

Note: this is a draft for the purpose of peer review. I have linked references below for now, and will be converting this paper to Quarto format and properly citing references for actual submission. I also need to add figure captions which I will also do for proper submission.

Abstract

TBD

Introduction

The 2023 Toronto Mayoral By-Election occurred after the resignation of Mayor John Tory, who was re-elected in 2022. The city of Toronto is home to almost 3 million people and the Mayor plays a large role in overseeing the success of the city. There was significant public interest in this election with a 38.5% voter turnout, which is 9% higher than that of the 2022 election. 102 people ran for the Mayor of Toronto, but voter polling indicated three front-running candidates: Olivia Chow, Ana Bailão, and Mark Saunders. These candidates represent diverse political interests and backgrounds, and understanding the distribution of votes by ward and subdivision helps to better understand Toronto's geopolitical landscape and general regional political dynamics.

Granularly analyzing the number of votes each candidate received by Ward and Subdivision allows us to identify variations in voting patterns and determine which areas contribute the most to the success of the winning candidate (i.e. 'swing' regions). Every area of Toronto has a different background, whether it be variations in socioeconomic status, race, gender, etc. Knowing and collecting this data is imperative to determining what issues and policies are important to different demographic backgrounds. Releasing the voting numbers also builds trust in the electoral process, keeps policy makers accountable (dissuades election fraud), and ensures that electoral districts are drawn fairly.

This paper will discuss the background and context of the data used and collected, analysis of the data that is visualized through various graphs and tables, and a discussion of the results and their implications.

Data

The data used in this analysis comes from the City Clerk of the City of Toronto's Office of the Mayor. It includes the number of votes cast for each candidate in all 25 Wards, which were then further broken down by polling subdivision. The data is displayed in aggregate, which protects voters anonymity and privacy.

There were 4 different variables included in this dataset.

Ward Number: Represents each of Toronto's 25 Wards (geographical areas of Toronto).

Subdivision: Geographical areas within a ward.

Candidate Names: All of the official candidates who ran for Mayor.

Vote Count: The number of votes a candidate received.

Although the Mayor of Toronto is elected by popular vote, each ward and subdivision may have varying demographic profiles that influence their voting patterns. Each ward also has their own representative. As shown in **Figure 1**, Olivia Chow won the popular vote to become Toronto's

Mayor, defeating Ana Bailão. The figure only depicts candidates who received more than 1000 overall votes, which narrows the pool of 102 down to 19.

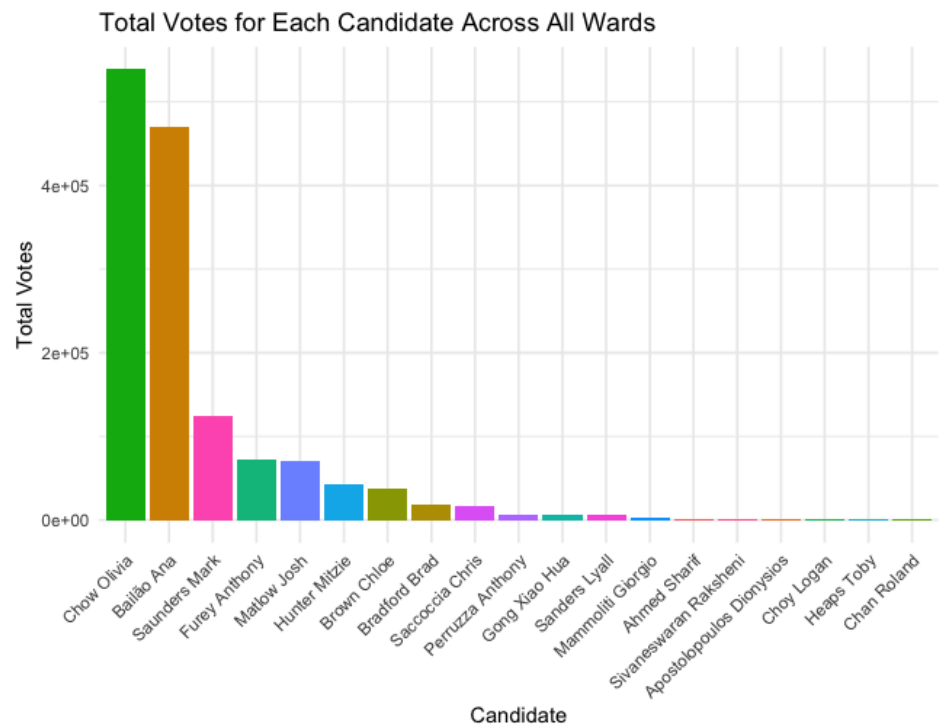


Table 1 helps to show regional preferences for each candidate. Wards 4, 14, and 13, which represent Parkdale - High Park, Toronto - Danforth, and Toronto Centre respectively, were all carried heavily by Olivia Chow. Meanwhile Wards 2, 8, and 15, which represent Etobicoke Centre, Eglington Lawrence, and Don Valley West respectively, were all carried heavily by Ana Bailão.

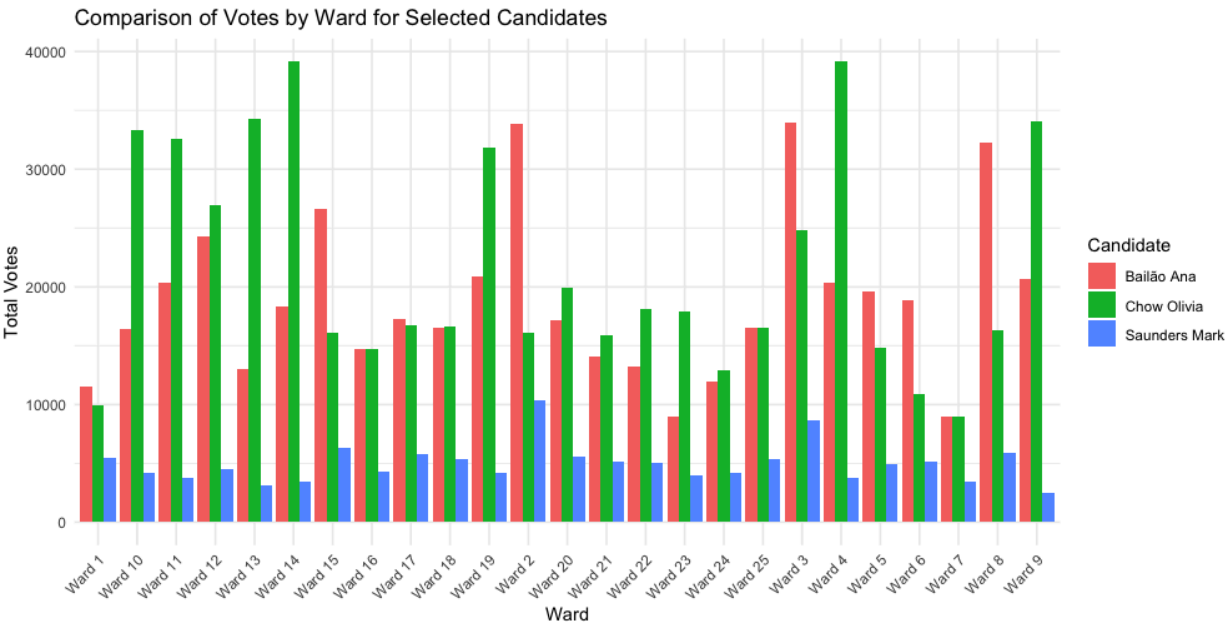
Looking at the median household income of each of these wards, we see a pattern. The wards carried by Chow had median household incomes of 89k, 131k, and 127k. Meanwhile, the wards carried by Bailão had median household incomes of 147k, 176k, and 225k. Similarly the wards heavily carried by Bailão had a higher median age than those carried by Chow.

On the flip side, there are a number of Wards that were more tightly contested (although since the election is by popular vote, this doesn't speak to the winner of the election but rather the demographic of the Ward itself). Bailão had only 4 more votes than Chow in Ward 7. Wards 16, 25, and 18 also had differences of less than 100 votes between either of the two candidates.

Table: Wards with Smallest Difference Between Winner and RunnerUp

Ward	Winner	Runner_Up	Vote_Difference
Ward 7	Bailão Ana	Chow Olivia	41
Ward 16	Bailão Ana	Chow Olivia	301
Ward 25	Bailão Ana	Chow Olivia	781
Ward 18	Chow Olivia	Bailão Ana	981
Ward 17	Bailão Ana	Chow Olivia	4881
Ward 24	Chow Olivia	Bailão Ana	9021
Ward 1	Bailão Ana	Chow Olivia	15521
Ward 21	Chow Olivia	Bailão Ana	18161
Ward 12	Chow Olivia	Bailão Ana	26061
Ward 20	Chow Olivia	Bailão Ana	28441
Ward 5	Bailão Ana	Chow Olivia	48541
Ward 22	Chow Olivia	Bailão Ana	49401
Ward 6	Bailão Ana	Chow Olivia	79341
Ward 23	Chow Olivia	Bailão Ana	89161
Ward 3	Bailão Ana	Chow Olivia	90861
Ward 15	Bailão Ana	Chow Olivia	104641
Ward 19	Chow Olivia	Bailão Ana	109621
Ward 11	Chow Olivia	Bailão Ana	122381
Ward 9	Chow Olivia	Bailão Ana	134381
Ward 8	Bailão Ana	Chow Olivia	158761
Ward 10	Chow Olivia	Bailão Ana	169641
Ward 2	Bailão Ana	Chow Olivia	177881
Ward 4	Chow Olivia	Bailão Ana	187761
Ward 14	Chow Olivia	Bailão Ana	207601
Ward 13	Chow Olivia	Bailão Ana	212881

Figure 2 displays the distribution of votes in each ward among Chow, Bailão, and Saunders. As wards have different population sizes and densities, this view allows you to see how wards vote in proportion to their own population as well as the size of other wards.



Releasing and tracking this data is incredibly important towards understanding why Torontonians vote the way they vote. It shows what issues are important to voters and what

policies and values resonate with the people. It is through understanding this information that we can work towards building a better Toronto that represents the wellbeing and wishes of its people.

Appendix

Table: Voting Totals and of Each Ward

Ward	Ward_Total	Winner	Winner_Votes
Ward 1	35644	Bailão Ana	11496
Ward 2	75850	Bailão Ana	33886
Ward 3	84378	Bailão Ana	33934
Ward 4	78340	Chow Olivia	39138
Ward 5	50048	Bailão Ana	19652
Ward 6	45406	Bailão Ana	18822
Ward 7	31872	Bailão Ana	8974
Ward 8	68898	Bailão Ana	32242
Ward 9	68430	Chow Olivia	34062
Ward 10	67136	Chow Olivia	33376
Ward 11	69608	Chow Olivia	32614
Ward 12	80298	Chow Olivia	26936
Ward 13	62794	Chow Olivia	34284
Ward 14	75384	Chow Olivia	39120
Ward 15	61716	Bailão Ana	26598
Ward 16	43916	Bailão Ana	14746
Ward 17	49554	Bailão Ana	17250
Ward 18	47576	Chow Olivia	16586
Ward 19	73888	Chow Olivia	31820
Ward 20	55916	Chow Olivia	19962
Ward 21	46122	Chow Olivia	15940
Ward 22	45414	Chow Olivia	18130
Ward 23	37920	Chow Olivia	17880
Ward 24	42272	Chow Olivia	12896
Ward 25	50896	Bailão Ana	16554

Add data cleaning notes.

References:

<https://www.toronto.ca/city-government/data-research-maps/neighbourhoods-communities/ward-profiles/>

<https://open.toronto.ca/dataset/elections-official-by-election-results/>

R Libraries: readxl, tidyverse, knitr, ggplot2

<https://thelocal.to/olivia-chow-mayor-toronto-election-results/>

<https://github.com/sophiabrothers1/2023mayoralelection/tree/main>