Assessing State of Affordability in Toronto*

Navya Hooda

January 22, 2024

Census 2021 results published in the dataset Ward Profile (25 Ward Model) were used in assessing affordability in Toronto. Based on income, education levels, shelter costs it is shown housing affordability is affecting people of all incomes in different ways. The paper draws a relationship between incomes and shelter costs to comment on affordability in Toronto.

Table of contents

1 Introduction **2**

2 Data **2**

2.0.1 Ward Profiles (25 Ward Model) 3
2.0.2 City Wards 3
2.0.3 Combining The Datasets 3

3 Results **4**

3.1 Ward Income Comparison 4
3.2 Average Household Income vs. % of people spending 30% or more income towards rent 4
3.3 Average Household Income vs. % of people spending 30% or more income towards owning homes 6

4 Discussion **6**

5 Conclusion **8**

References **9**

*Code and data are available at: https://github.com/hoodanav/Toronto_Affordability

1 Introduction

Over the past few years, living expenses and poor affordability in Toronto have skyrocketed. Toronto is the single most expensive city in Canada (Jackson 2023). The combination of record immigration, inflation, and a strong job market has been significantly impacting affordability.

The city has a population of approximately 2.7 million people in total. While Toronto usually experiences a high surge of new immigrants flowing into the city, there is a record high of residents leaving Toronto. In 2022 Toronto welcomed 138,000 new residents while 78,000 decided to leave. So much so that 1 in 4 Canadians who left Canada, were Toronto residents(Punwasi 2023). These statistics highlight the shifting dynamics of affordability in Toronto and have led to many residents being priced out of their city.

The census data used in this paper records a variety of socioeconomic and cultural categories like ethnocultural, employment status, and income for each ward in the city. However, the most significant indicators of affordability are income and housing-related. In this paper, I used the income, shelter costs, and education levels as the estimand to gain a better understanding of affordability in Toronto. To identify relationships between socioeconomic factors affecting affordability, several data examinations and analyses were employed. The focus of this paper is to observe a correlation between education, income, and shelter costs through varying types of neighbourhoods in Toronto, those with both low and high income on average. This is to observe the nature of affordability for various types of households and groups so that a definitive assessment can be made of Toronto's affordability overall.

In the Data Section, different data sources that were used are explained, and the data cleaning process that was applied to the datasets for analysis. The Results section discusses trends, observations, and correlations found. The Discussion section presents any additional data findings and overall insights into the analysis, additionally, any limitations of the analysis were mentioned. Lastly, the paper concludes with the Conclusion section which summarizes the main takeaways, and final insights from this paper.

2 Data

Data used in this paper is produced from the 2021 Census Data, and was provided by the City of Toronto through the library`opendatatoronto` (Gelfand 2022). Two different data sources were used in conjunction to analyze affordability: `Ward Profiles (25-Ward Model)`(Data 2021) and `City Wards` (Data 2022). The data has been cleaned and stored with capabilities of the open source statistical language R(R Core Team 2022), `tidyverse` (Wickham et al. 2019), `ggplot2`(Wickham 2016), `dplyr` (Wickham et al. 2022), `readr`(Wickham, Hester, and Bryan 2022), `tibble`(Müller and Wickham 2022), `janitor` (Firke 2021), `knitr`(Xie 2014),

Table 1: Sample of Cleaned Ward Profile Data

Ward	Avg Income	< 30% on House	< 30% on Rent	Bachelor's or Higher
0	121200	25.6	40.0	976620
1	95200	23.5	34.2	22120
2	146600	18.8	39.2	37540
3	127200	24.7	40.9	54175
4	127200	20.3	39.7	45405

`kable`(Zhu 2021), `here`(Müller 2020), and `tidyr`(Wickham 2021).The specific operations and analysis done using these sources has been discussed in further subsections.

2.0.1 Ward Profiles (25 Ward Model)

This data set records data on categories like Population, Dwelling, Ethnicities, and Income, for each of the 25 wards. As of January 22, 2024, the data set was last refreshed on January 3, 2024. The dataset includes past census results from 2016 and 2011, however, the first tab '2021 One Variable' data is the one that has been used for our purposes. For concise analysis, the data set was cleaned in several ways to produce a cleaner version. Only the variables of focus were extracted namely: population, average household income, % of people spending 30% or more on house payments, % of people spending 30% or more on rent and education levels. A sample of this cleaned data is shown in Table 1.

2.0.2 City Wards

The city wards data (Data 2024) is published on Open Data Toronto by the City Clerk's Office and was last updated on January 1, 2024. This dataset consists of information like codes, boundaries, and names of the 25 city wards. The names of the wards are extracted from the data and matched with the ward codes from our previous census as it did not originally contain them.

2.0.3 Combining The Datasets

The ward name data originating from the 'City Wards' dataset was combined with the 'Ward Profiles (25-Ward Model)' using the 'left_join' and 'select' functions to create one summarized dataset containing ward name, ward name, ward code, population, total income, people spending 30% or more on shelter, and number of people possessing a bachelor's or higher education level. Please refer to Table 2 for a snapshot of this summarized data.

3 Results

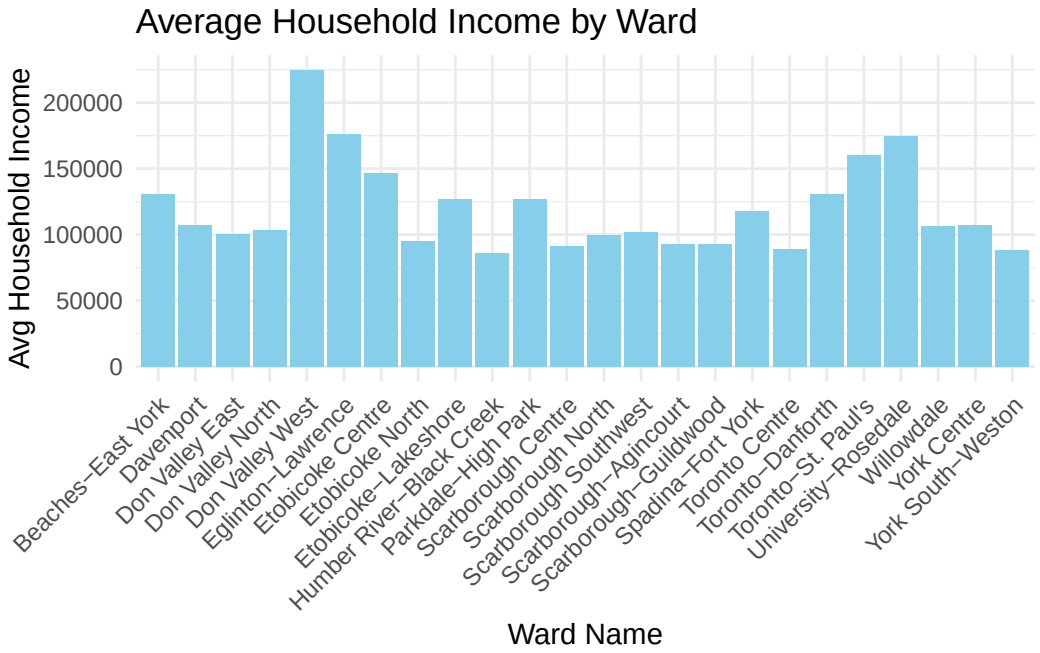

Figure 1: Income by Ward

3.1 Ward Income Comparison

Observing from Figure 1, and referencing Table 2 there are certain high-income wards and some low-income wards. The top three wards with high incomes are University-Rosedale (Ward 11), Don Valley Wast (Ward 15), and Eglinton-Lawrence (Ward 12) with incomes $176,400, $224,800 and $174,800 respectively. Similarly, the 3 lowest-income wards are Toronto Centre, York South-Weston and Humber River-Black Creek with incomes $85,700, $88,700, and $89,400 respectively.

3.2 Average Household Income vs. % of people spending 30% or more income towards rent

A common rule for safe budgeting expenses suggests that no more than 30% of income should be allocated towards housing expenses(Broverman 2023). As shown in Figure 2 there is somewhat a positive correlation between Income and % of people paying over 30% on rent expenses.This implies that as income increases, the amount of people paying more than 30% towards rent increases. This shows us the trends in the housing sector, and shows signs of bad affordability

Table 2: Sample of Combined Ward Profile Data

Ward	Ward Name	Avg Income	< 30% on House	< 30% on Rent	Bachelor's+
NA	Toronto	121200	25.6	40.0	976620
1	Etobicoke North	95200	23.5	34.2	22120
2	Etobicoke Centre	146600	18.8	39.2	37540
3	Etobicoke-Lakeshore	127200	24.7	40.9	54175
4	Parkdale-High Park	127200	20.3	39.7	45405
5	York South-Weston	88700	22.3	34.8	17910
6	York Centre	107500	25.3	36.1	30650
7	Humber River-Black Creek	85700	24.0	33.2	16310
8	Eglinton-Lawrence	176400	20.3	38.0	45065
9	Davenport	107300	21.6	41.3	34340
10	Spadina-Fort York	118200	35.2	43.7	82560
11	University-Rosedale	174800	29.8	48.8	57405
12	Toronto-St. Paul's	160400	24.8	44.6	57100
13	Toronto Centre	89400	35.1	43.1	58605
14	Toronto-Danforth	130800	18.2	37.8	40500
15	Don Valley West	224800	21.8	40.9	46220
16	Don Valley East	100300	26.1	39.1	29065
17	Don Valley North	103800	31.4	43.6	48980
18	Willowdale	106300	37.6	49.3	57030
19	Beaches-East York	130600	18.3	38.6	38480
20	Scarborough Southwest	102200	22.7	32.3	28980
21	Scarborough Centre	91500	26.0	35.8	27210
22	Scarborough-Agincourt	93000	32.0	36.0	28905
23	Scarborough North	100000	28.8	33.3	21660
24	Scarborough-Guildwood	92700	25.4	31.6	25115

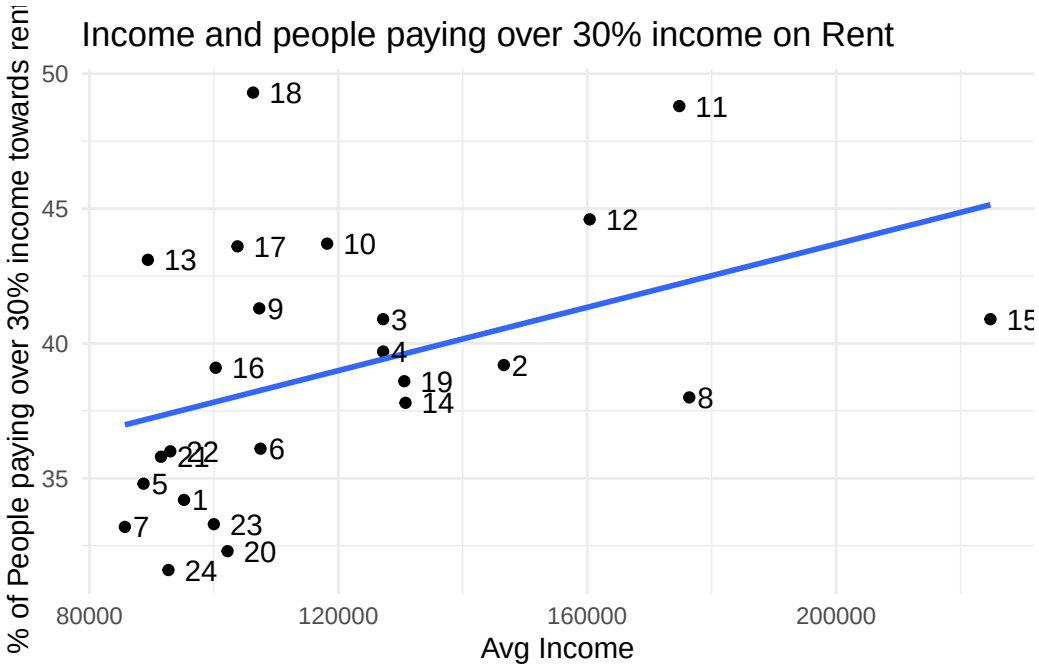

Figure 2: Correlations between income and % of people paying over 30% towards rent

since almost all income brackets have at least 40% of people over the advised budget spending on housing expenses (see Figure 4)

3.3 Average Household Income vs. % of people spending 30% or more income towards owning homes

Similarly the housing expenses for home owners was observed in Figure 3.

However, here a negative correlation is seen. This indicates that as the income increases the amount of people paying more than 30% towards home payments decreases, while it's at its peak in the lower income categories.

4 Discussion

Overall both correlation analyses between income and housing expenses reveal a disconnect from affordability, offering an insight into the poor state of affordability in Toronto. There is a negative correlation between income and amount of people paying over 30% on home payments based on Figure 3, this indicates that people in the lower income brackets are paying a large proportion of their income to afford their properties, while the high-income home owners have

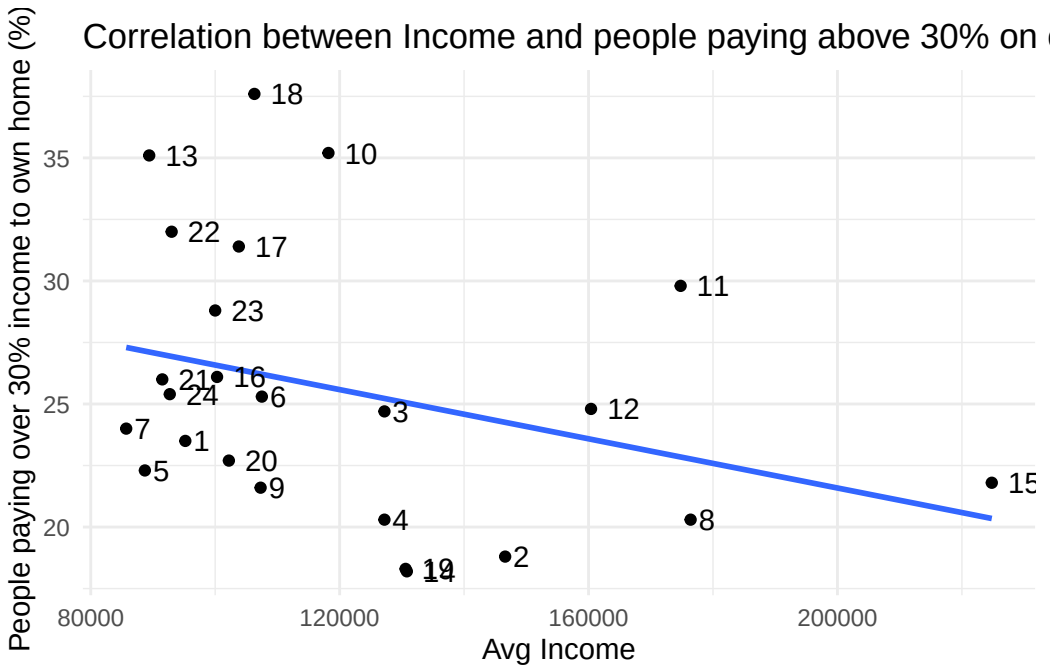

Figure 3: Income and % of people paying over 30% of income towards owning

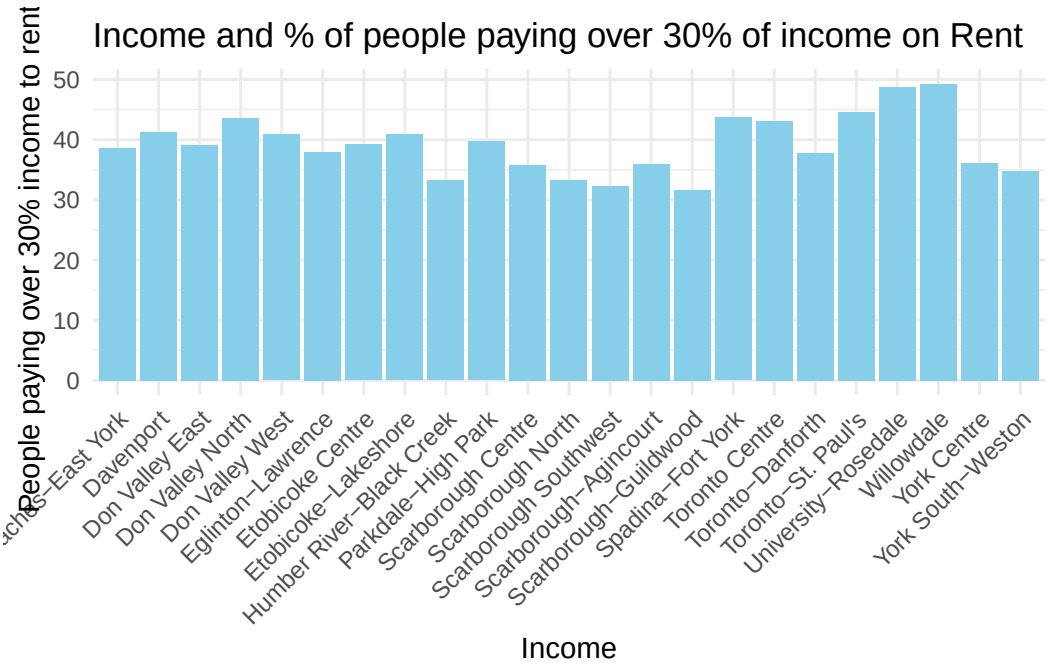

Figure 4: Correlation between income and the number of people paying over 30% of income on rent

mostly a stable payment amount towards home owning. Willowdale (Ward 18) highlights this notion, on this graph it indicates that 40% of Toronto-Danforth residents are spending over 30% of their income on owning a home, yet recall that they are in the bottom 3 of lowest income wards in Toronto, a concerning relationship. Since one would require a higher income to afford property comfortably in Toronto, this finding contributes evidence of low affordability towards our analysis on Toronto's affordability.

Based on Figure 2 we observe a clear positive correlation between income and the amount of people paying over 30% income towards rent. This indicates that as income increases, so does the amount of people paying over 30% of their income towards rent. Looking at Figure 4 almost each income bracket is consistently over the 30% threshold. Observe Ward 18, Willowdale where about 50% of residents are spending more than 30% of their income on rent, this is unprecedented because it implies half the residents can not comfortably afford rent. This trend signifies high rent prices across all of Toronto's 25 wards, providing another point of evidence revealing poor affordability in our analysis of Toronto's affordability.

However, the limitations and biases of the data set we have explored must be noted. While the data clearly categorizes rent prices, ward incomes, and facts about each ward, the data does not report on all aspects of affordability. For example, it is not explicitly stated whether the incomes reported are from a single paycheck, or if a home-owner is also a landlord for another resident. These aspects can affect our perception of affordability since it is unknown how many properties a single person may own, and whether that contributes to the problem of low housing affordability due to availability. The data also does not report on whether Toronto has built new housing since the last census, and if that is being done a steady rate compared to the demand of housing in the city.

5 Conclusion

Finally, the assessment of affordability in Toronto has provided evidence regarding the relationship between income and housing expenses, as well as how they differ by type of housing expense, rent and home-owning. The dataset focuses on statistics from 2021 and does show significant correlation between income and shelter costs, and they indicates that affordability is on the decrease in the city as observed in most wards, and even varying income brackets.

Overall, this examination of affordability in Toronto reveals a growing affordability problem across all of Toronto, as well as the nature of Toronto's expenses and the need for high incomes. The results from our analysis are able to provide a realistic perspective behind the low affordability found in the city and calls for necessary change in housing market attitudes.

References

Broverman, Aaron. 2023. "How Much Should You Spend on Rent?" https://money.ca/managing-money/budgeting/how-much-to-spend-on-rent#:~:text=The%2030%25%20rule%20of%20thumb,housing%20costs%20across%20the%20country.

Data, Toronto Open. 2021. "Ward Profiles (25-Ward Model)." https://open.toronto.ca/dataset/ward-profiles-25-ward-model/.

———. 2022. "CityWards." https://open.toronto.ca/dataset/city-wards/.

Firke, Sam. 2021. *Janitor: Simple Tools for Examining and Cleaning Dirty Data*. https://CRAN.R-project.org/package=janitor.

Gelfand, Sharla. 2022. *Opendatatoronto: Access the City of Toronto Open Data Portal*. https://CRAN.R-project.org/package=opendatatoronto.

Jackson, Hannah. 2023. "Toronto Ranks as Canada's Most Expensive City for 2nd Year in a Row: Survey." https://globalnews.ca/news/9767905/toronto-cost-of-living/.

Müller, Kirill. 2020. *Here: A Simpler Way to Find Your Files*. https://here.r-lib.org/.

Müller, Kirill, and Hadley Wickham. 2022. *Tibble: Simple Data Frames*. https://CRAN.R-project.org/package=tibble.

Punwasi, Stephen. 2023. "Toronto Residents Are Leaving at a Record Pace, Immigration Takes over Growth. Better Dwelling." https://betterdwelling.com/toronto-residents-are-leaving-at-a-record-pace-immigration-takes-over-growth/.

R Core Team. 2022. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. https://ggplot2.tidyverse.org.

———. 2021. *Tidyr: Tidy Messy Data*. https://CRAN.R-project.org/package=tidyr.

Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, et al. 2019. "Welcome to the tidyverse." *Journal of Open Source Software* 4 (43): 1686. https://doi.org/10.21105/joss.01686.

Wickham, Hadley, Romain François, Lionel Henry, and Kirill Müller. 2022. *Dplyr: A Grammar of Data Manipulation*. https://CRAN.R-project.org/package=dplyr.

Wickham, Hadley, Jim Hester, and Jennifer Bryan. 2022. *Readr: Read Rectangular Text Data*. https://CRAN.R-project.org/package=readr.

Xie, Yihui. 2014. "Knitr: A Comprehensive Tool for Reproducible Research in R." In *Implementing Reproducible Computational Research*, edited by Victoria Stodden, Friedrich Leisch, and Roger D. Peng. Chapman; Hall/CRC. http://www.crcpress.com/product/isbn/9781466561595.

Zhu, Hao. 2021. *kableExtra: Construct Complex Table with 'Kable' and Pipe Syntax*. https://CRAN.R-project.org/package=kableExtra.