

The Impact of Neighbourhood Composition on Resident COVID-19 Infection Rates in Toronto

Liam Browne

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1. Introduction

1.1. Background

The 2020 COVID-19 pandemic has gravely impacted every nation on Earth. Within the span of a few months, borders have closed, the hospitality industry has vastly dissipated, and remote working has become the norm in much of the developed world. The impact of this on the human experience is perhaps most widely felt at the community level as it is local communities that constitute the fabric of modern society. Resultingly, in Canada, much of the decision-making authority regarding the public health response relating to the transmission of the SARS-CoV-2 virus (the virus responsible for the coronavirus disease) has been entrusted to the provincial governments. The province of Ontario has opted for a regional approach in applying its public health policies due to the idiosyncratic nature of its cities. Ontario's capital and its largest city, Toronto, can be further thought of as a tapestry of distinct communities largely individualized by their local venues. The conventional wisdom, it follows, is that to decrease the transmission of SARS-CoV-2 in Toronto, one must engage in an examination of the local neighbourhoods that comprise the city.

1.2. Objective

Given the idiosyncratic nature of Toronto's neighbourhoods and the previously discussed conventional wisdom, the objective of this report is to determine if a segmentation of Toronto's neighbourhoods via their most popular venues provides an insight into the COVID-19 infection rates of the neighbourhoods' residents.

1.3. Relevant Stakeholders

Those conducting research into the spread of COVID-19 might be particularly interested in the transmission of the disease as it relates to the composition of neighbourhoods – in this case, using Toronto as a case study. Further to that group, public health officials in the offices of the Chief Medical Officer of Health for Ontario and the Medical Officer of Health for Toronto as well as those in the Ontario Premier's office and city officials would likely be interested in this information as they begin to lift so-called "lockdown restrictions" within the city of Toronto and neighbouring regions.

2. Data

2.1 Data Usage and Sources

The data used in this report come entirely from two different sources. All data relating to the venues that comprise the different neighbourhoods in Toronto is taken from Foursquare's location data.¹ This data includes the various venues in Toronto and their geographical coordinates that are used to determine which types of venues are most popular in each of Toronto's neighbourhoods. The COVID-19 data is the cases per 100,000 people in each neighbourhood. It should be noted that the cases used to create these case rates are based on where the residents live and are not necessarily where the residents contracted the disease. Nonetheless, this data is useful as it suffices as a proxy for where the infection was contracted. As for sources, the COVID-19 neighbourhood cumulative case rates are published by the department of Public Health within the City of Toronto.²

The list of Toronto venues and their geographical coordinates are used to determine which types of venues are most popular within a given neighbourhood. These venue types are then used as the features associated with the neighbourhoods for the purpose of neighbourhood segmentation via machine learning algorithms. The COVID-19 case rates, on the other hand, are used to create a choropleth map that is superimposed onto a map of Toronto neighbourhoods segmented by venue type. The superimposition of this choropleth map allows for a discussion of the association of the venue composition of Toronto's neighbourhoods and the COVID-19 infection rates of the neighbourhoods' residents.

¹ <https://developer.foursquare.com>

² <https://www.toronto.ca/home/covid-19/covid-19-latest-city-of-toronto-news/covid-19-status-of-cases-in-toronto/>