

The Impacts of COVID-19 on the Use of and Experiences of Greenspace,

Operationalized as Public Parks

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**Introduction:**

As the COVID-19 pandemic emerged throughout the globe, restrictions on the use of public space and physical distancing are measures that were implemented to reduce human contact and slow the rates of transmission from the virus. The severity of the lockdown restrictions continues to differ across nations, with most of the world's population being asked to stay at home or restrict movement in public spaces, depending on the severity of the virus outbreak. Governments have enacted policies to protect the public health of citizens, which has resulted in changes to human mobility patterns around the world.

One of the few privileges that remained was the opportunity to spend time outdoors, and to participate in activities that can be undertaken in greenspace. The term greenspace is an umbrella term used in the study of geography that describes environmental areas that are either maintained or unmaintained, which can include nature reserves, wilderness environments, and urban parks. In the urban context, greenspaces are specifically designed for aesthetics and recreational use (Burton and Rogerson, 2017).

**Objectives:**

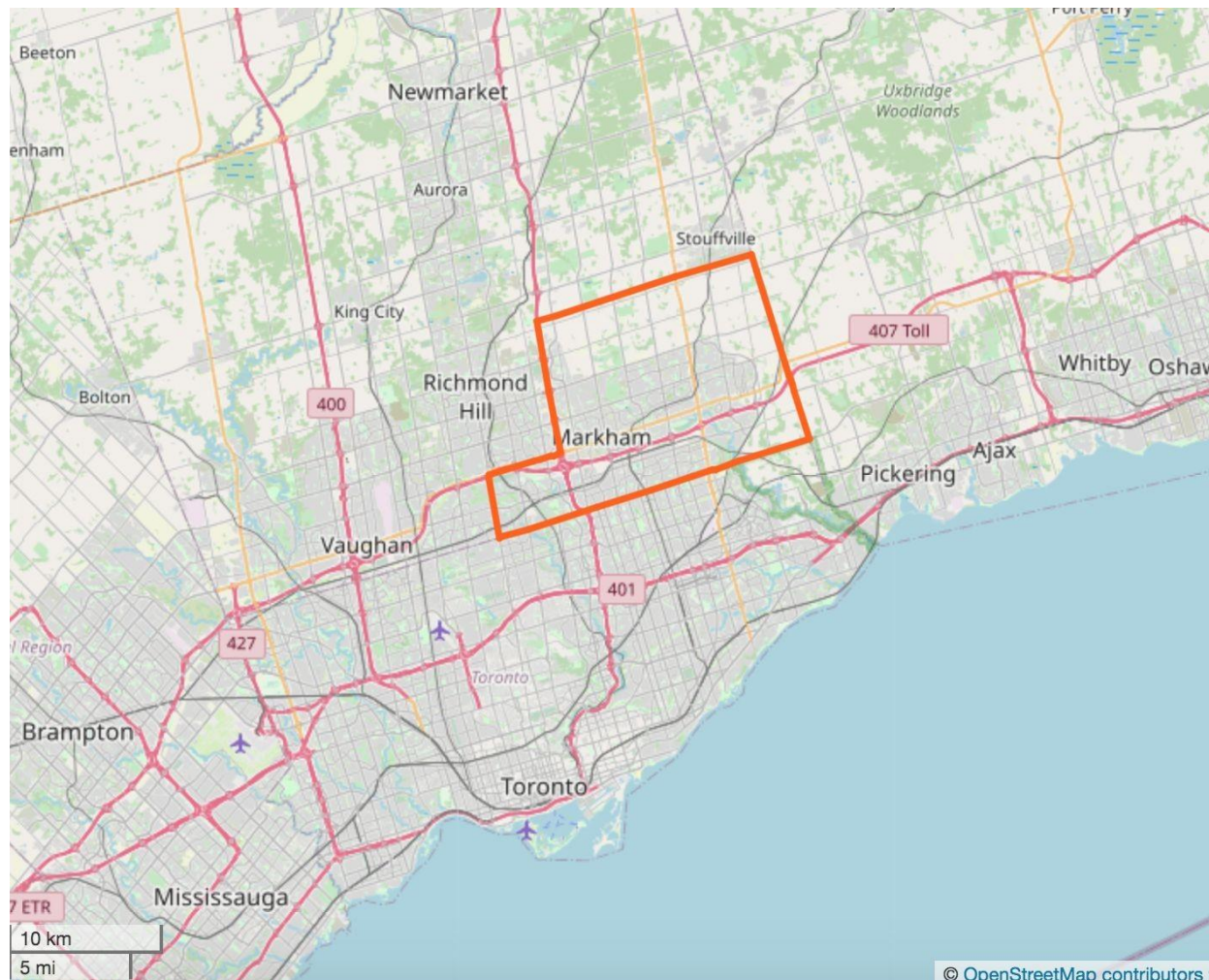
This case study focuses on the City of Markham, Ontario, whose lockdown began on March 17, 2020, and has since experienced unprecedented restrictions on residents' freedom of movement in public spaces (City of Markham, 2020). It is currently not apparent whether the use of greenspaces as a focus of outdoor recreation by Markham residents has increased or decreased due to the restrictions of the COVID-19 outbreak. However, it is evident that residents are unable to participate in most forms of public activities and with non-essential workers working from home, it could potentially create a greater demand for outdoor recreation. Conversely, the use of greenspaces may have diminished due to an effort to minimize the further spread of the virus by

residents. This research aims to explore the relationship between COVID-19 and greenspace, the latter which is operationalized as public parks in the City of Markham. Observational research has been conducted at five neighborhood parks within the city and is reflected in the following research questions:

- In what ways has the COVID-19 pandemic impacted the use and experiences of public parks in the City of Markham?
- Have the enforced physical distancing and safety measures affected the mobility patterns of city residents?
- How has COVID-19 influenced the behaviors of residents? (i.e.: activities undertaken by users, mode of transportation, group composition, etc.)

### **Markham, Ontario:**

The City of Markham is located in the Regional Municipality of York in Southern Ontario, Canada (see Figure 1). It has an estimated population of 328,940 people, which was ranked the largest in York Region, the fourth largest in the Greater Toronto Area (GTA), and the 16th largest in Canada (Statistics Canada, 2016). Markham is made up of many 19th century communities, each with its own distinctive characteristics and has over 22 kilometers of scenic pathways, twelve bridges that provide access for walkers, joggers, and cyclists to enjoy the different parks (City of Markham, 2020). The five chosen neighborhood parks where this research is conducted are all located within different communities in the City of Markham.



**Figure 1:** Map showing the location of Markham within the GTA (OpenStreetMap contributors, n.d)

### **Description of Parks:**

#### **Berczy Park**

Berczy Park is one of the five parks located within Berczy village and is a planned residential neighborhood in Markham that is named after William Berczy, who is considered as one of the founders of Markham. This community is known for its emphasis on open space, protection of environmentally sensitive areas, and conservation of woodlots. Berczy Park is

located along Bur Oak Avenue, and this road divides the park into a north and south section, otherwise known as Berczy Park North and Berczy Park South. Berczy Park North includes three soccer fields with bleachers, two tennis courts, public washrooms, circular pathways, a shaded area with picnic tables, a bridge, and a parking lot. It is most well-known for the natural pond that has barley wheat grass surrounding it and is home to protected species such as the Canadian geese. Berczy Park South includes a play structure, baseball diamond, basketball court, fitness area, oval pathway, and another parking lot.

### **Wismer Park**

Wismer Commons is a community within the City of Markham and is a neighborhood that provides intrinsic environmental and recreational benefits. Wismer Park is located in the center of the Wismer Commons neighborhood along Bur Oak Avenue, just east of Berczy Park. It includes two tennis courts, basketball courts, shared-use paths, a splash pad, soccer fields, and playground structures. As well, there is a scenic forest with deep wood hiking paths that's available for recreational use.

### **Centennial Park**

Centennial Park is an 8-hectare (20 acres) park that's located within the Bullock community and is conveniently adjacent to Centennial Community Centre, Centennial GO Station, and Markville Shopping Centre. This park features a 15,000 sq ft skatepark that was approved by the Markham Council in 2001 (York Region, 2007). Adding on, park amenities include two baseball diamonds, two play structures, a soccer field, and a half basketball court.

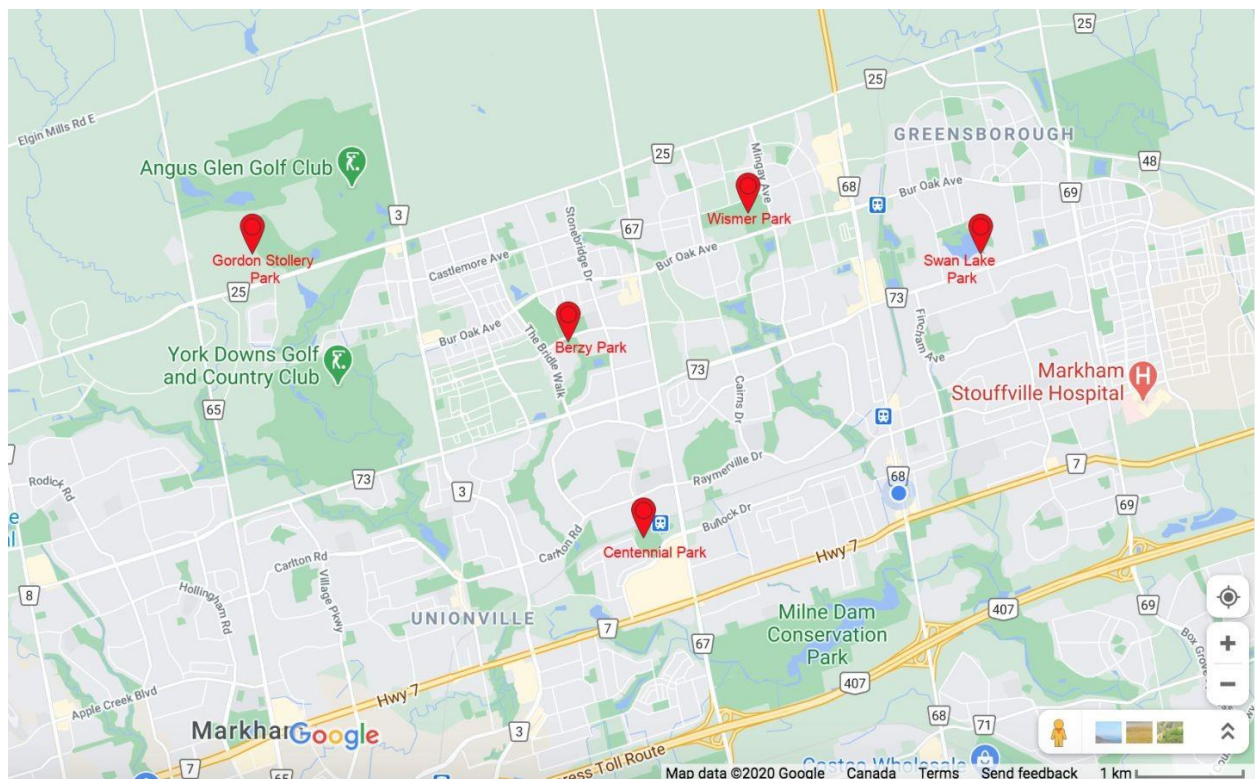
### **Gordon Stollery Park**

Gordon Stollery Park first opened to the public in May 2019 and is named after one of Canada's most successful businessmen, Gordon Stollery. The famous Angus Glen Golf Course is

down the street and this park is located within the Angus Glen community. The Gordon Stollery Park is on the north side of Angus Glen Community Centre & Library and contains two playgrounds, a splash pad, a skateboard park, a basketball court, a soccer field, public washrooms and a parking lot (City of Markham, 2020).

### Swan Lake Park

Swan Lake Park is a community feature near the heart of Historic Markham Village, located in the north part of Markham and gets its name from the unique lake that is home to over 90 different species of birds and animals (Markham Review, 2020). It has multiple natural scenic trails, playground structures, two tennis courts, a shade structure with picnic tables, skatepark and is surrounded by urban development. There is no parking lot at Swan Lake Park, and visitors that commute by vehicle will have to park on the side of the road.



**Figure 2:** Map of Markham showing the location of the five neighborhoods parks (Google Map, 2020)

### **Timeline of Public Park Restrictions in Markham:**

The Province of Ontario declared an emergency order under s 7.0.1 (1) the Emergency Management and Civil Protection Act on March 17, 2020, and the City of Markham's lockdown measures came into effect (Ontario, 2020). On March 30, the Ontario government ordered a province-wide closure of all outdoor recreational amenities, including beaches, playgrounds, and sports facilities; however, parks and trails remained open with restrictions. On May 28, 2020, outdoor facilities such as tennis courts, sports fields, skateparks, park benches, park shelters, and picnic tables were reopened to the public; however, basketball courts and playgrounds remained closed. The same rules under provincial emergency orders, including physical distancing of six feet and social gatherings of five or more people, were continued. Moving forward to Stage 3 of reopening, on July 30, 2020 all play structures within the city were reopened, and new signs were installed to remind users to maintain physical distancing, and to wash hands before and after use. The City of Markham has also opened all athletic fields, where physical distancing must be maintained, except if playing on a team sport. Team sports are permitted in facilities for sport and recreational fitness, in accordance with outdoor gathering limits, and must follow the specific rules for team sports. Starting on October 19, 2020, Markham has implemented Stage 2 restrictions as a result of its trends in public health indicators, including higher than average rates of COVID-19 transmission (City of Markham, 2020).

### **Review of Literature:**

This literature review examines the impacts of COVID-19 on the use of greenspace, operationalized as public parks. Firstly, the relationship between accessibility to greenspace and

its effects on the physical and mental health of individuals are explored, as well as how the pandemic influenced the experiences of these natural environments for residents. Secondly, the rules and regulations that are specific to park use are examined, as well as how cities have encouraged the compliance of physical distancing and other safety measures. This review will showcase cities from a number of different countries around the world and literature will range from peer-reviewed articles, news articles, city websites, etc.

### **The Relationship Between Greenspace and Health:**

It has been established by significant evidence within the field of geography and environmental psychology that access to greenspace is a determinant to the overall health of an individual and provides health benefits across the population. Many people associate nature as a place where they can rest and recover from daily stress, especially in today's society where there is an increasing demand for nature as a source of relaxation and recreation (Health Council of the Netherlands, 2004). There is a positive association between greenspace and health, it indicates that residents of neighborhoods with abundant greenspace (within a 1-3 km radius), on average have better health outcomes and this link is more apparent in the elderly, housewives, youth, and people from lower socioeconomic groups living in urbanized areas (Maas et al., 2006). There were similar findings by White et al. (2013), where people who live in neighborhoods with more greenspace reported significantly higher wellbeing.

Research has proven that when individuals are stressed, anxious, and socially isolated, (alike in a pandemic), their access to greenspace becomes significantly important. It is imperative that people find ways to cope with the stress of this pandemic in positive ways (Penbrooke, 2020). Greenspace is considered a therapeutic landscape in providing mental and physical health benefits, given that being surrounded by greenspace can reduce anxiety and



stress, and it provides an environment for social interaction and neighborhood integration. It can also be used in functioning as a preventive mental health promotion intervention or therapeutic intervention for vulnerable groups (Borton and Rogerson, 2017).

COVID-19 has revealed the inequalities that exist in regard to access to greenspaces as availability varies depending on the residential neighborhood. Having more access to more greenspace, less air pollution, and high physical activity participation provides mental and physical health benefits and can also reduce the risk of many chronic diseases (Rhodes et al, 2017). One study found that children with a park playground located within one kilometer of their home were almost five times more likely to be classified as having a healthy weight than those without nearby playgrounds (Kaczynski et al, 2008). In comparison to an individual with less access to local parks, gardens, and playfields, they are not as likely to receive the benefits that greenspaces provide. These inequalities existed prior to the pandemic; however, it brought more awareness about how access to greenspace was not available for everyone. In London, England, the richest neighborhoods have around 10% more public space in comparison to the most deprived areas (Masterton et al, 2020).

#### **Rules and Regulations Specific to Park Use:**

During the COVID-19 lockdown, Venter et al (2020) explored how social distancing measures affected the recreational use of greenspaces during the partial lockdown in the capital city of Oslo, Norway. They used mobile tracking data and Google mobility data from thousands of recreationists. In order to identify the direct effect of COVID-19 on recreational activity, the change in average activity during lockdown dates relative to the same dates during the previous three years was looked at. Venter et al. found that outdoor recreation activity in Oslo increased by 291%, 86,000 daily recreational activities rise during the 2020 lockdown. The pedestrian

activity was found to be greater in greenspaces which included forest and city parks. Cyclists showed escalated activity on trails with more greenery. Further, evidence proved that government advisories for social distancing in Oslo were considered as recreationists chose outdoor trails that were often more isolated, and greenspace provides additional resilience to the public health of the city during the COVID-19 pandemic.

A study by Rice and Pan (2020) explored the regional mobility trends, including park visitations using an open-source dataset made available from Google. The study focused on 111 counties in the western United States and results suggested that there was an average 2.5% increase in green space visitation. Differences across counties were primarily explained by seasonality, determined by latitude, which was the key driver in park visitation. A one-degree increase in latitude resulted in almost a 4% increase in park visitation. The presence of safer at-home orders, confirmed cases, population density, and access to parks did not change park visitation levels in the study, and this analysis shows seasonal variations had a greater impact on the changes of park visitation than the pandemic did.

In addition, results in the study by Rice and Pan (2020), provided evidence that there is a heightened risk for COVID-19 in the older population and have caused them to reduce park visitations (Lloyd-Sherlock et al, 2020). Rice and Pan (2020) proposed that a one year increase in the median age of a county caused a 1% decrease in park visitation, and while this indicates that older adults are adhering to social distancing regulations, Yang et al. (2020) argued that because they have less access to internet connectivity when compared to younger generations, older adults are more susceptible to mental health lapses as a direct result of safer at-home orders. Yang et al. (2020) study concluded that there is a well-established relationship between park use and health in older adults, specifically in China.

**Surveillance: How Authorities Are Encouraging Compliance**

In response to the COVID-19 pandemic, many countries around the world have closed or restricted access to outdoor recreational spaces. Canada is one of those countries and has implemented the risk mitigation tool that will assist in considering risks associated with the use of parks during this difficult time. It will provide examples that can be implemented to reduce transmission and are intended to be used alongside guidance from provincial/ territorial health authorities that will consider local epidemiology since this varies across the country. The risk mitigation strategies include the promotion of physical distancing of two meters apart, minimizing exposure to high-touch surfaces, and wearing face masks (Government of Canada, 2020).

Social distancing circles have been introduced in public parks as a tactic to prevent the transmission of COVID-19. Large white circles can be seen in Dolores Park in San Francisco, Domino Park in New York City, and in Trinity Bellwoods Park in Toronto, to encourage social distancing. The circles are 2.5 meters in diameter and three meters apart, big enough to accommodate three people from the same household (Novakovic, 2020). Adding on, non-park greenspace, for example, urban forests can be more difficult for the police to surveillance and control people's behaviors, however, social distancing regulations are still required.

It is also important to recognize the benefits of outdoor physical activity for the mind and body during these unprecedented times. The City of Markham has taken the initiative to offer free online fitness classes, boot camps, fitness plans, etc., in order to encourage staying active during quarantine; this was to combat the lack of availability of the outdoor amenities during lockdown (i.e: basketball courts, fitness equipment) (City of Markham, 2020). In addition, the US National Park Service (NPS) has been encouraging visitors to use the digital space as a way

to connect with outdoor parks from a distance through virtual activities that can be done at home.

The new concept of a “virtual park” is an excellent way to help stay connected which includes: virtual tours, live programs and events, kids activities, reading lists, digital suggestions, and more (NPS, 2020).

### **Partnerships:**

Students as Partners (SaP) is increasingly popular in higher education institutions around the world as it promotes students and staffs as active collaborators to enhance teaching, learning, and engagement in research (Healey, Flint, & Harrington, 2014). The partnership for this case study began in September 2020 when Cynthia Graham, Manager of Landscape Architectural Services (LAS) at the City Of Hamilton, and CityLAB, an innovation hub that supports partnerships between students, academic faculties, and other leaders to co-create, reached out to McMaster University looking for students who can participate in this research opportunity. Dr. Allison Williams, Professor of Geography at McMaster University agreed to supervise the project and act as the academic lead for this research to occur. Regular communication through email and video calls is used to document the effectiveness of this collaboration. This research has been made possible as a direct result of partnership and students can benefit from gaining real-world research skills and experiences that would lead to enhanced employability. In addition, engaging with students as partners can increase motivation and learning (Cook-Sather et al, 2014). This case study focused on COVID-19 and public park use will allow city staff, and specifically LAS to inform conversations about parkland supply, use, and management, while using the findings to help inform future city-wide park masterplans. There is uncertainty in terms of how COVID-19 will impact future greenspace design and its experiences with users, or

optimistically, how this global experience will lead to rethink the way public parks will be redesigned.

**Methodology:**

The current COVID-19 global pandemic has produced a wide range of changes in public spaces, as most of these changes have been shaped by government attempts to limit the transmission of the virus. Research evidence has played an important role in informing government policies (i.e. limits on social gatherings) and guiding approaches for the treatment of COVID-19. In this case study, the impacts of the COVID-19 pandemic on neighborhood parks in the City of Markham is examined, using a qualitative research approach. This method of research complements quantitative epidemiology data by providing qualitative insight into neighborhood populations and their pandemic response efforts in public parks. Researchers have highlighted the importance of qualitative research that focuses on not just the “what” but on the “how”, which is sometimes missed in epidemiological and clinical research (Teti et al, 2020). This case study has used direct descriptive observations gathered, without intervening, to observe the behaviors and mobility patterns of park users in their natural states.

**Process of Data Collection:**

The process of data collection began by identifying the sample of neighborhood parks in the City of Markham. The research partner for this case study, CityLAB Hamilton, suggested that conducting observations at a total of 5 diverse neighborhood parks would provide satisfactory findings for this research. These 5 parks were determined by conducting walkabouts and drive-about based on: location in the city, size, amenities available, physical environment, and significance to the neighborhood community. Data for this case study were obtained from direct observations of recreationists in the neighborhood parks sampled. The observational

research consisted of a 6-week period which began on September 21, 2020 and ended on November 2, 2020. These dates were selected to match the McMaster University Fall semester calendar (September to December). CityLabs Hamilton also suggested that the data collection process involves approximately a total of 10 hours a week across all 5 neighborhood parks. This resulted in 2 hours of observations per park each week. Each park was visited weekly for 6 continuous weeks. The original selection of the days of the week to perform observations in each of the 5 parks was determined randomly, and the selection of specific times of day was also randomly determined. However, the randomized time intervals were spread out to gather data throughout the day. The observations at the 5 parks took place following a circular rotational schedule, from Tuesday to Saturday, at designated times from 9 am through to 8 pm (as shown in Table 1). A weekly circular rotational pattern of the 5 parks was used to analyze the similarities/differences between the behaviors of recreationists during different times of the day, days of the week, and at different parks to see the greatest variability in observations over the 6 weeks. For this case study, the time between 9 am to 12 pm will be classified as the morning, 12 pm to 2 pm as the afternoon, 2 pm to 4 pm as the late-afternoon, and 6 pm to 8 pm as the evening.

**Table 1:** Observation Collection Schedule at Neighborhood Parks

<b>Days of the Week</b>	<b>Times of Day</b>
Tuesday	12 pm to 2 pm
Wednesday	9 am to 11 am
Thursday	2 pm to 4 pm
Friday	12 pm to 2 pm
Saturday	6 pm to 8 pm



**Data Analysis:**

The observational charts were analyzed manually using qualitative content analysis. Qualitative content analysis is defined as “a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns” (Hsieh & Shannon, 2005). Using an inductive approach, the content analysis consists of three main phases: preparation, organization, and reporting of findings. Phase 1, the preparation phases consisted of making sense of the data collected and this is done by generating the observation charts onto Excel to better interpret the data. Employing an inductive approach, Phase 2 - the organization phase, attempts to identify common themes within the data collected via the observational chart. Creating categories of the data is a useful strategy that allowed for easier interpretation and analysis. The data were grouped into the following categorical variables (1) ecological, (2) social, (3) spatial, (4) health, and (5) others.

**1. Ecological Variables**

Ecological variables are determined to effectively understand the vital connections between humans and the world around them. Age, sex, and race/ethnicity are identified to observe how COVID-19 impacts the use/experiences of greenspace by different demographics.

*1.1. Age Distribution*

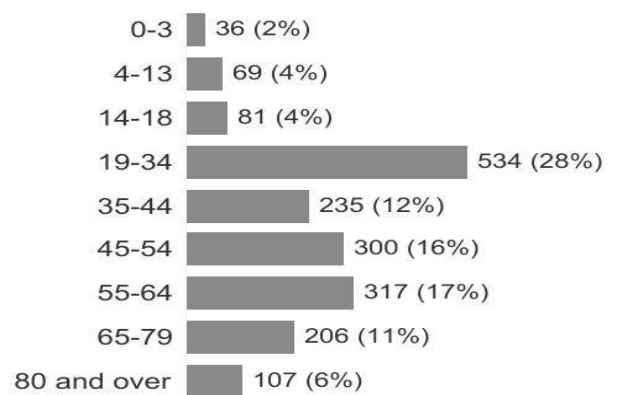
The risk of serious COVID-19 health consequences increases with the age of the individual. Older adults (over 60 years of age) are the most vulnerable age group and experience the largest proportion of serious COVID-19 outcomes (Government of Canada, 2020). Past research indicates that older adults who face chronic health challenges (i.e. heart disease, diabetes, and lung disease) are more likely to develop more severe health outcomes due to COVID-19 (NRPA, 2020). As of November 7, 2020, there are currently 1840 cases in the City of



Markham, with 34% of those cases being individuals over the age of 55 years old. In

comparison, children aged 0 to 18 years old only accounted for 10% of cases (As shown in Figure 3). The increased likelihood of transmission in the older population is likely to impact the age distribution of neighborhood park users. The fear of transmission can result in older adults choosing to stay at home.

**Figure 3:** Age Distribution of COVID-19 Cases in Markham Residents (York Region, 2020)



### 1.2 Sex Ratio

Risk factors have been proposed to account for the differences between sex and the number of COVID-19 cases. For example, the majority of healthcare workers are female, which increases their risk of infection due to exposure from infected patients. At the same time sex-specific behaviors, such as the higher smoking prevalence in males, can increase the risk of serious complications with COVID-19 (Government of Canada, 2020). Females are more likely to view COVID-19 as a serious health problem, such as abiding by public policies designed to fight the novel coronavirus. Another behavior difference among the sexes is that males typically seek healthcare later relative to females (Siedman, 2020). As of November 7, 2020, the sex ratio

of COVID-19 cases in Markham was (51%) male and (49%) female. When compared to the rest of Canada (45% males and 55% females), Markham has an almost balanced sex ratio.

### *1.3 Race & Ethnicity*

As noted in the Report on the State of Public Health in Canada 2020 by the Chief Medical officer of Canada, Dr. Teresa Lam, there are overlapping and compounding risks that are related to COVID-19 and racial/ethnic minority groups. (Government of Canada, 2020). Race is an important variable when analyzing the impact of COVID-19 on public parks. This could be correlated to some of the other variables that are considered. According to the 2016 census, 78% of Markham's population is comprised of racial and ethnic minority groups (Statistics Canada, 2016). Social determinants of health have historically prevented these groups from accessing opportunities available to established residents. Due to the large minority population in Markham, it is possible that a language barrier may cause these groups to be at greater risk due to not understanding the rules and regulations that are being enforced by the government as these populations may not be able to read and understand the COVID-19 safety signs at the parks. Further, 46% of Markham's total population is comprised of an ethnically Chinese population (Statistics Canada, 2016). There has been discrimination against the Chinese community due to the COVID-19 virus originated in Wuhan, China (Devakumar et al, 2020). Chinese immigrants and individuals may feel less inclined to visit public parks as they fear potential discrimination. Unfortunately, systemic discrimination that's described as patterns of behavior, policies, or practices that are part of the structures of an organization, and which create or perpetuate disadvantage for racialized persons exists in the very structures that are meant to protect the well-being of all individuals (OHRC, 2020). Statistics Canada completed a study in June 2020 that focused on stigma and the pandemic, exploring which groups in Canada are

concerned about being the target of unwanted behaviors because of perceived exposure risk to COVID-19. It was found that among those who were concerned immigrants were far more likely (42%) to report that they were concerned about stigma based on their racial identity when compared to the Canadian-born population (9%). It is unfortunate that COVID-19 has shined a light on the racial discrimination that exists.

## **2. Social Variables**

Social variables are used in this research to observe the group size of recreationists, activities undertaken, and repeat visitors. This helps to understand the ways in which COVID-19 has impacted the behaviors of park users.

### *2.1 Group Size*

In response to the COVID-19 pandemic, the City of Markham is abiding by the established public health orders by the province of Ontario on social gathering sizes. At the time when this research was conducted (21/09 to 2/11), there was an outdoor gathering limit of 25 people to better manage the spread of COVID-19. Group size is an important variable to consider when conducting this research because keeping small group sizes can reduce the number of uninfected individuals who can potentially come into contact with the virus. When group sizes at the neighborhood parks exceed the government guidelines, the risk of exposing people to COVID-19 will increase exponentially.

### *2.2 Activities*

Greenspace offers a setting for an abundance of different activities to encourage residents to spend time outdoors. Neighborhood parks that offer a variety of different amenities attract diverse groups of recreationists. The park size, together with the number and type of park amenities relates to the number of users and the types of activities they perform. For example,

parks with an open play structure attract a greater number of children than those that do not have such structures, parks with tennis courts attract tennis players, etc. Parks with more amenities often attract more recreationists, causing the park to be busier and thereby harder to social distance.

### *2.3 Repeated Visitor*

Increased frequency of park visitation helps to determine whether an individual is a repeat visitor. Parks with high amounts of repeat visitors are associated with the individual benefits that are received when visiting the park.

## **3. Spatial Variables**

Geography as space is operationalized through variables such as the direction of travel and mode of travel. Spatial variables are used to determine the spatial dimension and mobility patterns of park users.

### *3.1 Direction of Travel*

The direction of travel is used to interpret where park users are coming from and can be used to better implement COVID-19 signs. For example, if users are commonly found entering the park at a specific entrance, implementing COVID-19 signs in the direction of that entrance will increase readership.

### *3.2 Mode of Travel*

The mode of travel is associated with the direction of travel. For example, park users who walk from and back to the parking lot likely traveled to the park by vehicle. Users who walk from and back towards residential housing likely live within walking proximity to the park. If a park has a larger number of users traveling by vehicle, this suggests that they may be traveling some distance within the city, or potentially driving in from nearby cities.

#### **4. Health Variables**

Due to the nature of COVID-19, health variables are used to determine the connection between the COVID-19 rules and regulations that the government has imposed and measures the level of compliance by park users.

##### *4.1 Physical Distancing*

As of November 9, 2020, there were 1885 total confirmed COVID-19 cases in Markham (York Region, 2020). The number of active cases within an area has an impact on whether or not residents choose to visit public spaces like parks, ultimately affecting how busy the neighborhood parks become. Busy parks make it more difficult to social distance. Physical distancing that is enforced by the city can reduce the further spread of COVID-19 if park users are correctly following them.

##### *4.2 Safety Regulations*

Safety regulations, such as outdoor wearing mask/face covering, hand washing, and sanitizing are some safety protocols that the government has encouraged at public parks that will reduce the transmission of the virus and mitigates the threat to the overall health of the city residents. (As shown in Appendix A, B, C)

##### *4.3 Closed Playgrounds*

The closure of playgrounds potentially reduces the distribution of children at neighborhood parks. It can also reduce other age groups (such as adults) that may be accompanying children.

#### **5. Others**

The others variables are used to categorize the time of day, day of the week, weather which can be used to determine the busiest parks. The time of day and day of the week can

impact the number of people, their behaviors, and mobility patterns in neighborhood parks. For example, residents who work from 9 am to 5 pm on weekdays will likely use parks in the evenings and on weekends. Since the observational research was conducted during the fall season, the weather (i.e. temperature, precipitation), likely influences the number of people using neighborhood parks. Warmer weather can bring individuals to use neighborhood parks, making social distancing much more difficult. At the same time, when the weather conditions are inhospitable, (eg: heavy winds and precipitation) parks tend to be more empty than usual.

### **Findings:**

#### *Ecological Findings*

A total of 2243 (N=2243) park users were observed at the five neighborhood parks when following the rotational schedule (Table 1) from September 21, 2020 to November 2, 2020. Overall, four age groups were identified; children (0 to 12 years old), teenagers (13 to 19 years old), adults (20 to 59 years olds), and older adults (60+ years old). It was found that adults comprised the largest age distribution of park users, with 1032 (or 46%) of the total observed park users being adults, followed by 583 (26%) older adults, 381 (17%) children, and 247 (11%) teenagers. Adding on, 1131 (58%) of the total observed data are female, and 942 (42%) are male. Race and ethnicity of park users are identified, with the largest distribution of park users from visible minority groups. Park users who are East-Asian comprised of the largest minority group with 1077 (or 48%), followed by 605 (27%) South- Asian, 291 (13%) White, 157 (7%) Other, and 112 (5%) Black.

**Table 3:** Characteristics of the Study Population

<b>Characteristics</b>	<b>N</b>	<b>%</b>
<b>Age (years)</b>		
0-12	381	17
13-19	247	11
20-59	1032	46
60+	583	26
<b>Sex</b>		
Female	1131	58
Male	942	42
<b>Race/Ethnicity</b>		
East Asian	1077	48
South Asian	605	27
White	291	13
Black	112	5
Other	157	7

N= total number of observed park users

### *Social Findings*

The most common group size at the five neighborhood parks is between 1 to 4 people, with 83% of all park users falling into this range. The age distribution of observed individuals within the group size 1 to 4 primarily consisted of adult(s), older adult(s), and adult(s) with child(ren). The group size of 5 to 14 people accounted for 9%, and a group size of 15 to 20 people, comprising of all teenagers made up approximately 8% of the total observed population. The most popular activities among all the parks are (1) walking, (2) running/jogging, (3) playing on the play structure, (4) skateboarding, (5) playing outdoor sports (i.e. tennis, soccer), and (6) recreating with pets. The majority of park users are participating in some form of physical activity, and the users who are most sedentary are adults supervising children on play structure

and older adults. Group size also has an influence on the type of activities that are being performed by recreationists. For example, a group size of 1 person is most commonly found to be walking, running/jogging, and recreating with pets, whereas bigger group sizes are found to be skateboarding and participating in outdoor sports, such as tennis and soccer. The most recognizable repeat visitors are the two different groups of 15 to 20 teenagers at Centennial Park and Swan Lake Park. Based on the time of dismissal at local schools (around 3 pm) and the rotational schedule of data collection (Table 1), these groups are repeatedly observed at the parks on Thursdays between 3 pm to 4 pm and Saturdays from 6 pm to 7 pm. These groups consist of both males and females, with the majority of males skateboarding, biking, and socializing at the skatepark, whereas females are only using the skatepark to socialize. It is also important to note that most tennis players are repeat visitors because tennis courts are not amenities in every neighborhood park. For example, a group of 8 to 10, East-Asian, male and female older adults are seen playing tennis at Wismer Park during mornings/ afternoons on weekdays are always seen coming and leaving by car.

### *Spatial Findings*

The mode of travel that's most commonly observed by recreationists are (1) walking, (2) driving, and (3) biking. Since the five parks are located within residential areas, it makes getting to these parks very accessible, and therefore, walking is the most common mode of transportation. At the same time, because not all amenities are available at every neighborhood park, some recreationists will result in driving in order to access the amenities. For example, only 2/5 of neighborhood parks where this research is conducted have a skateboard park, and only 3/5 of neighborhood parks have a tennis court. Therefore, some recreationists will be more inclined to drive to a park that is further away from their immediate neighborhood that offers an



abundance of park amenities. Adding on, the most common direction of travel of park users are (1) individuals coming from residential housing towards the park and from the park towards residential housing. Second, individuals coming from a parking lot towards the park and from the park towards the parking lot. This finding is consistent with the most common mode of travel by recreationists being (1) walking and (2) driving.

### *Health Findings*

The City of Markham recommends individuals to maintain a physical distance of 6 feet (2 meters) apart. Most recreationists try to physical distance however, it is more difficult at busier parks. Two groups are most commonly found not to comply with this rule (1) teenagers at skateparks, and (2) children on the playground structure. Most teenagers are capable of understanding the physical distancing rule but are choosing not to abide by it. (As shown in Appendix D) Whereas young children on playground structures may not understand this concept and are ultimately up to the parent or guardian to ensure a physical distance is maintained. It is also found that it is very difficult for recreationists to physical distance on sidewalks, especially when there are people traveling from both directions. Often times, some individuals will step off the sidewalk to reduce contact. Adding on, although outdoor mask-wearing is only encouraged by the city and is not mandatory, this research found that only 128 (or 5.7%) of the observed 2243 park users were wearing a mask/ face covering. It was also observed that 101 of these 128 individuals who were wearing a mask is of East- Asian descent, 17 are South- Asian, 2 are White, and 8 individuals where their race/ethnicity was unable to be determined based on physical observations. Adding on, hand washing/sanitizing is recommended to limit the spread of COVID-19 (as seen in Appendix A, B, C) High touch surfaces at public parks such as playground structures, are not being regularly sanitized, and is an individual's responsibility to

ensure this. There has only been a total of 3 individuals that were observed to have sanitized their child's hands after playing on playground structures.

#### *Other Finding*

The busiest parks are (1) Centennial Park, (2) Berczy Park, (3) Wismer Park, (4) Swan Lake Park, and (5) Gordon Stollery Park and are ranked based on the number of observed recreationists at each park. During the first three weeks of research (21/09 to 19/10) the busiest time of day is between 6 pm to 8 pm. The temperature averaged 15 degrees Celsius in Markham, which was warm enough for residents to enjoy themselves outside. Towards the mid to end of the research period (19/10 to 02/11), the sun started to set earlier (around 5 pm) and temperatures significantly dropped. This resulted in a reduced number of park visitors between 6 pm to 8 pm and increased the number of park visitors during earlier times of the day, such as 2 pm to 4 pm.

#### **Discussion:**

This study is, to my knowledge, the first to investigate the impacts of COVID-19 on the use and experiences of greenspace in the City of Markham. Since there is no previous research conducted on public parks in Markham, it is difficult to determine whether or not there has been an increased demand for greenspace by city residents as a result of the COVID-19 pandemic. It is recognized in previous literature that in other cities such as Oslo, outdoor recreation activity increased by 291% during the lockdown (Venter et al, 2020). As well, research from western counties in the US suggested that there was an average 2.5% increase in green space visitation (Rice and Pan, 2020). In order to further determine the demand for greenspace by Markham residents, the demographics of park users from this research are compared with the demographics of Markham residents from Statistics Canada to see if they follow the same correlations. The age distribution of park users from this study comprised of (17%) children,

(11%) teenagers, (46%) adults, and (26%) older adults. (As shown in Table 3) According to Statistics Canada, 16.8% of Markham residents are children, (6.4%) teenagers, (55.0%) adults, and (21.6%) older adults. The research findings among the distribution of children at Markham parks is highly consistent with the same age distribution of Markham residents and can be interpreted as the COVID-19 pandemic has not impacted the frequency of park use in children. Older adults comprised 26% of the total observed population at parks compared to 21.6% of Markham's total population. This finding is consistent with the literature as Yang et al. (2020) argued that older adults have less access to internet connectivity and are more susceptible to mental health lapses as a direct result of safer at-home orders, therefore there is a higher percentage of older adults in greenspace. The increase in the percentage of teenagers that's evident at neighborhood parks compared to the percentage of teenagers in Markham's total population suggests a greater demand for park use by teenagers, as evident in skateparks where teens use this space for social hangouts. (Appendix D) There is also a 9% decrease of adults evident at parks compared to the total distribution of adults in Markham. While this is maybe not a significant decrease, it is the only age group that showed a smaller percentage of observed park users compared to the total population of Markham. This may imply that adults are the most impacted by COVID-19 and as a result, reduced their contact in public spaces. The sex distribution of (58%) female and (42%) male of park users is somewhat uncorrelated to the almost equal sex ratio in Markham, (49%) female and (51%) male. It is likely that life stage and family circumstances will impact on the relationship between female and greenspace during the pandemic. Popham & Mitchell (2006), for example, demonstrated that women's leisure time exercise behavior was more severely attenuated by having young children compared to the other sex however, this research cannot provide an explanation for this difference. Lastly, this finding

on the race/ethnicity of park users is consistent with the racial/ethnic distribution of city residents in Markham, with 78% of the population from minority groups (Statistics Canada, 2016).

According to the 2016 Census, when looking at family size by private households in Markham, 91% of all households consists of 4 people or less, and only 9% of households consists of 5 or more people (Statistics Canada, 2016). This research found that 83% of park users are in group sizes between 1 to 4 people and this is uniform with the dominant household size in Markham (91% of households consist of 4 people or less). This can lead to the interpretation that household size potentially impacts the group size of park users who are choosing to physical distance from others that are not from the same household. Although this assumption does not support the groups of 15-20 teenagers at who are evidently not from the same household. (As shown in Appendix D) Besides the groups that are not physical distancing (teenagers at skateparks and children in playgrounds), the findings from this research indicate that COVID-19 has influenced mobility patterns of park users, as people are traveling in smaller groups, hence the most common group size being 1 to 4.

As the world's population is becoming more concentrated in cities, facilitating people's recreational use of public greenspace and direct contact with nature in urban areas is critically important in reconnecting people and greenspace (Miller, 2005). Many studies have shown that the distance to greenspace is a crucial factor in determining the frequency of its use by people for recreational activities (Giles-Corti et al., 2005, Coombes et al., 2010) There is a positive association between greenspace and health, indicating that residents of neighborhoods with abundant greenspace (within a 1-3 km radius) have better health outcomes (Maas et al, 2006). From this study, it was found that the most common mode of travel is walking, and this can assume that most individuals live within walking distance to the park which positively affects

health and well-being. A possible explanation for better health outcomes is that greenspace promotes physical activity. The most common activities found is walking, running/jogging, play sports, etc, all involving some form of physical movement as well, very few people are sedentary. Since most indoor gyms are closed in Markham when this research took place, it's evident that recreationists are using greenspace for physical exercise. The types of activities that are performed in greenspace can lead park planners on reassessing where individuals might be able to exercise within public parks as COVID-19 can change the preferences about greenspaces (i.e. creating more spaces at parks for individualized use in comparison to team sports).

**Policy Implications:**

The City of Markham is Canada's most diverse community with 78% of the city's population from a visible minority group. The findings from this research have highlighted the racial/ethnic distribution of park users in Markham, with the two largest minority groups consisting of East-Asian (48%) and South Asian (27%). According to the 2016 Census, 10% of Markham residents do not speak English nor French as the top three non-official languages spoken being are (1) Cantonese, (2) Mandarin, and (3) Farsi (Statistics Canada, 2016). During the COVID-19 pandemic, language barriers create difficulties for non-English speaking individuals, since they will have trouble understanding the safety rules and regulations that are being enforced. For example, COVID-19 signage at public parks in Markham is one way the city is trying to promote a safer environment. All the signs that were observed have been written in English, and the messages of physical distancing, mask-wearing, etc., will not benefit individuals who are not able to read English. The city of Markham should implement COVID-19 signage that is translated into the top non-official languages, Chinese and Farsi. Culturally tailored and translated signage will not only ensure public health concepts are readily understandable across

all racial/ethnic groups but will promote cultural competence in the public space. The findings from this research also suggest that there need to be more signs in all park entrances, especially along the main sidewalks in the direction that recreationists enter from. This will remind users of the safety rules and regulations that should be complied with when using this space. Increasing signage near park entrances and at parks in general will increase the likelihood of park users reading the signs and ultimately, increase the chances of these individuals following them.

Maintaining a physical distance of 6 feet (2 meters) apart has been crucial in slowing the spread of COVID-19 infections, yet there are still people who are choosing not to adhere to this rule. This research identified two groups who are evidently not complying with this being (1) teenagers at skateparks and (2) children on playground structure. As mentioned, a big step in the right direction is to incorporate COVID-19 signs that specifically target a certain population is essential in trying to reduce transmission rates. For example, signage that specifically highlights the maximum group size at these parks, physical distancing of 6 feet and the importance of mask/face covering needs to be put at skateparks. There is also a need for more signage near playgrounds to remind children of safe practices. Tailoring these signs to a specific population, for example, implementing signs on play structures that consists of pictograms and less wording will make it easier for children to interpret and comply. Adding on, the city of Markham has not ensured the quality of the signs at public parks. It was found that some signs are disregarded on the ground and folded in half which makes the signs very difficult to read. (As seen in Appendix E) The city needs to take greater responsibility for updating signage at parks regularly or even by encouraging park users to report to the city when a sign needs replacement. Lastly, the COVID-19 signs encourages individuals to hand wash/ sanitize before and after use of playground structures, splash pads, fitness equipment, etc. (Appendix A, B, C) However, since

the vast majority of observed individuals are not complying with this safety protocol, implementing sanitizing stations near high touch surfaces (especially near play structures where children are not physical distancing) will further encourage more people to sanitize their hands and ultimately reduce the transmission rate of the virus.

**Limitations:**

This research has a number of limitations. Firstly, only five neighborhood parks in the City of Markham was used to obtain observations during data collection. Since not every neighborhood park in Markham was observed, the findings in this research lack a representative sample of all parks and park users in Markham. Secondly, the data collection period lasted 6 weeks (21/09 to 02/11) and occurred during the fall season. The duration of this short-term study is a limitation because it is unrepresentative of how COVID-19 has impacted the experiences of recreationists from when lockdown first began (March, 17, 2020) to September 20, 2020 (the day before data collection for this research began). This research can only provide data on the observations of park users within the 6 weeks, and can not determine the potential changes in the behaviors of park users prior to this research period (i.e. most common activities). Thirdly, collecting primary data based solely from observations is extremely difficult when categorizing park recreationists in terms of their age, sex, and race/ethnicity group. The demographic data from this research are from making prediction, where a high possibility for observational error can occur. For example, an individual who physically looks 58 years old but is actually 65 years old, or another individual who may have the physical characteristics of an East-Asian individual but is actually mixed-race. The reliability of this data is impacted by merely using observations as the primary method of research. Another limitation of this study is not being able to determine the percentages of recreationists participating in each activity. Individuals can be indulging in

multiple activities at once, for example, an individual which is walking but is also recreating with pets, or another individual who is running but is walking during occasional breaks. This is difficult to interpret with just observations. Conducting semi-structured interviews with random park users could have potentially provided a more in-depth analysis of how COVID-19 impacted their personal experiences at neighborhood parks. As well, it would allow for local recreationists to express their opinions on the COVID-19 safety rules or any recommendations for the redesign of greenspace. Due to the nature of COVID-19, data collection from observations would reduce contact and is in the public health interest of both park users and researcher.

### **Future Greenspace Planning and Development:**

In this research, it was found that there was limited physical distancing among individuals on sidewalks. A physical distancing of 6ft (2 meters) is very difficult on sidewalks at parks in Markham where sidewalks are generally only 5 ft (1.5 meters) (City of Markham, 2020). The majority of park users on sidewalks who pass by one another are in close contact and do not meet the 6ft distance. In order to successfully physical distance, individuals are left with no choice but to step out of the sidewalk however, this is not always sufficient if there's oncoming traffic or during winter months where there's snow piles. Implementing wider sidewalks in greenspace will increase proximity among recreationists and ultimately reduces the risk of virus transmission. In addition, it is recommended that future park planners implement park infrastructure that is made from stainless steel in comparison to wood, such as benches and picnic tables. Although most benches in Markham are made from stainless steel, picnic tables are commonly made from wood. Research has indicated that the lifespan of COVID-19 lasts longer on wooden surfaces that can last up to 96 hours, in comparison to stainless steel surfaces lasting up to 72 hours (WebMD, 2020). Stainless steel is also easier to clean, but natural, porous



materials like wood more effectively trap microbes (O’neill, 2020). There is a great level of uncertainty as to how COVID-19 will impact future greenspace design, use and perceptions. At the same time, what is certain is that a pivot towards healthier cities requires park planners to consider how to effectively implement public health protocols in greenspace design that will prepare public spaces for future infectious disease.

**Conclusion:**

The COVID-19 pandemic has made evident the complexities of responding to a global public health crisis. With most of the world’s population being asked to restrict movement in public spaces, it has demonstrated the importance of greenspace since it was one of the few privileges that remained open. In this study, the impacts of the use and experiences of greenspace, operationalized as public parks were analyzed. The overall findings of this research suggested that demographic factors (i.e. age, race/ethnicity) showed consistency with other data and literature, as COVID-19 has not decreased the demand for greenspace, with the exception of adults. With the most common activities all involving physical exercise, it is interpreted that the vast majority of recreationists are using public parks for physical activity. The most common group size (1 to 4 people) indicates there is public adherence with physical distancing however, teenagers and children are two age groups that demonstrate the need for stronger government policies in order for them to comply with COVID-19 regulations. Surprising findings from this research include only 5.7% of the total observed population was wearing a mask/ face covering and only 0.13% of individuals were seen sanitizing after using playground structures. The City of Markham as well as other cities across the globe should consider how to best implement some of the recommendations that are proposed while maintaining physical distancing and ensuring safety protocols are met. It is also worth mentioning that future research on the income of park

users in Markham could greatly benefit the city by trying to understand to what degree spatial configurations promote health in different socio-economic neighborhoods. For example, if having one large park is better serving restoration needs than several smaller greenspaces. This is an area that needs further research to have an impact on decision-makers and the creation of greenspace policies that could have a positive benefit on promoting the health and well-being of Markham residents.

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Appendix A:





Appendix B:



Appendix C:



Appendix D:



Appendix E:

