Introduction

Plastics have been recognized as a substantial issue affecting the marine environment since the 1970s (Colton, Burns, and Knapp 1974), with their pervasive presence causing significant harm to ecosystems and wildlife. Despite growing awareness, many individuals remain uninformed about the severity of this problem, leading to continued dependence on single-use plastic products, which exacerbate pollution and its detrimental effects on our planet. The overuse of plastics contributes to issues such as the accumulation of microplastics, the entanglement and ingestion of plastic debris by marine life, and the leaching of hazardous chemicals into the environment, all of which have lasting consequences for biodiversity and human health.

Given the urgency of addressing the plastic pollution crisis, it is essential to assess public opinions on reducing single-use plastic products and understand how demographic factors may influence these perspectives. To accomplish this, Solid Waste Management Services conducted an online survey to collect input from a diverse range of people. The information gathered will be crucial in informing policy decisions and shaping public education initiatives aimed at curbing plastic consumption.

In this report, we employ a logistic regression model to elucidate the relationship between demographic factors and an individual's stance on a by-request/ask-first bylaw, which aims to reduce single-use eating utensil consumption in the City of Toronto. By analyzing these factors, we can better understand public receptiveness to such a bylaw and develop targeted strategies to raise awareness and foster behavioral changes that ultimately contribute to mitigating the adverse effects of plastic pollution on our environment.

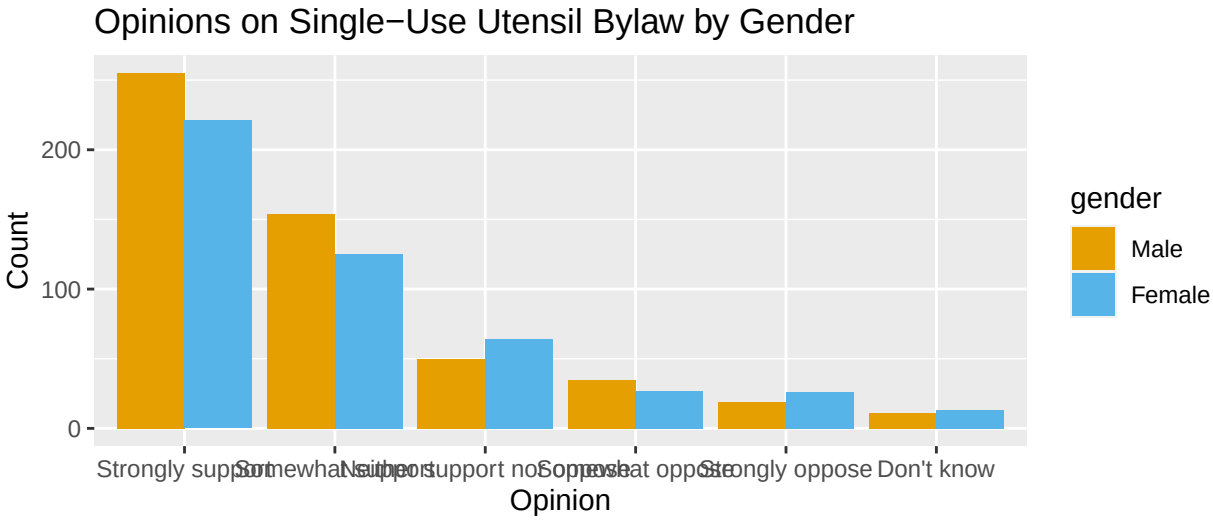
We obtained the dataset from OpenDataToronto (Gelfand 2022). This analysis will be performed in R (R Core Team 2022), using the tidyverse Wickham and Averick (2021), dplyr (Wickham et al. 2022), tidyr (Wickham 2021), haven (Wickham, Miller, and Smith 2022), readr (Wickham et al. 2021), knitr (Xie 2021). All tables in the report are generated by , and kableExtra (Zhu 2021). All figures in the report are generated using ggplot2 (Wickham 2016).And we used modelsummary (Larmarange 2021), nnet (Ripley and Venables 2021) for the model analyzing.

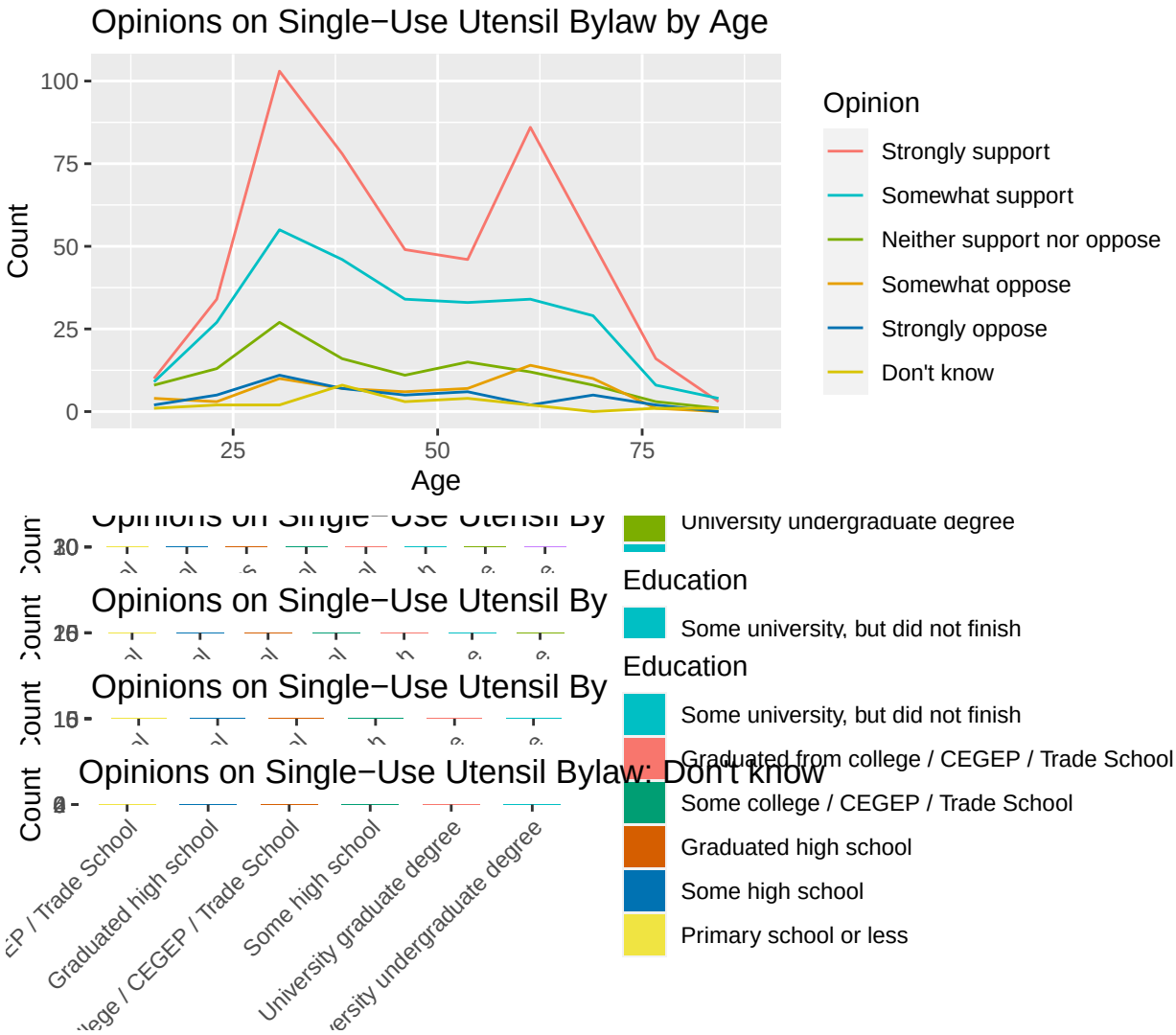
Data

Data Source and Collection

Data Cleaning

Data Visualization





Model

Our final logistic regression model is as follows:

$$log(\frac{\hat{p}_i}{\hat{p}_{ref}}) = \beta_{i0} + \beta_{i1}x_{gender} + \beta_{i2}x_{age} + \beta_{i3}x_{education} + \beta_{i4}x_{household_income} + \beta_{i5}x_{location}$$

The multinomial logistic regression model estimates the probability of a person's opinion on a by-request/ask-first bylaw aimed at reducing single-use eating utensil consumption in the City of Toronto. The possible opinions include: Strongly Support, Somewhat Support, Neither Support nor Oppose, Somewhat Oppose, Strongly Oppose, and Don't Know. The model takes into account the following 5 predictor variables:

1) Age is a continuous numeric variable representing the individual's age.
2) Gender is a binary variable (female/male) indicating a person's gender.
3) Education is a categorical variable representing the highest level of education a respondent had at the time of taking the survey. Categories include Graduated from college/CEGEP/Trade School, Graduated high school, Primary school or less, Some college/CEGEP/Trade School, Some high school, Some university but did not finish, University graduate degree, and University undergraduate degree.

Table 1: Number and Proportion of people opinion on a by-request / ask first bylaw to reduce the use of single-use eating utensils in the City of Toronto

single_use_utensil_bylaw_opinion	count	percentage
Don't know	24	2.4
Neither support nor oppose	114	11.4
Somewhat oppose	62	6.2
Somewhat support	279	27.9
Strongly oppose	45	4.5
Strongly support	476	47.6

Table 2: Model Evaluation Metrics: Residual Deviance and Akaike Information Criterion (AIC)

Residual.Deviance	2455.234
AIC	2855.234

4) Household income is a categorical variable indicating the respondent's household income range. Categories encompass different income ranges and a "Prefer not to answer" option.

5) Location is a categorical variable representing the respondent's location within the City of Toronto. Categories include Toronto, East York, Etobicoke, North York, Scarborough, and York.

Results

Table 1 presented summarizes the choices made by respondents regarding single-use takeaway items. The results indicate that 47.6% of respondents showed strong support for a by-request/ask-first bylaw to reduce the use of single-use eating utensils in the City of Toronto. Additionally, 27.9% of respondents somewhat supported the bylaw, while 11.4% of them neither supported nor opposed it. However, 6.2% of respondents somewhat opposed the bylaw, and 4.5% strongly opposed it. These findings suggest that while there is a significant level of support for the bylaw, there are still some concerns or reservations that need to be addressed.

Overall, the analysis suggests that there is mixed support for the single-use utensil bylaw, with a slight majority of respondents showing strong support for it. It is interesting to note that a significant percentage of respondents are still on the fence, as they neither support nor oppose the bylaw. This could indicate a lack of awareness or understanding of the issues surrounding single-use utensils and their impact on the environment.

Table 2 shows that the logistic regression model has a statistically significant fit, as demonstrated by the significant difference between the null and residual deviance values. This suggests that the model has captured important information about the relationship between the predictors and the response variable. Furthermore, the AIC value of 2855.234 indicates that the model has some degree of complexity, but still performs reasonably well in terms of goodness-of-fit. These findings suggest that the model is a viable predictor of individual opinions towards a single-use utensil bylaw, based on their age, gender, education, household income, and location.

Reference

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