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1 Introduction

According to Homelessness (2012), homeless is defined as "the situation of an individual, family or community without stable, safe, permanent, appropriate housing, or the immediate

*Code and data are available at: LINK.

prospect, means and ability of acquiring it". It is estimated that about 23,500 Canadian people experienced every type of Homeless every year Gaetz, Gulliver, and Richter (2014). On SEP 12, 2024, there are still more than 9500 people staying in shelters in the city of Toronto Toronto (2024b). To reduce homelessness, Toronto city government published the supportive houseing development plan, which aims to build more affordable housings for the homeless people Toronto (2024a). A recent two-year plan starting 2022 aiming to build 4,000 more affordable homes as well as supportive houseings by the end of 2024.

In this paper, we studied the demographical shift of total homeless populations in the city of Toronto, and find that the underlyin demographics of homesless populations changed significantly. This would indicate that the tradition plan which mainly focus on buliding houses would no longer solve new homeless problem.

In the following sections, we will first introduce our sourse of data as well as potential cleaning procedures. Then, we will show our results of the demographic change. Finally, we would indicate the reason of our claim base on the analysis of the result and give some suggestions that would help better reduce homelessness in the city.

2 Data

2.1 Raw data

The data used in here is downloaded from opendattoronto (Gelfand 2022). Specifically, we used the Shelter System Flow Data released by Toronto government (City of Toronto 2024).The data loading, cleaning and analysis process is done by R (R Core Team 2023), togehter with packges include tidyverse (Wickham et al. 2019)… This data measures number of people requiring for shelter inside city of Toronto from Jan-2018 till Jun-2024 by each month (actively_homeless). Also, this dataset provides division of age group, refugee status, gender, as well as chronic status to provide further detailed study into the change of composition of homeless people over time. While there are several other dataset including daily shelter occupacancy in opendatatoronto, they do not have the subdivision information such as age or refugee status as this one.

2.2 Cleaned Data

We dropeed the only missing row corresponding to july-2024. We selected our columns of interest, namely, gender: ('male', 'female', 'transgender_non_binary_or_two_spirit'), total number of homeless people every month ('actively_homeless'), as well as refugee and chronic status in polulation column. In addition, we grouped age group by whether they are suitable for work (age under 24 for early career stage, age25-44 for working age and age above 45 for pre-retirement and retirement age). Finally, we replace the month data by averaged quatered

data for better analysis and visualization of a prelonged time period. The cleaned data could be seen in Table 1.

Table 1: cleaned dataset

Time (Quaters)	Subdivision	Total people	Female	Male	Other Gender	Early Career Stage	Working Age	Pre-retire and Retire
2018Q1	All Population	8232	3001	5148	83	2413	3029	2791
2018Q1	Chronic	2562	874	1660	29	579	717	1267
2018Q1	Refugees	2575	1261	1300	14	1248	1005	322
2018Q2	All Population	9457	3553	5809	95	2959	3557	2941
2018Q2	Chronic	2692	927	1730	35	629	767	1295

3 Results

3.1 Overall trend

First, we plot the bar graph of over all trend of homeless people over the pass of the time. In Figure 1, we observe an slightly increase of total number of homeless people from first quarter 2018 to second quarter of 2024. There is a decrease of homeless population in late 2020-early 2021, but increased quickly after that.

3.2 Gender trend

Next, we investigate the trend of gender proportion. We plot the proportion of male, female, and Other genders against time in Figure 2. Even thought there is some flatuations of the proportion of these three gender types, the overall trend is quite stable. The male proportion is around 60% while female proportion around 40% and others around 1%.

3.3 Chronic trend

Figure 3 shows the trend of the proportion of chronic population among all of homeless people over the quarters of a year. Here, according to Echenberg and Munn-Rivard (2020), chronic homeless refers to, "People who meet one of the two following criteria, as per the federal definition of chronic homelessness. The person has recorded a minimum of 180 overnight stay in the past year (365 days); or the person has recurrent overnight stays over the past three

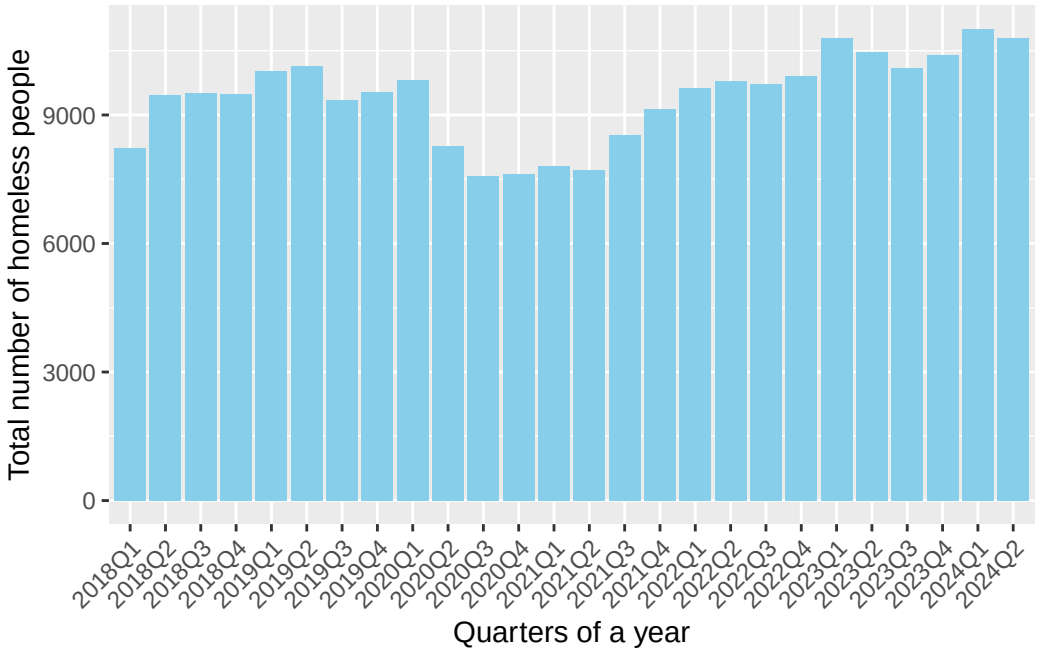

Figure 1: Homeless Population Over Quarters

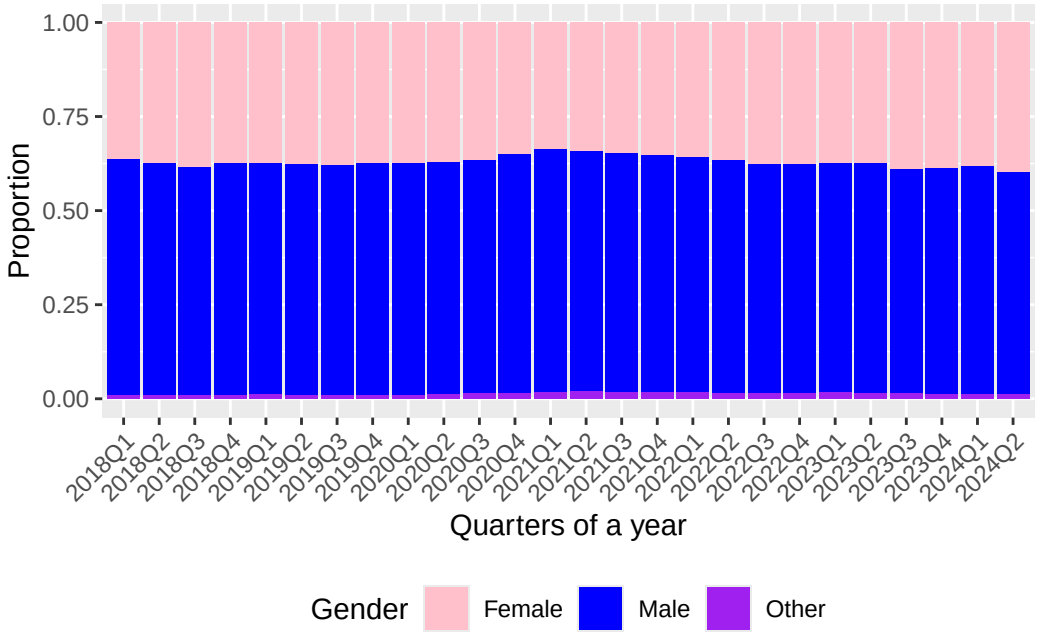

Figure 2: Proportion of Active Homeless Population by Gender Over Quarters

years with a cumulative duration of at least 546 nights." We can see form the graph that the proportion in chronic homeless increased a lot, from less than 35% in first quarter of 2018 to more than 65% in the second quarter of 2024.

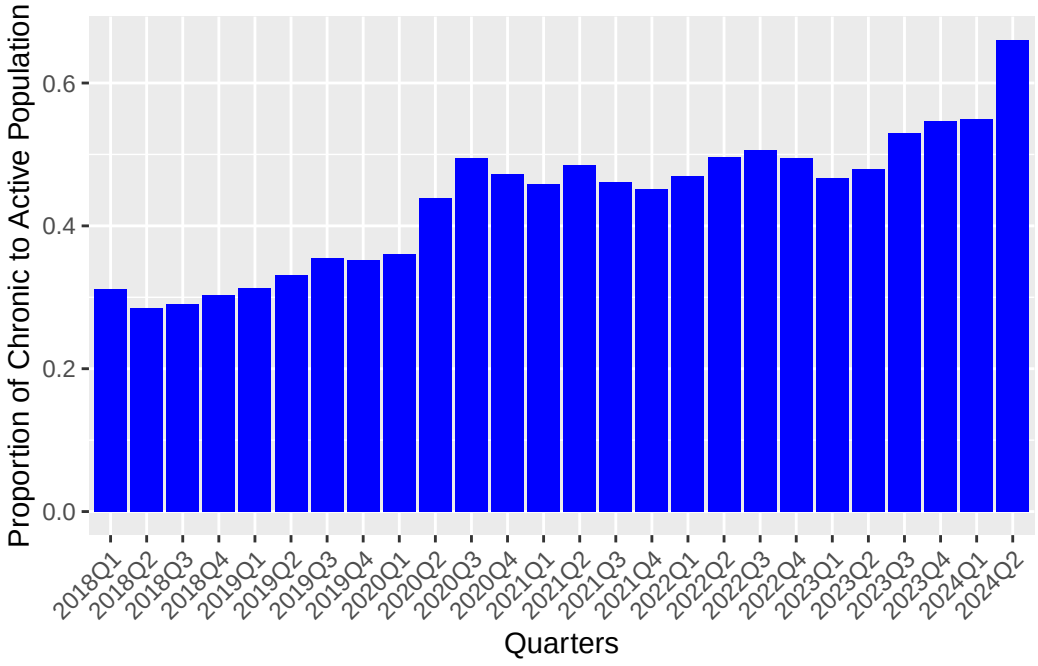

Figure 3: Proportion of Chronic population to Active Population by Quarter

3.4 Age trend

Figure 4 shows the trend of the proportion of different working age statuses among the actively homeless population over the quarters of a year. Here, the working age statuses are categorized into three groups: Early Career Stage, Working Age, and Pre-Retirement and Retirement Age.Even thought the trend is not huge, We can see from the graph that the proportion of the Early Career Stage population as well as pre-retire and retire have decreased (from 29% and 33% separately in first quarter of 2018 to 25% and 28% in second quarter in 2024). On the other hand, working age proportion increased to 47% in 2024Q2 from 37% in 2018Q1.

3.5 Refugee trend

Figure 5 shows the trend of the proportion of refugees among the actively homeless population over the quarters of a year. We observe a signifiacant decrease of the trend accompanyed by even more signifcant increase.

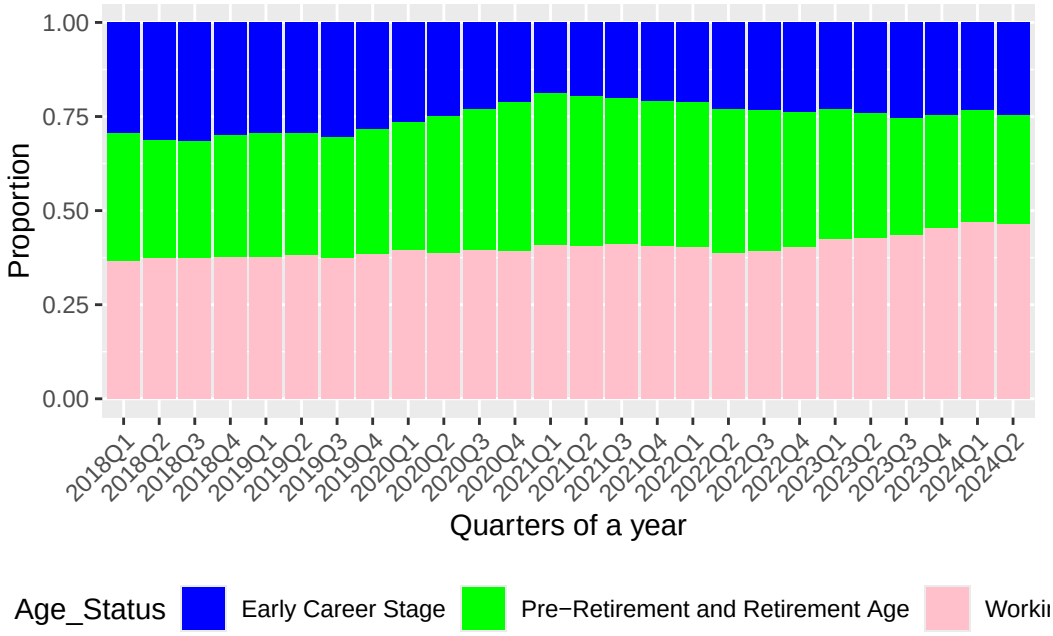

Figure 4: Proportion of working age population to Active Population by Quarter

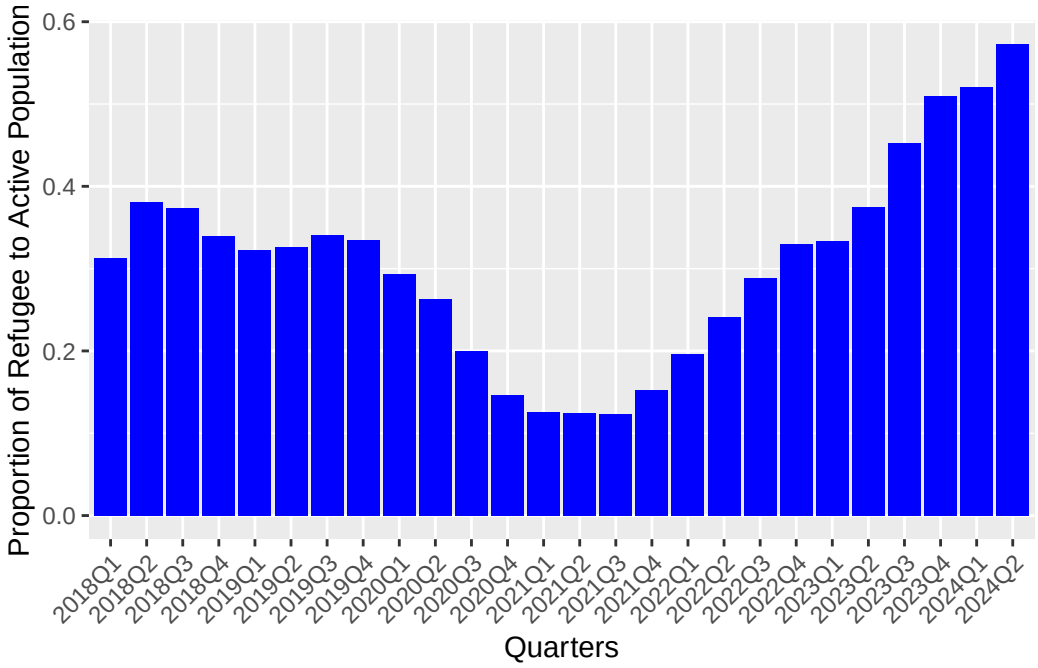

Figure 5: Proportion of Chronic population to Active Population by Quarter

4 Discussion

Based on the analysis of the results section, we observe that, even though the overall population of homeless people did not incur significant variation in the past six years, its demographics changed a lot. Specifically, the proportion of refugees, chronic people as well as working-aged people. In the past, the City of Toronto has devoted its efforts to reducing the number of homeless people, especially through projects of building affordable houses (**torontosol?**). However, our study shows that with the change of demographics, the city government should also give its focus on other strategies for reducing homelessness.

First, as the result section points out, the proportion of chronically homeless people nearly doubled in the past six years. Despite its nature of long-lasting homeless status, studies have also shown that chronic homelessness is closely associated with chronic illness or mental problems Echenberg and Munn-Rivard (2020). As pointed out by another study, the average income of people experiencing mental illness and other types of disorders is significantly lower than that of normal people Sareen et al. (2011). Thus, it is very hard for those people who have already experienced mental and physical illness to escape homelessness. In addition, homeless people would face more severe health problems due to lack of adequate food, discrimination, barriers to health care, etc (Sleet and Francescutti 2021). A combination of these would become an obvious negative cycle: illness leads to a decrease in income, which leads to becoming homeless, which would further depend on illness. What the city government can do, on the other hand, is to increase the public health care system, especially focused on low-income and homeless people. In fact, merely building houses only increased the proportion of chronically homeless people and its aim is to reduce (Auditor General of Canada 2022).

Second, due to increased global conflict in Eastern Europe and the Middle East, the number of refugees entering Toronto has increased (**cbc23.On?**) the other hand, the Toronto government has not been prepared to support such a huge increase of refugees as the portion of refugees in homeless people roared from less than 20% in the first three quarters of 2021 to nearly 60% at second quarter 2024. We observe an emergency for the government to increase its speed of helping these newly entered refugees and give them a job and a secure place to live.

Finally, we observe an increase in the proportion of people of working age. This indicates the need for the government to create more jobs for the people who need them to make a living, like people who are experiencing mental health problems or physical disabilities.

4.1 Weaknesses and next steps

Even though our data is the most uptodate and accurate date aviliable for homeless population on opendatatoronto, it might have potential bias towards estimation the ture homeless population in city of Toronto. One clear bias is that people would not stay in the shelter everyday and they would enter and exit the shelter frequently (City of Toronto 2024). Correctly measure the ture popution demegraphic is a very diffcult on-going problem in Canada, but the shelter

flow data would provide a proper estimate of our interest (Dionne et al. 2023). To understand the probelms better and develop more strategies the next steps would be to research stratgies that could reach out and survey the population that is diffcult to contact such as unsheltered homeless population. Also, a new homeless reduction plan should to develop and adopt to suit the ongoing change of demegraphic of homeless population.

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