Racial, but no Income Disparities, Identified in the Distribution of Toronto's Parks and Recreation Facilities Projects*

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January 22, 2024

Social inequity in sustainable urban development projects systematically disadvantages certain communities, by limiting access to opportunities, resources, and essential services. This study aims to test the hypothesis that Toronto's Parks and Recreation Facilities (PRF) projects are unevenly distributed in low-income and high-minority wards. Analysis of current PRF projects and 2021 Census data reveals no significant correlation between the number of projects and the proportion of low-income households per ward. However, a moderately negative correlation exists between the number of projects and the proportion of visible minorities per ward, supporting the hypothesis of a racial disparity in access to sustainability development initiatives across Toronto.

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*Code and data supporting this analysis is available at: https://github.com/julia-ve-kim/toronto_parks_recreation_facilities

1 Introduction

Sustainable urban development is an integrated approach to development, which balances economic growth, environmental protection and social equity interests (Trudeau 2018). However, social equity — the idea that the benefits and burdens of social development should be distributed evenly in a community — has proven to be very difficult to actually implement in sustainable development projects and so is often routinely left out in practice (Sarmiento and Sims 2015). This is done at the expense of marginalised groups, such as low-income earners and ethnic minorities, for whom such projects are intended to promote their socio-economic development. This discrepancy between theory and practice has been an area of great interest among researchers, who have historically focused on proposing conceptual frameworks to better align theory with practice (Trudeau 2018).

This paper seeks to take a different approach, by examining whether an important category of sustainable development project — parks and recreations facilities (PRF) — that are integral to the city of Toronto indeed delivers on its social equity claims. According to the Toronto PRF Master Plan (2017), PRF projects are designed to provide an equitable distribution of facilities on a geographic and demographic basis for all residents, thereby ensuring universal access to quality infrastructure and services. This paper scrutinises this claim, by determining whether there exists current inequitable distribution in PRF projects, on the basis of two social factors: high-minority and low-income levels.

Upon analysis of the PRF projects and 2021 Census datasets, a moderately negative and statistically significant correlation between the number of projects and the proportion of racial minorities per ward, supporting the hypothesis that fewer projects occur in high-minority wards. By contrast, no significant relation between the number of projects and the proportion of low-income private households was found. Accordingly, there is some evidence to support a lack of social equity in city-funded sustainable development initiatives based on race / ethnicity, but not on income, in partial contradiction to the universal accessibility claims in Toronto's PRF Master Plan (2017). Such racial disparities in project distribution, if observed consistently over time, might lead to important deprivations of facilities in high-minority wards, thereby limiting their access to open spaces, community resources and essential services.

The remainder of this paper is structured, as follows. Section 2 discusses the software used, data sources and methods used to clean the data. Section 3 provides key findings in the data, including trends and correlation between variables of interest. Section 4 discusses the significance and broader impact of these key findings, while acknowledging the limitations of the research. Section 5 provides some concluding remarks about the main results of the investigation and suggests possible avenues for future research.

2 Data

Datasets `Parks and Recreation Facilties Projects` (Data 2024) and `Ward Profiles (25-Ward Model)` (Data 2021) were imported from the Open Data Toronto Portal via the `opendatatoronto` library (Gelfand 2022). Data were cleaned and analysed using the statistical programming language R (R Core Team 2022). In-built functionalities from the `tidyverse` (Wickham et al. 2019) package were used for data manipulation, `janitor` (Firke 2021) for cleaning, `knitr` (Xie 2021) for formatting and `here` (Müller 2020) for managing file paths. Packages `ggplot2` (Wickham 2016) and `kableExtra` (Zhu 2021) were used to generate tables and graphs. More discussion as to data collection, cleaning and analysis can be found further on in this paper.

2.1 Parks and Recreation Facilities Projects

This dataset, published by Toronto Forestry, Parks & Recreation, contains information of city-funded projects, which build or improve parks and recreation centres across Toronto. Data are refreshed on a weekly basis to feature projects that are in-progress or that have been recently completed in the last three to six months, but to exclude any planned projects that have not yet been initiated. At the time of the analysis, on January 19, 2024, the dataset features 120 recorded projects, including their name, address, types and image URL, together with the name and number of the ward in which they are taking place. Note that by project type is meant one of these five categories: 'New Park', 'Master Plan', 'New Community Recreation Centre' , 'Park or Facility Improvements' and 'Playground Improvements'. To simplify the analysis of the distribution of PRF projects among wards, the ward name and number are kept in favour of more precise or descriptive location indicators, such as street addresses or image URL. A sample of the cleaned dataset is shown below (Table 1).

Table 1: Sample of cleaned PRF data

Ward Name	Ward Number	Project Type
Spadina-Fort York	10	New Park
Willowdale	18	Park or Facility Improvements
Toronto Centre	13	Park or Facility Improvements

Ward Name	Ward Number	Project Type
Scarborough-Guildwood	24	New Park
York South-Weston	5	Playground Improvements

An issue in this dataset is that it contains a *non-exhaustive* list of state of good repair (SGR) projects, defined as projects that address past deferred maintenance or replace systems that have surpassed their useful life (Cevallos 2016). This lack of SGR representation may be a source of bias, that would inaccurately portray the distribution of facilities among wards. However, it is known that the city's past levels of investment in maintaining its parks and recreation facilities in a good state of repair have been inadequate and inconsistent, leading to a substantial backlog in such initiatives ("Parks and Recreation Facilities Master Plan 2019-2023" 2017). As of 2017, this Plan reports funding levels to be insufficient for any meaningful implementation of SGR projects. With much of the city's development budget tied in upgrading or constructing new facilities, whose projects *are* exhaustively included in the dataset, potential missing observations on ongoing SGR projects are thus not expected to significantly impact the conclusions of this research.

2.2 Ward Profiles (25-Ward Model)

The Ward Profiles data, published by City Planning, contains census data on the demographic, social and economic composition of each of the 25 municipal voting wards in Toronto. These data were collected from the 2021, 2016 and 2011 Censuses of Population and are refreshed on Open Data Toronto as they are made available. At the time of the analysis, the last update was made on January 3, 2024.

The Ward Profiles is downloadable as an `xlsx` file with multiple tabs, of which only the `2021 One Variable` is relevant. It contains 2021 Census of Population data, giving counts of the population, visible minority population and private households with low-income status per ward. A sample of the cleaned dataset is shown below (see Table 2), with 'population' abbreviated to 'pop.'

Table 2: Sample of cleaned wards data

Ward Number	Total Pop.	Visible Minority Pop.	Low Income Pop.
1	115120	90130	14870
2	117200	37210	9215
3	139920	48675	15385
4	104715	30445	12510
5	115675	67120	17060

In the table above, *visible minority pop.* makes count of the number of persons, other than Indigenous peoples, who are either non-Caucasian in race or non-white in colour (Statistics Canada 2021). *Low-income pop.* makes count of the number of private households whose income falls below 50% of the national household median income (Statistics Canada 2019). In this context, a *private* household designates a person or group thereof who live together, having no other usual place of residence in Canada or abroad (Statistics Canada 2023). Again, the lack of representation of other types of households, of which there are *collective* households and households *abroad*, with low-income may introduce error in this investigation. However, it is the established convention of Statistics Canada that all census products be done for private households only (Statistics Canada 2023), so it sensible to follow their reasoning and adopt the same convention here.

2.3 Merging Data

Table 3 summarises the information contained in the two datasets most relevant to the analysis. For each ward, it shows the distribution of each project type and the proportions of populations who are visible minorities or in private households of low-income.

In this Table, notice that 'Recreation' is abbreviated to 'Rec.' and the counts for 'Park or Facility Improvements' and 'Playground Improvements' have been merged together to create a new project type called 'Facility Upgrade.' Notice also that *population percentage* of visible minorities and low-income private households are obtained by respectively dividing the total population of visible minorities and low-income private households by the total population in each ward.

3 Results

3.1 Parks and Recreation Facilities Project Statistics

At the time of the analysis, there are 210 Parks and Recreation Facilities projects in Toronto, 58 of are building new parks, 9 of which are building new community recreation centres, 19 of which are developing master plans and 124 of which are upgrading facilities (including parks, recreation facilities and playgrounds). In using the 25-Ward model, the mean number of projects per ward can be calculated to be 8.4 with a standard deviation of 3.8. The five wards in which the greatest number of projects are taking place are Spadina-Fort York, Toronto Centre, Etobicoke-Lakeshore, Etobicoke Centre and Eglinton-Lawrence with 16, 15, 14, 13 and 13 projects, respectively. Conversely, the five wards with the least number of projects are Scarborough North, Scarborough Centre, Humber-River Black-Creek, Toronto-Danforth and Etobicoke North with 5, 5, 5, 3 and 2 projects, respectively.

Table 3: Project types, visible minority and low-income proportions per ward

Ward		Number of Projects				Population Percentage	
Code	Name	New Park	New Rec. Centre	Master Plan	Facility Upgrade	Visible Minority	Low-Income
1	Etobicoke North	0	0	1	1	78.29	12.92
2	Etobicoke Centre	2	0	2	9	31.75	7.86
3	Etobicoke-Lakeshore	6	0	1	7	34.79	11.00
4	Parkdale-High Park	0	1	1	5	29.07	11.95
5	York South-Weston	2	0	1	6	58.02	14.75
6	York Centre	3	0	0	6	52.54	11.50
7	Humber River-Black Creek	2	1	0	2	78.21	15.10
8	Eglinton-Lawrence	4	1	1	7	36.81	10.15
9	Davenport	2	1	2	4	33.62	10.84
10	Spadina-Fort York	7	1	2	6	51.99	14.11
11	University-Rosedale	3	0	0	3	37.55	15.28
12	Toronto-St. Paul's	7	1	1	3	34.99	12.54
13	Toronto Centre	4	0	0	11	57.42	22.24
14	Toronto-Danforth	0	0	0	3	34.25	11.48
15	Don Valley West	3	0	1	4	46.93	12.60
16	Don Valley East	3	1	0	2	63.10	14.44
17	Don Valley North	0	0	0	9	74.49	14.40
18	Willowdale	3	1	0	8	71.04	17.84
19	Beaches-East York	2	0	1	4	36.15	11.86
20	Scarborough Southwest	1	0	1	5	61.36	13.94
21	Scarborough Centre	2	0	2	1	74.42	13.26
22	Scarborough-Agincourt	1	0	1	5	82.31	14.72
23	Scarborough North	0	0	0	5	92.18	11.84
24	Scarborough-Guildwood	1	0	1	4	76.42	14.66
25	Scarborough-Rouge Park	0	1	0	4	75.63	7.77

3.2 Ward Profile Census Statistics

According to the 2021 Census of Population, visible minorities occupy, on average, 56.1% of the population of each ward, with a standard deviation of 19.6%. The five wards with the largest proportion of visible minorities are Scarborough North, Scarborough-Agincourt, Etobicoke North, Humber River-Black Creek and Scarborough-Guildwood, with proportions of 92.18%, 82.31%, 78.29%, 78.21% and 76.42%, respectively. Conversely, the five wards with the least proportion of visible minorities are Etobicoke-Lakeshore, Toronto-Danforth, Davenport, Etobicoke Centre and Parkdale-High Park, with proportions of 34.79%, 34.25% 33.62%, 31.75% and 29.07%, respectively.

On the other hand, persons with low-income status represent, on average, 13.2% of the population of each ward, with a small standard deviation of 3.0%. The five wards with the largest proportion of persons with low-income status are Toronto Centre, Willowdale, University-Rosedale, Humber River-Black Creek and York South-Weston, with proportions of 22.24%, 17.84%, 15.28%, 15.10% and 14.7%. Conversely, the five wards with the least proportion of persons with low-income status are Etobicoke-Lakeshore, Davenport, Eglinton-Lawrence, Etobicoke Centre and Scarborough-Rouge Park, with proportions of 11.00%, 10.84%, 10.15%, 7.86% and 7.77%.

3.3 Distribution of Projects in High-Minority Wards

To determine whether a relationship between the number of projects and high-minority wards exists, *linear regression* is performed on the two variables, as shown in Figure 1.

Linear regression is defined as a method to model the relationship between two variables by fitting a linear equation through the data ("Linear Regression" 1997). In attempting to fit such a line, it is found that the line of *best fit* — the one that minimises the sum of the squares of the vertical deviations from each point to the line ("Linear Regression" 1997) — is given by

$$y = (13 \pm 2) + (-0.08 \pm 0.04)x, \tag{1}$$

where y denotes the number of projects and x the proportion of visible minorities by ward. There is a moderately negative correlation coefficient between the two variables of -0.402, whereby the two variables tend to move in opposite directions. To ascertain whether this correlation coefficient is statistically significant or merely the result of random chance, the associated p-value is computed. It represents the probability of obtaining a coefficient as equally or more extreme than the one observed, assuming that the true correlation coefficient is 0 (an assertion termed the 'null hypothesis', H_0) ("Statistics Knowledge Portal," n.d.). Certainly, a very low p-value would mean that the coefficient is unlikely to have occurred under H_0, implying it should be rejected in favour of the 'alternative hypothesis', H_a-- that

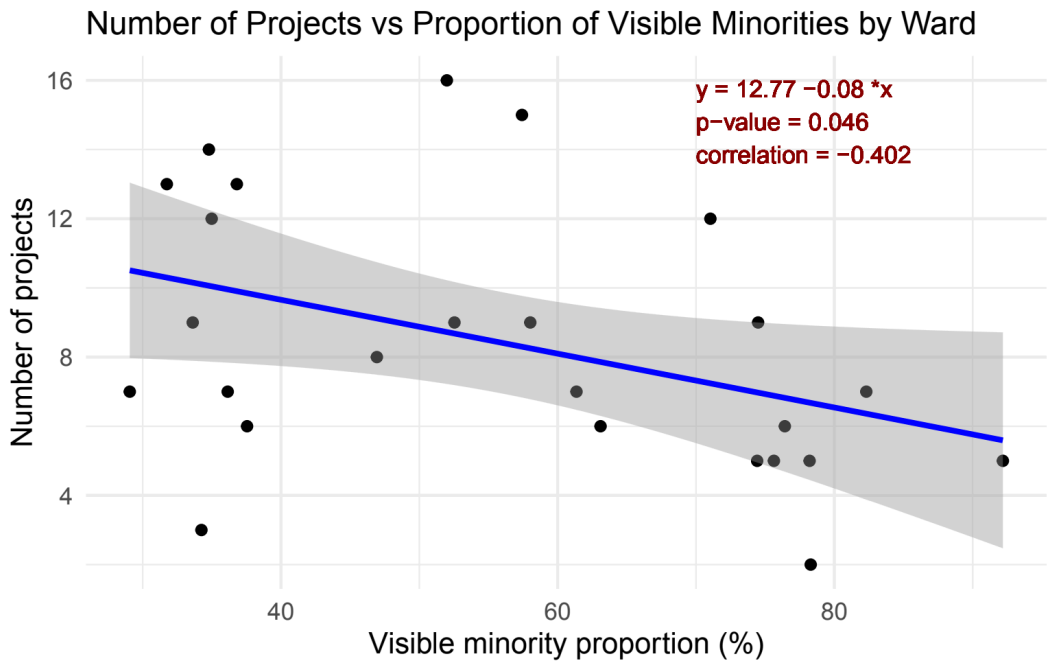

Figure 1: Relation between number of projects and visible minorities proportion per ward.

the true correlation coefficient is indeed different to 0. The threshold for rejecting the null hypothesis is called the significance level α, often taken to be 0.05. Here, the associated p-value for the linear model is 0.046, which is slightly less than $\alpha = 0.05$, so H_0 can be rejected. In other words, this inverse relationship between the two variables can be stated to indeed be statistically significant.

3.4 Distribution of Projects in Low-Income Wards

To compare the number of projects with the proportion of low-income households per ward, linear regression is again performed on these two variables, as shown in Figure 2. The line of best fit is given by

$$y = (0.2 \pm 0.3) + (5 \pm 3)x, \tag{2}$$

where y denotes the number of projects and x the proportion of low-income earners by ward. Here, very weak positive correlation coefficient between the two variables of 0.17 is found, whereby both variables very weakly tend to change in the same direction. However, the associated p-value is high at 0.42, so *no* sufficient evidence exists to conclude that such a correlation is indeed statistically significant.

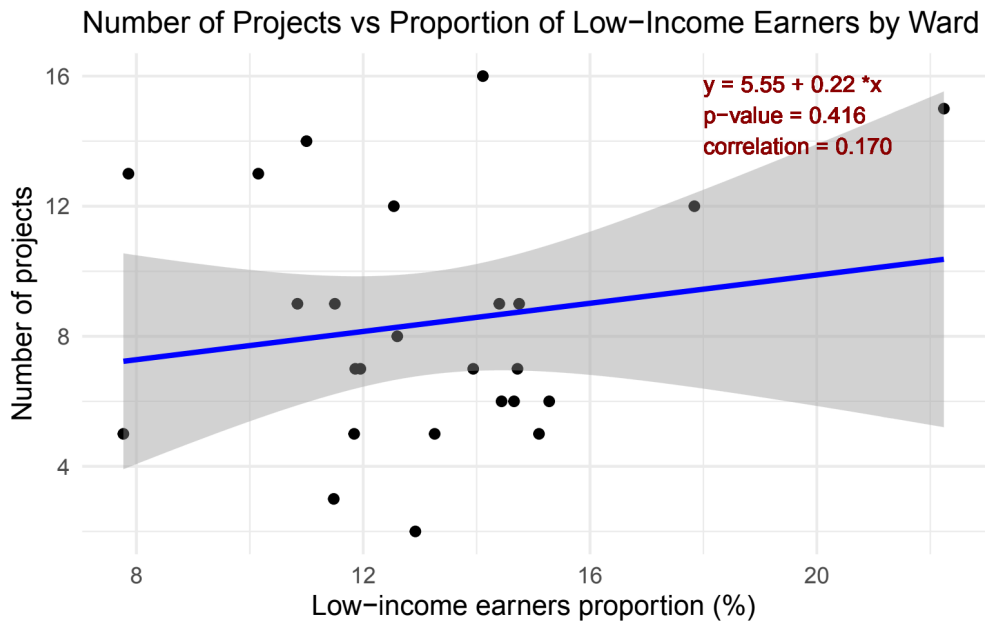

Figure 2: Relation between number of projects and proportion of low income household proportion per ward.

4 Discussion

There is a moderately strong negative relationship between the number of projects and the proportion of visible minorities by ward, whereby fewer projects occur in high-minority wards. Present findings are consistent with previous studies (see, e.g., Moore 2008; and 2021 for details) that found lower availability of recreational resources and green spaces in high-minority areas. The relative lack of development projects in high-minority wards has the potential to widen the existing infrastructure gap between low- and high-minority areas (Nicoletti, Mikhail, and Trivik 2022), by reducing access to parks and recreation facilities and speeding up the decline in the safety and quality of existing infrastructure. For the city of Toronto to meet its racial equity objectives, as outlined in its Master Plan, a reasonable policy goal would be to redirect sustainable development funding to high-minority wards. Strategies like these would help to mitigate racial disparities in the city of Toronto.

By contrast, the paper found no significant relationship between the number of facilities projects and the proportion of low-income private households by ward. This finding is consistent with at least two studies (see, e.g., Abercrombie et al. 2008; and Mckenzie et al. 2013) that found no correlation between the number of community centre facilities and neighbourhood income. Interestingly, the study by Abercrombie et al. (2008) found instead the *quality* of such facilities to be positively correlated to income; to verify this result can represent a

valuable direction for future research.

However, there exist several limitations to this analysis of note. First, the PRF Projects dataset contains only a small and non-exhaustive number ($n = 210$) of projects that are in-progress or have been recently completed. It excludes any planned projects that have not yet been initiated and a subset of SGR projects, both of which may be important factors to assess the true distribution of projects across wards. Moreover, as the dataset is refreshed on a weekly basis, the analysis is limited by its being able to only provide insights specific to the initial dataset. In other words, the analysis cannot capture changes in the underlying dynamics of the data, and no assessment was performed in this report to determine how frequently they occur. There is also a potentially important temporal 'lag' between the projects data, updated last at the time of this report on January 3, 2024, and the census data, collected in 2021. It is therefore possible that the census data may no longer accurately capture current demographic, ethnocultural and socioeconomic conditions in wards across the city of Toronto.

5 Conclusion

This paper investigates the current distribution of PRF Projects across the City of Toronto to assess whether inequitable distribution occurs on the basis of two social factors: high-minority and low-income levels. Analysis showed a significant, moderately negative correlation between the number of projects and the proportion of minorities in wards, but no significant relation between the number of projects and the proportion of low-income private households. As such, there is some evidence to support inequity in city-funded sustainable development initiatives on the basis of race / ethnicity, but not that of income, in partial fulfillment of the social equity goals in Toronto's PRF Master Plan (2017). Future studies could benefit by investigating past records of PFP project distribution in order to assess whether these conclusions are consistent over time or to identify any potential trends in their allocation. Future studies could also compare the number of PFP projects with other socioeconomic metrics, such as the number of Indigenous, immigrants or persons with disabilities per ward. Exploring these factors would help to provide a more comprehensive understanding of whether the city of Toronto is delivering on its social equity objectives for sustainable project development.

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