Infectious Diseases

An analysis of cases and outbreaks in the Southwestern Public Health region

Community Health Status Report
Southwestern Public Health
September 2024

Author

Sarah Croteau, MPH
Epidemiologist
Foundational Standards
Southwestern Public Health

Reviewers

Jenny Santos, MSc
Epidemiologist
Foundational Standards
Southwestern Public Health

Carolyn Richards, MSc
Program Manager
Foundational Standards and Sexual Health
Southwestern Public Health

Ashley Vito, MSc
Data Analyst
Foundational Standards
Southwestern Public Health

David Smith, MBA, CHE
Program Director
Healthy Foundations
Southwestern Public Health

Cynthia St. John, MBA
Chief Executive Officer
Executive Leadership
Southwestern Public Health

How to cite this document:

Croteau S. Infectious diseases: an analysis of cases and outbreaks in the Southwestern Public Health region. Woodstock, ON: Southwestern Public Health; 2024.

Contents

Summary

Sexually Transmitted and Blood-borne Infections

- In recent years, the local rates of chlamydia, gonorrhea and infectious syphilis were lower than the provincial rates, however, the rate of hepatitis C was slightly higher locally.
- Chlamydia rates were higher among females, while gonorrhea, infectious syphilis and hepatitis C rates tended to be higher among males. In 2018, SWPH had its first female case of infectious syphilis and since then the rate among females has risen.
- Overall, the local rate of infectious syphilis has been increasing over time, while the rate of hepatitis C has been decreasing. Gonorrhea case counts and rates increased between 2018 and 2022, however, experienced a sharp decrease in 2023.

Vector-borne Disease

- Estimated Lyme disease risk areas grew considerably between 2018 and 2022, expanding into the SWPH region for the first time. The rate of Lyme disease in the SWPH region increased steeply in recent years, surpassing the provincial rate in 2023.

Enteric and Foodborne Diseases

- Campylobacteriosis is the most commonly reported enteric disease in the SWPH region. Since 2019, the local rate of infection has been higher than the province.
- In recent years the local rate of salmonellosis was very similar to the provincial rate, decreasing between 2019 and 2021 and increasing between 2021 and 2022.

Respiratory Diseases

- In 2022 and 2023, COVID-19 hospitalizations peaked in the winter and fall months. More hospitalized cases were in the ICU in 2021 and 2022 compared to 2023. This could indicate that the population has developed immunity (from vaccine or previous illness) or that more recent circulating variants of COVID-19 are less severe.

- During the 2022/23 respiratory season, the local rate of influenza was higher than any other flu season in the 5 years prior. The highest rates of illness were among children 9 years of age and under.
- Pertussis cases tend to come in waves locally that are not seen on a provincial level. Most cases occur among unvaccinated communities within the SWPH region.
- Between 2022 and 2023, the rate of invasive group A streptococcus (iGAS) more than doubled in the SWPH region and Ontario.

Institutional Outbreaks

- The number of confirmed local institutional outbreaks more than doubled in 2022 compared to pre-pandemic in 2019. The pathogen responsible for the majority of outbreaks in 2022 was COVID-19.

Introduction

This report presents local findings for many Diseases of Public Health Significance (DOPHs), examining case counts and rates as well as highlighting differences by age and sex where relevant. Not all DOPHs were included in this report and factors such as the volume of cases reported per year along with major changes to either the rate or demographics were considered when deciding which diseases would be included.

Surveillance data for diseases reported in 2020 and 2021 should be interpreted with caution. During the COVID-19 pandemic, there were many changes in the availability of health care, health seeking behaviour, public health follow-up and case entry. All of these factors had an impact on the data and a decrease in rate was observed for many diseases during this time frame.

Sexually Transmitted and Blood-borne Infections

Chlamydia

Chlamydia is a preventable and curable sexually transmitted infection (STI).[1] It can spread through unprotected vaginal, anal or oral sex with an infected person. It's sometimes referred to as the "silent disease" because many cases of chlamydia are asymptomatic. However, without antibiotic treatment, chlamydia can lead to pelvic inflammatory disease and infertility in women.[1]

Chlamydia is the most commonly reported STI both locally and provincially. While hundreds of cases are reported to Southwestern Public Health (SWPH) per year, the local rate of chlamydia was consistently lower than the provincial rate between 2018 and 2022 (Figure 1 and Figure 2). The rate of chlamydia declined locally and provincially in 2020 and 2021 and increased in 2022.

Figure 1. Confirmed Chlamydia Cases, SWPH region, 2018 - 2022

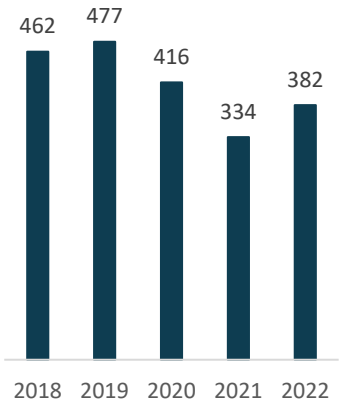
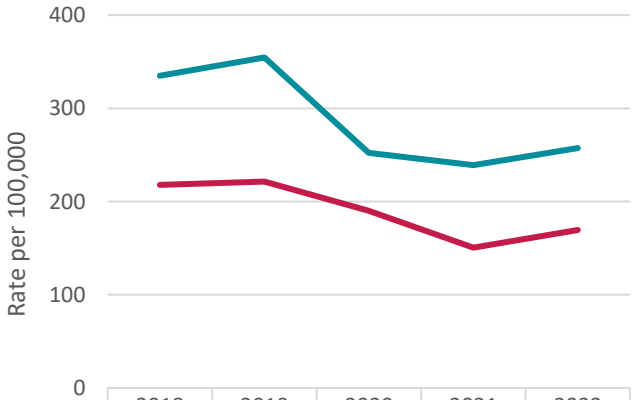


Figure 2. Chlamydia Rates, SWPH region and Ontario, 2018 - 2022



	2018	2019	2020	2021	2022
SWPH Rate	218.0	221.4	190.0	150.5	169.3
Ontario Rate	335.0	354.5	252.1	239.0	257.4

Similar to the province, case counts and rates of chlamydia in the SWPH region were higher among females compared to males (Figure 3 and Figure 4). Between 2018 and 2022, females accounted for 63% of all cases. Locally, the highest rates of chlamydia among females are in a younger age range (15-24 years old) compared to males (20-29 years old).

Figure 3. Confirmed Chlamydia Cases among Males and Females, SWPH region, 2018 - 2022

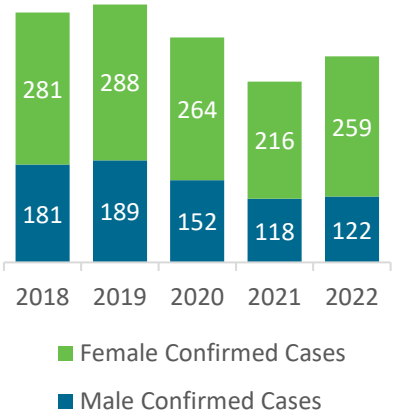
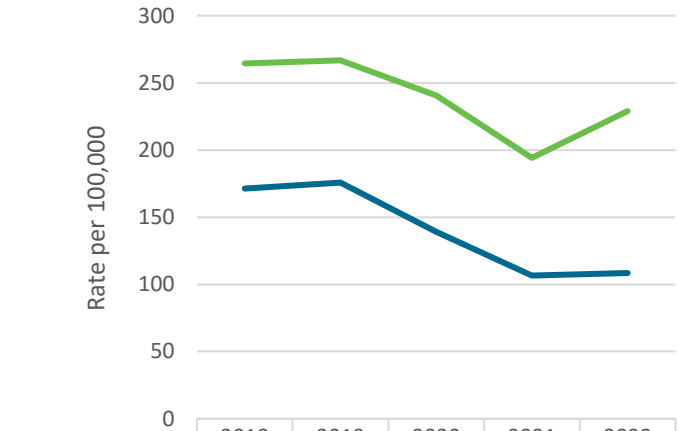


Figure 4. Chlamydia Rates among Males and Females, SWPH region, 2018 - 2022



	2018	2019	2020	2021	2022
Male Rate	171.4	175.8	139.2	106.6	108.4
Female Rate	264.4	266.8	240.7	194.2	229

Gonorrhea

Gonorrhea is a preventable and curable STI.[2] It can spread through unprotected vaginal, anal or oral sex with an infected person. It can also spread from an infected mother to her baby during childbirth. If left untreated, gonorrhea can lead to pelvic inflammatory disease and infertility in females. Although rare, it can also lead to infertility in males. Without antibiotic treatment, it can spread through the blood to other parts of the body, which can be life-threatening.[2] A high proportion of people infected with gonorrhea are at risk of co-infection with chlamydia.[3]

Locally, gonorrhea case counts and rates increased between 2018 and 2022, followed by a sharp decrease in 2023 (Figure 5 and Figure 6). Several other health units also experienced a decline, however provincially, rates climbed in 2023, largely driven by an increase in cases in the Greater Toronto Area. There were no province-wide changes, such as a change in case

definition or lab testing, that would explain the decrease seen by many health units, indicating it is likely a true decline in cases.

Figure 5. Confirmed Gonorrhea Cases, SWPH region, 2018 - 2023

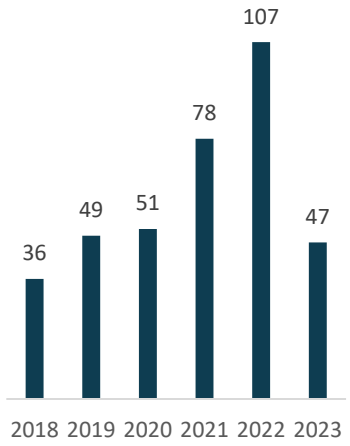
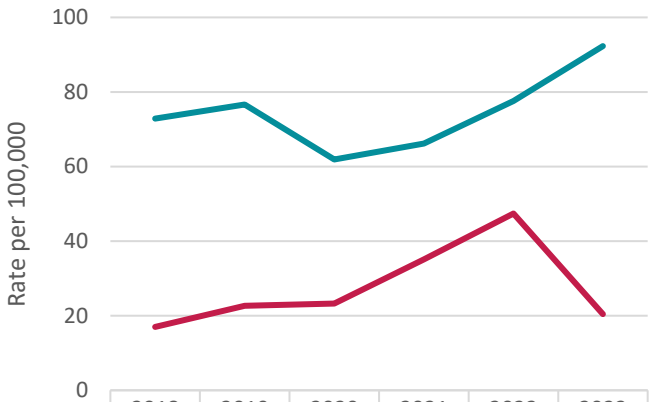


Figure 6. Gonorrhea Rates, SWPH region and Ontario, 2018 - 2023



	2018	2019	2020	2021	2022	2023
SWPH Rate	17.0	22.7	23.3	35.1	47.4	20.4
ONT Rate	72.9	76.6	61.9	66.2	77.6	92.3

Locally, the case count and rate of gonorrhea in males tend to be higher compared to females, however, they were similar in some years examined (Figure 7 and Figure 8). Between 2018 and 2023, the rate of gonorrhea ranged from 1.1x to 2.6x higher among males compared to females.

Figure 7. Confirmed Gonorrhea Cases among Males and Females, SWPH region, 2018 - 2023

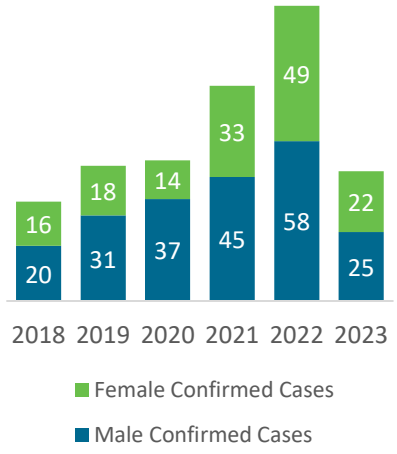
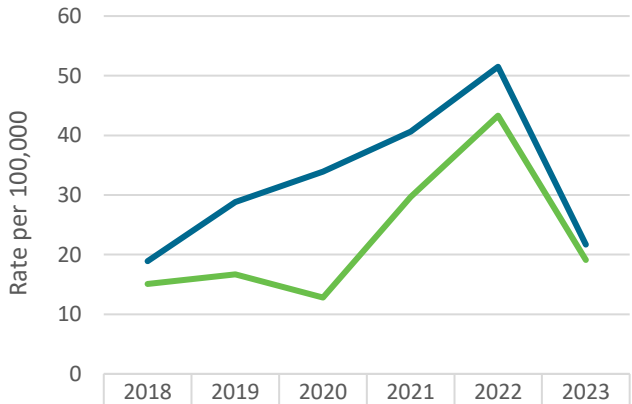


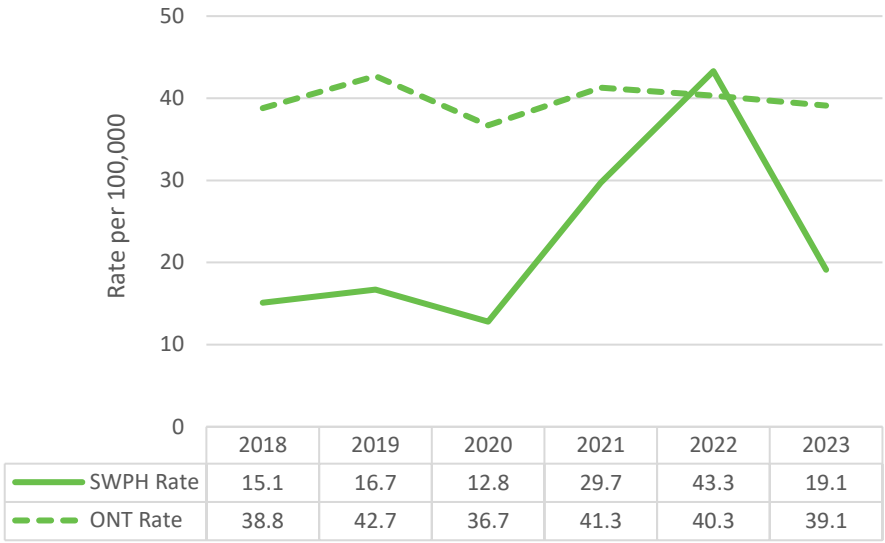
Figure 8. Gonorrhea Rates among Males and Females, SWPH region, 2018 - 2023



	2018	2019	2020	2021	2022	2023
Male Rate	18.9	28.8	33.9	40.6	51.5	21.7
Female Rate	15.1	16.7	12.8	29.7	43.3	19.1

Between 2020 and 2022, the local rate of gonorrhea among females more than tripled, surpassing the provincial rate in 2022 (Figure 9). However, between 2022 and 2023, there was a steep decline in the local rate.

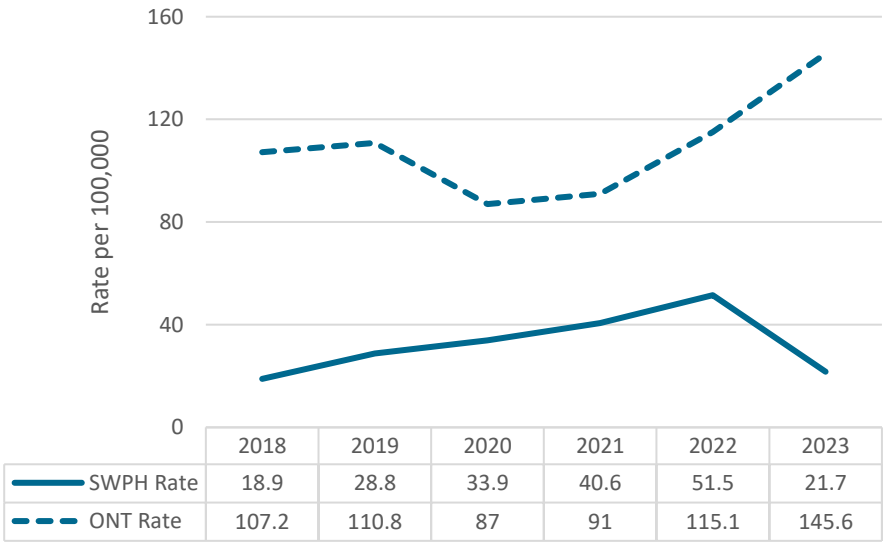
Figure 9. Gonorrhea Rate among Females, SWPH region and Ontario, 2018 - 2023



	2018	2019	2020	2021	2022	2023
SWPH Rate	15.1	16.7	12.8	29.7	43.3	19.1
ONT Rate	38.8	42.7	36.7	41.3	40.3	39.1

In the SWPH region, the rate of gonorrhea among males steadily increased between 2018 and 2022 and declined in 2023 (Figure 10). The rate among males was consistently lower than the provincial rate.

Figure 10. Gonorrhea Rate among Males, SWPH region and Ontario, 2018 - 2023



	2018	2019	2020	2021	2022	2023
SWPH Rate	18.9	28.8	33.9	40.6	51.5	21.7
ONT Rate	107.2	110.8	87	91	115.1	145.6

Infectious Syphilis

Syphilis is a preventable and curable infection that can be spread through vaginal, anal or oral sex.[4] It can also be spread from an infected mother to her baby during pregnancy or childbirth (congenital syphilis). If syphilis is left untreated, the infection can move through 4 stages: primary, secondary, latent and tertiary. Each of these stages is characterized by different signs and symptoms. Generally, syphilis is infectious during the primary, secondary and early latent stages. Tertiary syphilis can cause severe damage to the brain, heart, blood vessels and nervous system and can eventually lead to death.[4]

The data in this section focuses on infectious syphilis only. With the exception of a slight decrease in 2020 (likely influenced by the COVID-19 pandemic), the local rate of infectious syphilis has been increasing, almost doubling between 2018 and 2022 (Figure 12). The local rate was consistently lower than the provincial rate between 2018 and 2022.

Figure 11. Confirmed Infectious Syphilis Cases, SWPH region, 2018 - 2022

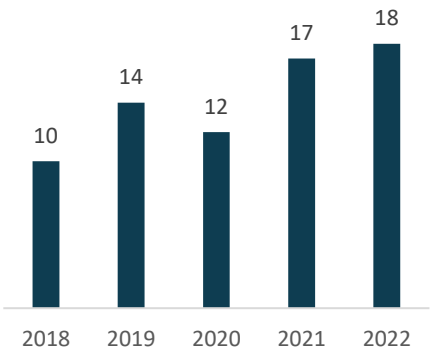
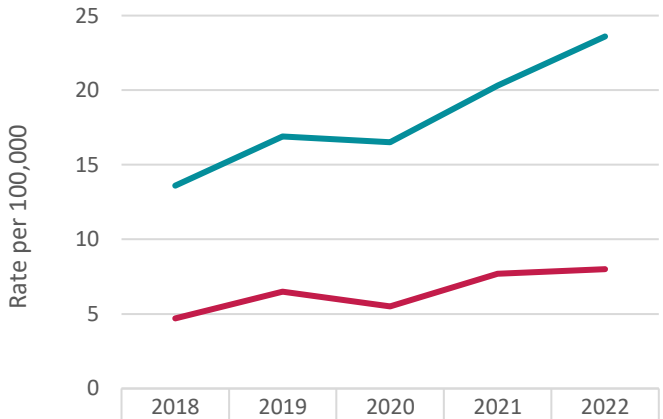


Figure 12. Infectious Syphilis Rates, SWPH region and Ontario, 2018 - 2022



	2018	2019	2020	2021	2022
SWPH Rate	4.7	6.5	5.5	7.7	8.0
ONT Rate	13.6	16.9	16.5	20.3	23.6

In 2018, SWPH had its first female case of infectious syphilis (Figure 13). Between 2018 and 2021, the rate among females grew considerably from 0.9 to 6.3 cases per 100,000 females (Figure 14). However, between 2021 and 2022 the rate declined to 5.3. Locally, the ratio of male-to-female cases has decreased substantially. A similar trend has been seen provincially; the ratio of male-to-female cases decreased from 25:1 in 2014 to 5:1 in 2022 due to steady increases in the incidence of infectious syphilis in females.

Figure 13. Confirmed Infectious Syphilis Cases among Males and Females, SWPH region, 2018 - 2022

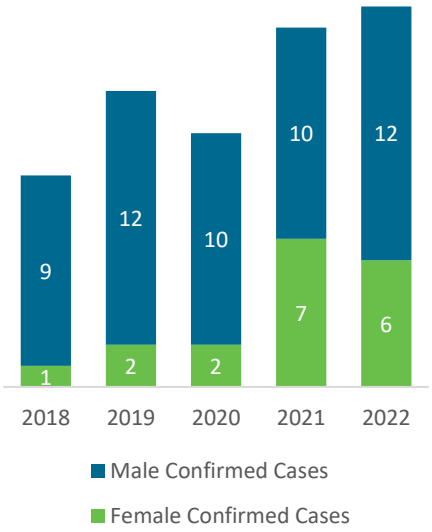
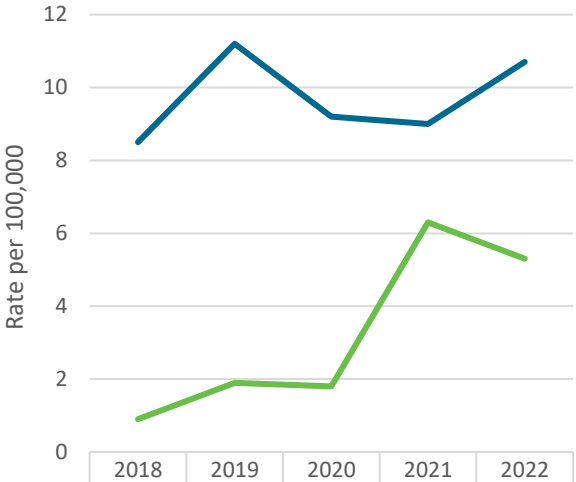


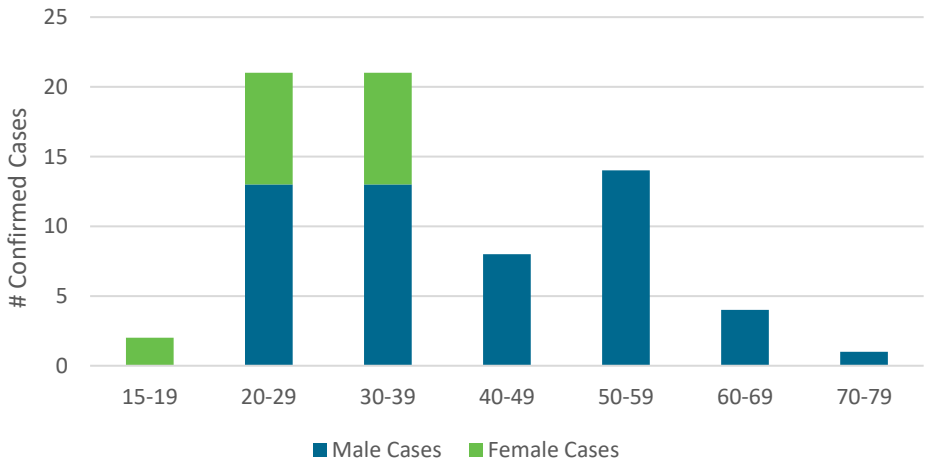
Figure 14. Infectious Syphilis Rates among Males and Females, SWPH region, 2018 - 2022



	2018	2019	2020	2021	2022
Female Rate	0.9	1.9	1.8	6.3	5.3
Male Rate	8.5	11.2	9.2	9.0	10.7

Examining cases of infectious syphilis by sex and age group, it is evident that cases among males are occurring among a wider age range (20-79 years of age) compared to females (15-39 years of age) (Figure 15). Cases among females are occurring among those that are childbearing age, which raises the concern of congenital syphilis among this group.

Figure 15. Confirmed Infectious Syphilis Cases among Males and Females by Age Group, SWPH region, 2018 - 2022



Hepatitis C

Hepatitis C is a liver infection that is caused by the hepatitis C virus.[5] It is most commonly transmitted through infected blood and is often spread through sharing needles or other injection drug equipment. It can also be spread through sexual contact, unsterilized tattoo or body piercing equipment or unsterilized medical equipment, although these methods of transmission are rare. Hepatitis C can be acute or chronic and when left untreated, may lead to cirrhosis of the liver, liver cancer and premature death.[5]

Case counts and rates of hepatitis C have been decreasing over time, both locally and provincially (Figure 16 and Figure 17). The rate of hepatitis C infection decreased by almost 40% locally between 2018 and 2022.

Figure 16. Confirmed Hepatitis C Cases, SWPH region, 2018 - 2022

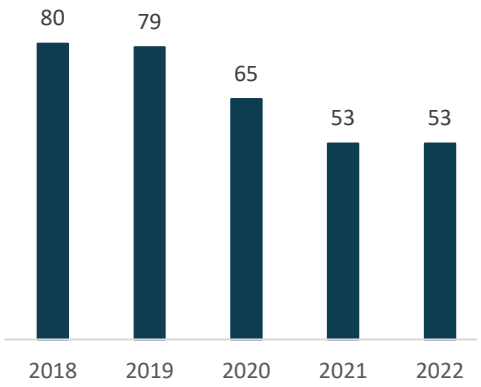
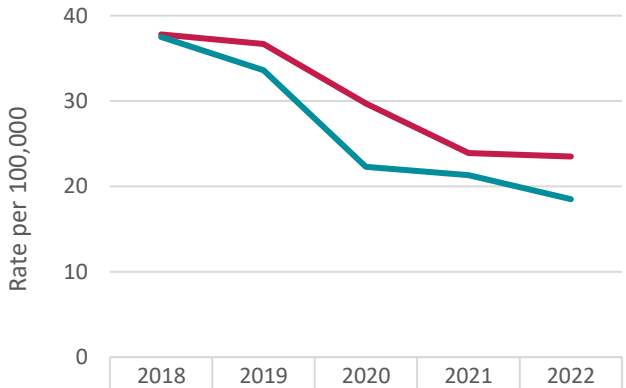


Figure 17. Hepatitis C Rates, SWPH region and Ontario, 2018 - 2022



	2018	2019	2020	2021	2022
SWPH Rate	37.8	36.7	29.7	23.9	23.5
ONT Rate	37.5	33.6	22.3	21.3	18.5

Case counts and rates of Hepatitis C were higher among males compared to females (Figure 18 and Figure 19). Locally, the highest rates among males and females are seen among people aged 25-34.

Figure 18. Confirmed Hepatitis C Cases among Males and Females, SWPH region, 2018 - 2022

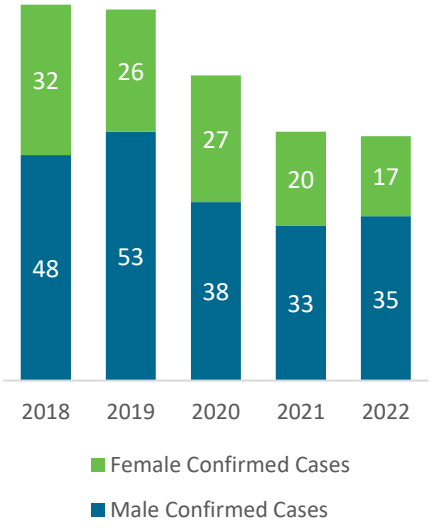
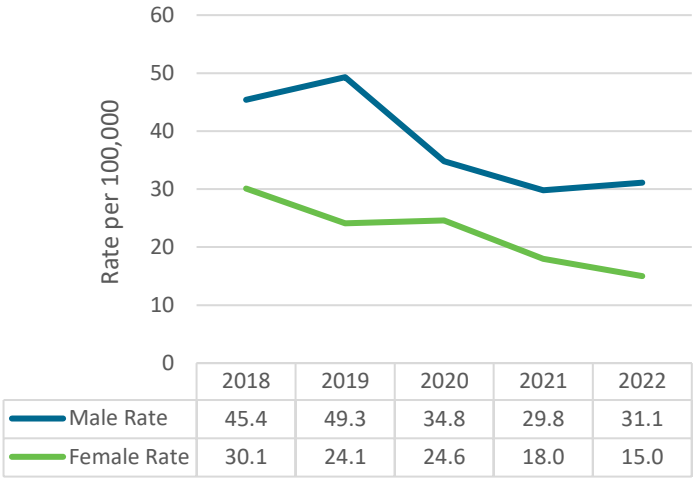


Figure 19. Hepatitis C Rates among Males and Females, SWPH region, 2018 - 2022



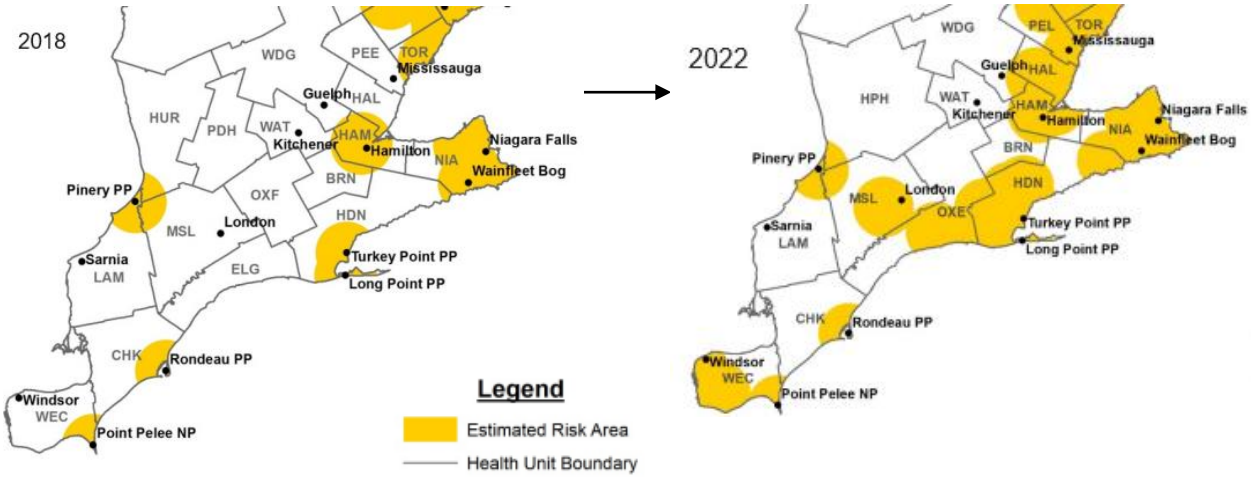
	2018	2019	2020	2021	2022
Male Rate	45.4	49.3	34.8	29.8	31.1
Female Rate	30.1	24.1	24.6	18.0	15.0

Vector-borne Disease

Lyme Disease

Lyme disease is typically spread through the bite of an infected blacklegged tick, also known as a deer tick.[6] Each year, Public Health Ontario releases a map of estimated risk areas that show where people are most likely to come into contact with an infective blacklegged tick in Ontario. The estimated risk areas grew considerably between 2018 and 2022, expanding into the SWPH region (Figure 20).[7,8]

Figure 20. Lyme Disease Risk Area Map, Southern Ontario, 2018 and 2022



The case count and rate of Lyme disease has been increasing both locally and provincially and in 2023 the local rate surpassed the provincial rate (Figure 21 and Figure 22). The rate of Lyme disease in the SWPH region increased steeply in recent years and was over 7x higher in 2023 compared to 2018. In addition, the majority of confirmed cases in 2023 were most likely acquired locally (i.e. the tick bite occurred within the SWPH region).

Figure 21. Confirmed Lyme Disease Cases, SWPH region, 2018 - 2023

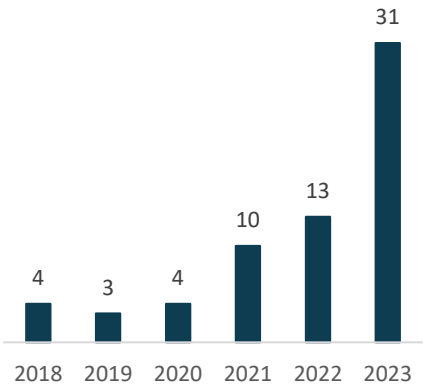
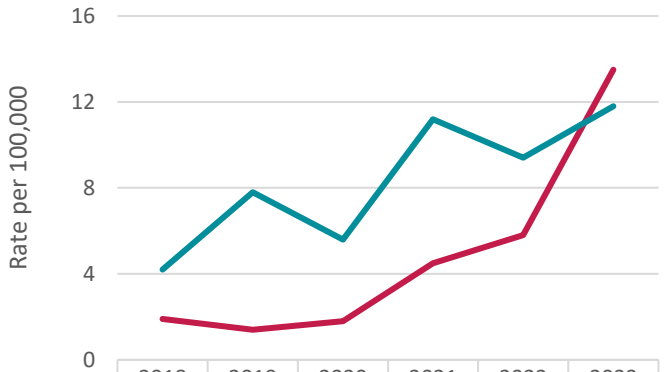


Figure 22. Lyme Disease Rates, SWPH region and Ontario, 2018 - 2023



	2018	2019	2020	2021	2022	2023
SWPH Rate	1.9	1.4	1.8	4.5	5.8	13.5
ONT Rate	4.2	7.8	5.6	11.2	9.4	11.8

Enteric and Foodborne Diseases

Campylobacteriosis and Salmonellosis

Campylobacteriosis and salmonellosis are bacterial infections that can be acquired in several different ways.[9,10] The bacteria are spread through contaminated food or drinks, contact with infected animals or people, or swimming in contaminated water. Symptoms include fever, nausea, vomiting and diarrhea. While most people recover on their own, some people may have more serious illnesses, requiring hospitalization. Those who have a weak immune system are at the highest risk of serious illness, including young children, the elderly and pregnant women.[9,10]

Campylobacteriosis is the most commonly reported enteric disease in the SWPH region. Since 2019, the rate of infection locally has been higher than the province (Figure 24). The local rate increased between 2021 and 2022, while the provincial rate decreased.

Figure 23. Confirmed Campylobacter Cases, SWPH region, 2018 - 2022

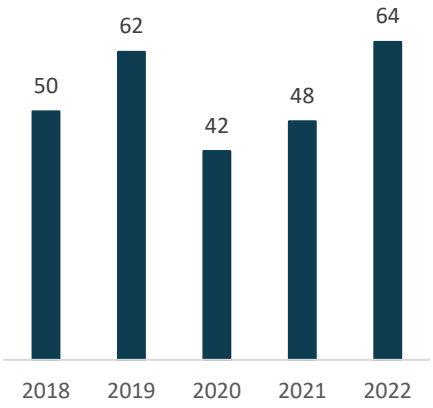
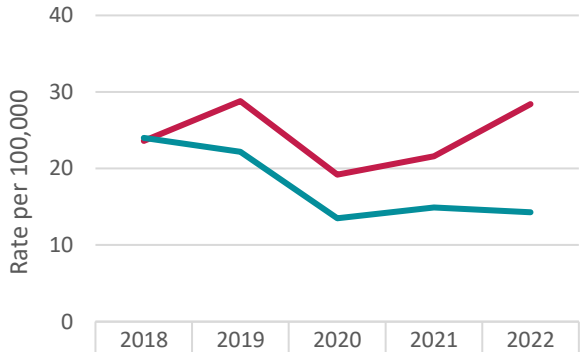


Figure 24. Campylobacter Rates, SWPH region and Ontario, 2018 - 2022



	2018	2019	2020	2021	2022
SWPH Rate	23.6	28.8	19.2	21.6	28.4
ONT Rate	24	22.2	13.5	14.9	14.3

In recent years the local rate of salmonellosis was very similar to the provincial rate (Figure 26). While the rate decreased between 2019 and 2021, there was an increase both locally and provincially between 2021 and 2022.

Figure 25. Confirmed Salmonellosis Cases, SWPH region, 2018 - 2022

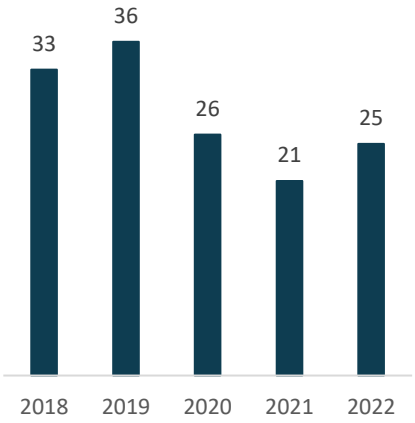
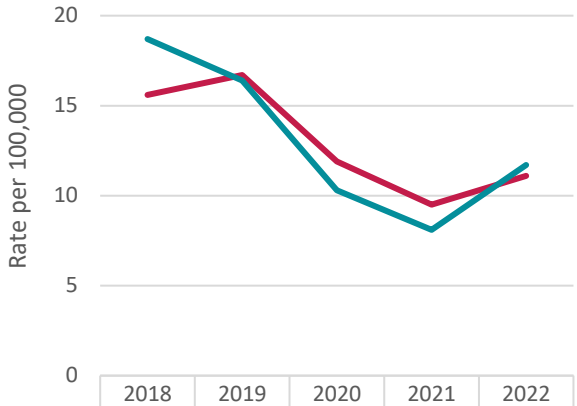


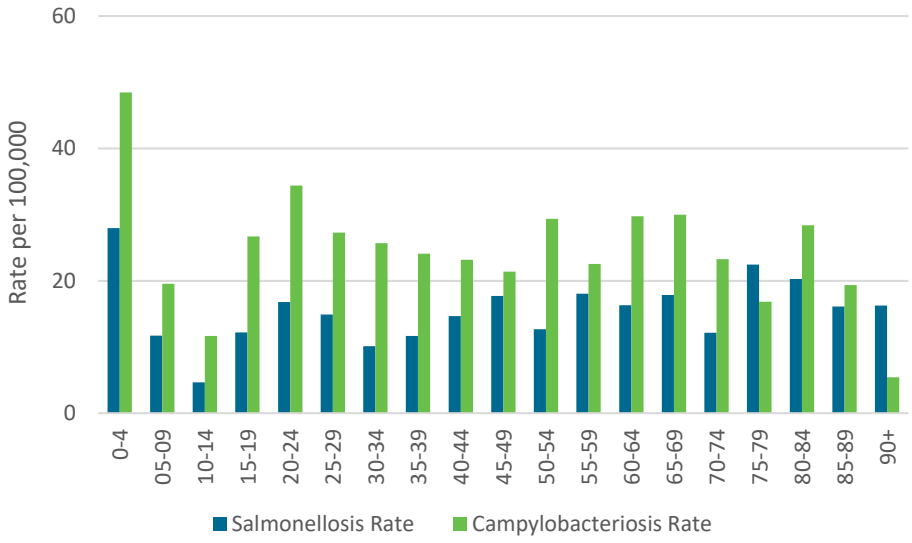
Figure 26. Salmonellosis Rates, SWPH region and Ontario, 2018 - 2022



	2018	2019	2020	2021	2022
SWPH Rate	15.6	16.7	11.9	9.5	11.1
ONT Rate	18.7	16.4	10.3	8.1	11.7

While infection happens among people of all ages, children 4 and under are most likely to have a reported infection (Figure 27).

Figure 27. Campylobacter and Salmonellosis Rates by Age Group, SWPH region, 2013 - 2022



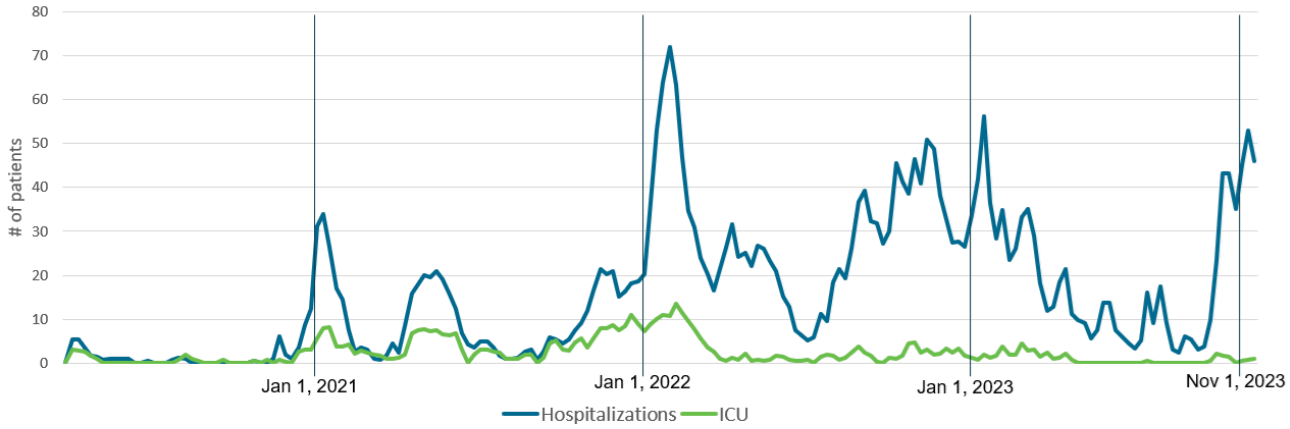
Respiratory Diseases

COVID-19

Coronavirus disease 2019 (COVID-19) is a respiratory illness caused by the SARS-CoV-2 virus. The virus was first detected in China in December 2019 and on March 11, 2020, the World Health Organization declared that there was a pandemic, indicating worldwide spread.[11] On March 20, 2020, the first local case of COVID-19 was reported to SWPH. The disease is spread from an infected person through respiratory droplets and aerosols that are created when they cough, sneeze, talk, breathe or sing.[12] It can also be spread through contaminated surfaces. Disease severity and symptoms vary from person to person. Symptoms can include sore throat, runny nose, headache, cough, shortness of breath and fever. Vaccination reduces the risk of severe illness and death.[12]

Local and provincial COVID-19 case counts and rates are not presented in this report. This data can be difficult to interpret due to frequent changes in eligibility criteria for PCR testing and the introduction of rapid tests later in the pandemic. The results from rapid tests were not routinely reported to SWPH. Instead, hospitalization data is presented to help communicate the severity of COVID-19 in the SWPH region over time (Figure 28). In 2022 and 2023, hospitalizations peaked in the winter and fall months. Proportionately, more hospitalized cases were in the ICU in January 2021 and 2022 compared to January 2023. This could indicate that the population has developed immunity (from vaccine or previous illness) or that more recent circulating variants of COVID-19 are less severe.

Figure 28. COVID-19 Hospitalizations by Week, SWPH region, Mar 2020-Nov 2023



Influenza (flu)

Influenza (flu) spreads person-to-person through talking, sneezing and coughing.[13] Infection can also spread through contaminated surfaces. Influenza symptoms include fever, cough, muscle aches and pain, headache, sore throat and runny nose. While everyone is at risk of getting sick, young children, the elderly and those with weakened immune systems are at highest risk of complications. The annual flu shot is the best way to prevent infection.[13]

During the 2022/23 respiratory season (Sept 1, 2022 – Aug 31, 2023), there were more confirmed influenza cases locally than any other flu season in the time period examined (Figure 29). The rate of influenza locally has followed a similar trend compared to the province (Figure 30).

Figure 29. Confirmed Influenza Cases, SWPH region, 2017/18 – 2022/23

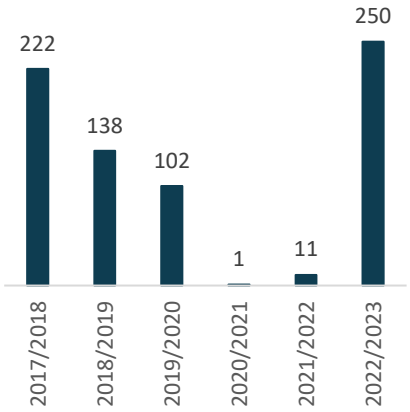
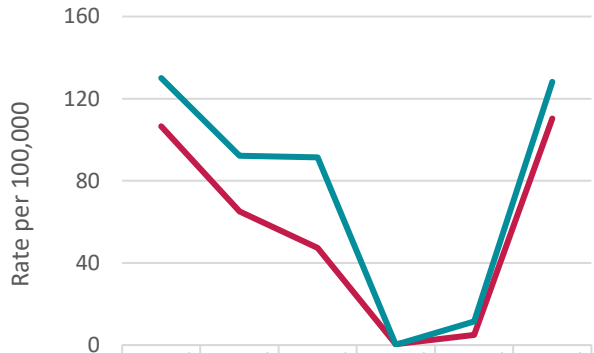


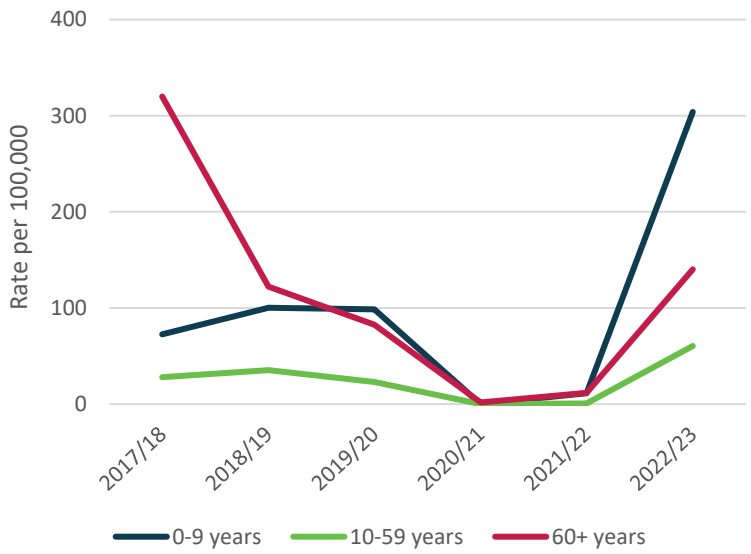
Figure 30. Influenza Rates, SWPH region and Ontario, 2017/18 – 2022/23



	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
SWPH Rate	106.5	65.1	47.3	0.5	4.9	110.3
ONT Rate	130.0	92.1	91.4	0.2	11.5	128.2

In recent years the 2017/18 and 2022/23 respiratory seasons had the highest rates of influenza illness. However, different age groups were hit hardest during each of these seasons. In 2017/18, those 60 years of age and older had the highest rates, while in 2022/23 those 9 and under had the highest rates of illness (Figure 31). In 2017/18 both influenza A and B were circulating, while in 2022/23 the vast majority of cases tested positive for influenza A (96.4%).

Figure 31. Influenza Rates by Age Group, SWPH region, 2017/18 – 2022/23

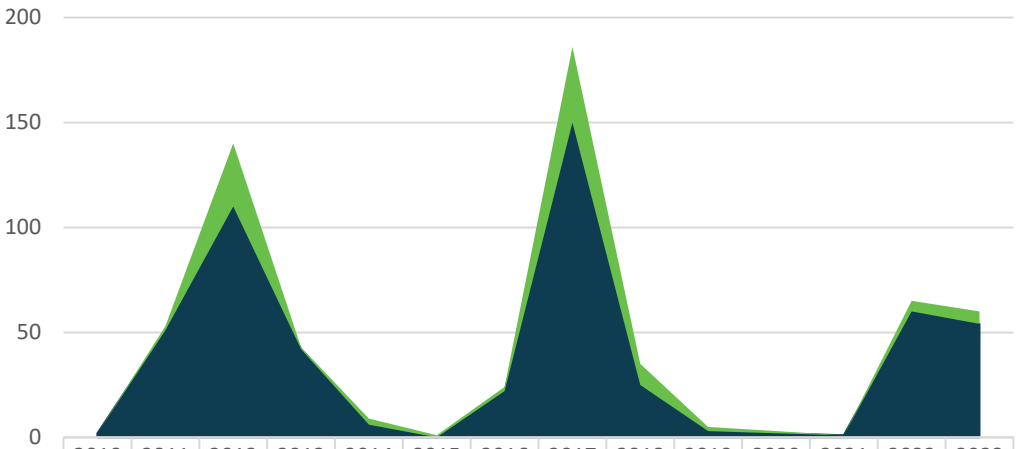


Pertussis (whooping cough)

Pertussis, more commonly known as whooping cough, is a contagious respiratory infection. It causes severe coughing that may lead to choking or vomiting.[14] It spreads through droplets in the air when an infected person coughs or sneezes. Immunization can provide protection against pertussis. Vaccination programs begin at 2 months of age; thus newborns are at the highest risk of infection. The most severe illness is seen among children under 1 year of age, especially among those who are unvaccinated or under-vaccinated.[14]

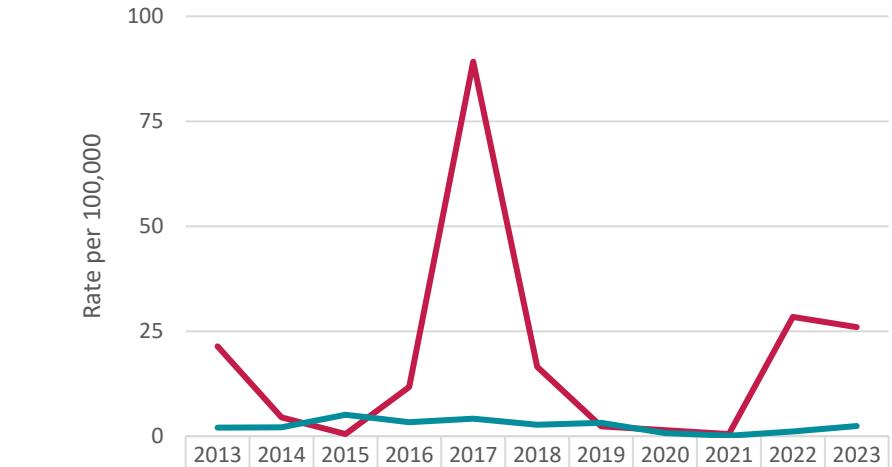
Examining over a decade of data, it is evident that locally, pertussis cases come in waves (Figure 32). These waves of pertussis happen on a local level and are not seen provincially (Figure 33). The majority of cases occur among unvaccinated communities within the SWPH region.

Figure 32. Confirmed and Probable Pertussis Cases, SWPH region, 2010-2023



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Probable Cases	0	2	30	1	3	1	2	36	10	2	1	0	5	6
Confirmed Cases	2	51	110	42	6	0	22	150	25	3	2	1	60	54

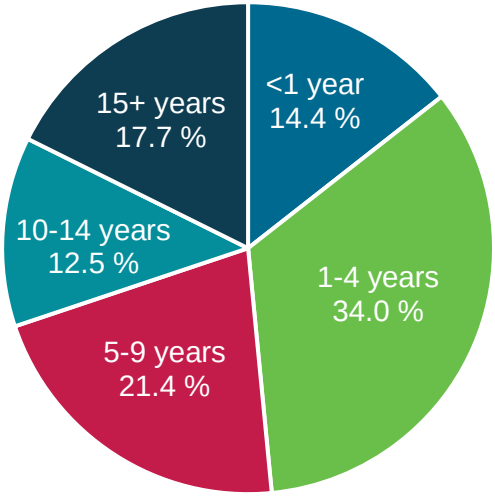
Figure 33. Pertussis Rates, SWPH region and Ontario, 2013-2023



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
SWPH Rate	21.4	4.5	0.5	11.7	89.2	16.5	2.3	1.4	0.5	28.4	26.0
ONT Rate	2.0	2.1	5.1	3.3	4.2	2.7	3.2	0.7	0.1	1.1	2.4

Over 80% of local confirmed pertussis cases are among children and youth 14 years of age and under (Figure 34). This may reflect the difference in severity of symptoms among people of different ages and vaccination status. Many people may not be tested for or know they have whooping cough due to mild symptoms. However, they can still spread the bacteria to vulnerable individuals.[14]

Figure 34. Pertussis Cases by Age Group, SWPH region, 2010-2023



Invasive Group A Streptococcus (iGAS)

Group A streptococcus bacteria can cause mild or moderate infections such as strep throat or impetigo and some healthy people carry these bacteria with no signs or symptoms of infection.[15] Bacteria can spread person-to-person through direct contact. Sometimes these bacteria invade the blood, lungs, brain or other parts of the body where they are not normally found, causing severe life-threatening illness. These are invasive group A streptococcus (iGAS) infections, including necrotizing fasciitis (flesh-eating disease) and complications such as toxic shock syndrome.[15]

In 2023 there was an increase in confirmed iGAS cases and rates, both locally and provincially (Figure 35 and Figure 36). Between 2022 and 2023 the rate of iGAS more than doubled in the SWPH region and in Ontario.

Figure 35. Confirmed Invasive Group A Streptococcus Cases, SWPH region, 2018 - 2023

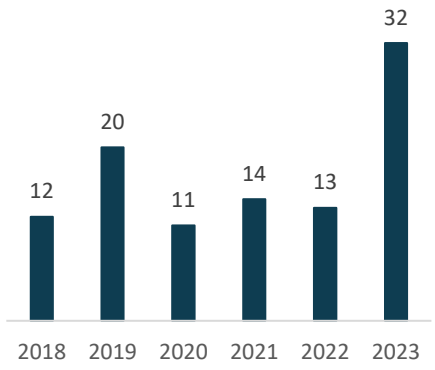
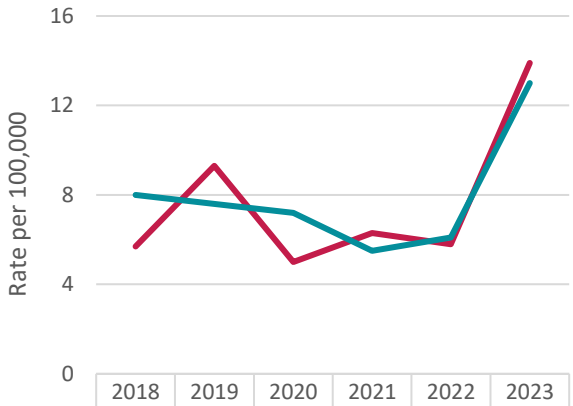


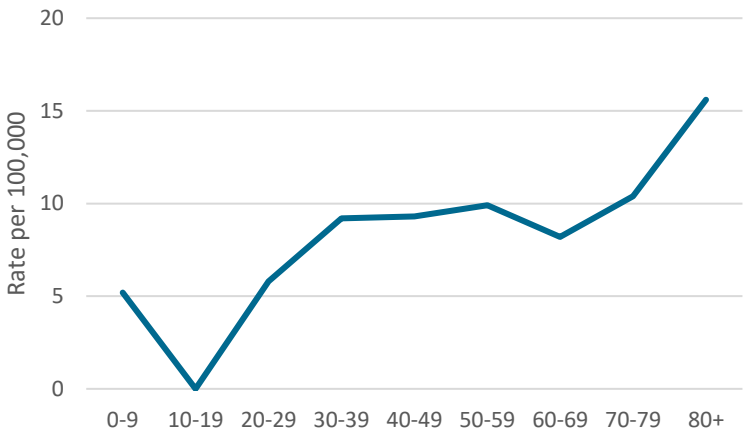
Figure 36. Invasive Group A Streptococcus Rates, SWPH region and Ontario, 2018 - 2023



	2018	2019	2020	2021	2022	2023
SWPH Rate	5.7	9.3	5.0	6.3	5.8	13.9
ONT Rate	8.0	7.6	7.2	5.5	6.1	13.0

With the exception of children aged 9 and under, the rate of iGAS infection tends to increase with age with those 80 years of age and over experiencing the highest rate of infection in the region (Figure 37).

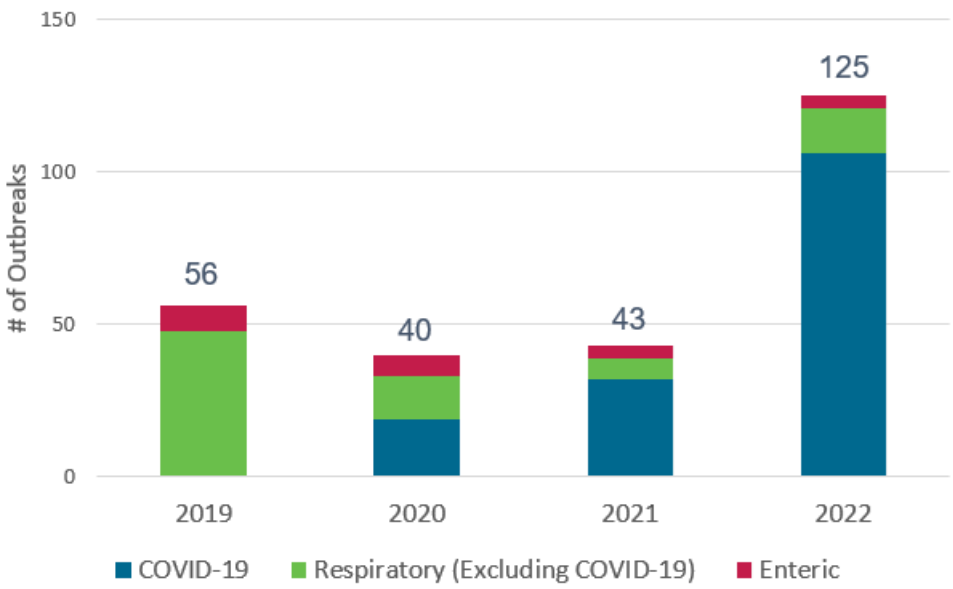
Figure 37. Invasive Group A Streptococcus Rates by Age Group, SWPH region, 2018 - 2023



Institutional Outbreaks

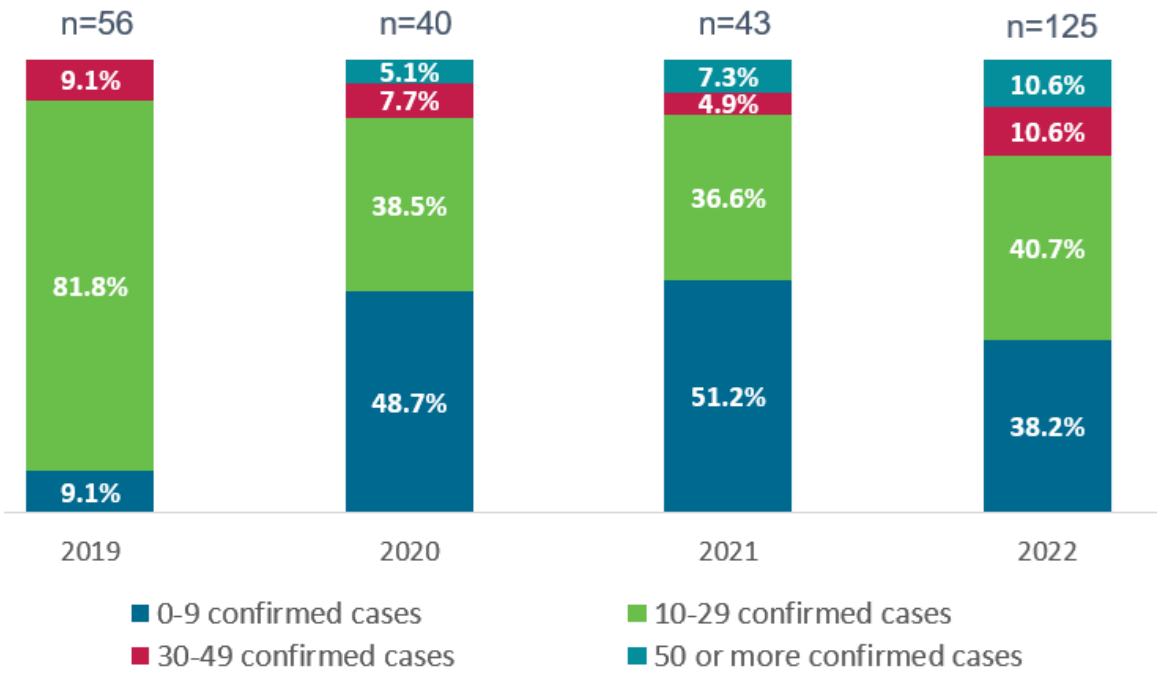
SWPH works with hospitals, retirement homes and long-term care homes (institutions) in the region to prevent, investigate and manage the spread of infectious diseases. The number of confirmed local institutional outbreaks more than doubled in 2022 compared to pre-pandemic in 2019 (Figure 38). The pathogen responsible for the vast majority of outbreaks in 2022 was COVID-19 (84.8%), while enteric and other respiratory pathogens accounted for far less (3.2% and 12.0%, respectively).

Figure 38. Number of Confirmed Institutional Outbreaks, SWPH region, 2019 - 2022



A change in the distribution of institutional outbreak size began in 2020, as the first COVID-19 outbreaks started occurring locally. Small outbreaks with 9 or fewer cases, as well as very large outbreaks with 50 or more cases, became more common (Figure 39).

Figure 39. Confirmed Institutional Outbreaks by Size, SWPH region, 2019 - 2022



References

1. Public Health Agency of Canada. Chlamydia [Internet]. [cited 2024 Jul 10]. Available from: https://www.canada.ca/en/public-health/services/diseases/chlamydia.html

2. Public Health Agency of Canada. Gonorrhea [Internet]. [cited 2024 Jul 10]. Available from: https://www.canada.ca/en/public-health/services/diseases/gonorrhea.html

3. Public Health Ontario. Ontario Gonorrhea Testing and Treatment Guide, 2nd Edition [Internet]. 2018. Available from: https://www.publichealthontario.ca/-/media/documents/G/2018/guide-gonorrhea-testing-treatment.pdf

4. Public Health Agency of Canada. Syphilis [Internet]. [cited 2024 Jul 10]. Available from: https://www.canada.ca/en/public-health/services/diseases/syphilis.html

5. Public Health Agency of Canada. Hepatitis C: Symptoms and treatment [Internet]. [cited 2024 Jul 11]. Available from: https://www.canada.ca/en/public-health/services/diseases/hepatitis-c.html

6. Public Health Agency of Canada. Lyme disease: Prevention and risks [Internet]. [cited 2024 Aug 16]. Available from: https://www.canada.ca/en/public-health/services/diseases/lyme-disease/prevention-lyme-disease.html

7. Public Health Ontario. Ontario Lyme Disease Map 2018: Estimated Risk Areas. [cited 2024 Aug 16]; Available from: https://www.publichealthontario.ca/-/media/documents/L/2018/lyme-disease-risk-area-map-2018.pdf

8. Public Health Ontario. Ontario Lyme Disease Map 2022: Estimated Risk Areas [Internet]. [cited 2024 Aug 16]. Available from: https://www.publichealthontario.ca/-/media/Documents/O/2022/lyme-disease-risk-area-map-2022.pdf

9. Public Health Agency of Canada. Campylobacteriosis (Campylobacter) [Internet]. [cited 2024 Jul 24]. Available from: https://www.canada.ca/en/public-health/services/diseases/campylobacteriosis-campylobacter.html

10. Public Health Agency of Canada. Salmonellosis (Salmonella) [Internet]. [cited 2024 Jul 24]. Available from: https://www.canada.ca/en/public-health/services/diseases/salmonellosis-salmonella.html

11. World Health Organization. Coronavirus disease (COVID-19) pandemic [Internet]. [cited 2024 Jul 24]. Available from: https://www.who.int/europe/emergencies/situations/covid-19

12. Public Health Agency of Canada. Coronavirus disease (COVID-19) [Internet]. [cited 2024 Jul 24]. Available from: https://www.canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19.html

13. Public Health Agency of Canada. Flu (influenza) [Internet]. [cited 2024 Aug 19]. Available from: https://www.canada.ca/en/public-health/services/diseases/flu-influenza.html

14. Public Health Agency of Canada. Pertussis (whooping cough) [Internet]. [cited 2024 Aug 20]. Available from: https://www.canada.ca/en/public-

health/services/immunization/vaccine-preventable-diseases/pertussis-whooping-cough.html

15. Public Health Agency of Canada. Group A streptococcal diseases (Streptococcus pyogenes) [Internet]. [cited 2024 Aug 22]. Available from: https://www.canada.ca/en/public-health/services/diseases/group-a-streptococcal-diseases.html

Data Sources

1. Infectious disease query. Public Health Ontario. [cited 2024 Sept 5].

2. Population Estimates (2013-2021), Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO. [cited 2024 Sept 5]

3. Population Projections (2022-2023), Ministry of Health and Long-Term Care, IntelliHEALTH ONTARIO. [cited 2024 Sept 5]

4. Integrated Public Health Information System (iPHIS) (2010-2023). [cited 2024 Sept 5]

5. CPAD Visual Analytics Hub, Ministry of Health and Long-Term Care. [cited 2024 Sept 5]

Southwestern Public Health
www.swpublichealth.ca

St. Thomas Site
1230 Talbot Street
St. Thomas, ON N5P 1G9

Woodstock Site
410 Buller Street
Woodstock, ON N4S 4N2