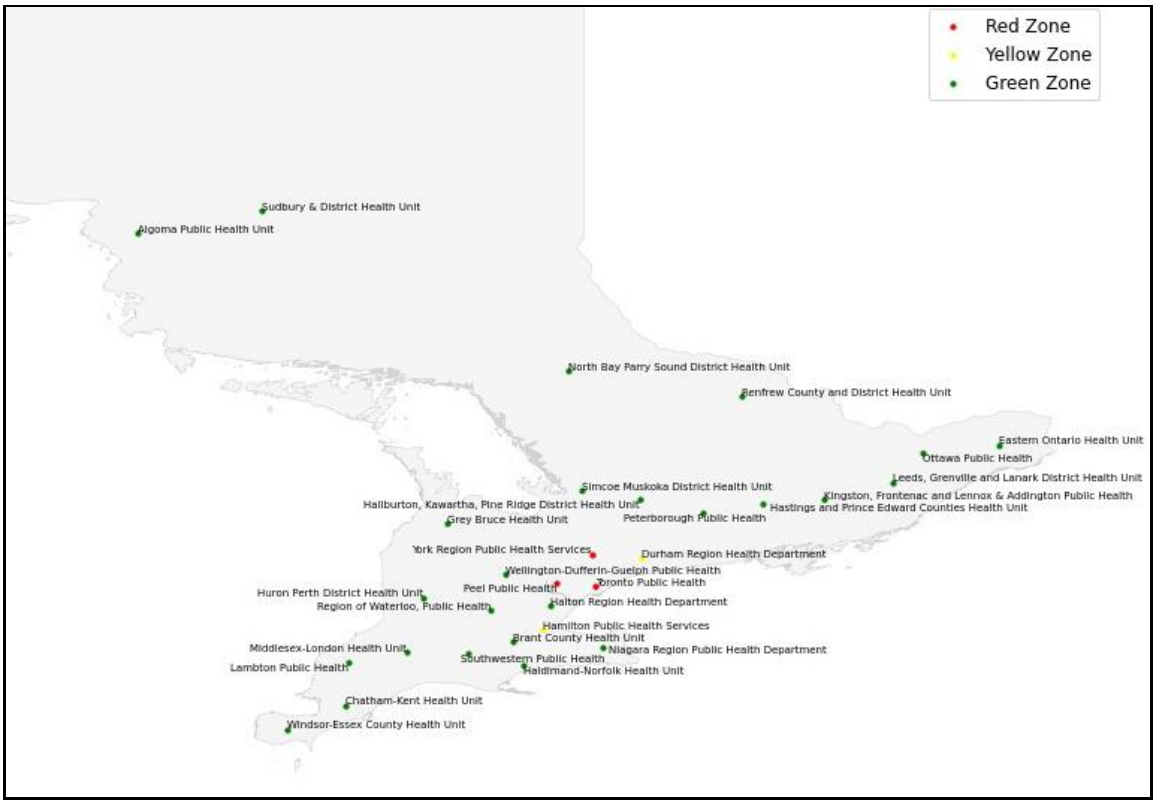
COVID-19 Vaccine Distribution Analysis



Health regions and severity zones in Ontario

Summary

In this group assignment, we chose to work on analyzing COVID-19 data to find out which type of person should receive the vaccination first based on the mortality rate based on their gender, age, health region, and exposure.

Hypothesis

The rollout of the vaccine should be prioritized in health regions with the *highest active and total number of COVID-19 infections starting with elderly individuals over the age of 65* based on the idea that they have the highest death rate amongst other age groups. Also the health regions within the province of Ontario which has the highest number of active and total cases will be prioritized. Shipment deployments of a safe and effective vaccine will be prioritized based on where they will make the most impact and save lives.

Data source

Our dataset was downloaded from https://resources-covid19canada.hub.arcgis.com/datasets/compiled-covid-19-case-details-canada/data which is an open data source. As the coronavirus pandemic seems to be the most significant issue all over the world, we assumed that the distribution of vaccines in Ontario would be the best topic for data-analysis.

https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1710000501 will also be used to back up the data of gender and death rates within different age groups.

We have selected COVID-19 case details in Ontario as our data set, transformed and cleaned, conducted data analysis and generated some visualizations. Our goal was to determine which group/category of individuals should receive the vaccine first amongst the different categories of people in various regions in Ontario using statistical features and gain insights using the available data.

Analysis

a) Health region

- **Toronto Public Health Region** has the highest number of active cases at 4935 and the highest number of total cases at 42963 cases.
- The **Severity Zone** column was created as an additional feature column to analyze and rank the regions based on the number of active cases with over 1000 active cases being in the red zone, 500 to 1000 active cases being in the yellow zone, and finally under 500 active cases being in the green zone. ***Toronto Public Health Region*** once again stands out as the region with the highest severity in terms of active cases (see the map of Ontario in the first page).
- Based on the ***Odds of Survival*** column, Toronto does not have the lowest odds of survival at approximately 93% survival rate.

b) Exposure Type

- The exposure type does not appear to have an impact on the fate of the patient.
- Majority of the virus cases (63%) was caused by the close contact exposure type.

- The exposure type and the age group classification within the different exposure types was found to be independent of gender.
- The younger population, particularly <29, has mostly captured the virus by close contact exposure type (around 7 times higher than the oldest age group) suggesting greater mobility for the younger population and significantly greater probability of spreading the virus in community.

c) Age Groups and Gender

- The death rate in 80 is the highest among all the age groups.
- The death rate in Males is higher than Females for all the age groups however the trend is reversed in the 80+ age group. To explain the opposite trend in the death rate trend in the female population we looked at the population distribution Of Ontario and there are significantly higher numbers of females in age groups 80+.
- Overall data is normally distributed between Female and Male population.
  Female 51%
  Male 49%
  Not Reported 1%

Conclusion

Based on exposure type analysis, to limit the spread of the virus, the younger population, particularly <29 should be targeted. But since mortality rates for the younger generation are negligible compared to the older generation, the vaccination should be focused on the older generation to limit mortalities by the virus.

Below is the ranking of the type of people who should receive the vaccination first, beginning with the highest priority

- Females in the Toronto Health Region above 80 should receive the vaccine with the highest death rate
- Male elders between 60-80 in the Toronto Health Region should receive the vaccine next because they have the second highest death rate
- age groups 20-50 should receive the vaccine next
- children should receive the vaccination last

Overall, our hypothesis was accurate where we stated that elderly people should receive the vaccination first within the region with the highest number of active and total cases. The in-depth analysis showed a thorough understanding of how the vaccinate should be distributed amongst different age groups, genders, health regions and locations.