Inequitable Access*

An Analysis of Licensed Child Care in Toronto's 25 Wards in 2024

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Child care is essential for the well being of families, communities, and the children able to attend these facilities. This paper examines the accessibility of licensed child care centres across Toronto's 25 wards. Findings indicate that there are more children per existing child care space in wards with lower household incomes, lower proportions of English speaking households, and higher proprotions of the population identifying as racialized. These findings suggest inequitable access to licensed child care spaces based on a variety of social factors, supporting initiatives aimed at increasing access to licensed child care in the city of Toronto.

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*Code and data are available at: https://github.com/ThomasWilliamFox/child_care_access.git.

1 Introduction

Equitable access to child care is essential to the social and economic health of a community such as the City of Toronto. Access to child care has been shown have a positive impact occupational and educational opportunities for parents, especially those in lower income brackets (Gunaseelan 2021). These economic advantages for parents and families bring benefits to their physical and social well-being (Gunaseelan 2021). Child care access also impacts the health and development of children attending these facilities (Rhijn et al. 2021). Vulnerable children disproportionately benefit from child care access as these centers help to facilitate early intervention methods (Underwood and Frankel 2012). Equitable access to child care is therefore a vital facet of community health and development.

This paper explores child care data from Toronto Children's Services (2024) and ward data from Toronto City Planning (2024) to explore child care access across the city of Toronto. These data sets are made freely available by Open Data Toronto (Gelfand 2022). Data analysis and processing was performed using the programming language R (R Core Team 2023). Various packages were used throughout the writing of this paper including `tidyverse` (Wickham et al. 2019), `arrow` (Richardson et al. 2023), `here` (Müller 2020), `ggmap` (Kahle and Wickham 2013), `maps` (Richard A. Becker, Ray Brownrigg. Enhancements by Thomas P Minka, and Deckmyn. 2023), `knitr` (Xie 2023), `dplyr` (Wickham et al. 2023), `janitor` (Firke 2023), and `rstanarm` (Goodrich et al. 2022).

This analysis explores relationships between child care demand and various demographic metrics across Toronto's 25 wards (see Section 4). The paper's estimand is that average household income is negatively correlated with the number of children per child care space by ward. The paper also explores the relationships between existing child care spaces and the proportion of racialized and non-native-English speaking populations by ward. These findings demonstrate inequitable access to child care across the city of Toronto. As child care plays a central role in the social and economic well-being of communities, and has an especially positive impact

on vulnerable children and low-income families, these findings support measures and initiatives aimed at ensuring more equitable access to child care in the city of Toronto (see Toronto 2017).

The remainder of this paper is structured as follows. Section 2 outlines the data sets used throughout this paper made available by Open Data Toronto (Gelfand 2022). Section 2.1 explores the "Licensed Child Care Centres" data set provided by Toronto Children's Services (2024), while Section 2.2 explores the "Ward Profiles (25-Ward Model)" data set provided by Toronto City Planning (2024). A model built to explore the impact of average household income on child care spaces in Toronto is outlined in Section 3. Results of data analysis are found in Section 4. This is followed by a discussion surrounding these findings and their implications in Section 5. This section also includes discussions around potential weaknesses and next steps regarding this research.

2 Data

2.1 Licensed Child Care Centres

The "Licensed Child Care Centres" data set is provided to Open Data Toronto (Gelfand 2022) by the City of Toronto's Children's Services division (Toronto Children's Services 2024). The data is updated on an ongoing basis and the data used in this paper was updated on April 19, 2024. The data set contains 1,066 entries, each corresponding to a licensed child care facility in Toronto. Variables chosen to isolate after cleaning include the facility ID number, the ward number where the facility is located, and the total number of individual child care spaces at the facility. Each facility's operation type is also isolated, with the data showing that there are 703 non profit, 324 commercial, and 39 public (City operated) facilities in Toronto. Information about whether the each facility has a fee subsidy contract or participates in the Canada-Wide Early Learning & Child Care (CWELCC) system is also included, with 68% of facilities having subsidy contracts and 87% of facilities participating in CWELCC. Table 1 shows the first six entries in this data set and Figure 1 shows the location of each facility across Toronto.

Table 1: Sample of Cleaned Toronto Licensed Child Care Centre Data

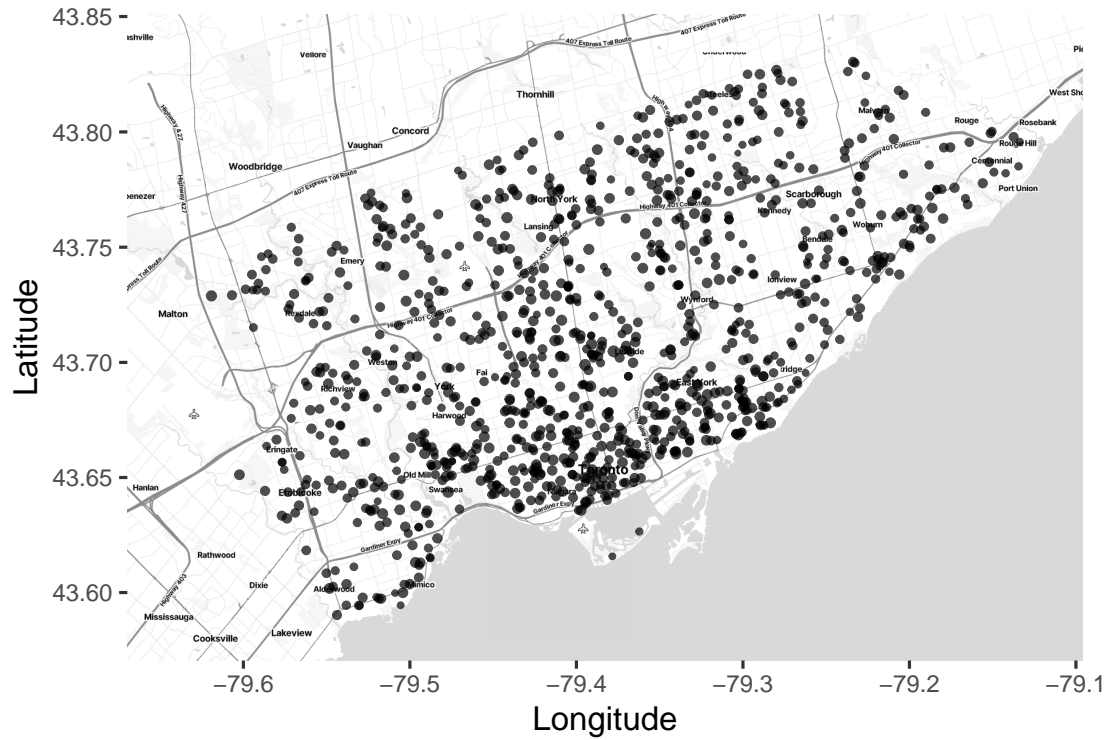| Facility ID	Ward Number	Total Spaces	Type	Subsidy	CWELCC
1	3	164	Non Profit Agency	Y	Y
2	8	83	Non Profit Agency	Y	Y
3	25	102	Non Profit Agency	Y	Y
4	10	65	Non Profit Agency	Y	Y
5	20	26	Non Profit Agency	Y	Y
6	24	62	Non Profit Agency	Y	Y

Figure 1: Map Showing the Loction of Each Licensed Child Care Centre in Toronto

Figure 2 displays the total individual child care spaces found in each of Toronto's 25 wards. The wards with the fewest number of licensed child care spaces are Scarborough-Rouge Park with 1935 spaces, Etobicoke-North with 2094, and Scarborough North with 2104. The wards with the greatest number of child care spaces are Parkdale-High Park with 4632, Etobicoke-Lakeshore with 4937, and Toronto-Danforth with 5054.
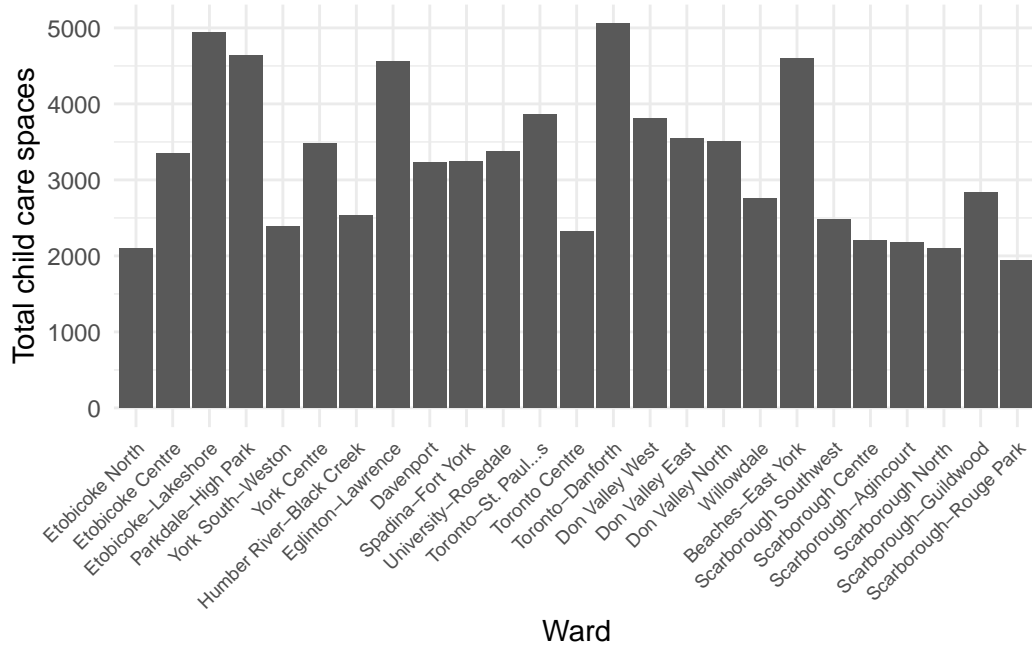
Figure 2: Total Number of Licensed Child-Care Spaces in Toronto by Ward

2.2 Toronto Ward Profiles

The "Ward Profiles (25-Ward Model)" data set is provided to Open Data Toronto (Gelfand (2022)) by Toronto City Planning (Toronto City Planning 2024). The data sets of interest in this paper found through this resource are the "2023-WardProfiles-2011-2021-CensusData" data set which is used to determine demographic information related to each ward, and the "25-WardNames-Numbers" data set that is used to code names to ward numbers in this paper (Toronto City Planning 2024). Variables isolated from the 2021 Canada Census include ward number, population, number of children under 15, average yearly household income, number of households where English is spoken most often, population identifying as racialized. Table 2 shows the first six entries in the cleaned data set.

Table 2: Sample of the First Six Entries in the Cleaned Toronto Ward Data

Ward	Total Population	Children Under 15	Average Household Income	English Spoken Most Often in Household	Population Identifying as Racialized
1	115120	18500	95200	67360	90130
2	117200	17300	146600	85330	37210
3	139915	18460	127200	105230	48675

5

Table 2: Sample of the First Six Entries in the Cleaned Toronto Ward Data

Ward	Total Population	Children Under 15	Average Household Income	English Spoken Most Often in Household	Population Identifying as Racialized
4	104715	15015	127200	85720	30445
5	115675	18465	88700	76075	67120
6	107355	15555	107500	63260	56405

Figure 3 displays the total number of children under the age of 15 in each ward. Age range was selected to represent the child care age ranges found on the Government of Ontario's child care rules website (Ontario 2023). The wards with the fewest number of children are University-Rosedale with 8980, Spadina-Fort York with 9270, and Toronto Centre with 9310. The wards with the greatest number of children are Beaches-East York with 18685, Humber River-Black Creek with 18770, and Eglinton-Lawrence with 19115.
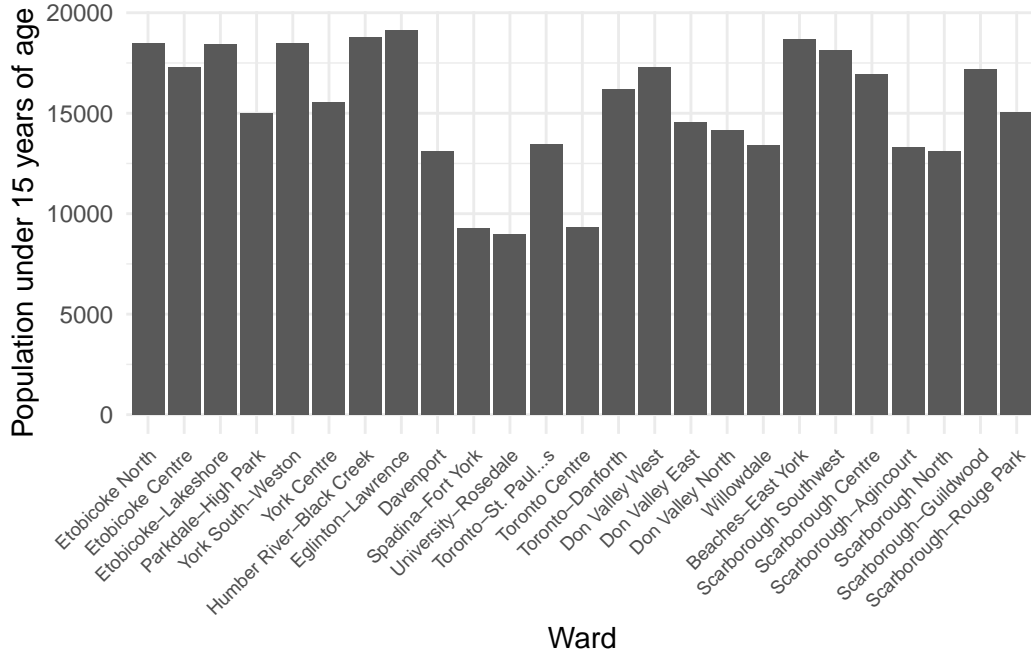

Figure 3: Population Under 15 Years of Age in Each of Toronto's 25 Wards

Figure 4 shows the average yearly household income in each of Toronto's 25 wards. The wards with the lowest average income in Toronto are Humber River-Black Creek with $85700, York South-Weston with $88700, and Toronto Centre with $89400. Toronto's wards with the highest

average income are University-Rosedale with $174800, Eglinton-Lawrence with $176400, and Don Valley West with $224800.
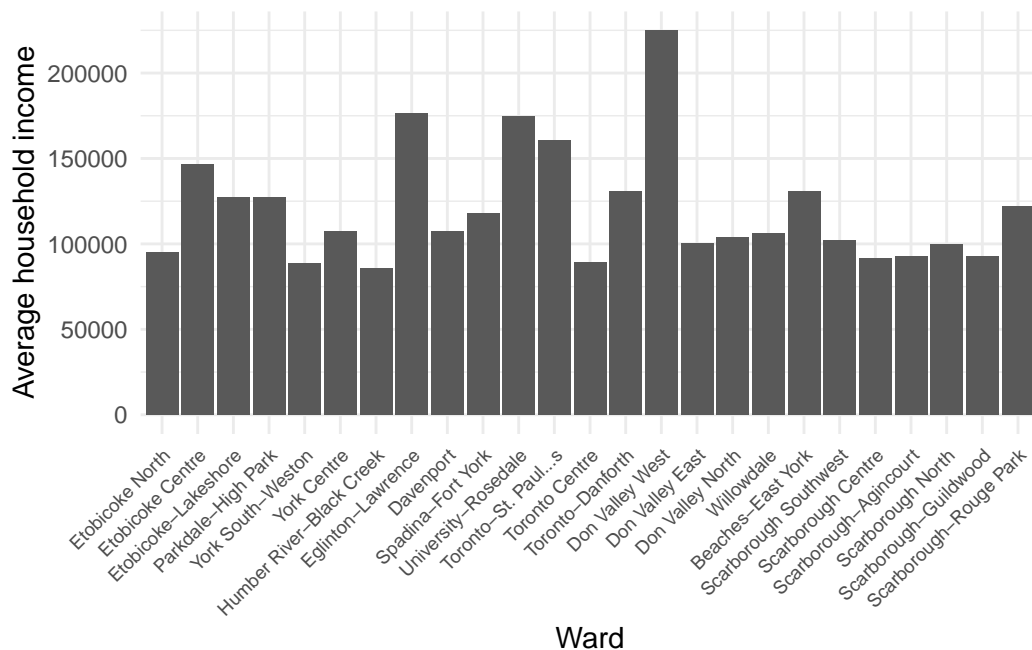

Figure 4: Average Household Income in Each of Toronto's 25 Wards

Figure 5 shows the proportion of the population in each of Toronto's 25 wards that speaks English most often in their households. The wards with the lowest proportion of English speaking households in Toronto are Humber River-Black Creek with 41%, York South-Weston with 43%, and Toronto Centre with 48%. Toronto's wards with the highest proportion of English speaking households are Toronto-Danforth with 81%, Beaches-East York with 81%, and Park Dale-High Park with 82%.
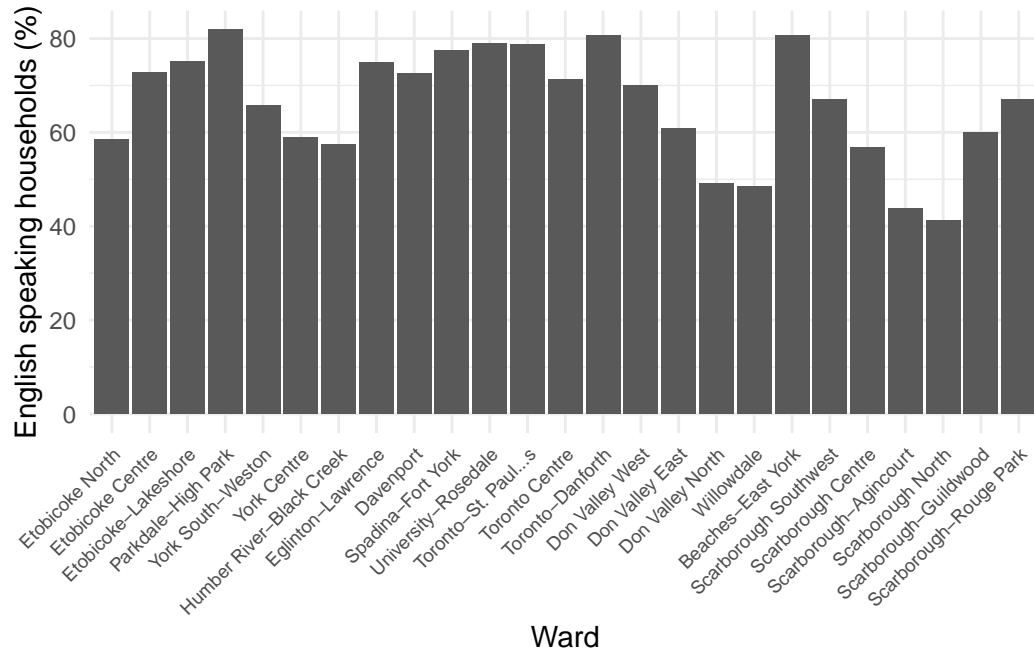
Figure 5: Proportion of the Population in Each of Toronto's 25 Wards That Speak English Most Often at Home
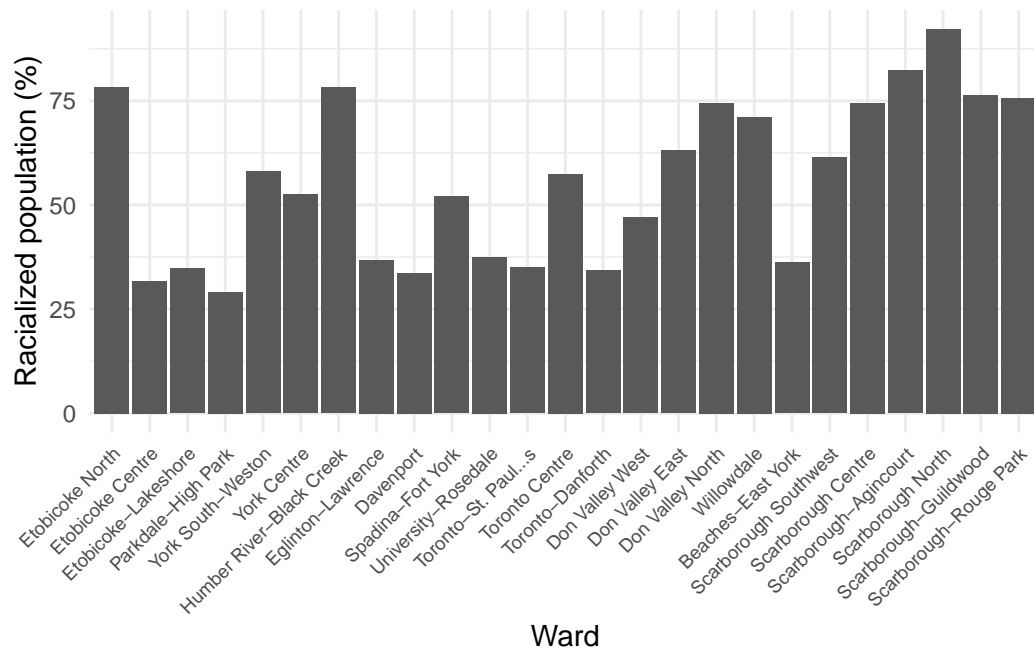

Figure 6: Proportion of the Population in Each of Toronto's 25 Wards Identify as Racialized

Figure 6 shows the proportion of the population in each of Toronto's 25 wards that identifies as racialized. The wards with the lowest proportion of racialized population in Toronto are Parkdale-High Park with 29%, Etobicoke Centre with 32%, and Davenport with 34%. Toronto's wards with the highest proportion of racialized population are Etobicoke-North 78%, Scarborough-Agincourt with 82%, and Scarborough-North with 92%.

3 Model

The goal of this paper's modelling strategy is to investigate the effect that average household income has on the number of children per existing child care space in each of Toronto's 25 wards.

Further model details and diagnostics are included in Appendix B.

3.1 Model set-up

Define y_i as the number of children per child care space in a ward. Then β_i is the average household income in the ward.

$$y_i | \mu_i, \sigma \sim \text{Normal}(\mu_i, \sigma) \tag{1}$$
$$\mu_i = \alpha + \beta_i \tag{2}$$
$$\alpha \sim \text{Normal}(0, 2.5) \tag{3}$$
$$\beta \sim \text{Normal}(0, 2.5) \tag{4}$$
$$\sigma \sim \text{Exponential}(1) \tag{5}$$

The model is executed in R (R Core Team 2023) using the `rstanarm` package of Goodrich et al. (2022) with the package's default prior settings.

3.1.1 Model justification

A negative relationship is expected between average household income and the number of children per child care space by ward. Normal distributions with auto scaling are used for priors.

Table 3: Explanatory models of flight time based on wing width and wing length

	First model
(Intercept)	8.12
	(1.21)
income	−5.64
	(2.17)
Num.Obs.	25
R2	0.216
R2 Adj.	0.103
Log.Lik.	−47.108
ELPD	−49.5
ELPD s.e.	2.7
LOOIC	98.9
LOOIC s.e.	5.4
WAIC	98.7
RMSE	1.55

3.1.2 Model Results

The model results are summarized in Table 3. The model shows that the intercept, or children per child care space if β_i were 0, would be 8.12. The model also shows that the impact of average household income being 1.0, or the maximum average income in Toronto's 25 wards is -5.64 children per child care space. This infers that average income has a negative relationship with the number of children per existing child care space in the city of Toronto.

4 Results

To explore the effect that average household income, language, and racialized population have on the total number of child care spaces by ward, a merged and summarized data set was created with variables for ward name, average yearly household income, total childcare spaces, and total population aged 0 to 14, total population, population identifying as racialized, English speaking population, and children per child care space (see **?@sec-data-details**). Figure 7 displays the number of children per existing child care space by ward. These values help infer the accessibility and demand for child care spaces in each ward. The wards with the greatest number of children per existing child care space are Etobicoke North with 8.8, Scarborough-Rouge Park with 7.8, and York South-Weston with 7.7. The wards with the fewest number of children per child care space are Toronto-Danforth with 3.2, Spadina-Fort York with 2.9, and University-Rosedale with 2.7.
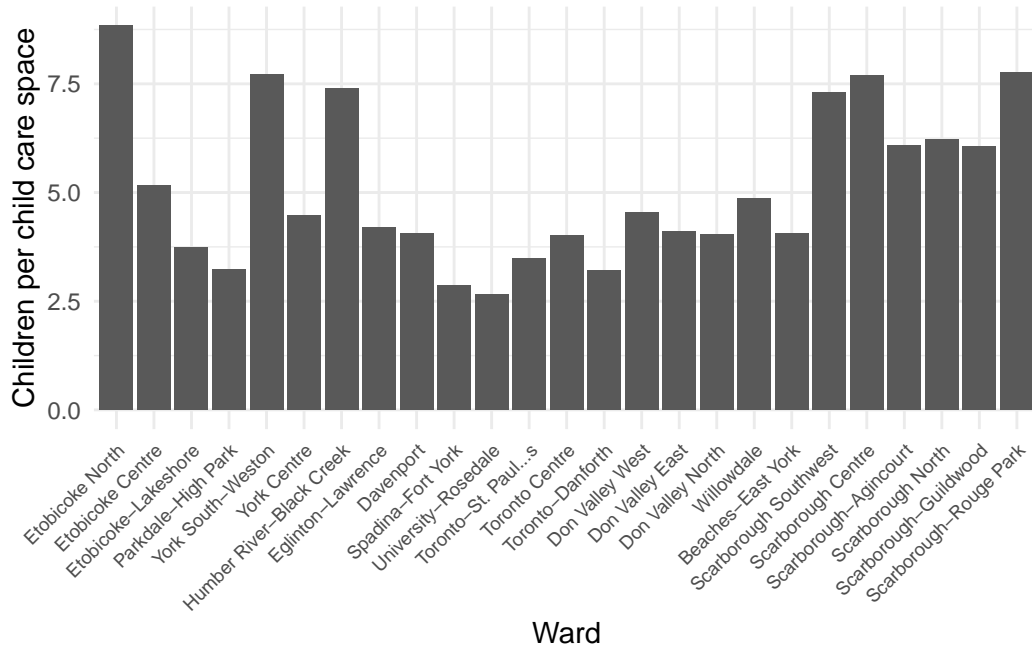
Figure 7: Number of Children for Every Existing Licensed Child Care Space in Each of Toronto's 25 Wards

Figure 8 aims to assess the relationship between average household income and children per child care space in Toronto's 25 wards. The plot displays a negative correlation between average household income and children per child care space. The two wards with the highest households income, which are Eglinton-Lawrence and Don Valley West, have 4.2 and 4.5 children per child care space. The two wards with the lowest average household income, Humber River-Black Creek and York South-Weston have 7.4 and 7.7 children per child care space. The seven wards with the lowest average household income have an average of 6.8 children per child care space, while the seven wards with highest average household income have an average of 3.9. These findings suggest that there is increased competition for child care spaces in wards with lower incomes and decreased competition for spaces in wards with higher incomes.
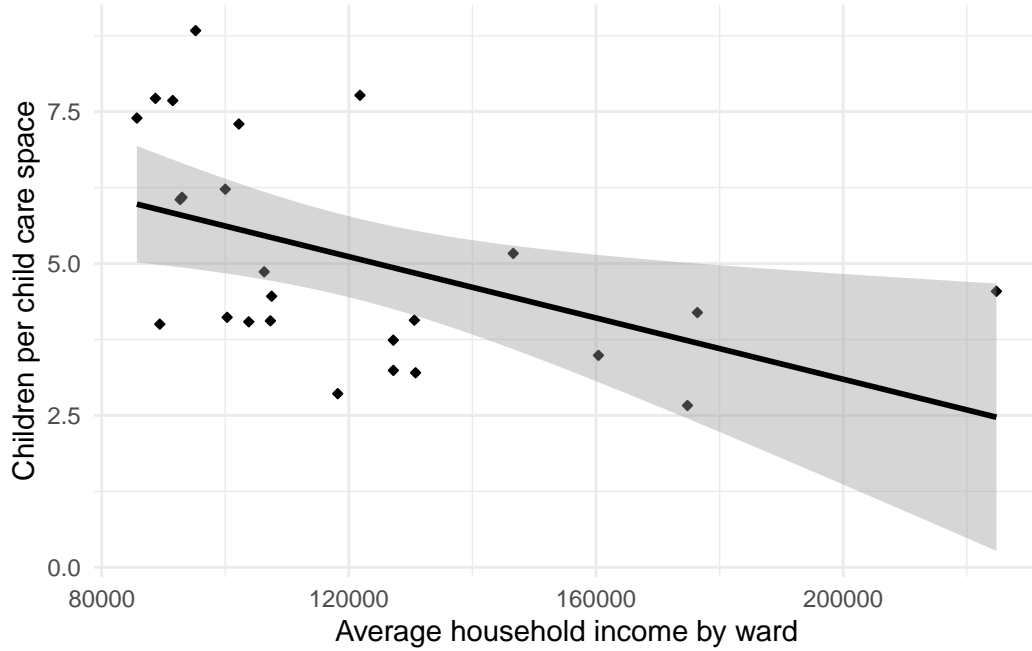
Figure 8: Relationship between income and child care spaces

Figure 9 explores the relationship between English speaking household populations and children per child care space in Toronto's 25 wards. The plot displays a negative correlation between the proportion of English speaking populations and children per child care space. The two wards with the highest proportion of English speaking households, Parkdale-High Park and Beaches-East York, have 3.2 and 4.1 children per child care space. The two wards with the lowest proportion of English speaking households, Scarborough North and Scarborough-Agincourt have 6.2 and 6.1 children per child care space. The seven wards with the lowest proportion of English speaking households have an average of 6.42 children per child care space, while the seven wards with highest proportion of English speaking households have an average of 3.9. These findings suggest that wards with large proportions English speaking population proportions have decreased competition for child care spaces.
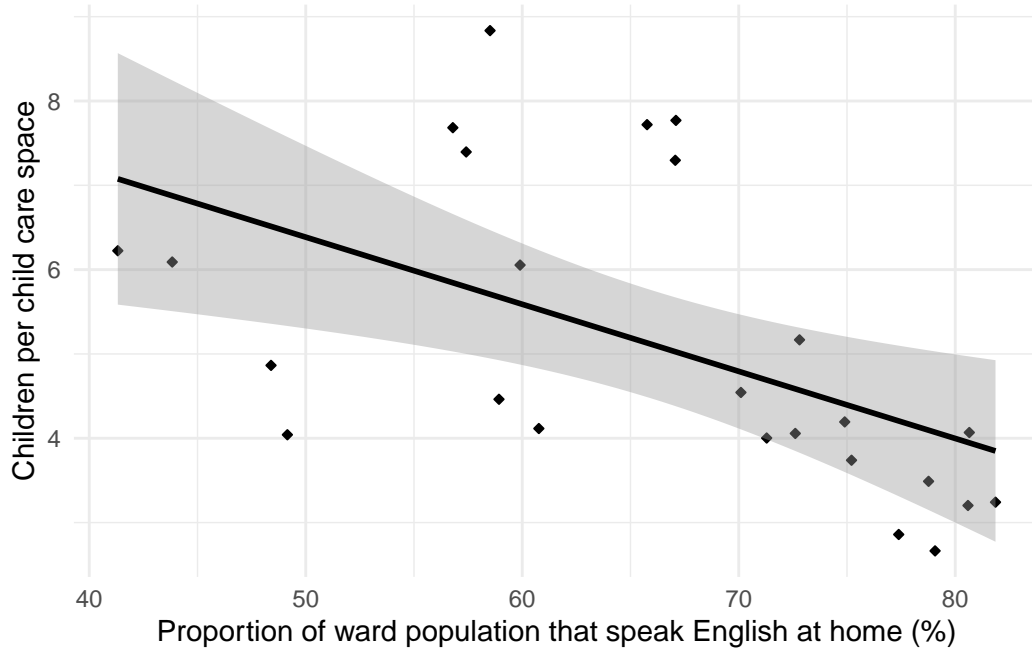
Figure 9: Relationship between language and child care spaces

Figure 10 examines the relationship between non-racialized populations and children per child care space in Toronto's 25 wards. The plot shows a negative correlation between proportion populations identifying as non-racialized and children per child care space. The two wards with the highest proportion of non-racialized population, Parkdale-High Park and Etobicoke Centre, have 3.24 and 5.16 children per child care space. The two wards with the lowest proportion of non-radicalized residents, Scarborough North and Scarborough-Agincourt have 6.2 and 6.1 children per child care space. The seven wards with the lowest proportion of non-racialized residents have an average of 6.62 children per child care space, while the seven wards with highest proportion of non-racialized residents have an average of 3.8. These findings suggest that wards with large proportions of their populations identifying as non-racialized have decreased competition for and increased supply of child care spaces.
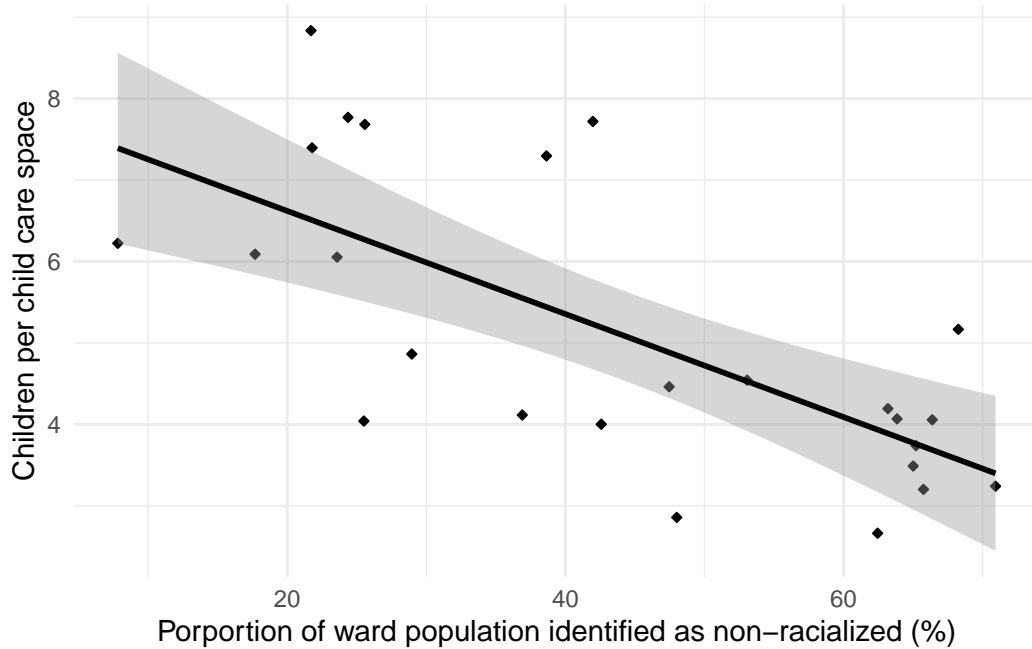
Figure 10: Relationship between non-racialized population by ward and child care spaces

5 Discussion

This paper investigates issues of access and demand for licensed child care spaces throughout Toronto's 25 wards. By examining up-to-date information made available through Open Data Toronto regarding licensed child care centres and exploring demographic information from the 2021 Canada census related to Toronto's 25 wards, a detailed analysis was possible. The paper examines the effect that average household income has on the demand for child care spaces across Toronto's 25 wards. The paper also explores the relationship between English language prevalence, and racialized population proportion on child care demand throughout the city of Toronto.

5.1 Income, Language, and Racialized Population

As outlined in Figure 8, a negative correlation exists between average household income and children pre child care space across Toronto. In Figure 9 a similar trend is displayed with less children per existing child care space in wards with higher proportions of English speaking households. Figure 10 shows a negative relationship between the proportion of residents identifying as non-racialized and the number of children per space. These findings infer that

wards with higher incomes, higher proportions of English speaking households, and lower proportions of racialized residents less children per existing child care space, and therefore, more accessibility to licensed child care.

These findings are troubling for a variety of reasons. Children with at least one parent who speaks a language other than English in the home benefit disproportionately from child care access when compared to children from English speaking households (Maki Park and Giang 2022). Income disparity related to child care access is especially concerning as both dual language and racialized children are more likely to experience poverty Tome (2021). With Toronto having the highest rate of income inequality between racialized and non-racialized individuals in Canada, further research regarding the relationship between the variables examined in this paper would be beneficial (Tome 2021). As quality child care is an instrumental facet of community, family, and individual health, these findings support any steps taken to ensure equitable access to quality child care across the city of Toronto.

5.2 General Access

An alarming finding in this paper is that on average, there are 5.1 children in Toronto for every space at a licensed child care facility, indicating a shortage of childcare throughout the city. Both inequitable access to and general lack in supply of licensed quality child care spaces may be influenced by the market-model child care system (Friendly 2019). This type of child care system means that non profit and commercial facilities out number publicly operated facilities as is reflected in Section 2.1. Non profit and commercial providers operate privately and therefore have different operational strategies and objectives when compared to publicly operated facilities (Friendly 2019). Measures to increase both the number of child care spaces and ensure equitable child care access are therefore important and essential public policy initiatives (Toronto 2017).

5.3 Weaknesses and Next Steps

The child care data provided by the Child Service's division only contains information about licensed child care centres (Toronto Children's Services 2024). The Government of Ontario specifies that unlicensed child care providers can operate with five or fewer children out of their homes (Ontario 2023). This may account for many of the children who are unable to obtain a space in a licensed child care facility as may family members and private sitters. The Ward data used in the paper is from the 2021 Canada Census and more current demographic information would contribute to a more precise analysis. The Census data is also generated from a 25% sample size which may lead to errors or misrepresentations in the data.

Exploring the average cost of child care at each facility could help to provide more insight into equitable access but this information is unavailable. A variable which may skew the data or produce outliers is the multitude of individual neighborhoods with each ward with their

own social and economic considerations (Toronto City Planning 2024). Outliers like Toronto Centre and Scarborough Rouge-Park for example could be influenced by variation in income by neighborhood or higher child care supply based on commuting population and business density. A more robust multiple regression model would be a generative future project for inference investigation and exploration of other variables.

Table 4: Sample of Merged Licensed Child Care Centres in Toronto and Ward Profiles

Ward Name	Average Household Income	Child Care Spaces	Population Aged 0 - 14
Etobicoke North	95200	2094	18500
Etobicoke Centre	146600	3348	17300
Etobicoke-Lakeshore	127200	4937	18460

Total Population	Racialized Population	English Speakng Population	Children Per Space
115120	90130	67360	8.834766
117200	37210	85330	5.167264
139915	48675	105230	3.739113

Appendix

A Additional Data Details

In Table 4 a sample of the merged data set used for the results section of this paper can be seen.

B Model details

B.1 Posterior predictive check

In Figure 11a we implement a posterior predictive check. This shows that the model can be used to simulate data similar to our source data.
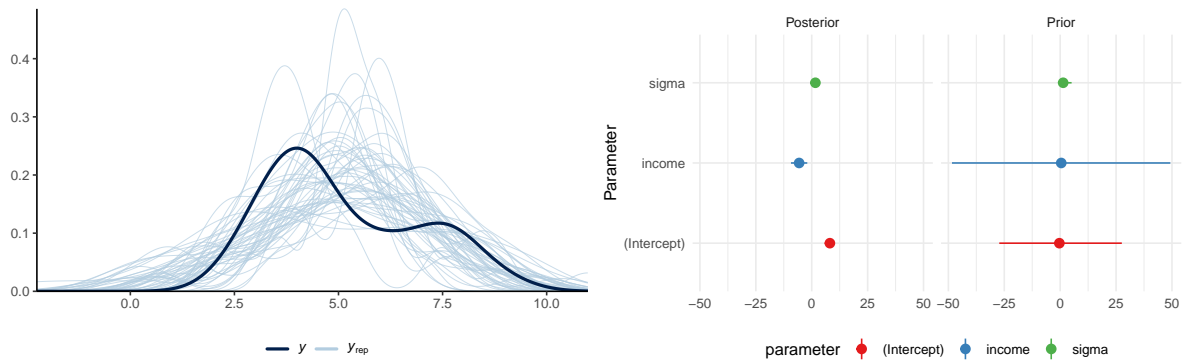
In Figure 11b we compare the posterior with the prior. This shows how much the model's estimates change once the source data is incorporated.

B.2 Diagnostics

Figure 12 displays the 95% credibility interval for the intercept, average income, and standard deviation (sigma)

Figure 13a is a trace plot showing that after checking the model for inconsistencies, the model appears to be working properly.

Figure 13b is a Rhat plot, similarly showing that the model appears to be working properly.

(a) Posterior prediction check

(b) Comparing the posterior with the prior

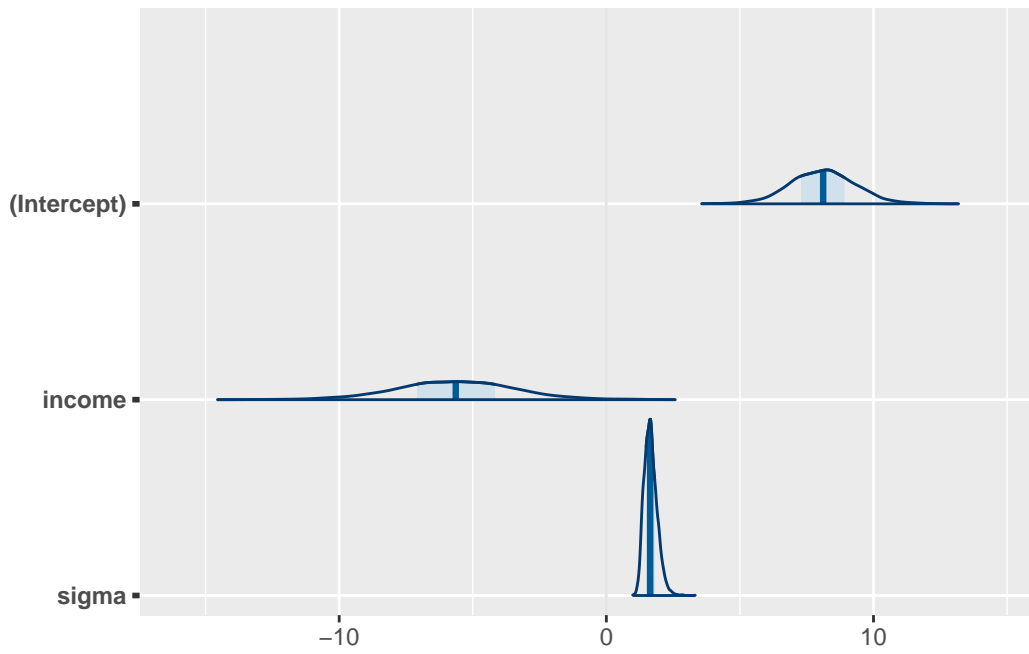Figure 11: Examining how the model fits, and is affected by, the data
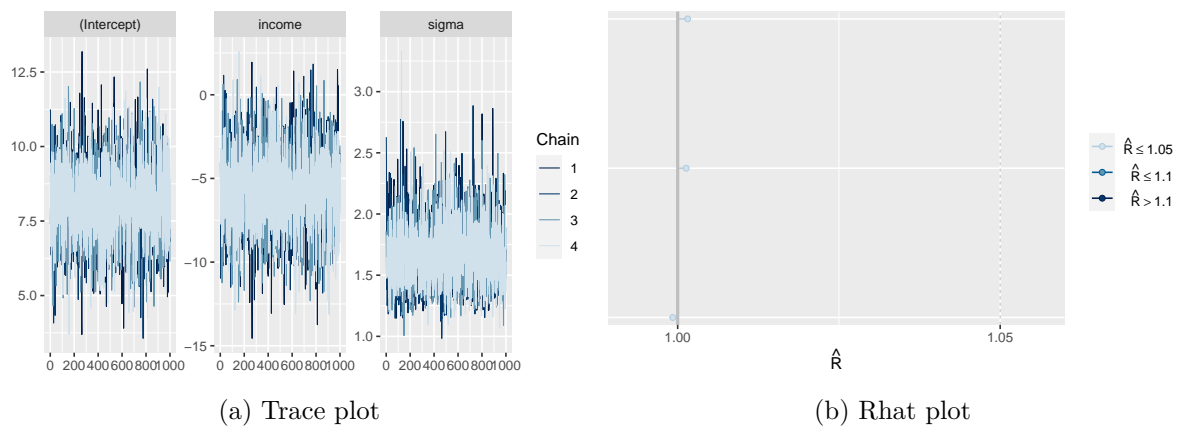

Figure 12: Checking the credibility of the model

(a) Trace plot

(b) Rhat plot

Figure 13: Checking the convergence of the MCMC algorithm

References

Alexander, Rohan. 2023. *Telling Stories with Data.* Chapman; Hall/CRC. https://tellingstorieswithdata.com.

Firke, Sam. 2023. *Janitor: Simple Tools for Examining and Cleaning Dirty Data.* https://CRAN.R-project.org/package=janitor.

Friendly, Martha. 2019. "A Bad Bargain for Us All: Why the Market Doesn't Deliver Child Care That Works for Canadian Children and Families." *Occasional Paper*, no. 31: 1–24. https://childcarecanada.org/documents/research-policy-practice/19/06/bad-bargain-us-all-why-market-doesn't-deliver-child-care.

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

Goodrich, Ben, Jonah Gabry, Imad Ali, and Sam Brilleman. 2022. "Rstanarm: Bayesian Applied Regression Modeling via Stan." https://mc-stan.org/rstanarm/.

Gunaseelan, Vinusha. 2021. "A New Normal for Child Care in Canada: Accessible, Affordable, Universal. Wellesley Institute."https://www.wellesleyinstitute.com/children-youth/a-new-normal-for-child-care-in-canada-affordable-accessible-universal/.

Kahle, David, and Hadley Wickham. 2013. "Ggmap: Spatial Visualization with Ggplot2." *The R Journal* 5 (1): 144–61. https://journal.r-project.org/archive/2013-1/kahle-wickham.pdf.

Maki Park, Jacob Hofstetter, and Ivana Tú Nhi Giang. 2022. "Overlooked but Essential: Language Access in Early Childhood Programs." https://www.migrationpolicy.org/sites/default/files/publications/mpi_ecec-language-access-2022_final.pdf.

Müller, Kirill. 2020. *Here: A Simpler Way to Find Your Files.* https://CRAN.R-project.org/package=here.

Ontario, Government of. 2023. "Child Care Rules in Ontario." https://www.ontario.ca/page/child-care-rules-ontario.

R Core Team. 2023. *R: A Language and Environment for Statistical Computing.* Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Rhijn, Tricia van, Kathryn Underwood, Elaine Frankel, Donna S. Lero, Karen Spalding, Magdalena Janus, Martha Friendly, and Arlene Haché. 2021. "Role of Child Care in Creating Inclusive Communities and Access for All." *Canadian Public Policy* 47 (3): 399–409. https://doi.org/10.3138/cpp.2021-010.

Richard A. Becker, Original S code by, Allan R. Wilks. R version by Ray Brownrigg. Enhancements by Thomas P Minka, and Alex Deckmyn. 2023. *Maps: Draw Geographical Maps.* https://CRAN.R-project.org/package=maps.

Richardson, Neal, Ian Cook, Nic Crane, Dewey Dunnington, Romain François, Jonathan Keane, Dragoș Moldovan-Grünfeld, Jeroen Ooms, Jacob Wujciak-Jens, and Apache Arrow. 2023. *Arrow: Integration to 'Apache' 'Arrow'.* https://CRAN.R-project.org/package=arrow.

Tome, Samantha. 2021. "Racialization of Poverty." https://horizonsforyouth.org/blog/racializationofpoverty#:~:text=Racial%20disparities%20therefore%20occur%20in,the%

20%27racialization%20of%20poverty%27.

Toronto Children's Services. 2024. "Licensed Child Care Centres." https://open.toronto.ca/dataset/licensed-child-care-centres/.

Toronto, City of. 2017. "Torontos Licensed Child Care Growth Strategy." https://www.toronto.ca/wp-content/uploads/2022/11/9791-Torontos-Licensed-Child-Care-Growth-Strategy.pdf.

Toronto City Planning. 2024. "Ward Profiles (25-Ward Model)." https://open.toronto.ca/dataset/ward-profiles-25-ward-model/.

Underwood, Kathryn, and Elaine B Frankel. 2012. "The Developmental Systems Approach to Early Intervention in Canada." *Infants & Young Children* 25 (4): 286–96. https://doi.org/10.1097/IYC.0b013e3182673dfc.

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, Kirill Müller, and Davis Vaughan. 2023. *Dplyr: A Grammar of Data Manipulation.* https://CRAN.R-project.org/package=dplyr.

Xie, Yihui. 2023. *Knitr: A General-Purpose Package for Dynamic Report Generation in r.* https://yihui.org/knitr/.