programs in the future, especially with respect to illnesses where our local rates are higher than provincial rates.

Improvements to the collection and reporting of risk factor and exposure information on sporadic cases and outbreaks of enteric diseases in Waterloo Region were implemented in July 2010 with the introduction of improved enteric disease worksheets. These worksheets will lead to enhanced surveillance and reporting of enteric diseases, particularly related to risk factors for the diseases. In addition, Region of Waterloo Public Health is partnered with the Public Health Agency of Canada (PHAC) in the National Enteric Pathogen Surveillance System (C-EnterNet) initiative. PHAC is currently conducting a case control study which will provide data necessary for Region of Waterloo Public Health to better assess significant risk factors for local cases of enteric disease. Study findings should be available in 2011 and results will inform the planning of Public Health enteric disease programs and decision making to reduce the burden of enteric disease.

Public Health will continue to manage all cases and contacts of reportable enteric illness, as well as all suspected or confirmed enteric outbreaks of infectious diseases, as required by the Infectious Diseases Protocol (2008) and the Health Protection and Promotion Act. Continued work with our health care and community partners, especially in long-term care homes and in child care centres, will assist in the prevention of outbreaks.

Public Health will continue to educate cases on transmission and the appropriate prevention measures including hand hygiene, food safety, private well water protection and the importance of avoiding ingestion of water from lakes, ponds, streams and pools, which can be sources of bacterial and parasitic illnesses. We will continue to exclude ill individuals from sensitive occupations to prevent the spread of illness in the community.

Region of Waterloo Public Health will continue to balance enforcement and education strategies in the food safety program through the inspection of food premises, enforcement of the Health Protection and Promotion Act, food safety awareness and promotion, disclosure of food inspection results, reporting enforcement activity to Community Services Committee and providing access to Food Safety Training courses.

Travel to or recent immigration from endemic countries emerged as a significant risk factor for several enteric diseases. Travelers to endemic countries should seek advice on travel-related risks and take appropriate precautions. Region of Waterloo Public Health Travel Clinic is one of the places citizens can access this service.

Ongoing and enhanced disease surveillance, combined with regular review and adjustment of programs in light of surveillance information, and continued collaboration with our health care partners, will facilitate the prevention and control of enteric diseases and contribute to a healthier population in Waterloo Region.
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Introduction

Infectious diseases are illnesses caused by a specific infectious agent or its toxic products. Since these diseases may cause serious illness and can be transmitted to large numbers of individuals, they are of great importance to public health authorities.

Infectious diseases transmitted by food, water and animals are commonly referred to as enteric illnesses. They are caused by ingesting infectious agents (bacteria, viruses or other parasitic organisms) that are shed in the feces of an infected person or animal and can contaminate our food and water sources. Transmission occurs primarily through ingestion of contaminated food or water (common source), and more rarely through direct or fecal-oral contact with an infected person (person-to-person transmission). All of these diseases can cause symptoms of diarrhea and/or vomiting lasting a few days. In some cases, these diseases can lead to severe chronic conditions, such as kidney failure or systemic infection, and sometimes death.

This report provides a series of briefs on a selected list of enteric diseases (i.e. diseases transmitted by food, water and animals) in Waterloo Region reported to Public Health from 2005 to 2009. The briefs in this report are specifically related to the reportable enteric diseases as designated in Ontario’s Health Protection and Promotion Act (HPPA) and its associated regulations (refer to Appendix A for a complete list of reportable diseases under the HPPA). Under provincial law, all cases of such diseases in Waterloo Region must be reported to Public Health. Reports of diseases included in this document are for individuals who lived in Waterloo Region at the time of their illness.

For the purposes of this report, reportable enteric diseases include:

- Amebiasis
- Brucellosis
- Botulism
- Campylobacteriosis
- Cholera
- Cryptosporidiosis
- Cyclosporidiosis
- Giardiasis
- Hepatitis A
- Listeriosis
- Salmonellosis
- Shigellosis
- Trichinosis
- Typhoid/Paratyphoid Fever
- Verotoxin Producing Escherichia coli
- Yersiniosis

The briefs were completed for enteric diseases where ten or more cases were reported during the study period (2005 to 2009), or if Public Health undertook significant measures to prevent transmission of the disease. For each disease, the number of cases and rate of illness are described, overall and by sex, age group and year. Temporal trends (seasonal and other cyclical variations over time) are also presented. Examination of temporal trends is an important component of health surveillance as it allows for the interpretation of the current status of health in the context of the historical background. It also allows for the forecasting of future trends of enteric disease and the related consequences in the absence of relevant interventions or policy changes. Diseases are presented in alphabetical order and follow a standard format. Rare diseases for which there were fewer than five reported cases are not highlighted in this report, but are summarized in Appendix C.
Overview of Enteric Disease in Waterloo Region

Infectious diseases transmitted by food, water and animals, commonly referred to as enteric illnesses, are caused by ingesting infectious agents (bacteria, viruses or other parasitic organisms) that are shed in the feces of an infected person or animal and can contaminate our food and water sources. Transmission occurs primarily through ingestion of contaminated food or water, and more rarely through direct or fecal-oral contact with an infected person. All of these diseases can cause symptoms of diarrhea and/or vomiting lasting a few days. In some cases, these diseases can lead to severe chronic conditions, such as kidney failure or systemic infection, and sometimes death.

The relative proportion and the ranking of each enteric disease reported to Region of Waterloo Public Health between 2005 and 2009 are listed in Table 1. Rare reportable diseases for which there were fewer than five cases between January 1, 2005 and December 31, 2009 in Waterloo Region have insufficient data to generate rates or trends across time and are not summarized in the following disease-specific sections of this report. Rare reportable diseases are summarized in Appendix C.

Table 1. Number and proportion of enteric diseases*, Waterloo Region, 2005-2009

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Disease</th>
<th>Number of Cases</th>
<th>Proportion of Cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Campylobacteriosis</td>
<td>787</td>
<td>34.7</td>
</tr>
<tr>
<td>2</td>
<td>Salmonellosis</td>
<td>612</td>
<td>27.0</td>
</tr>
<tr>
<td>3</td>
<td>Giardiasis</td>
<td>333</td>
<td>14.7</td>
</tr>
<tr>
<td>4</td>
<td>Amebias</td>
<td>130</td>
<td>5.7</td>
</tr>
<tr>
<td>5</td>
<td>Verotoxin producing <em>Escherichia coli</em></td>
<td>114</td>
<td>5.0</td>
</tr>
<tr>
<td>6</td>
<td>Cryptosporidiosis</td>
<td>93</td>
<td>4.1</td>
</tr>
<tr>
<td>7</td>
<td>Yersiniosis</td>
<td>67</td>
<td>3.0</td>
</tr>
<tr>
<td>8</td>
<td>Hepatitis A</td>
<td>41</td>
<td>1.8</td>
</tr>
<tr>
<td>9</td>
<td>Shigellosis</td>
<td>40</td>
<td>1.8</td>
</tr>
<tr>
<td>10</td>
<td>Typhoid/Paratyphoid fever</td>
<td>20</td>
<td>0.9</td>
</tr>
<tr>
<td>11</td>
<td>Cyclosporiasis</td>
<td>17</td>
<td>0.8</td>
</tr>
<tr>
<td>12</td>
<td>Listeriosis</td>
<td>8</td>
<td>0.4</td>
</tr>
<tr>
<td>13</td>
<td>Brucellosis</td>
<td>3</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>2,265</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

* Diseases with one or more cases reported between January 1, 2005 and December 31, 2009.

Overall, there were a total of 2,265 cases of enteric diseases reported to Region of Waterloo Public Health (ROWPH) from 2005 to 2009. The three most frequently reported diseases during this period were campylobacteriosis, salmonellosis and giardiasis which represented over 75 per cent of all reportable enteric diseases. This is similar to the ranking and proportion of enteric diseases in Ontario (Table 2).
Table 2. Number and proportion of enteric diseases*, Ontario, 2005-2009

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Disease</th>
<th>Number of Cases</th>
<th>Proportion of Cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Campylobacteriosis</td>
<td>18,297</td>
<td>36.3</td>
</tr>
<tr>
<td>2</td>
<td>Salmonellosis</td>
<td>12,717</td>
<td>25.3</td>
</tr>
<tr>
<td>3</td>
<td>Giardiasis</td>
<td>7,700</td>
<td>15.3</td>
</tr>
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<td>4</td>
<td>Amebias</td>
<td>3,722</td>
<td>7.4</td>
</tr>
<tr>
<td>5</td>
<td>Cryptosporidiosis</td>
<td>1,687</td>
<td>3.3</td>
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<td>6</td>
<td>Yersinia</td>
<td>1,458</td>
<td>2.9</td>
</tr>
<tr>
<td>7</td>
<td>Verotoxin producing <em>Escherichia coli</em></td>
<td>1,321</td>
<td>2.6</td>
</tr>
<tr>
<td>8</td>
<td>Shigellosis</td>
<td>1,230</td>
<td>2.4</td>
</tr>
<tr>
<td>9</td>
<td>Hepatitis A</td>
<td>700</td>
<td>1.4</td>
</tr>
<tr>
<td>10</td>
<td>Typhoid/Paratyphoid fever</td>
<td>659</td>
<td>1.3</td>
</tr>
<tr>
<td>11</td>
<td>Cyclosporiasis</td>
<td>565</td>
<td>1.1</td>
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<tr>
<td>12</td>
<td>Listeriosis</td>
<td>265</td>
<td>0.5</td>
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<tr>
<td>13</td>
<td>Brucellosis</td>
<td>21</td>
<td>&lt;0.1</td>
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<tr>
<td>14</td>
<td>Botulism</td>
<td>14</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>15</td>
<td>Cholera</td>
<td>7</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>16</td>
<td>Trichinosis</td>
<td>1</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>50,364</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

* Diseases with one or more cases reported between January 1, 2005 and December 31, 2009.

The age-standardized incidence rates of all enteric diseases reported in Waterloo Region between 2005 and 2009 were slightly higher than the provincial average (Figure 1 and Table 3). In general, incidence rates of enteric diseases have been declining both within Waterloo Region and Ontario between 2005 and 2009.
Figure 1. Enteric disease standardized incidence rates*, Waterloo Region and Ontario, 2005-2009


Enteric illness can be categorized according to the place where the illness was acquired (exposure setting) and includes endemic (locally acquired), non-endemic (travel-associated) and outbreak-related cases. Endemic cases are those that occur sporadically within the geographic area of interest (Waterloo Region). Travel-associated cases were identified as those that had travelled outside of Canada during the relevant timeframe before the onset of illness. Cases were classified as outbreak-related if they could be linked to an identified outbreak through laboratory methods.

The number and proportion of enteric diseases reported to Region of Waterloo Public Health between 2005 and 2009 by their exposure setting are listed in Table 4. Approximately 70 per cent of all reported and laboratory-confirmed enteric diseases were locally acquired (endemic), about one-quarter were associated with international travel outside of Canada, and less than 5 per cent were associated with an outbreak.

Illness associated with travel represented a substantial amount of disease for several enteric diseases. Almost all typhoid/paratyphoid cases (94.1 per cent) were associated with international travel. In addition, over half of cyclosporidiosis cases (61.5 per cent) and shigellosis cases (57.1 per cent) were associated with international travel, while approximately 40 per cent of amebiasis, giardiasis and Hepatitis A cases were not locally acquired.
Table 4. Number and proportion of reported and laboratory-confirmed enteric disease cases by exposure setting, Waterloo Region, 2005-2009

<table>
<thead>
<tr>
<th>Disease</th>
<th>Exposure Period</th>
<th>Endemic No.</th>
<th>% of Total</th>
<th>Travel No.</th>
<th>% of Total</th>
<th>Outbreak No.</th>
<th>% of Total</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amebiasis</td>
<td>2-4 weeks</td>
<td>69</td>
<td>57.5</td>
<td>51</td>
<td>42.5</td>
<td>0</td>
<td>0.0</td>
<td>120</td>
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<tr>
<td>Brucellosis</td>
<td>5-60 days</td>
<td>1</td>
<td>33.3</td>
<td>2</td>
<td>66.7</td>
<td>0</td>
<td>0.0</td>
<td>3</td>
</tr>
<tr>
<td>Campylobacteriosis</td>
<td>10 days</td>
<td>552</td>
<td>77.0</td>
<td>139</td>
<td>19.4</td>
<td>26</td>
<td>3.6</td>
<td>717</td>
</tr>
<tr>
<td>Cryptosporidiosis</td>
<td>1-12 days</td>
<td>68</td>
<td>78.2</td>
<td>19</td>
<td>21.8</td>
<td>0</td>
<td>0.0</td>
<td>87</td>
</tr>
<tr>
<td>Cyclosporidiosis</td>
<td>2-14 days</td>
<td>5</td>
<td>38.5</td>
<td>8</td>
<td>61.5</td>
<td>0</td>
<td>0.0</td>
<td>13</td>
</tr>
<tr>
<td>Giardiasis</td>
<td>3-25 days</td>
<td>186</td>
<td>59.6</td>
<td>125</td>
<td>40.1</td>
<td>1</td>
<td>0.3</td>
<td>312</td>
</tr>
<tr>
<td>Hepatitis A*</td>
<td>15-50 days</td>
<td>17</td>
<td>48.6</td>
<td>14</td>
<td>40.0</td>
<td>5</td>
<td>14.3</td>
<td>35</td>
</tr>
<tr>
<td>Listeriosis</td>
<td>3-70 days</td>
<td>5</td>
<td>62.5</td>
<td>0</td>
<td>0.0</td>
<td>3</td>
<td>37.5</td>
<td>8</td>
</tr>
<tr>
<td>Salmonellosis*</td>
<td>6-73 hours</td>
<td>380</td>
<td>66.8</td>
<td>145</td>
<td>25.5</td>
<td>45</td>
<td>7.9</td>
<td>569</td>
</tr>
<tr>
<td>Shigellosis</td>
<td>1-3 days^</td>
<td>15</td>
<td>42.9</td>
<td>20</td>
<td>57.1</td>
<td>0</td>
<td>0.0</td>
<td>35</td>
</tr>
<tr>
<td>Typhoid/Paratyphoid fever</td>
<td>3-60 days^ψ</td>
<td>1</td>
<td>5.9</td>
<td>16</td>
<td>94.1</td>
<td>0</td>
<td>0.0</td>
<td>17</td>
</tr>
<tr>
<td>Verotoxin producing Escherichia coli</td>
<td>2-10 days</td>
<td>90</td>
<td>84.9</td>
<td>5</td>
<td>4.7</td>
<td>11</td>
<td>10.4</td>
<td>106</td>
</tr>
<tr>
<td>Yersiniosis</td>
<td>3-7 days</td>
<td>56</td>
<td>84.8</td>
<td>10</td>
<td>15.2</td>
<td>0</td>
<td>0.0</td>
<td>66</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>1,445</strong></td>
<td><strong>69.2</strong></td>
<td><strong>554</strong></td>
<td><strong>26.5</strong></td>
<td><strong>91</strong></td>
<td><strong>4.4</strong></td>
<td><strong>2,088</strong></td>
</tr>
</tbody>
</table>

* Includes one case that was classified as both travel and outbreak-related.
^ Up to one week for Shigellosis dysenteriae.
ψ 1-10 days for Paratyphoid fever.

Note: C-EnterNet data collection began in the second quarter of 2005 and data represent a subset of the total number of enteric diseases reported to ROWPH over the five year study. Therefore, the total number of cases for each disease may not correspond to the number of cases reported in iPHIS.

The source of infection for most enteric illness is commonly unknown due to variable incubation periods (the interval from the moment of exposure to an infectious agent until signs and symptoms of the disease appear). When enteric illnesses are of low severity, cases are more likely to delay seeking medical attention, or may not seek medical attention at all, making source attribution difficult.

Due to the highly infectious nature of many enteric illnesses, and the ability for infection to spread to large numbers of people, outbreaks of enteric disease are common. From 2005 to 2009, there were a total of 335 enteric disease outbreaks reported to ROWPH. Of these, approximately half were in institutional settings (hospitals, long-term care homes, residential facilities and retirement homes) (49.9 per cent), close to half were in child care centres (45.1 per cent), and a small proportion were community outbreaks (5.1 per cent) (Table 5). It is important to note that the number of outbreaks does not necessarily reflect the total burden of outbreak-related illness in Waterloo Region. The number of outbreaks that occur in the region is potentially under-reported as it is dependent on the severity of symptoms experienced by affected individuals. In addition, community outbreaks are not required to be reported to Public Health.
Table 5. Number and per cent of enteric disease outbreaks by exposure setting and year, Waterloo Region, 2005-2009

<table>
<thead>
<tr>
<th>Exposure Setting</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2005 - 2009 Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child care centre</td>
<td>30 (50)</td>
<td>37 (50)</td>
<td>32 (39)</td>
<td>25 (45)</td>
<td>27 (42)</td>
<td>151 (45)</td>
</tr>
<tr>
<td>Institution*</td>
<td>29 (48)</td>
<td>33 (45)</td>
<td>45 (56)</td>
<td>26 (46)</td>
<td>34 (53)</td>
<td>167 (50)</td>
</tr>
<tr>
<td>Community</td>
<td>1 (2)</td>
<td>4 (5)</td>
<td>4 (5)</td>
<td>5 (9)</td>
<td>3 (5)</td>
<td>17 (5)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>60</strong></td>
<td><strong>74</strong></td>
<td><strong>81</strong></td>
<td><strong>56</strong></td>
<td><strong>64</strong></td>
<td><strong>335</strong></td>
</tr>
</tbody>
</table>

*Institutions include hospitals, long-term care homes, residential facilities and retirement homes.


The average annual number of outbreaks reported in Waterloo Region from 2005 to 2009 was 67, ranging from 56 outbreaks in 2008 to 81 outbreaks in 2007. The average and median duration of all outbreaks were 12 days and 7 days, respectively.
Amebiasis

Amebiasis in Waterloo Region and Ontario, 2005 - 2009

Figure 2. Amebiasis standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

* Rates age-standardized according to the 1991 Canadian population, Statistics Canada.

Figure 3. Amebiasis incidence rates by age group and sex, Waterloo Region, 2005-2009*

*Excludes cases with unknown sex and/or age.
Interpretation

What is it?

- Amebiasis is an intestinal infection caused by the microscopic parasite *Entamoeba histolytica*. This parasite only lives in humans and is passed through their stool.
- Amebiasis can present with mild abdominal discomfort, bloody diarrhea or infection outside of the gastrointestinal tract, involving the liver, lungs or brain. Some cases may be asymptomatic.
- Symptoms usually appear two to four weeks from the time of infection. The illness lasts about three weeks with medication, but can last longer if untreated.

What are the causes or risk factors?

- *Entamoeba histolytica* live in the intestinal tract of humans and cause illness when people ingest contaminated food or water containing the cysts. Transmission may also occur sexually through fecal-oral routes.
- The disease is endemic in many developing countries and is common among people living in or travelling to countries with poor sanitary conditions.
- The disease is most prevalent in young adults and in men who report having sex with men. It rarely occurs in children under 5 years of age.

What are the trends in Waterloo Region?

- Between 2005 and 2009, there were 130 reported cases of amebiasis (5.3 cases per 100,000). In 2009 there were 25 reported cases of amebiasis which represented a decrease of 8 cases (24 per cent) from 2008 (Figure 2).
- With the exception of a decline in 2006, the number of cases and incidence rates of amebiasis has remained fairly constant from 2005 to 2009. Waterloo Region rates were less than those for Ontario for all years except 2008.
- Males were diagnosed with amebiasis more frequently than females, accounting for 60 per cent of all cases over the 5 year period. Rates of disease were higher in males than females from 2005 to 2009. A similar trend was observed in Ontario.
- Amebiasis cases were reported more frequently in adults aged 25 to 49 years, accounting for 59 per cent of cases. The average age at onset of illness was 35 years.
- The highest rates of amebiasis were reported for males 35 to 39 years of age (13.1 cases per 100,000) (Figure 3).
- There was no marked seasonal trend in the incidence of amebiasis over the 5 year study period.
- Of reported amebiasis cases, 42 per cent (*n* = 51) were associated with travel and 58 per cent were classified as endemic.

What can be done about it?

- General Disease Prevention and Control Strategies:
  - Educate cases on transmission of amebiasis and the appropriate preventative measures, including proper hand hygiene and food safety.
- Role of Region of Waterloo Public Health:
  - Receive and confirm reports of the disease from health care providers and laboratories.
  - Investigate all cases reported to Public Health.
  - Follow-up all case contacts.
  - Recommend treatment for known carriers.
  - Enforce work restrictions of symptomatic food handlers and care providers.
  - Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  - Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  - Respond to requests for information on the disease, transmission, risk factors and prevention strategies.
Figure 4. Campylobacteriosis standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

*Rates age-standardized according to the 1991 Canadian population, Statistics Canada.

Figure 5. Campylobacteriosis incidence rates by age group and sex, Waterloo Region, 2005-2009*

*Excludes cases with unknown sex and/or age.
Interpretation

What is it?
- Campylobacteriosis is a bacterial infection that affects the intestinal tract and, in rare cases, the bloodstream.
- It is one of the most common bacterial causes of diarrheal illness in Canada (Government of Canada, 2006) characterized by diarrhea, abdominal pain, fever and nausea within two to five days after exposure to the organism. In some cases there are no symptoms associated with the illness.
- The illness typically lasts about one week; however, more serious episodes can last up to 10 days.

What are the causes or risk factors?
- Campylobacteriosis is acquired through the ingestion of the *Campylobacter* bacteria in contaminated food and water, undercooked meat, unpasteurized milk, as well as by direct contact with infected animals or pets (especially puppies, kittens and fowl). However, most cases are associated with handling raw poultry or eating raw or undercooked poultry.

What are the trends in Waterloo Region?
- Campylobacteriosis was the most frequently reported enteric disease in Waterloo Region, accounting for 30 per cent of all enteric cases reported in 2009.
- Between 2005 and 2009, there were 787 reported cases of campylobacteriosis (31.1 cases per 100,000). In 2009 there were 116 reported cases of campylobacteriosis which represented a decrease of 63 cases (35 per cent) from 2008 (Figure 4).
- Incidence rates have been similar to or higher than provincial rates from 2005 to 2008. In 2009, there was a decrease in the rate of Campylobacteriosis below the province rate.
- Males accounted for 54 per cent (n = 426) of all cases between 2005 and 2009, and their rates of disease exceeded female rates each year.
- The average age at onset of campylobacteriosis was 36 years. However, the very young (children less than 5 years of age) were most likely to become ill.
- The highest rates of disease occurred in males 4 years of age and younger (77.8 cases per 100,000) (Figure 5).
- The incidence of campylobacteriosis was higher during the summer months from June to August, peaking at an average of 4.4 cases per 100,000 in June.
- Of reported campylobacteriosis cases, 77 per cent (n = 68) were classified as endemic, 19 per cent were associated with travel, and 4 per cent were associated with an outbreak.

What can be done about it?
- General Disease Prevention and Control Strategies:
  - Educate cases on transmission of campylobacteriosis and the appropriate preventative measures, including proper hand hygiene and food safety.
  - Promote awareness of the risks of unpasteurized milk consumption and the importance of cooking all poultry products thoroughly.
- Role of Region of Waterloo Public Health:
  - Receive and confirm reports of the disease from health care providers and laboratories.
  - Investigate all cases reported to Public Health.
  - Inspect food premises routinely to reduce the risk of foodborne illness.
  - Enforce requirements of the *Health Protection and Promotion Act*, including seizing and destroying food unfit for human consumption and issuing health protection orders.
  - Support the Canadian Food Inspection Agency in food recalls as required.
  - Enforce work restrictions of symptomatic food handlers and care providers.
  - Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  - Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  - Provide information on the disease, transmission, risk factors and prevention strategies.
Cryptosporidiosis

Cryptosporidiosis in Waterloo Region and Ontario, 2005 - 2009

Figure 6. Cryptosporidiosis standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

*Rates age-standardized according to the 1991 Canadian population, Statistics Canada.

Figure 7. Cryptosporidiosis incidence rates by age group and sex, Waterloo Region, 2005-2009*

*Excludes cases with unknown sex and/or age.
Interpretation

What is it?
- Cryptosporidiosis is a diarrheal illness caused by the parasite Cryptosporidium species.
- The prominent symptom is diarrhea, which can be profuse and watery. It is often accompanied by abdominal cramping, fatigue, nausea, vomiting, and low grade fever. Some persons infected with cryptosporidiosis may not become ill.
- Symptoms usually start two to ten days after exposure, and may last up to 30 days in otherwise healthy individuals. However, the infection may last longer and be more serious in people whose immune system is not working properly.

What are the causes or risk factors?
- Cryptosporidiosis is transmitted through the fecal-oral route, which includes person-to-person contact, animal-to-person contact, as well as through waterborne and foodborne transmission (Heymann, 2004). For waterborne transmission, cryptosporidiosis can be acquired by drinking contaminated water or through recreational activities in contaminated streams, lakes or pools.
- Cryptosporidiosis is also an infection of veterinary importance, infecting small and large animals. Therefore, household pets, farm animals and animals at petting zoos could be a source of infection for humans.
- Children under two years of age, animal handlers, travellers, men who report having sex with men, and close contacts of infected individuals are particularly at risk (Heymann, 2004).

What are the trends in Waterloo Region?
- Between 2005 and 2009, there were 93 reported cases of cryptosporidiosis (4.1 cases per 100,000). In 2009 there were 21 reported cases of cryptosporidiosis which represented an increase of 4 cases (24 per cent) from 2008 (Figure 6).
- Incidence rates have been higher than the provincial rates during the 5 year study period. Similar trends in the rates of disease were observed in Waterloo Region and the province, except for 2009 when Waterloo Region experienced an increase in incidence rates compared to Ontario.
- Males accounted for 57 per cent of all cases between 2005 and 2009, and over three-quarters of cases reported in 2009.
- Cryptosporidiosis cases were reported more frequently in children less than 10 years of age, accounting for almost 50 per cent of cases. The average age at onset of illness was 18 years.
- Incidence rates declined with increasing age. The highest rates of disease were reported for males 4 years of age and younger (17.1 cases per 100,000) and males 5 to 9 years of age (18.0 cases per 100,000) (Figure 7).
- The incidence of cryptosporidiosis peaked in August or September each year, with over 50 per cent of cases occurring in these two months, possibly influenced by increased exposure to untreated recreational water (lakes, ponds, etc.) during the summer months.
- Of reported cryptosporidiosis cases, 78 per cent (n = 68) were classified as endemic and 22 per cent were travel-associated.
What can be done about it?

- General Disease Prevention and Control Strategies:
  - Routine municipal drinking water treatment and monitoring. An outbreak of cryptosporidiosis associated with the municipal drinking water system occurred in Waterloo Region in 1993 which affected approximately 200 cases. Subsequent to this outbreak, a state of the art water filtration system was put in place to ensure the safety of the municipal drinking water supply.
  - Drinking water regulation (Ontario Regulation 170/03) mandates that designated facilities such as child and health care facilities on a private water supply monitor and maintain a safe drinking water supply.
  - Educate cases on transmission of cryptosporidiosis and the appropriate preventative measures, including hand hygiene and the importance of avoiding ingestion of untreated water from lakes, ponds, streams and pools.

- Role of Region of Waterloo Public Health:
  - Receive and confirm reports of the disease from health care providers and laboratories.
  - Investigate all cases reported to Public Health.
  - Issue a boil water advisory when appropriate (e.g. breakdown in the municipal drinking water treatment system, suspicion of a waterborne outbreak).
  - Enforce restrictions of infected children from child care facilities when symptomatic.
  - Enforce work restrictions of symptomatic food handlers and care providers.
  - Conduct beach water monitoring program on all regional beaches.
  - Ensure local splash pads, wading pools, and water slides adhere to the Ministry of Health’s recently released Guidelines for Non-Regulated Recreational Water Facilities.
  - Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  - Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  - Provide information on the disease, transmission, risk factors and prevention strategies.
## Cyclosporiasis

### Cyclosporiasis in Waterloo Region and Ontario, 2005 - 2009

![Graph showing cyclosporiasis standardized incidence rates, Waterloo Region & Ontario, 2005-2009](image)

**Figure 8.** Cyclosporiasis standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

<table>
<thead>
<tr>
<th>Year</th>
<th>Waterloo Cases</th>
<th>Waterloo Rate</th>
<th>Ontario Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>5</td>
<td>0.8</td>
<td>1.0</td>
</tr>
<tr>
<td>2006</td>
<td>1</td>
<td>0.2</td>
<td>0.7</td>
</tr>
<tr>
<td>2007</td>
<td>3</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>2008</td>
<td>4</td>
<td>0.7</td>
<td>0.8</td>
</tr>
<tr>
<td>2009</td>
<td>4</td>
<td>0.8</td>
<td>1.0</td>
</tr>
</tbody>
</table>

*Rates age-standardized according to the 1991 Canadian population, Statistics Canada.


### Interpretation

**What is it?**
- Cyclosporiasis is a disease caused by a microscopic parasite called *Cyclospora cayetanensis*.
- The parasite infects the small intestines of humans and typically causes watery diarrhea, and occasionally explosive bowel movements. Other symptoms can include loss of appetite, weight loss, nausea, bloating/gas, stomach cramps, muscle ache, vomiting, low grade fever and fatigue.
- Symptoms generally appear about one week after infection, and if not treated the illness may last from a few days to a month or longer. Symptoms may also return one or more times (relapse).

**What are the causes or risk factors?**
- *Cyclospora* oocysts are excreted in stool. Within days to weeks oocysts sporulate and become infectious outside the body. Therefore, it is unlikely to be passed directly from one person to another.
- *Cyclospora* is transmitted through contaminated food or water and can occur either by drinking contaminated water or through the consumption of contaminated fruits and vegetables. Outbreaks have previously been linked to foods such as imported raspberries, fresh basil, and mesclual lettuce.
- While *Cyclospora* is not naturally found in or on fruits and vegetables, it is suspected that contamination occurs during cultivation, harvest, packaging or transportation through contact with infected water or farm workers.
What are the trends in Waterloo Region?

- Between 2005 and 2009, there were 17 reported cases of cyclosporiasis (0.6 cases per 100,000). In 2009 there were 4 reported cases of cyclosporiasis which represented no change from 2008 (Figure 8).
- Incidence rates have remained similar to or lower than provincial rates during the 5 year study period.
- Between 2005 and 2009, females accounted for two-thirds of all cases and experienced higher rates of disease than males each year except 2006 when no cases were reported among females.
- Most cases of cyclosporiasis were reported among adults age 30 years and older. The age group with the highest incidence rate over the 5 year period was 30 to 34 years (1.6 per 100,000). The average age at onset of illness was 45 years.
- Reports of cyclosporiasis did not exhibit a marked seasonal trend, but cases were reported more often in the spring and early summer months.
- Of reported cyclosporiasis cases, 62 per cent (n = 8) were associated with travel and 38 per cent were locally acquired.

What can be done about it?

- General Disease Prevention and Control Strategies:
  - Federal agencies monitor imported food items and restrict importation as necessary.
  - Travellers to Cyclospora endemic areas should seek advice on travel risks and take appropriate precautions.
  - Educate cases on transmission of cyclosporiasis and the appropriate preventative measures, including food safety.
- Role of Region of Waterloo Public Health:
  - Receive and confirm reports of the disease from health care providers and laboratories.
  - Investigate all cases reported to Public Health.
  - Operate a comprehensive travel clinic that provides residents with pre-travel counselling.
  - Support the Canadian Food Inspection Agency in food recalls as required.
  - Enforce work restrictions of symptomatic food handlers and care providers.
  - Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  - Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  - Respond to requests for information on the disease, transmission, risk factors and prevention strategies.
**Giardiasis**

**Giardiasis in Waterloo Region and Ontario, 2005 - 2009**

Figure 9. Giardiasis standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

*Rates age-standardized according to the 1991 Canadian population, Statistics Canada.

Figure 10. Giardiasis incidence rates by age group and sex, Waterloo Region, 2005-2009*

*Excludes cases with unknown sex and/or age.

**Interpretation**

Document #: 754760  Version: v1
What is it?
- Giardiasis is an infection of the intestines caused by the microscopic parasite *Giardia lamblia*. It is regarded as one of the most common causes of waterborne disease in humans in North America (Government of Canada, 2006).
- Symptoms include diarrhea, mucousy pale greasy stool, stomach cramps, bloating, severe gas, weight loss and fatigue. A few people will not have any symptoms.
- Symptoms may appear within 5 to 25 days after infection, although 7 to 10 days is the most common incubation period. Diarrhea and other symptoms usually last 2 to 6 weeks, but can occasionally become chronic.

What are the causes or risk factors?
- The *Giardia* parasite lives in the intestines of animals and people, and is passed through stool. The illness is acquired through ingestion of *Giardia* cysts.
- Illness can be transmitted through person-to-person contact and by hand-to-mouth transfer of cysts from the feces of infected humans or animals. Ingestion of cysts can also occur from fecally contaminated food, drinking water and recreational water.
- Giardiasis occurs more frequently in people in institutional settings (such as day care centres), among travellers to areas with poor sanitation, and individuals who ingest improperly treated surface water from lakes, rivers and streams. Generally, children are infected more often than adults (Heymann, 2004).

What are the trends in Waterloo Region?
- Between 2005 and 2009, there were 333 reported cases of giardiasis (13.9 cases per 100,000). In 2009 there were 67 reported cases of giardiasis which represented a decrease of 13 cases (16 per cent) from 2008 (Figure 9).
- Incidence rates remained similar to provincial rates between 2005 and 2007. However, rates for Waterloo Region have exceeded the rate reported in the rest of Ontario since 2008.
- On average over the 5 year period, males accounted for 56 per cent of all cases and experienced rates of disease that were approximately 25 per cent higher than female rates.
- Giardiasis cases were reported more frequently in the very young. Children less than 10 years of age accounted for over 30 per cent of cases. The average age at onset of illness was 27 years.
- The highest rates of disease were reported for males less than 5 years of age (39.5 cases per 100,000) and females 5 to 9 years of age (34.7 cases per 100,000) (Figure 10). Incidence rates were similar in males and females for all age groups.
- While cases of giardiasis were reported year-round, the incidence peaked in the summer, with over one-quarter of cases occurring in July and August, possibly influenced by increased exposure to untreated recreational water (lakes, ponds, etc.) during the summer months.
- Of reported giardiasis cases, 40 per cent (n = 125) were associated with travel and 60 per cent were locally acquired.
What can be done about it?

- General Disease Prevention and Control Strategies:
  - Routine municipal drinking water treatment and monitoring.
  - Drinking water regulation (Ontario Regulation 170/03) mandates that designated facilities such as child and health care facilities on a private water supply monitor and maintain a safe drinking water supply.
  - Educate cases on transmission of cryptosporidiosis and the appropriate preventative measures, including hand hygiene and the importance of avoiding ingestion of untreated water from lakes, ponds, streams and pools.

- Role of Region of Waterloo Public Health:
  - Receive and confirm reports of the disease from health care providers and laboratories.
  - Investigate all cases reported to Public Health.
  - Issue a boil water advisory when appropriate (e.g. breakdown in the municipal drinking water treatment system, suspicion of a waterborne outbreak).
  - Enforce restrictions of infected children from child care facilities.
  - Enforce work restrictions of symptomatic food handlers and care providers.
  - Conduct beach water monitoring program on all regional beaches.
  - Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  - Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  - Provide information on the disease, transmission, risk factors and prevention strategies.
Hepatitis A
Hepatitis A in Waterloo Region and Ontario, 2005 - 2009

Figure 11. Hepatitis A standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

![Graph showing hepatitis A incidence rates](image)

*Rates age-standardized according to the 1991 Canadian population, Statistics Canada.

Figure 12. Hepatitis A incidence rates by age group and sex, Waterloo Region, 2005-2009*

![Graph showing hepatitis A incidence rates by age group and sex](image)

*Excludes cases with unknown sex and/or age.
**Interpretation**

**What is it?**
- Hepatitis A is a viral infection of the liver.
- Symptoms include fever, abdominal pain, fatigue and jaundice (yellowing of the skin), usually occurring 15-50 days after exposure to the virus. Children often do not show any symptoms of infection.
- Symptoms may last from 1-2 weeks to several months, and full recovery can take up to six months. Most people recover completely and then are immune to re-infection. However, the disease may be fatal in rare cases, especially in older adults.

**What are the causes or risk factors?**
- Hepatitis A is transmitted through the fecal-oral route. It can be transmitted via contaminated food and water, and also spreads easily through close person-to-person contact. Once infected, a person can pass the virus on to others before experiencing any symptoms.
- The disease can also be spread when feces enters the mouth through oral-anal sexual contact.
- Community-wide outbreaks have recently accounted for most disease transmission (Heymann, 2004).
- A vaccine is available to prevent illness in travellers and others who may be exposed to the virus.

**What are the trends in Waterloo Region?**
- Between 2005 and 2009, there were 41 reported cases of Hepatitis A (1.7 cases per 100,000). In 2009 there were 6 reported cases of Hepatitis A which represented a small increase from 2008 (Figure 11).
- Incidence rates have been higher than the provincial rates during most of the 5 year study period, particularly in 2005 and 2006. In 2005, there were an increased number of cases due to a community outbreak at a restaurant with an ill food handler (Heywood et al., 2007). In 2008, the Waterloo Region rate fell below that reported for the province, but increased above the provincial rate in 2009.
- Between 2005 and 2009, males accounted for 51 per cent of all cases. Except for an increase in the number of female cases in 2009, there has been a steady decline in reported cases among males and females over the 5 year study period.
- Hepatitis A cases and incidence rates were highest among children less than 10 years of age, adults 30 to 39 years of age and adults 50 to 54 years of age (Figure 12). The average age at onset of illness was 27 years.
- There was no marked seasonal trend in the incidence of Hepatitis A over the 5 year study period. One notable exception was an increase in the number of cases reported in June of 2005, due to a community outbreak at a restaurant with an ill food handler.
- Of reported Hepatitis A cases, 40 per cent (n = 14) were associated with travel, 11 per cent were outbreak-related and 49 per cent were classified as endemic. It is important to note that the proportion of outbreak-related cases is likely higher than reported due to a community outbreak in 2005. However, data limitations prevented these cases from being included in this analysis (see Appendix D).

**What can be done about it?**
- **General Disease Prevention and Control Strategies:**
  o Promote the need for Hepatitis A vaccinations among recommended recipients.
  o Educate cases on transmission of Hepatitis A and the appropriate preventative measures, including proper hand hygiene.
- **Role of Region of Waterloo Public Health:**
  o Receive and confirm reports of the disease from health care providers and laboratories.
  o Investigate all cases reported to Public Health.
  o Assess contacts of cases for possible Hepatitis A and recommend post-exposure immunization as required.
  o Initiate immunization clinics for eligible contacts during outbreaks.
  o Operate a comprehensive travel clinic that provides residents with pre-travel counselling.
  o Enforce restrictions of infected children from child care facilities.
  o Enforce work restrictions of infected food handlers and care providers.
  o Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  o Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  o Provide information on the disease, transmission, risk factors and prevention strategies to the general public.
Listeriosis

Listeriosis in Waterloo Region and Ontario, 2005 - 2009

Figure 13. Listeriosis standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

*Rates age-standardized according to the 1991 Canadian population, Statistics Canada.

Interpretation

What is it?
- Listeriosis is an infection caused by eating foods contaminated with the bacterium *Listeria monocytogenes*.
- Symptoms include fever, muscle aches, headache, and sometimes gastrointestinal symptoms such as nausea or diarrhea.
- Infected pregnant women may experience only a mild, flu-like illness. However, infections during pregnancy can lead to miscarriage or stillbirth, premature delivery, or infection of the newborn.

What are the causes or risk factors?
- Listeriosis is acquired through the ingestion of *Listeria monocytogenes* bacteria. The bacteria are commonly found in water, soil or vegetation, and are carried in the gastrointestinal tracts of animals and humans. Cases have been linked to unpasteurized milk and cheese, contaminated vegetables and contaminated food products, especially ready-to-eat products such as deli meats.
- The bacteria can also be transmitted from mother to fetus in the womb or during passage through the infected birth canal.
- Pregnant women, the very young, and adults with weakened immune systems are the most susceptible.
What are the trends in Waterloo Region?

- Between 2005 and 2009, there were 8 reported cases of listeriosis (0.3 cases per 100,000). In 2009 there was 1 reported case of listeriosis which represented a decrease of 4 cases (80 per cent) from 2008 (Figure 13).
- Incidence rates have remained lower than provincial rates during the 5 year study period, with the exception of 2008. In 2008, there was a national listeriosis outbreak which accounted for the increase in the number of cases observed in Waterloo Region, and the province, that year.
- Males and females accounted for an equal proportion of cases during the 5 year period, and experienced similar rates of disease.
- Older age groups were the most vulnerable to listeriosis. Over the 5 year period, almost 90 per cent of reported cases were over 65 years of age. The average age at onset of illness was 74 years.
- Incidence rates were similar in males and females for all age groups. The highest rates of disease were reported for adults 65 years of age and older (2.4 cases per 100,000).
- Too few cases of listeriosis were reported between 2005 and 2009 to identify any seasonal trends in the incidence of the disease.
- Of reported listeriosis cases, 63 per cent (n = 5) were endemic and all others (37 per cent) were outbreak-related.

What can be done about it?

- General Disease Prevention and Control Strategies:
  - Federal agencies monitor local and imported food items and restrict importation and distribution as necessary.
  - Reduce the risks of contamination throughout the production process.
  - Educate cases on transmission of listeriosis and the appropriate preventative measures, including proper hand hygiene and food safety.
- Role of Region of Waterloo Public Health:
  - Receive and confirm reports of the disease from health care providers and laboratories.
  - Investigate all cases reported to Public Health.
  - Inspect food premises routinely to reduce the risk of foodborne illness.
  - Enforce requirements of the Health Protection and Promotion Act, including seizing and destroying food unfit for human consumption and issuing health protection orders.
  - Support the Canadian Food Inspection Agency in food recalls as required.
  - Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  - Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  - Respond to requests for information on the disease, transmission, risk factors and prevention strategies.
Salmonellosis
Salmonellosis in Waterloo Region and Ontario, 2005 – 2009

Figure 14. Salmonellosis standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

*Rates age-standardized according to the 1991 Canadian population, Statistics Canada.

Figure 15. Salmonellosis incidence rates by age group and sex, Waterloo Region, 2005-2009*

*Excludes cases with unknown sex and/or age.
Interpretation

What is it?

- Salmonellosis is a foodborne infection caused by the *Salmonella* bacteria. It is one of the main causes of foodborne illness worldwide (Government of Canada, 2006). There are many different kinds of *Salmonella* bacteria. *S. Typhimurium* and *S. Enteritidis* are the most common.
- Most persons infected with *Salmonella* develop abdominal cramps accompanied by diarrhea, nausea, fever, chills, headache and vomiting 12 to 72 hours after infection. The illness usually lasts 4 to 7 days and most people recover without treatment. However, the illness can last several weeks, and the elderly, infants and those with impaired immune systems are more likely to have a severe illness.

What are the causes or risk factors?

- Salmonella bacteria normally live in the intestinal tract of animals, poultry and other birds. The bacteria are usually transmitted to people when they eat foods derived from infected animals or contaminated with animal feces. Foods can also be contaminated by food handlers who do not thoroughly wash their hands with soap after handling raw meat or using the bathroom.
- The most common sources of the disease are contaminated foods, such as raw meat, poultry and eggs that have not been cooked properly. However, all foods, including fruits and vegetables, can become contaminated.
- Salmonella can also be found in the feces of some pets, especially those with diarrhea. Exotic pets, such as snakes, turtles and reptiles may carry *Salmonella* even when healthy. People can become infected if they do not wash their hands after contact with these animals.

What are the trends in Waterloo Region?

- Salmonellosis is the second most commonly confirmed enteric pathogen in Waterloo Region, accounting for 30 per cent of all enteric cases reported in 2009.
- Between 2005 and 2009, there were 612 reported cases of salmonellosis (24.8 cases per 100,000). In 2009 there were 115 reported cases of salmonellosis which represented an increase of 4 cases (4 per cent) from 2008 (Figure 14).
- Incidence rates were higher than provincial rates between 2005 and 2009.
- Males and females accounted for an equal proportion of cases during the 5 year period, and experienced similar rates of disease.
- Salmonellosis cases were reported most frequently in children less than 5 years and adults 20 to 24 years of age. The average age at onset of illness was 30 years.
- Incidence rates were similar for males and females across all age groups. The highest rates of disease were reported for children under 5 years of age (64.6 cases per 100,000) and young adults 20 to 24 years of age (36.3 cases per 100,000) (Figure 15).
- The incidence of salmonellosis was highest in July and August, accounting for approximately one-quarter of all cases. A notably higher incidence of disease was reported in November 2005 due to a provincial outbreak related to consumption of mung bean sprouts.
- Of reported salmonellosis cases, 67 per cent were endemic, 8 per cent were outbreak-related and 25 per cent were associated with travel outside of Canada.
What can be done about it?

- General Disease Prevention and Control Strategies:
  - Federal agencies monitor local and imported food items and restrict importation and distribution as necessary.
  - Educate the public on the transmission of salmonellosis and the appropriate preventative measures, including proper hand hygiene and food safety.

- Role of Region of Waterloo Public Health:
  - Receive and confirm reports of the disease from health care providers and laboratories.
  - Investigate all cases reported to Public Health.
  - Inspect food premises routinely to reduce the risk of foodborne illness.
  - Enforce requirements of the Health Protection and Promotion Act, including seizing and destroying food unfit for human consumption and issuing health protection orders.
  - Support the Canadian Food Inspection Agency in food recalls as required.
  - Enforce work restrictions of symptomatic food handlers and care providers.
  - Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  - Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  - Provide information on the disease, transmission, risk factors and prevention strategies.
**Shigellosis**

**Shigellosis in Waterloo Region and Ontario, 2005 - 2009**

Figure 16. Shigellosis standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of cases</th>
<th>Rate per 100,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
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</tr>
<tr>
<td>2009</td>
<td>9</td>
<td>1.9</td>
</tr>
</tbody>
</table>

*Rates age-standardized according to the 1991 Canadian population, Statistics Canada.


**Interpretation**

**What is it?**
- Shigellosis is a disease caused by a group of bacteria called *Shigella*.
- Symptoms include diarrhea, which may be bloody, fever, nausea, and vomiting. Infection with certain strains of *Shigella* bacteria, such as *Shigella flexneri*, can lead to chronic arthritis, known as Reiter's syndrome, among those who are genetically predisposed to it (Government of Canada, 2006).
- The incubation period is usually one to three days, but can range up to one week. The illness usually resolves within five to seven days, but more severe cases can last for several weeks.
- The disease is more severe in children than in adults and can be associated with Hemolytic Uremic Syndrome (HUS), a leading cause of kidney failure in the elderly and young adults.

**What are the causes or risk factors?**
- *Shigella* is found in the intestinal tract of infected people, and is spread by eating or drinking food or water contaminated by an infected person. It can also be spread by direct contact with an infected person.
- Water may become contaminated if in contact with sewage. Fruit and vegetables irrigated with contaminated water, and shellfish irrigated with contaminated water may also spread *Shigella* bacteria.
What are the trends in Waterloo Region?

- Between 2005 and 2009, there were 40 reported cases of shigellosis (1.7 cases per 100,000). In 2009 there were 9 reported cases of shigellosis which represented a decrease of 3 cases (50 per cent) from 2008 (Figure 16).
- Incidence rates have remained fairly stable between 2005 and 2009, and were similar to or lower than provincial rates during this period.
- There were no notable differences in the number of cases or rates of disease by sex, with females accounting for 55 per cent of all cases between 2005 and 2009.
- Children, especially toddlers aged 2 to 4, are the most likely to get shigellosis. Cases were reported most frequently in children less than 10 years of age, accounting for 25 per cent of cases. The average age at onset of illness was 29 years.
- The highest rates of disease were reported for children less than 10 years of age (3.3 cases per 100,000).
- There was no marked seasonal trend in the incidence of shigellosis over the 5 year study period.
- The majority of reported cases (57 per cent) were associated with travel. All other cases (43 per cent) were locally acquired.

What can be done about it?

- General Disease Prevention and Control Strategies:
  - Federal agencies monitor local and imported food items and restrict importation and distribution as necessary.
  - Travellers to endemic areas should seek advice on travel risks and take appropriate precautions.
  - Educate cases on transmission of *Shigella* and the appropriate preventative measures, including hand hygiene and food safety.
- Role of Region of Waterloo Public Health:
  - Receive and confirm reports of the disease from health care providers and laboratories.
  - Investigate all cases reported to Public Health.
  - Inspect food premises routinely to reduce the incidence of foodborne illness.
  - Enforce requirements of the *Health Protection and Promotion Act*, including seizing and destroying food unfit for human consumption and issuing health protection orders.
  - Support the Canadian Food Inspection Agency in food recalls as required.
  - Operate a comprehensive travel clinic that provides residents with pre-travel counselling.
  - Enforce restrictions of infected children from child care facilities.
  - Enforce work restrictions of symptomatic food handlers and care providers.
  - Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  - Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  - Provide information on the disease, transmission, risk factors and prevention strategies.
**Typhoid / Paratyphoid Fever**

**Typhoid / Paratyphoid Fever in Waterloo Region and Ontario, 2005 – 2009**

Figure 17. Typhoid / Paratyphoid fever standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

![Graph showing incidence rates](image)

*Rates age-standardized according to the 1991 Canadian population, Statistics Canada.

**Interpretation**

**What is it?**

- Typhoid fever is a life-threatening illness caused by the bacterium *Salmonella typhi*. Paratyphoid fever is also a bacterial infection and it is caused by *Salmonella paratyphi A* and *B*.
- The onset of typhoid fever is gradual with fever, malaise, chills, headache, and generalized muscle and joint aches. Infection may also cause the spleen to enlarge, the white blood cell count to drop, and small rose-coloured spots to develop on the trunk of the body. Diarrhea occurs infrequently. Vomiting may occur late in the first week following infection, but is usually not severe.
- Paratyphoid fever has similar symptoms but is usually milder, shorter in duration, and with fewer complications.
- *Salmonella typhi* can cause a severe systemic illness. The usual case fatality rate is 10 per cent but can be reduced to less than 1 per cent if prompt antibiotic treatment is administered.
What are the causes or risk factors?
- An infected person will carry the bacteria in their bloodstream and intestinal tract. A small number of people, referred to as carriers, recover from the infection but continue to carry the bacteria.
- Both ill people and carriers shed the bacteria in their feces. Food and water contaminated with *Salmonella* typhi and *Salmonella* paratyphi can be a source of transmission of the infection.
- Typhoid fever is common in countries lacking modern water and sewage treatment facilities and in areas where they do not pasteurize milk. Individuals who travel to these countries are at an increased risk of acquiring the infection.

What are the trends in Waterloo Region?
- Between 2005 and 2009, there were 20 reported cases of typhoid/paratyphoid fever (0.8 cases per 100,000). In 2009 there were 2 reported cases of typhoid/paratyphoid fever which represented no change from 2008 (Figure 17).
- Incidence rates have been lower than the provincial rates during the 5 year study period, except in 2006.
- Males and females accounted for an equal proportion of cases over the 5 year period. However, in 2006, the incidence rate in males was four times higher than the female rate (3.2 cases per 100,000 males versus 0.8 cases per 100,000 females).
- While there were no marked differences across any age groups, numbers of cases were small. Provincial disease trends suggest that the incidence of typhoid/paratyphoid fever is highest in children and declines with increasing age.
- There was no seasonal trend in the incidence of typhoid/paratyphoid fever over the 5 year study period.
- Almost all reported cases (94 per cent) were associated with travel outside of Canada.

What can be done about it?
- General Disease Prevention and Control Strategies:
  - Promote the need for typhoid fever immunization for those traveling to endemic areas.
  - Travellers to endemic areas should seek advice on travel risks and take appropriate precautions.
  - Educate cases on transmission of typhoid fever and paratyphoid fever and the appropriate preventative measures, including hand hygiene.
- Role of Region of Waterloo Public Health:
  - Receive and confirm reports of the disease from health care providers and laboratories.
  - Investigate all cases reported to Public Health.
  - Operate a comprehensive travel clinic that provides residents with pre-travel counselling.
  - Monitor incidence of disease to rapidly detect any clustering or linking of cases for the purposes of outbreak management.
  - Enforce restrictions of infected children from child care centres.
  - Enforce work restrictions of symptomatic food handlers and care providers.
  - Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  - Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  - Respond to requests for information on the disease, transmission, risk factors and prevention strategies.
Verotoxin producing *Escherichia coli* (VTEC)

Verotoxin producing *Escherichia coli* (VTEC) in Waterloo Region and Ontario, 2005 - 2009

Figure 18. VTEC standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

![Graph showing VTEC incidence rates](image)

*Rates age-standardized according to the 1991 Canadian population, Statistics Canada.

Figure 19. VTEC incidence rates by age group and sex, Waterloo Region, 2005-2009*

![Graph showing VTEC incidence rates by age and sex](image)

*Excludes cases with unknown sex and/or age.
Interpretation

What is it?
- Verotoxin producing *Escherichia coli* (VTEC) is one of six major categories of *E. coli* bacterium. The most widely recognized serotype within this group of pathogens is O157:H7.
- *E. coli* O157:H7 can cause a severe illness with bloody diarrhea, abdominal cramps, and sometimes a mild fever. The illness usually lasts 7-10 days.
- Most people recover without problems but the disease can be more severe in the very young and very old, and an unusual form of kidney failure called Haemolytic Uremic Syndrome (HUS) can occur.

What are the causes or risk factors?
- The bacterium is found in the intestines of cattle, other animals or contaminated water.
- *E. coli* can contaminate the surface of meat when animals are slaughtered, and the bacterium has been found in pork, chicken, turkey and beef (especially ground beef).
- Untreated water (drinking and recreational), unpasteurized apple juice/cider, unpasteurized milk/milk products, including cheese produced with unpasteurized milk, have also been sources of infection.
- Raw fruits and vegetables can become contaminated with pathogens by using improperly composted manure, contaminated water, as well as through exposure to farm animals, wild animals and poor hygienic practices of farm workers. Petting zoos are also an area of risk.
- *E. coli* O157:H7 bacteria are most often spread from direct person-to-person contact, or can be acquired by eating contaminated food or water. Both animals and people infected with the bacteria can be carriers, although it is not know whether infected persons who are asymptomatic are an important factor in spreading the infection.

What are the trends in Waterloo Region?
- Between 2005 and 2009, there were 114 confirmed cases of VTEC (4.5 cases per 100,000). In 2009 there were 10 reported cases of VTEC which represented a decrease of 5 cases (33 per cent) from 2008 (Figure 18).
- Incidence rates have been higher than the provincial rates during the 5 year study period, but have experienced a declining trend since 2006, similar to that observed for the province. Outbreaks in local child care facilities contributed to an increase in the rate of disease above the Ontario rate in 2005 and 2006. During that period, the increased number of local cases was investigated in consultation with the Public Health Agency of Canada and no other common links between cases were found (Gilbert et al., 2008).
- Although more cases were reported among females than males in 2005 and 2006, there were no notable differences in the number of cases or rates of disease by sex from 2007 to 2009.
- VTEC disproportionately affects the young. Between 2005 and 2009, 45 per cent of reported cases were less than 10 years of age. The 5 year period mean age at onset was 23 years.
- The highest incidence rates were reported for males (19.8 per 100,000) and females (18.8 per 100,000) less than 5 years of age (Figure 19).
- The incidence of VTEC was more common in summer than winter, with 60 per cent of all reported cases occurring between June and August, possibly related to greater consumption of ground beef hamburgers during the summer barbeque season. On average, the highest incidence rate was observed in July (1.1 per 100,000).
- VTEC is primarily a domestically acquired infection. Of reported cases, 5 per cent (n = 5) were travel-associated, 10 per cent were outbreak-related and 85 per cent were classified as endemic.
What can be done about it?

• General Disease Prevention and Control Strategies:
  o Promote awareness of the importance of cooking all ground beef and hamburger thoroughly.
  o Promote awareness of the risks of unpasteurized milk consumption.
  o Routine municipal drinking water treatment and monitoring.
  o Drinking water regulation (Ontario Regulation 170/03) mandates that designated facilities such as child and health care facilities on a private water supply monitor and maintain a safe drinking water supply.
  o Federal agencies monitor local and imported food items and restrict importation and distribution as necessary.
  o Reduce the risk of E. coli 0157:H7 contamination throughout the food production process for vegetables and meat.
  o Educate cases on transmission of E. coli 0157:H7 and the appropriate preventative measures, including proper hand hygiene and food safety.

• Role of Region of Waterloo Public Health:
  o Receive and confirm reports of the disease from health care providers and laboratories.
  o Investigate all cases reported to Public Health.
  o Monitor incidence of disease to rapidly detect any clustering or linking of cases for the purposes of outbreak management.
  o Issue a boil water advisory when appropriate (e.g. adverse water result, breakdown in the municipal drinking water treatment system).
  o Conduct beach water monitoring program at all regional beaches.
  o Provide a well water sampling program for Waterloo Region residents.
  o Inspect food premises to reduce the risk of foodborne illness.
  o Enforce restriction of infected children from child care facilities.
  o Enforce work restrictions of symptomatic food handlers and care providers.
  o Support the Canadian Food Inspection Agency in food recalls as required.
  o Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  o Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  o Provide information on the disease, transmission, risk factors and prevention strategies.
Yersiniosis

Yersiniosis in Waterloo Region and Ontario, 2005 - 2009

Figure 20. Yersiniosis standardized incidence rates, Waterloo Region & Ontario, 2005-2009*

*Rates age-standardized according to the 1991 Canadian population, Statistics Canada.

Figure 21. Yersiniosis incidence rates by age group and sex, Waterloo Region, 2005-2009*

*Excludes cases with unknown sex and/or age.
**Interpretation**

**What is it?**
- Yersiniosis is an infectious disease caused by *Yersinia* bacteria, with most human illness caused by one species, *Y. enterocolitica*.
- The illness can last one to three weeks or longer, and common symptoms include fever, abdominal pain, and diarrhea which is often bloody.
- Approximately two-thirds of the cases occur among infants and children, and symptoms in adolescents and young adults can mimic appendicitis (Heymann, 2004).

**What are the causes or risk factors?**
- Yersiniosis can occur after eating or drinking food or water contaminated with *Yersinia* bacteria, but can also be transferred from person to person through unwashed hands.
- Infected dogs and cats can also pass this bacterium to humans through fecal-oral transmission.
- Infection is most often acquired by eating raw or undercooked pork products, drinking unpasteurized milk products or ingesting untreated surface water.

**What are the trends in Waterloo Region?**
- Between 2005 and 2009, there were 67 confirmed cases of yersiniosis (2.8 cases per 100,000). In 2009 there were 7 reported cases of yersiniosis which represented a decrease of 4 cases (36 per cent) from 2008 (Figure 20).
- Incidence rates have been similar to or lower than the provincial rates since 2008.
- Males accounted for 57 per cent (n = 38) of all cases between 2005 and 2009, although rates were similar for both sexes in 2005, 2008 and 2009.
- Children that were 4 years of age or younger comprised the majority of yersiniosis cases (36 per cent) and experienced the highest incidence rate (15.9 cases per 100,000). The 5 year period mean age at onset was 21 years.
- The highest incidence rates were reported for males (21.1 per 100,000) and females (10.8 per 100,000) less than 5 years of age (Figure 21).
- Cases of yersiniosis occurred throughout the year, and no seasonal trend was noted.
- Yersiniosis is primarily a domestically acquired infection. Of all reported cases, 15 per cent (n = 10) were associated with travel and 85 per cent were classified as endemic.

**What can be done about it?**
- General Disease Prevention and Control Strategies:
  - Educate cases on transmission of yersiniosis and the appropriate preventative measures, including proper hand hygiene and food safety.
- Role of Region of Waterloo Public Health:
  - Receive and confirm reports of the disease from health care providers and laboratories.
  - Investigate all cases reported to Public Health.
  - Enforce work restrictions of symptomatic food handlers and care providers.
  - Provide timely updates on disease status in Waterloo Region to local health care providers and other stakeholders when relevant.
  - Report all laboratory-confirmed cases to the Ministry of Health and Long-Term Care.
  - Respond to requests for information on the disease, transmission, risk factors and prevention strategies.
Enteric Outbreaks

Enteric Outbreaks in Waterloo Region and Ontario, 2005 - 2009

Figure 22. Number of enteric outbreaks by month, Waterloo Region, 2005-2009

<table>
<thead>
<tr>
<th>Month</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>5-year Average</th>
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<td>May</td>
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<td>8</td>
<td>11</td>
<td>10</td>
<td>4</td>
<td>8.4</td>
</tr>
</tbody>
</table>


Figure 23. Proportion of enteric outbreaks by risk setting, Waterloo Region, 2005-2009

Community, 5.1%  
Hospital, 6.0%  
Long-Term Care Home, 26.6%  
Child Care Centre, 45.1%  
Retirement Home, 11.3%  
Residential Facility, 6.0%

**Interpretation**

- There were 335 outbreaks of enteric disease (approximately 67 per year) reported in Waterloo Region for the period 2005 to 2009. The annual number of outbreaks ranged from 56 in 2008 to 81 in 2007.

- In 2009, there were 64 enteric outbreaks reported. This represents an increase of 8 (14 per cent) from 2008 when 56 outbreaks were reported (Figure 22).

- During the 5 year period, almost half (45.1 per cent) of all outbreaks occurred in child care centres, followed by long-term care homes (26.6 per cent). Only 6.0 per cent of outbreaks occurred in hospitals and 5.1 per cent in community settings (Figure 23). Note that community outbreaks are not required to be reported to Public Health.

- There was a seasonal trend in reported outbreaks, with approximately 60 per cent of all outbreaks occurring during the winter months from December to March (Figure 22). Outbreaks were more often reported during the winter months in child care centres and institutions, while reported community outbreaks were more likely to occur in the spring and summer from April through August.

- The average and median duration of outbreaks during the 5 year period was 12 days and 7 days, respectively. The range was 2 to 37 days.

- The average attack rate for outbreaks among child care centre attendees and staff during the 5-year period was 25.0 per cent and 23.7 per cent, respectively. The average attack rate for institutional outbreaks was 32.6 per cent among residents and 14.3 per cent among staff.

- For the majority of outbreaks, the specific agent of disease could not be confirmed (80 per cent), although many had symptoms and patterns of spread consistent with Norovirus infection. Information collected by the Canadian National Enteric Surveillance Program has shown that the incidence of viral infections such as Norovirus appears to peak in winter and spring (Edge et al., 2006).
References


Appendix A: List of Reportable Diseases, 2009

**REPORTABLE DISEASES 2009**

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:

<table>
<thead>
<tr>
<th>Disease</th>
<th>Reportable yes/no</th>
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<tbody>
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<tr>
<td>Amebiasis</td>
<td>E</td>
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<tr>
<td>Anthrax</td>
<td>E</td>
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<td>Botulism</td>
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<tr>
<td>Campylobacter Enteritis</td>
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<tr>
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<tr>
<td>Chickenpox (Varicella)</td>
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<tr>
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<td>Cyclosporiasis</td>
<td>E</td>
</tr>
<tr>
<td>Cytomegalovirus Infection, congenital</td>
<td>C</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>C</td>
</tr>
<tr>
<td>Encephalitis, including:</td>
<td></td>
</tr>
<tr>
<td>i. primary, viral</td>
<td>C</td>
</tr>
<tr>
<td>ii. post-infectious</td>
<td>C</td>
</tr>
<tr>
<td>iii. vaccine-related</td>
<td>C</td>
</tr>
<tr>
<td>iv. subacute sclerosing panencephalitis</td>
<td>C</td>
</tr>
<tr>
<td>v. unspecified</td>
<td>C</td>
</tr>
<tr>
<td>Food Poisoning, all causes</td>
<td>E</td>
</tr>
<tr>
<td>Gastroenteritis, institutional outbreaks</td>
<td>E</td>
</tr>
<tr>
<td>Giardiasis, except asymptomatic cases</td>
<td>E</td>
</tr>
<tr>
<td>Gonorrhea</td>
<td>C</td>
</tr>
<tr>
<td>Group A Streptococcal Disease, invasive</td>
<td>C</td>
</tr>
<tr>
<td>Group B Streptococcal Disease, neonatal</td>
<td>C</td>
</tr>
<tr>
<td>Haemophilus Influenza b Disease, invasive</td>
<td>C</td>
</tr>
<tr>
<td>Hantavirus Pulmonary Syndrome</td>
<td>E</td>
</tr>
<tr>
<td>Hemorrhagic Fever, including:</td>
<td></td>
</tr>
<tr>
<td>i. Ebola virus disease</td>
<td>C</td>
</tr>
<tr>
<td>ii. Marburg virus disease</td>
<td>C</td>
</tr>
<tr>
<td>iii. other viral causes</td>
<td>C</td>
</tr>
<tr>
<td>Hepatitis, viral</td>
<td></td>
</tr>
<tr>
<td>i. Hepatitis A</td>
<td>E</td>
</tr>
<tr>
<td>ii. Hepatitis B</td>
<td>C</td>
</tr>
<tr>
<td>iii. Hepatitis C</td>
<td>C</td>
</tr>
<tr>
<td>iv. Hepatitis D (Delta Hepatitis)</td>
<td>C</td>
</tr>
<tr>
<td>Herpes, neonatal</td>
<td>C</td>
</tr>
<tr>
<td>Influenza</td>
<td>C</td>
</tr>
<tr>
<td>Lassa Fever</td>
<td>E</td>
</tr>
<tr>
<td>Legionellosis</td>
<td>E</td>
</tr>
<tr>
<td>Leprosy</td>
<td>C</td>
</tr>
<tr>
<td>Listeriosis</td>
<td>E</td>
</tr>
<tr>
<td>Lyme Disease</td>
<td>E</td>
</tr>
<tr>
<td>Malaria</td>
<td>C</td>
</tr>
<tr>
<td>Measles</td>
<td>C</td>
</tr>
<tr>
<td>Meningitis, acute</td>
<td></td>
</tr>
<tr>
<td>i. bacterial</td>
<td>C</td>
</tr>
<tr>
<td>ii. viral</td>
<td>C</td>
</tr>
<tr>
<td>iii. other</td>
<td>C</td>
</tr>
<tr>
<td>Meningococcal disease, invasive</td>
<td>C</td>
</tr>
<tr>
<td>Mumps</td>
<td>C</td>
</tr>
<tr>
<td>Ophthalmia neonatorum</td>
<td>C</td>
</tr>
<tr>
<td>Paratyphoid fever</td>
<td>E</td>
</tr>
<tr>
<td>Pertussis (Whooping Cough)</td>
<td>C</td>
</tr>
<tr>
<td>Plague</td>
<td>E</td>
</tr>
<tr>
<td>Pneumococcal disease, invasive</td>
<td>C</td>
</tr>
<tr>
<td>Poliomyelitis, acute</td>
<td>C</td>
</tr>
<tr>
<td>Psittacosis / Ornithosis</td>
<td>E</td>
</tr>
<tr>
<td>Q Fever</td>
<td>E</td>
</tr>
<tr>
<td>Rabies</td>
<td>E</td>
</tr>
<tr>
<td>Respiratory Infection Outbreaks in Institutions</td>
<td>C</td>
</tr>
<tr>
<td>Rubella</td>
<td>C</td>
</tr>
<tr>
<td>Rubella, congenital syndrome</td>
<td>C</td>
</tr>
<tr>
<td>Salmonellosis</td>
<td>C</td>
</tr>
<tr>
<td>Severe Acute Respiratory Syndrome (SARS)</td>
<td>C</td>
</tr>
<tr>
<td>Shigellosis</td>
<td>E</td>
</tr>
<tr>
<td>Smallpox</td>
<td>C</td>
</tr>
<tr>
<td>Syphilis</td>
<td>C</td>
</tr>
<tr>
<td>Tetanus</td>
<td>C</td>
</tr>
<tr>
<td>Transmissible Spongiform Encephalopathy, including</td>
<td></td>
</tr>
<tr>
<td>i. Creutzfeldt-Jakob Disease, all types</td>
<td>C</td>
</tr>
<tr>
<td>ii. Gerstmann-Strassler-Scheinker Syndrome</td>
<td>C</td>
</tr>
<tr>
<td>iii. Fatal Familial Insomnia</td>
<td>C</td>
</tr>
<tr>
<td>iv. Kuru</td>
<td>C</td>
</tr>
<tr>
<td>Trichinosis</td>
<td>E</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>C</td>
</tr>
<tr>
<td>i. active infection</td>
<td></td>
</tr>
<tr>
<td>ii. latent infection (positive TB skin test)</td>
<td></td>
</tr>
<tr>
<td>Tularemia</td>
<td>E</td>
</tr>
<tr>
<td>Typhoid Fever</td>
<td>E</td>
</tr>
<tr>
<td>Verotoxin – producing E. coli infection indicator conditions include Hemolytic Uremic Syndrome (HUS)</td>
<td>E</td>
</tr>
<tr>
<td>West Nile Virus Illness (WNV)</td>
<td>C</td>
</tr>
<tr>
<td>Yellow Fever</td>
<td>C</td>
</tr>
<tr>
<td>Yersiniosis</td>
<td>E</td>
</tr>
</tbody>
</table>

Reporting to Region of Waterloo Public Health - Weekdays 8:30 - 4:30pm
C – Communicable Disease 519-883-2007, ext. 5275
E – Environmental Health 519-883-2008, ext. 5147
Fax # 519-883-2248
Emergency after hours/weekends/holidays #: 519-650-8200 or 519-575-4504

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

Revised March, 2009
Appendix B: Glossary of Terms

**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. 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.

**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.

**Case-Fatality Ratio**: The proportion of persons with a particular disease who die from the disease during a given period of time. It is usually expressed as a percentage.

**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. In this report, endemic refers to cases of disease that were acquired locally.

**Haemolytic Uremic Syndrome (HUS)**: A complication of some diarrheal infections. Shiga-toxin producing bacteria like *E. coli* O157:H7 and *Shigella* are the bacteria that usually cause HUS. The bacteria can make toxins that destroy red blood cells, causing anemia, and the kidneys can fail.

**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.

**Median:** The median is the value that divides a set of numbers exactly in half when they are placed in order from lowest to highest. In other words, half of the values occur before the median and half of the values occur after the median.

**Mode:** The most frequently occurring value in a set of observations.

**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. In this report, non-endemic refers to cases of disease that were not acquired locally, including cases that were acquired during travel outside of Canada.

**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.

**Recall Bias:** Systematic error due to differences in accuracy or completeness of remembering past events or experiences. For example, an individual with a condition may be more complete in describing events and experiences that may have lead to their illness, compared to an individual without the condition.
**Relapse:** The return of signs and symptoms of a disease after a case has experienced a remission.

**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 [http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90h07_e.htm](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90h07_e.htm)). 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.

**Sentinel Surveillance:** Surveillance based on selected population samples chosen to represent the relevant experience of particular groups.

**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.

**Surveillance:** Surveillance is the ongoing, systematic collection, collation, analysis, interpretation and dissemination 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. Trends can be expressed in many forms, including tables, graphs and pie charts.

**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.
Appendix C: Rare Reportable Diseases

There are several enteric diseases that are rare and/or have not been reported in Waterloo Region from 2005 to 2009. Some of these diseases are relatively new and continue to emerge while others have been controlled through successful public health programs. Other diseases are not endemic to North America but contagious enough that their rare appearance is monitored. Table 6 summarizes these rare diseases for which there were fewer than five cases in Waterloo Region between 2005 and 2009. There was insufficient data to generate rates or trends across time, sex or age groups for these diseases.

Table 6. Diseases for which fewer than five cases were reported to Region of Waterloo Public Health, Waterloo Region, 2005-2009

<table>
<thead>
<tr>
<th>Disease</th>
<th>Disease Category</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botulism Enteric, food and waterborne</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Brucellosis Vectorborne and zoonotic</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Cholera Enteric, food and waterborne</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Psittacosis/Ornithosis Vectorborne and zoonotic</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Trichinosis Enteric, food and waterborne</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Appendix D: Technical Notes

Data Sources
This report summarizes the enteric diseases that health care practitioners (e.g. family physicians, hospitals and medical laboratories) are required to report to the local Medical Officer of Health. All reports of enteric disease for Waterloo Region included in this report were collected by Region of Waterloo Public Health (ROWPH) under the authority of the Health Protection and Promotion Act (HPPA), which mandates notification of all confirmed or suspect reportable diseases to the Medical Officer of Health by health care practitioners where the patient resides. Case reports are investigated by Public Health staff as part of their routine activities. Confirmed cases are entered into a provincially-mandated information and surveillance (monitoring) system, the integrated Public Health Information System (iPHIS), maintained by the Ontario Ministry of Health and Long-term Care (MOHLTC). iPHIS was implemented in every Ontario health unit in 2005 and replaced the previous provincial reporting system which was in operation since 1990, the Reportable Disease Information System (RDIS). There were some issues around data integrity affecting the previous reporting system, and these data quality issues remain relevant after cases were migrated from RDIS into iPHIS.

a) Sporadic Cases
Regional enteric disease data were extracted from iPHIS. Local cases of disease reported to ROWPH with an episode accurate (onset) date between January 1, 2005 and December 31, 2009 were included in this report. Only confirmed cases of reportable enteric diseases were included. Provincial case summaries are compiled by the Infectious Diseases Branch of the Ontario MOHLTC. Provincial data was downloaded from the Ontario Public Health Portal, MOHLTC, and included all enteric diseases reported in the province of Ontario with an episode accurate (onset) date between January 1, 2005 and December 31, 2009. Only confirmed cases of reportable enteric diseases were included. 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 ROWPH and the MOHLTC at the date of data extraction (spring 2010) with the stipulation that these data are provisional and subject to change. In addition, provincial data for 2009 have not been cleaned and may include duplicate cases.

b) Outbreaks
Outbreak occurrences of enteric disease are recorded by ROWPH’s Health Protection and Investigation (HPI) Division. For every confirmed outbreak, staff in the HPI Division completes an enteric outbreak summary report that documents detailed information pertaining to the outbreak, including the aetiologic agent, duration of the outbreak, reporting information, exposure setting, control measures, and specimen information if available. The internal outbreak database was accessed in order to investigate the distribution of enteric disease outbreaks by month and year of onset, risk setting and type of agent. For this report, outbreak data for Waterloo Region was extracted from the HPI internal database during spring 2010. All enteric outbreak records (outbreaks with a reportable enteric disease identified as the aetiologic agent) with a reported date between January 1, 2005 and December 31, 2009 and that met the provincial surveillance case definition were extracted. An enteric outbreak is defined as the occurrence of two or more cases of enteric illness linked 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. Although outbreaks of enteric disease are recorded in iPHIS, reporting of outbreak information to the provincial database has not been consistent or complete since 2005. Therefore, outbreak data extracted from iPHIS may not correspond with HPI’s internal outbreak database and the data described in this report. Differences in the method of information collection, as well as in the definition of what constitutes an outbreak versus a sporadic occurrence, may also explain the discrepancies in reporting between the HPI data and iPHIS data.
c) Exposure Data
For every confirmed case of enteric disease reported to ROWPH, detailed case follow-up is conducted by Region of Waterloo Public Health staff using a standardized enteric disease case questionnaire.

Although a pre-defined set of exposure or risk factor information is available in iPHIS, the data are incomplete with large proportions of missing information for any particular field (risk factor, risk setting or source of infection). Therefore, exposure data contained in the provincial iPHIS database were not used in this report.

d) Population Data
Incidence rates were calculated using population estimates and projections obtained from the Ontario MOHLTC, intelliHealth database. IntelliHealth is a repository of health information that contains datasets within the Provincial Health Planning Database (PHPDB). It is maintained by the MOHLTC and contains information on a variety of health topics at the individual level, including hospital services, community care, medical services, vital statistics, and population estimates and projections.

Statistics Canada data and Ministry of Finance assumptions are used to calculate population estimates. Projections are based on the 2006 Census and are available by calendar year, sex and single year of age to 2031. Since population projections are based on assumptions and are “predictive” in nature, they are not an exact population estimate. Population estimates are based on the 1986, 1991, 1996, 2001 and 2006 census counts, while projections are extrapolated using the growth rates observed between the 2001 and 2006 census counts. The population estimates and projections in this report may differ from those presented elsewhere due to differences in methodology.

Methodology
All enteric reportable diseases with an accurate episode date between January 1, 2005 and December 31, 2009 were included in this report. Confirmed 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.

For each reportable enteric disease, data on the number of cases and incidence rates were presented. Where possible, disease case counts and rates were further broken down by:
- Sex (male and female)
- 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)

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 1991 Canadian Standard population. For each disease, age-standardized incidence rates were presented for Waterloo Region and Ontario on a yearly basis and refer to the number of new cases of disease per 100,000 population. The 18 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+.

When available, exposure or risk setting data were reported. The number and proportion of cases acquired locally (endemic), associated with travel outside of Canada (non-endemic), and associated with an outbreak were investigated separately. Only cases with complete exposure histories were included in the analysis.

Proportions and rates were rounded to one decimal place. As much as possible, data are presented in a consistent format with a figure highlighting the age-standardized overall rates for Waterloo Region and Ontario, allowing a provincial comparison. Following this, the number of cases and/or crude rates was presented by sex, age group, seasonality and any other temporal trends that may be of interest.
Data Limitations

Enteric diseases are generally under-reported. 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. 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 promptly inform public health.

This report only includes laboratory confirmed cases reported to Region of Waterloo Public Health; individuals who do not submit a laboratory specimen to confirm the existence of the disease are excluded. As a result, the data presented in this report likely reflect an underestimation of the true burden of enteric illness. 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).

In some instances, the annual number of reported cases may change in succeeding years due to periodic data quality assurance checks and corrections that result in the reclassification of reports (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 artefacts, may also account for some of the variation in enteric disease incidence over time and for different geographic areas (i.e. within Ontario) (MOHLTC, 1996).

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 or cross various health unit boundaries.

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, community outbreaks are dependent on the severity of symptoms experienced by affected individuals. Those who are able to tolerate symptoms from certain infections may not seek medical attention and these outbreaks of diseases would not be captured in the reported statistics. Therefore, there may remain some degree of under-reporting and the data presented in this report likely reflect an underestimation of the true burden of enteric outbreaks.

Due to inconsistent data collection procedures during the study period, there were incomplete data available on the number of cases, type of agent (bacterial, viral or parasitic), and mode of transmission for outbreaks reported to ROWPH. There was also incomplete data available on how many outbreaks resulted in the hospitalization or death of cases. As a result, information on case-hospitalization and case-fatality rates for outbreaks could not be presented in this report.

Data on the number and proportion of cases acquired locally (endemic), associated with travel (non-endemic), and associated with an outbreak were obtained from standardized enteric disease case questionnaires which were implemented in the second quarter of 2005. Exposure information extracted for that year is based on cases with onset dates of April 1, 2005 or later. Therefore, the total number of cases reporting exposure associated with travel or an outbreak may differ from the overall number reported in iPHIS.

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, 2009a). Ontario's new case definitions were updated to reflect the changing epidemiology of infectious diseases and the use of more current laboratory diagnostic practices including newer laboratory technologies (see Appendix E). These updates impacted the classification of cases for several diseases and may influence the incidence of some diseases during the year.
2009. As such, an observed increase or decrease in disease incidence during this period may not reflect a true change in incidence. Efforts are currently underway at all public health units to reclassify cases according to the new case definitions. However, due to continued data cleaning efforts, local and provincial data are subject to change.

Finally, the data presented in this report only relate to data collected on cases residing in Waterloo Region. Therefore, generalization of these results beyond the regional level is cautioned.
Appendix E: Summary of Changes to the Reportable Diseases Case Definitions, 2009

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, 2009a). Ontario’s new case definitions were updated to reflect the changing epidemiology of infectious diseases and the use of more current laboratory diagnostic practices including 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.

Some individuals with signs and symptoms and laboratory confirmation were considered confirmed cases under the old case definitions. However, under the new case definitions, only laboratory confirmed individuals are considered confirmed cases. Alternatively, some confirmed cases that were reported as confirmed (as per the old case definitions) based on signs and symptoms and having an epidemiological-link to a confirmed case have been reclassified as probable cases. Finally, an epidemiological link to a laboratory confirmed case was not a criterion in the old case definitions for Listeriosis and Typhoid/Paratyphoid fever, but is now included in the new case definition as either probable or confirmed.

The main changes to the case definitions, and the diseases which are affected, are summarized below:

1. For case definitions where individuals with signs and symptoms and an epidemiologic link to a laboratory confirmed case were previously classified as confirmed and are now regarded as probable cases.
   - Diseases include: Amebiasis, Botulism, *Campylobacter* Enteritis, Chancroid, Cryptosporidiosis, Cyclosporiasis, Food Poisoning (all causes), Giardiasis, Hepatitis A, Salmonellosis, Shigellosis, Smallpox, Trichinosis, Verotoxin-producing E. coli infection, Yersiniosis

2. For case definitions where individuals with signs and symptoms and a laboratory confirmation were considered confirmed cases, however in the new definition only laboratory confirmation is required.
   - Diseases include: Amebiasis, Anthrax, *Campylobacter* Enteritis, Chancroid, Cryptosporidiosis, Cyclosporiasis, Hepatitis B, Malaria, Paratyphoid Fever, Salmonellosis, Shigellosis, Typhoid Fever, Verotoxin-producing E. coli infection, Yersiniosis

3. For case definitions where individuals with signs and symptoms and an epidemiologic link to a laboratory confirmed case were previously classified as confirmed, now these criteria no longer exists as a confirmed case.
   - Diseases include: *Chlamydia trachomatis* infections, Gonorrhoea, Pneumococcal disease

4. For case definitions where an epidemiologic link to a laboratory confirmed case was not a criterion in the previous definition, but is now included in the new case definition.
   - Diseases include: Anthrax, Brucellosis, Cholera, Diphtheria, Group A Streptococcal disease, invasive Hemorrhagic Fevers, Hepatitis B, Lassa Fever, Leprosy, Listeriosis, Paratyphoid Fever, Poliomyelitis, acute, Psittacosis, Q Fever, Typhoid Fever

5. In some instances, case definitions where an individual with signs and symptoms and an epidemiologic link to a laboratory confirmed case was previously classified as confirmed, is still considered a confirmed case.
   - Diseases include: Gastroenteritis, institutional outbreaks, Influenza, Measles, Mumps, Pertussis (Whooping Cough), Rubella