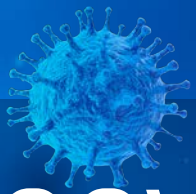
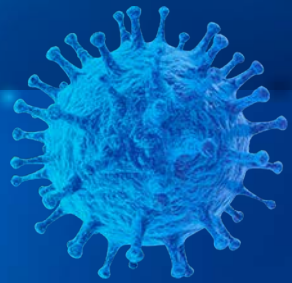
# Analyzing the spread of COVID-19 in Ontario.





# Project Members

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# At the end of this report, we will know....

1. Who was affected by the virus?
2. Which regions in Ontario were affected?
3. How was the virus contracted?
4. What roles do weather conditions play in the spread of the virus in Toronto?

# Data Sources

*All data collected from January 23, 2020 to June 30,2020*

https://data.ontario.ca

https://www.wunderground.com/history/monthly/ca/toronto

https://www.kaggle.com

# 1. Data Exploring and Cleanup

# Ontario Dataset (before)

| | _id | Row_ID | Accurate_Episode_Date | Case_Reported_Date | Test_Reported_Date | Specimen_Date | Age_Group | Client_Gender | Case_AcquisitionInfo | Outcome1 | Outbreak_Related | Reporting_PHU | Reporting_PHU_Address | Reporting_PHU_City | Reporting_PHU_Postal_Code | Reporting_PHU_Website | Reporting_PHU_Latitude | Reporting_PHU_Longitude |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 1 | 2020-03-08T00:00:00 | 2020-03-08T00:00:00 | 2020-03-11T00:00:00 | 2020-03-10T00:00:00 | 40s | FEMALE | Travel | Resolved | NaN | Ottawa Public Health | 100 Constellation Drive | Ottawa | K2G 6J8 | www.ottawapublichealth.ca | 45.345665 | -75.763912 |
| 1 | 2 | 2 | 2020-03-11T00:00:00 | 2020-03-11T00:00:00 | 2020-03-15T00:00:00 | 2020-03-11T00:00:00 | 60s | FEMALE | CC | Resolved | NaN | Sudbury & District Health Unit | 1300 Paris Street | Sudbury | P3E 3A3 | www.phsd.ca | 46.466092 | -80.998059 |
| 2 | 3 | 3 | 2020-03-07T00:00:00 | 2020-03-11T00:00:00 | 2020-03-11T00:00:00 | 2020-03-10T00:00:00 | 20s | FEMALE | Travel | Resolved | NaN | Toronto Public Health | 277 Victoria Street, 5th Floor | Toronto | M5B 1W2 | www.toronto.ca/community-people/health-wellnes... | 43.656591 | -79.379358 |
| 3 | 4 | 4 | 2020-03-07T00:00:00 | 2020-03-10T00:00:00 | 2020-03-11T00:00:00 | 2020-03-10T00:00:00 | 50s | MALE | Travel | Resolved | NaN | Hamilton Public Health Services | 110 King St. West, 2nd Floor | Hamilton | L8P 4S6 | www.hamilton.ca/publichealth | 43.257631 | -79.871341 |
| 4 | 5 | 5 | 2020-03-09T00:00:00 | 2020-03-11T00:00:00 | 2020-03-10T00:00:00 | 2020-03-10T00:00:00 | <20 | FEMALE | Travel | Resolved | NaN | Toronto Public Health | 277 Victoria Street, 5th Floor | Toronto | M5B 1W2 | www.toronto.ca/community-people/health-wellnes... | 43.656591 | -79.379358 |

# Ontario Dataset (after)

| | Case Reported Date | Age | Gender | Virus Acquired | Outcome | Hospital | City | Hospital Postal Code | Hospital Latitude | Hospital Longitude | Month |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2020-03-08 | 40s | FEMALE | Travel | Resolved | Ottawa Public Health | Ottawa | K2G 6J8 | 45.345665 | -75.763912 | 03 |
| 1 | 2020-03-11 | 60s | FEMALE | CC | Resolved | Sudbury & District Health Unit | Sudbury | P3E 3A3 | 46.466092 | -80.998059 | 03 |
| 2 | 2020-03-11 | 20s | FEMALE | Travel | Resolved | Toronto Public Health | Toronto | M5B 1W2 | 43.656591 | -79.379358 | 03 |
| 3 | 2020-03-10 | 50s | MALE | Travel | Resolved | Hamilton Public Health Services | Hamilton | L8P 4S6 | 43.257631 | -79.871341 | 03 |
| 4 | 2020-03-11 | <20 | FEMALE | Travel | Resolved | Toronto Public Health | Toronto | M5B 1W2 | 43.656591 | -79.379358 | 03 |

Using the Ontario dataset and Toronto weather dataset, we decided to merge data frames.

# Toronto Weather Dataset (after)

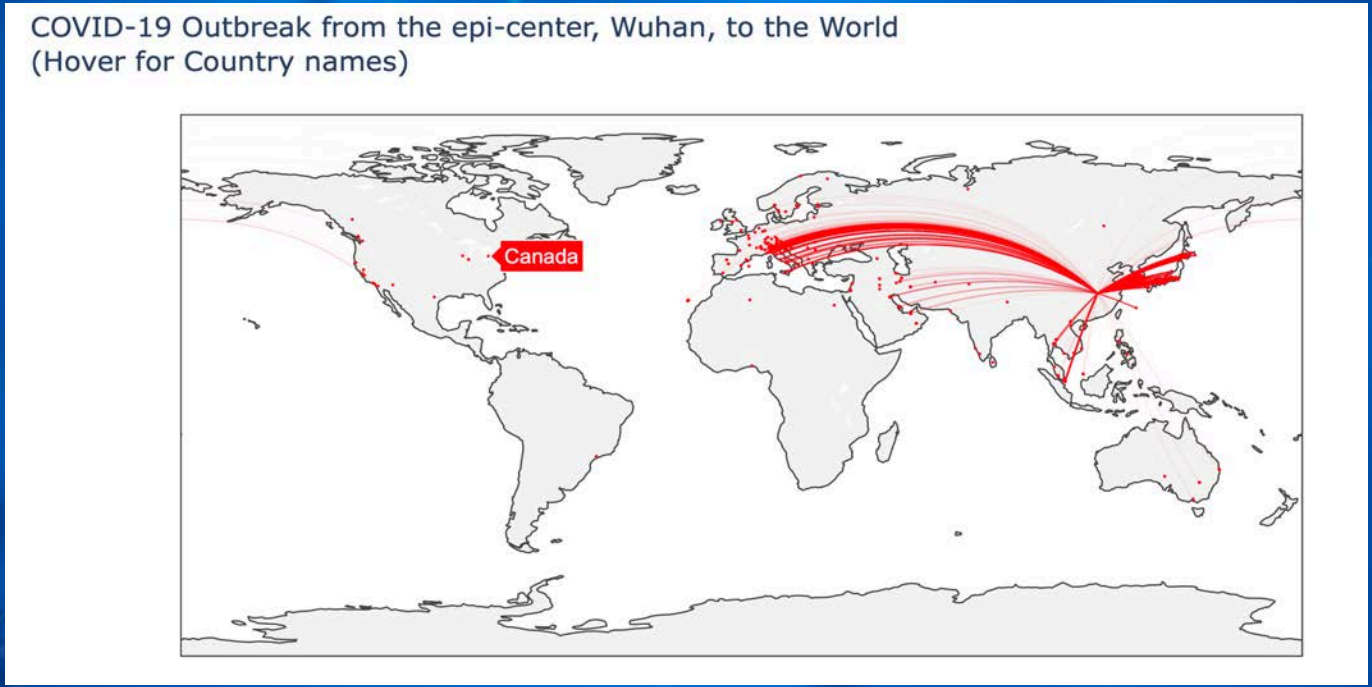
| | Case Reported Date | Temp Max (F) | Temp Avg (F) | Temp Min (F) | Humidity Max | Humidity Avg | Humidity Min | Wind Speed Max (mph) | Wind Speed Avg (mph) | Wind Speed Min (mph) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2020-01-01 | 32 | 30.0 | NaN | 81 | 72.9 | 60 | 24 | 18.9 | 9 |
| 1 | 2020-01-02 | 41 | 38.5 | 34.0 | 93 | 80.5 | 70 | 20 | 13.6 | 6 |
| 2 | 2020-01-03 | 45 | 41.4 | 37.0 | 100 | 80.7 | 65 | 16 | 8.4 | 5 |
| 3 | 2020-01-04 | 39 | 34.6 | 32.0 | 100 | 84.5 | 65 | 18 | 7.7 | 2 |
| 4 | 2020-01-05 | 36 | 33.0 | 30.0 | 100 | 81.8 | 60 | 23 | 12.6 | 3 |

# Toronto Weather Dataset (after)

| | Case Reported Date | Age | Gender | Virus Acquired | Outcome | Hospital | City | Hospital Postal Code | Hospital Latitude | Hospital Longitude | Month | Temp Max (F) | Temp Avg (F) | Temp Min (F) | Humidity Max | Humidity Avg | Humidity Min | Wind Speed Max (mph) | Wind Speed Avg (mph) | Wind Speed Min (mph) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2020-01-23 | 50s | FEMALE | Travel | Resolved | Toronto Public Health | Toronto | M5B 1W2 | 43.656591 | -79.379358 | 01 | 36 | 32.4 | 28.0 | 93 | 76.9 | 69 | 13 | 5.3 | 0 |
| 1 | 2020-01-23 | 50s | MALE | Travel | Resolved | Toronto Public Health | Toronto | M5B 1W2 | 43.656591 | -79.379358 | 01 | 36 | 32.4 | 28.0 | 93 | 76.9 | 69 | 13 | 5.3 | 0 |
| 0 | 2020-02-21 | 20s | FEMALE | Travel | Resolved | Toronto Public Health | Toronto | M5B 1W2 | 43.656591 | -79.379358 | 02 | 34 | 25.6 | 18.0 | 74 | 62.0 | 44 | 28 | 19.3 | 10 |
| 1 | 2020-02-25 | 60s | FEMALE | Travel | Resolved | Toronto Public Health | Toronto | M5B 1W2 | 43.656591 | -79.379358 | 02 | 43 | 38.7 | 36.0 | 93 | 74.3 | 53 | 14 | 9.8 | 6 |
| 2 | 2020-02-26 | 60s | MALE | Travel | Resolved | Toronto Public Health | Toronto | M5B 1W2 | 43.656591 | -79.379358 | 02 | 39 | 32.7 | 27.0 | 93 | 83.5 | 52 | 16 | 11.1 | 6 |

# Data Analysis

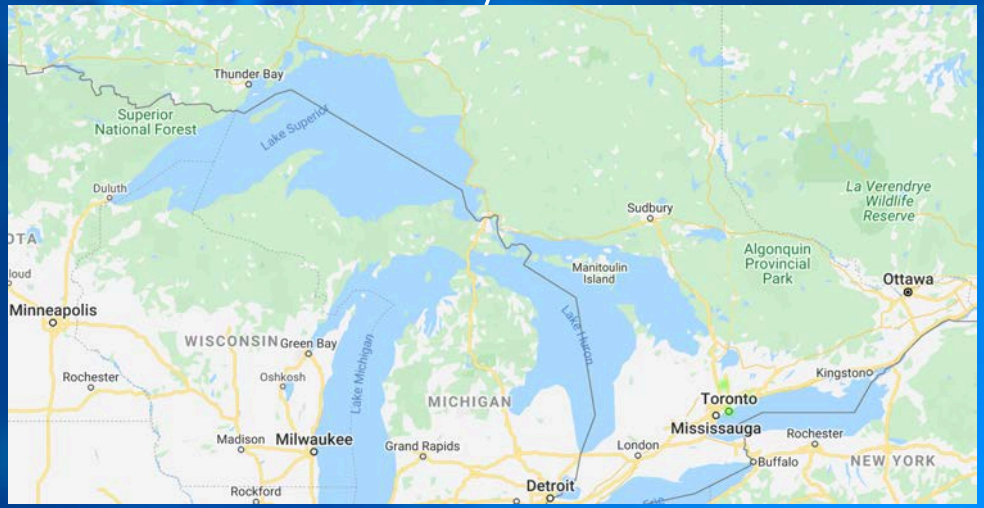
By 24th Feb. 2020, ten travelers had arrived Canada from Wuhan, China. Seven of them landed in British Columbia and three in Ontario. One of the three cases was in London. The other two, both in their 50s, were in Toronto.



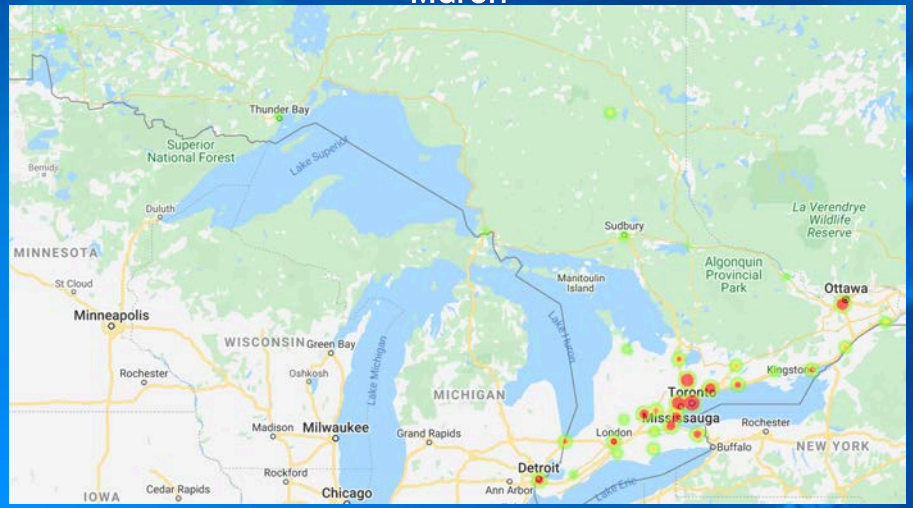

Now, let's look at the numbers in Ontario four months later and a deep dive into weather conditions in Toronto later in this analysis.

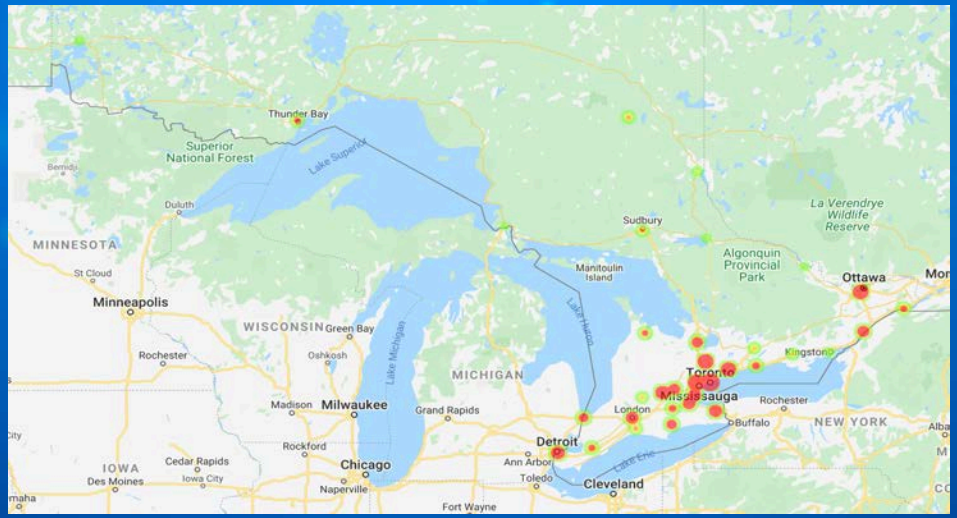
# Which regions in Ontario were affected?

February




March

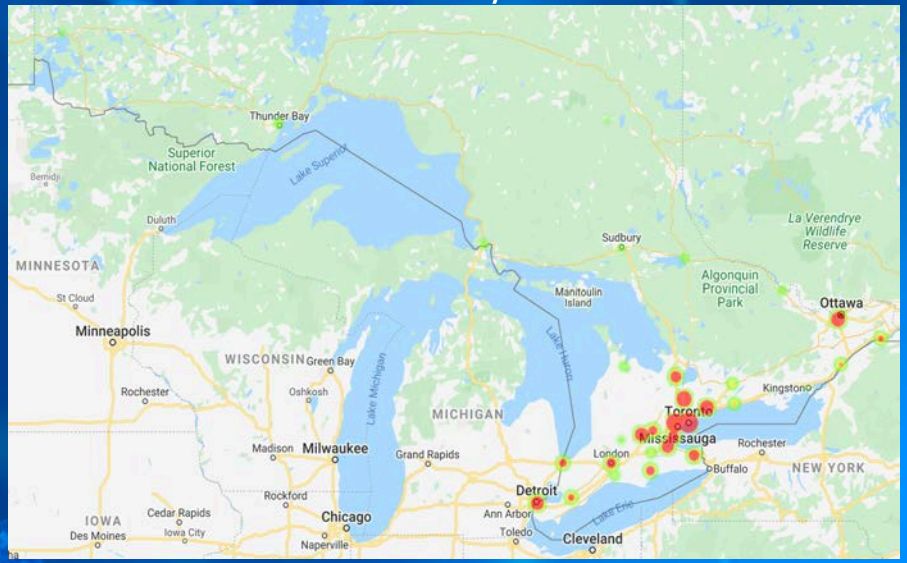


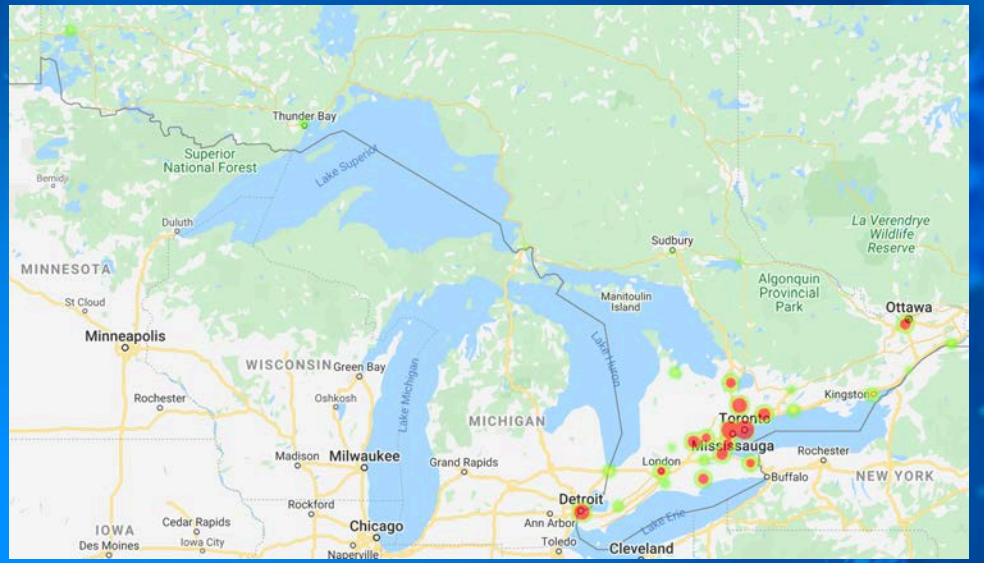

April

Which regions in Ontario were affected?

May

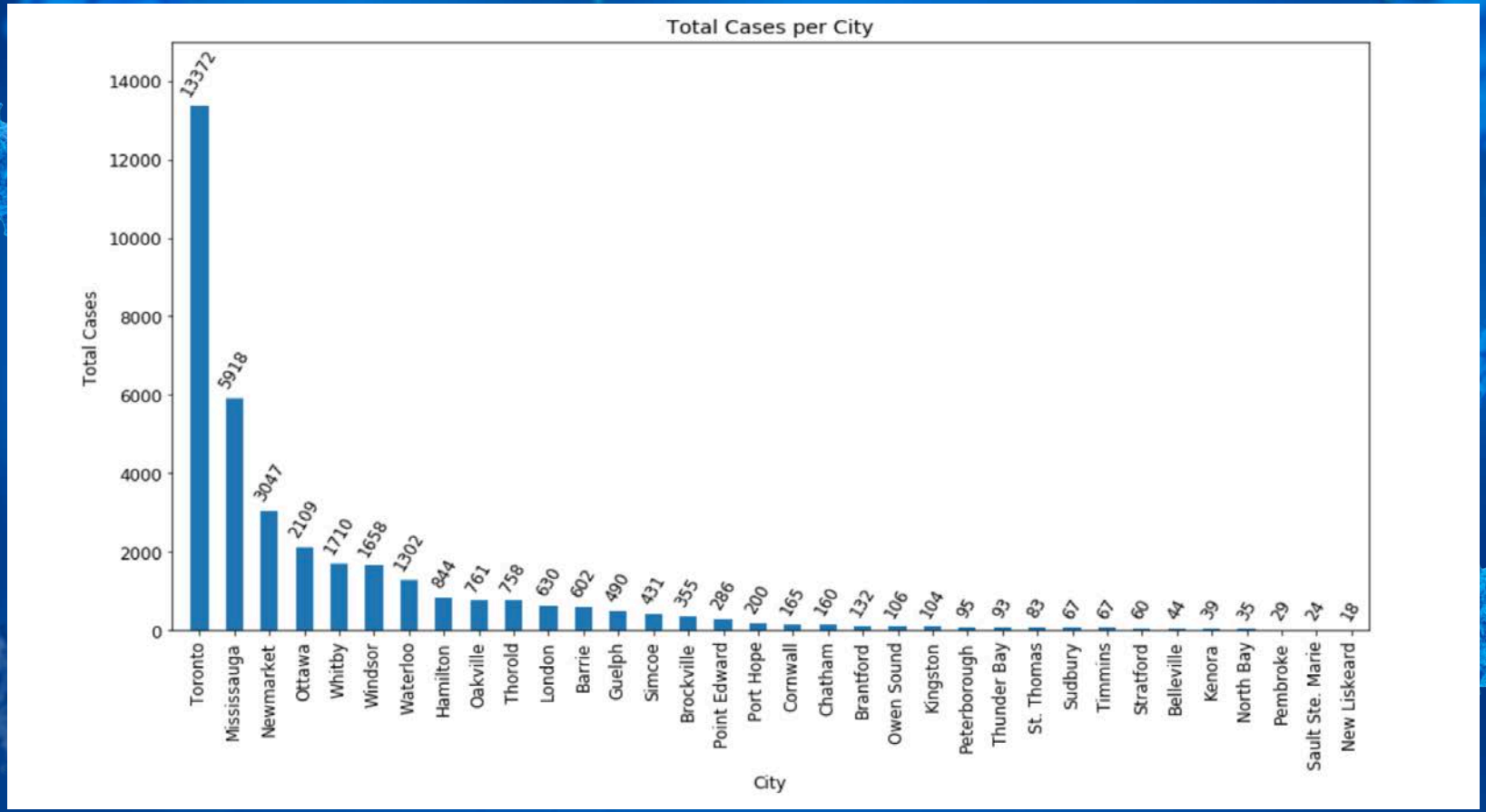



June

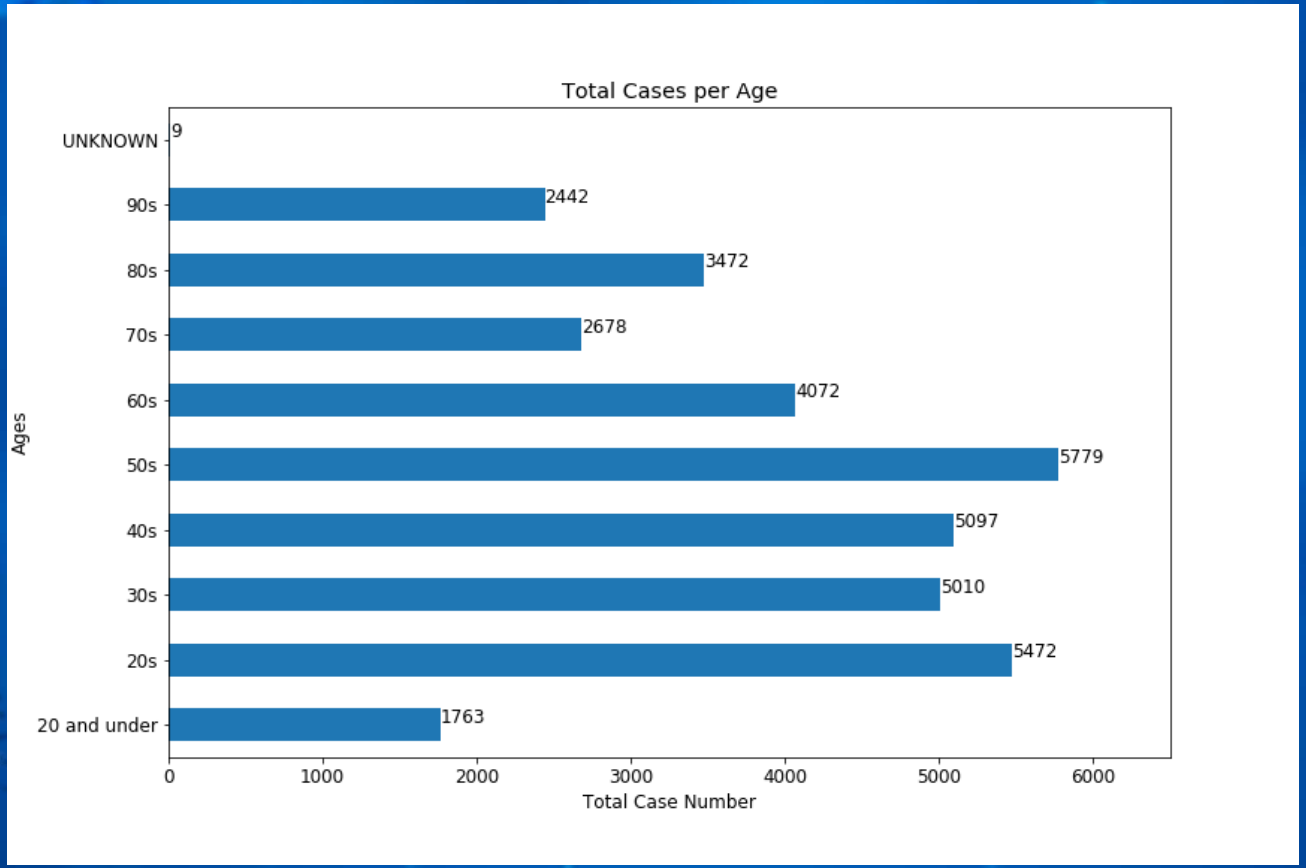



From April to May, there was a 25% decrease in the number of cases, while from May to June, there was a huge decline of 42% in the number of cases. By the end of June, New Liskeard did not report any cases.

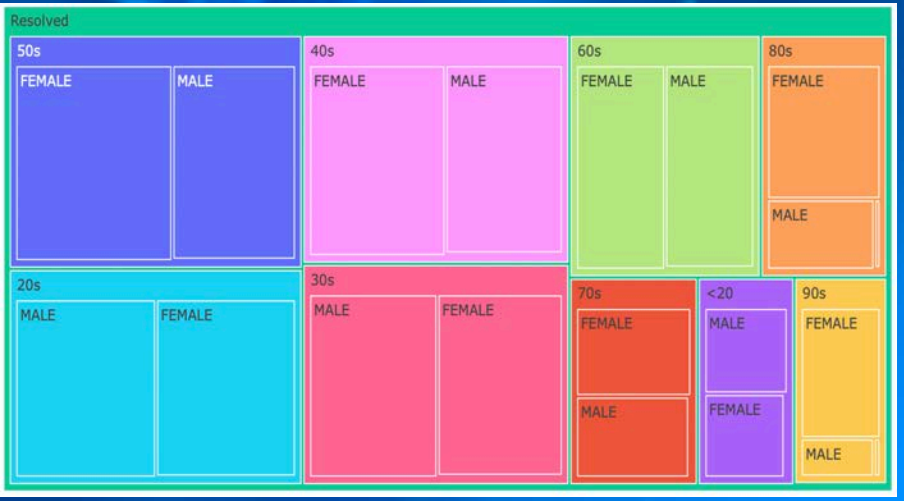
# Which regions in Ontario were affected?



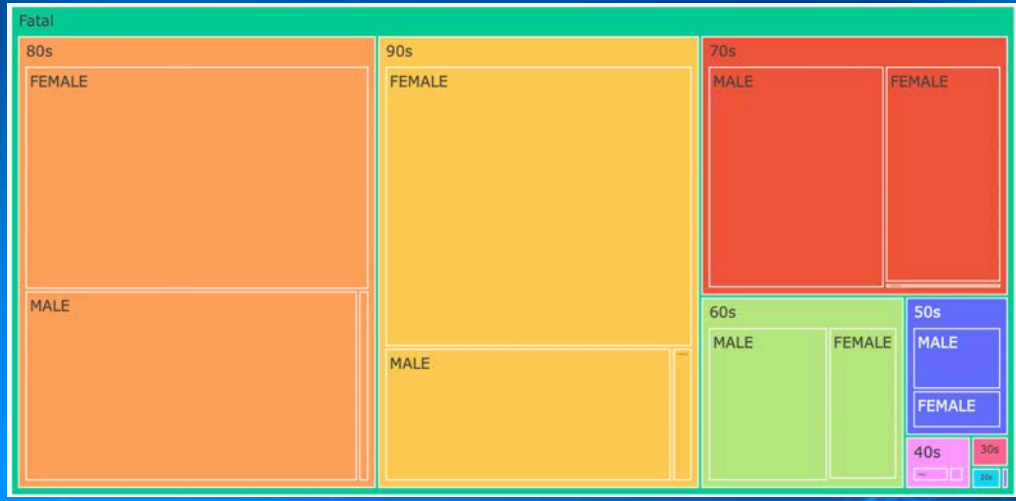
# What age groups were mainly affected by the virus?

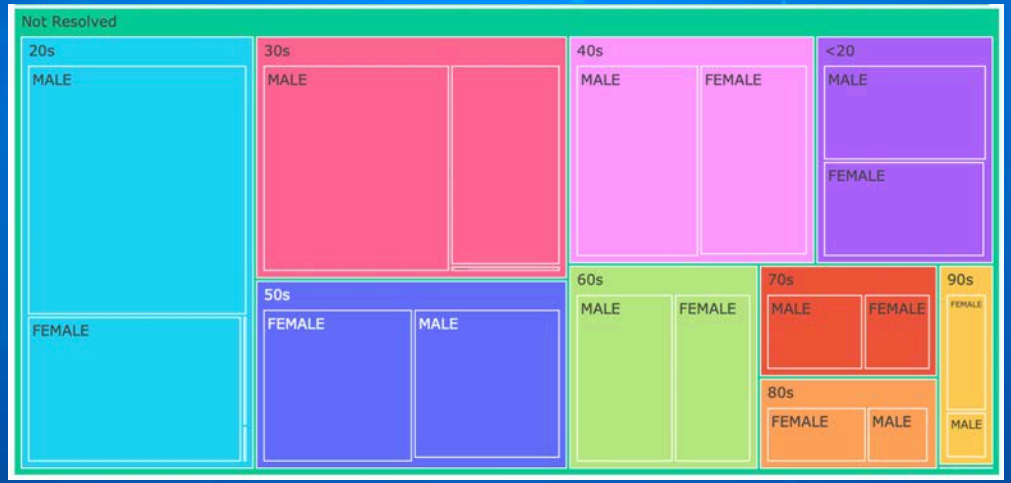


## Resolved cases




## Fatal cases

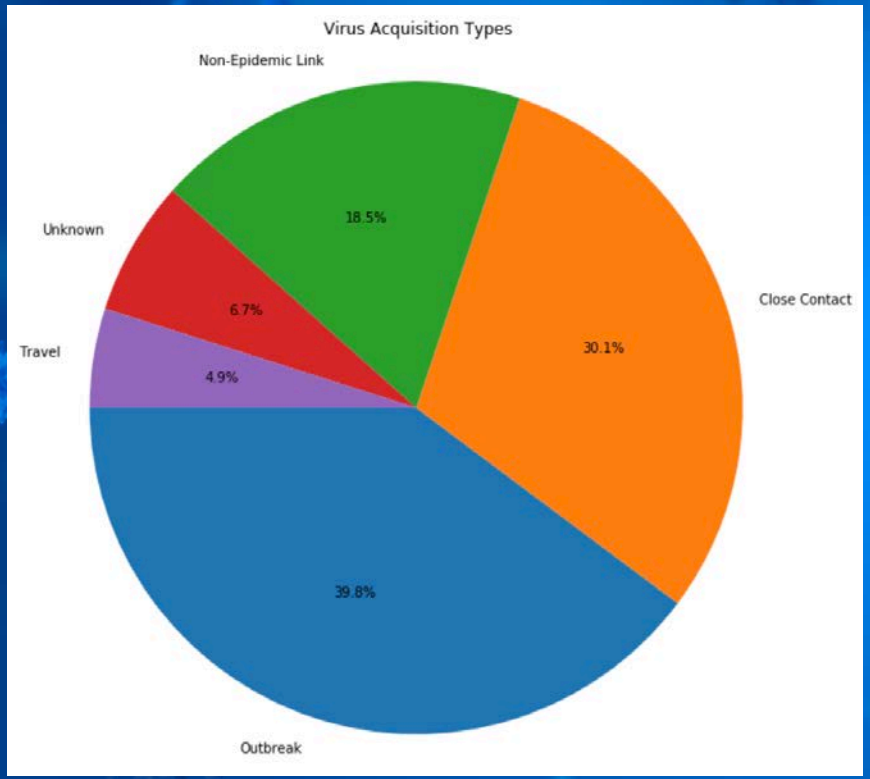


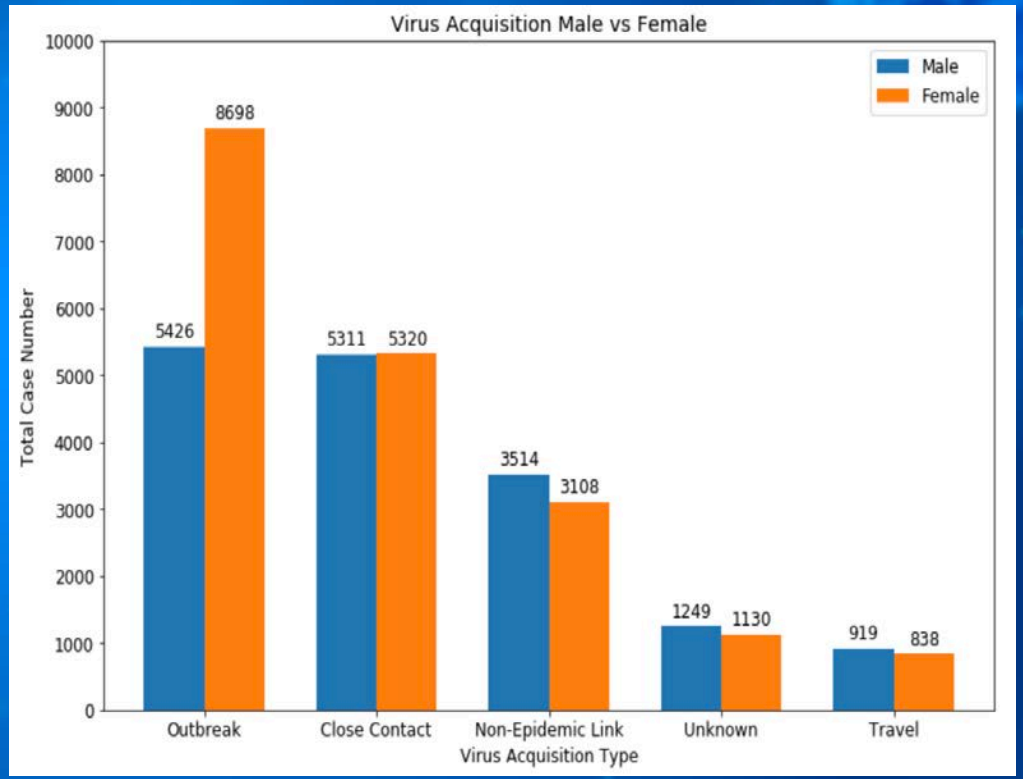




## Not Resolved cases

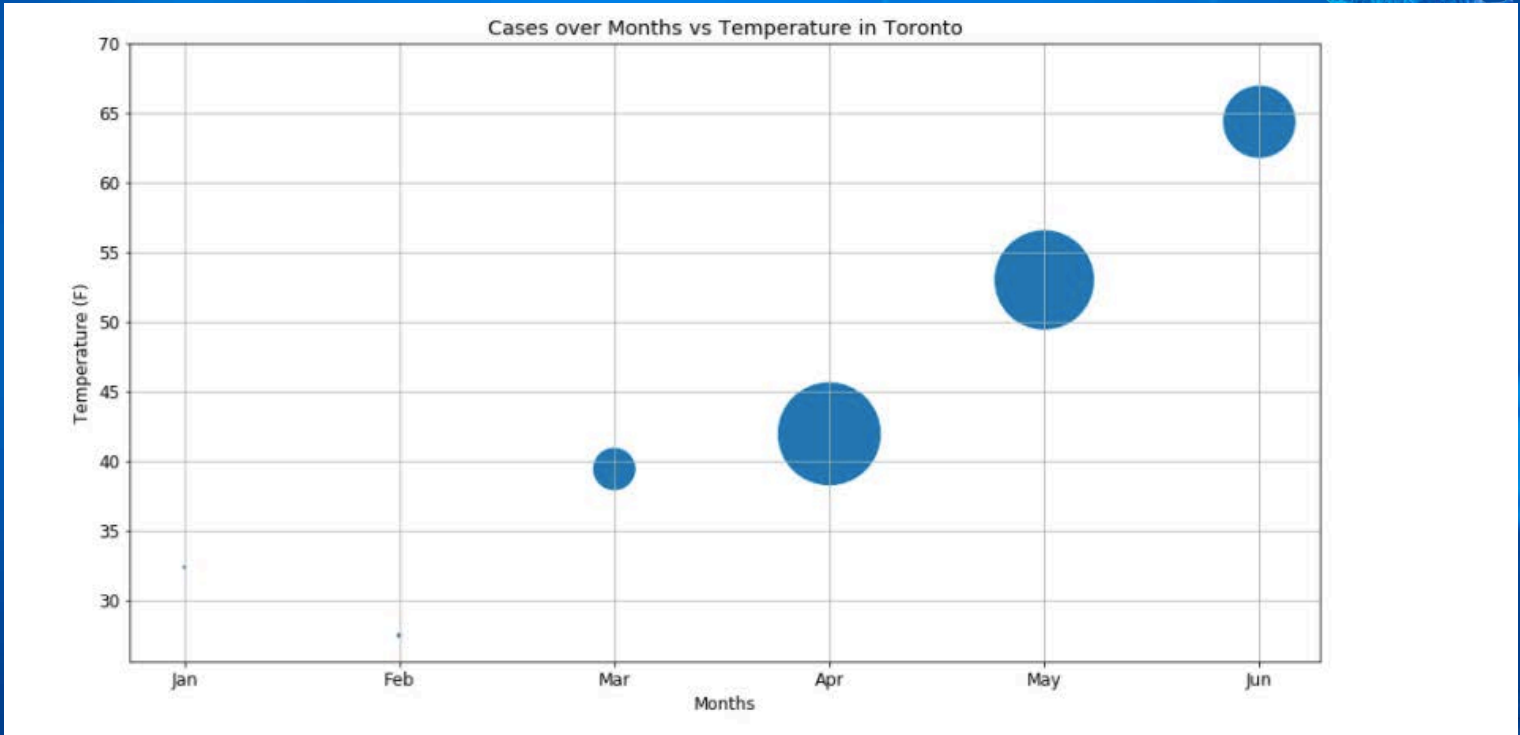
Resolved cases – 87.3%
Fatal cases – 7.5%
Not Resolved cases – 5.1%

# How was the virus contracted?



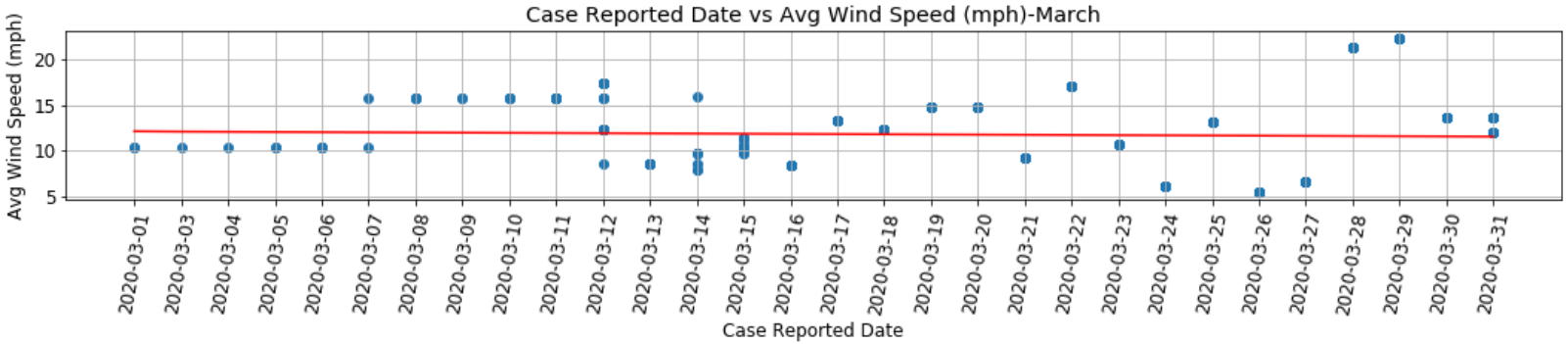



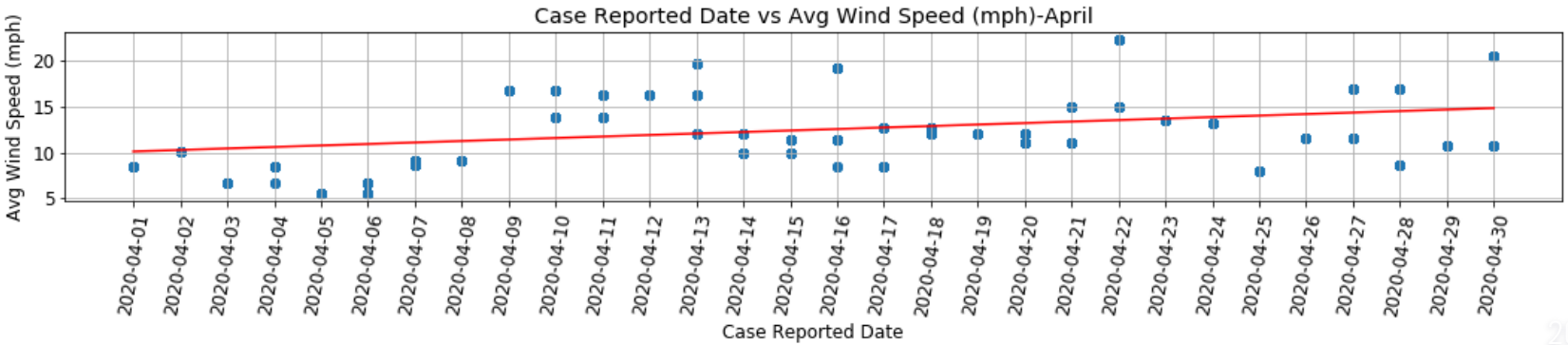
# What roles do weather conditions play in the spread of the virus in Toronto?

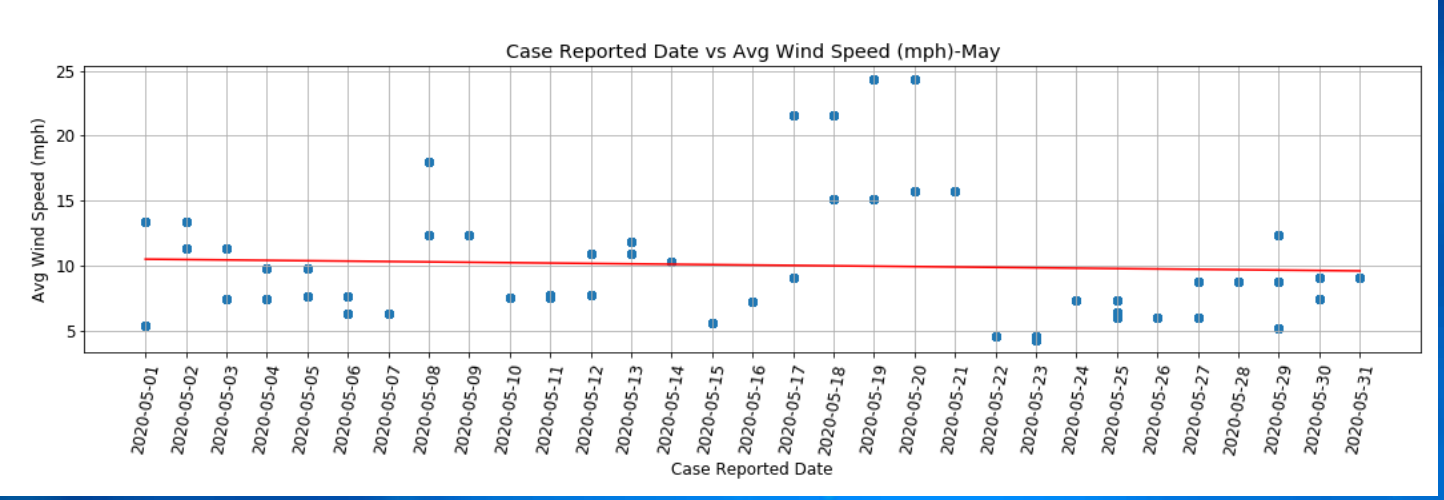


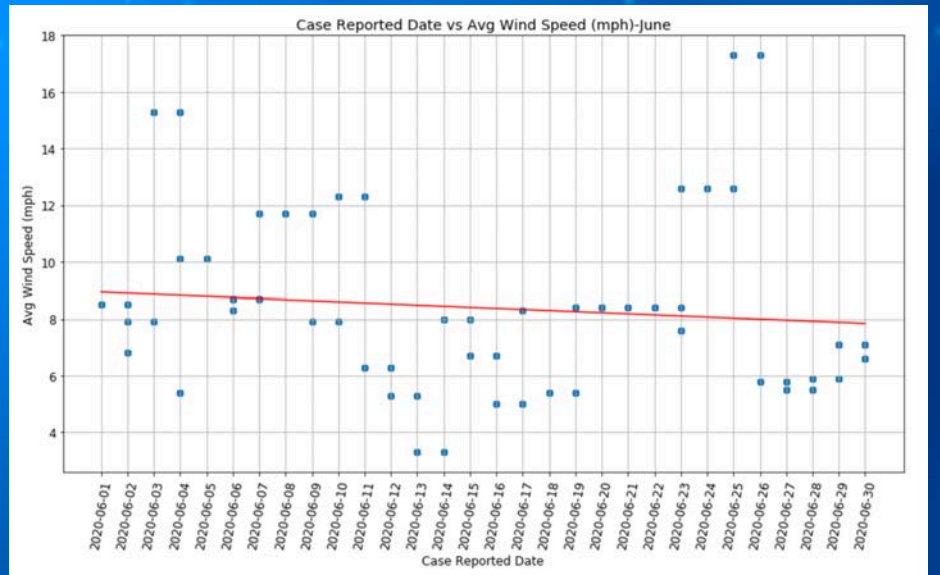
# What roles do weather conditions play in the spread of the virus in Toronto?

*Case Reported Date vs Wind Speed (mph)*


Case Reported Date vs Avg Wind Speed (mph)-March
Avg Wind Speed (mph)
5
10
15
20
2020-03-01
2020-03-03
2020-03-04
2020-03-05
2020-03-06
2020-03-07
2020-03-08
2020-03-09
2020-03-10
2020-03-11
2020-03-12
2020-03-13
2020-03-14
2020-03-15
2020-03-16
2020-03-17
2020-03-18
2020-03-19
2020-03-20
2020-03-21
2020-03-22
2020-03-23
2020-03-24
2020-03-25
2020-03-26
2020-03-27
2020-03-28
2020-03-29
2020-03-30
2020-03-31
Case Reported Date


Case Reported Date vs Avg Wind Speed (mph)-April
Avg Wind Speed (mph)
5
10
15
20
2020-04-01
2020-04-02
2020-04-03
2020-04-04
2020-04-05
2020-04-06
2020-04-07
2020-04-08
2020-04-09
2020-04-10
2020-04-11
2020-04-12
2020-04-13
2020-04-14
2020-04-15
2020-04-16
2020-04-17
2020-04-18
2020-04-19
2020-04-20
2020-04-21
2020-04-22
2020-04-23
2020-04-24
2020-04-25
2020-04-26
2020-04-27
2020-04-28
2020-04-29
2020-04-30
Case Reported Date


Case Reported Date vs Avg Wind Speed (mph)-May
Avg Wind Speed (mph)
Case Reported Date

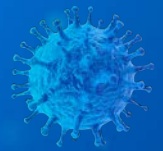

Case Reported Date vs Avg Wind Speed (mph)-June
Avg Wind Speed (mph)
Case Reported Date

# Conclusions

- In Ontario, major cities were severely impacted including Toronto (largest numbers) and GTA.
- April 2020 was the peak spread of the virus as it had the most cases in Ontario.
- Females had a higher mortality rate but also a higher recovery rate than males.
- Females were mostly contracting the virus through outbreak, while males were mostly contracting the virus through close contact.
- Majority of the data shows as the temperature increases over time; total reported cases reduces.
- Windspeed does not seem to be a driver that impacts the number of cases in Toronto.

# Implications of Findings

- Some of the reported cases in Ontario occurred in cities closes to the US borders, suggesting this might have added to the spread.
- The most common means of contracting the virus was due to lack of proper precautions.
- Largely populated cities are responsible for most of the spread in Ontario.
- In February, population was not reporting symptoms as virus was not classified as severe at that time. In March, the virus was considered a pandemic and reported cases increased significantly but started reducing by the end of May and June.
- Temperature played a significant role in the decease of total cases.



Thanks to the datasets discovered, we were able to create interesting correlations which represents how the Coronavirus pandemic has affected all of us. The current weather has certainly been a factor in the decrease of total cases, so continue to enjoy the summer with caution.