

# Warning! Bicycle Thefts in Toronto!

Bingrui Wu and Danny Xu

November 18, 2022

According to the City of Toronto Cycling Study, which was conducted by Nanos for the city in July 2019, the percentage of Toronto residents who cycle to travel or exercise has increased from 48% to 70% over the past 20 years. On the other hand, there was also an increasing number of cyclists who reported bike thefts.

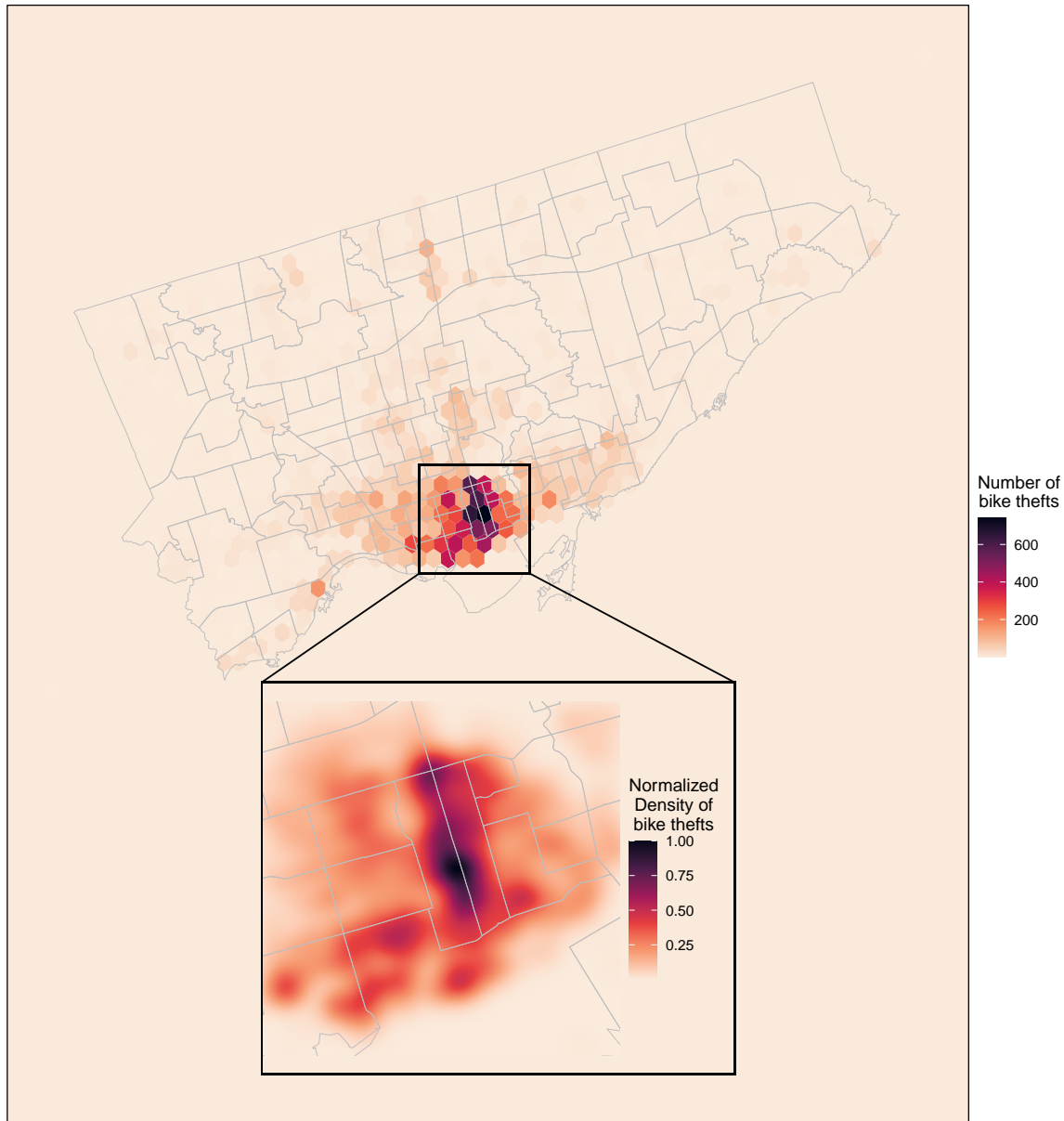
The purpose of this data-driven article is to reveal some patterns of bike thefts in the city, to give some advice, and hence to help the general cyclist community in Toronto to avoid these situations.

The analysis and visualizations are based on data of reported bike theft cases from the Toronto Police Service Public Safety Data Portal.

Imagine you are a cyclist in Toronto, one of your concerns might be: if I am going to Tim Hortons and grab a cup of coffee, will it be safe to lock my bike and leave it on the street for a while?

Well, it really depends on which district.

## Where are bicycle thefts most common in Toronto?



This visualization illustrates the number of bike theft incidents that happened in each neighborhood from 2014 to 2019. There is a noticeable polarization in the graph: the number of bike theft incidents in the southern parts of division 14 and division 52 are significantly higher, exceeding 2,000, while the number of bike theft incidents in other parts of Toronto appear to be much lower.

By further analysis, we notice that the distribution of bike theft incidents can be approximately divided into three different levels: the highest-level, which is at the region of Waterfront Communities-The Island; the middle-level, which are mainly neighborhoods that surround Waterfront Communities-The Island, including Kensington-Chinatown, University, Bay Street Corridor, Niagara, Annex, and South Riverdale; rest of the parts of Toronto go to the lowest level.

It is worth mentioning that Waterfront Communities-The Island, which is the neighborhood of highest-level, account for 10.5% of the bike theft incidents that happened in Toronto, while the middle-level

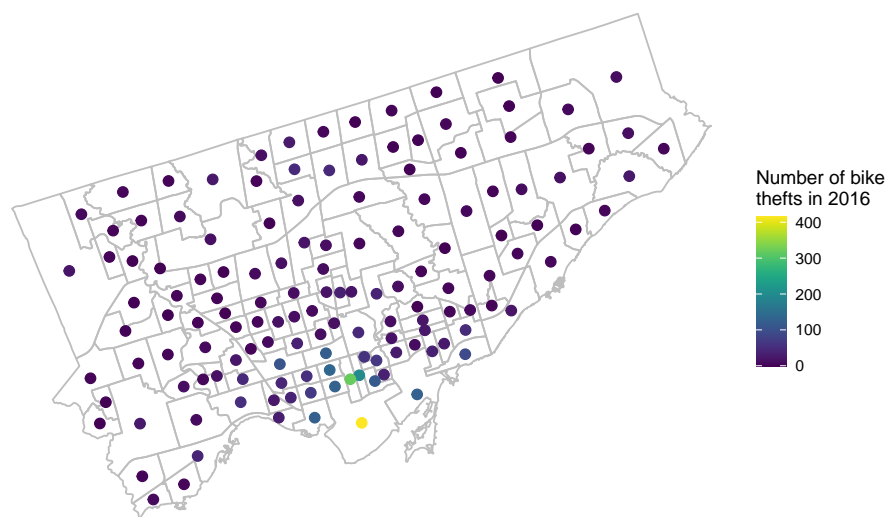
neighborhoods contribute 26.1%. Therefore, for the safety of your property, one really needs to think twice before locking up your wheel in these regions, especially at Waterfront Communities-The Island.

The result is intuitive. If we look at the population density map of Toronto, we will find that the southern part of Toronto is more populated, which indicates that in these regions, there are more cyclists, and therefore more bike thefts happen.

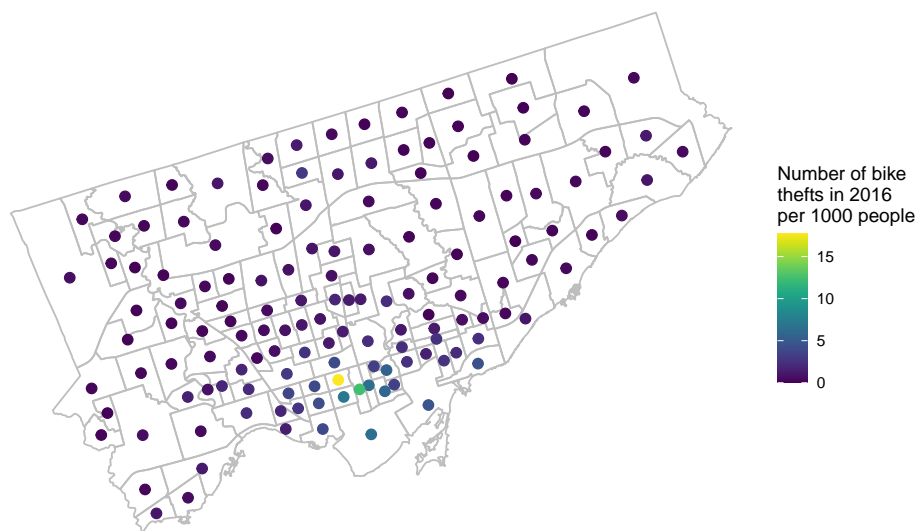
What if we adjust the data according to the population of each district? Would the result show that in some neighborhoods there are higher risks that your bikes might be stolen?

## How do bicycle thefts change if we account for population?

Before neighbourhood population adjustment



After neighbourhood population adjustment



Before taking the population factor into consideration, we have Waterfront Communities-The Island as the neighborhood with the highest bike thefts frequency. However, once we account for the population,

we can see that University has the highest rate of 9.3%, indicating there are 17.75 cases reported to police per 1,000 residents. This is bad news for U of T students!

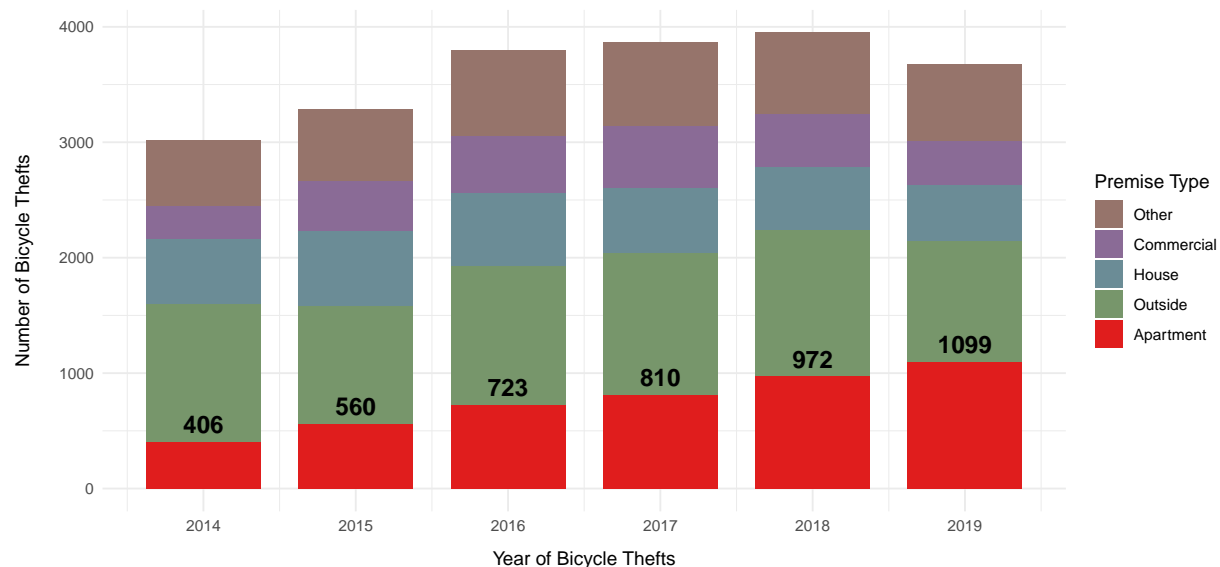
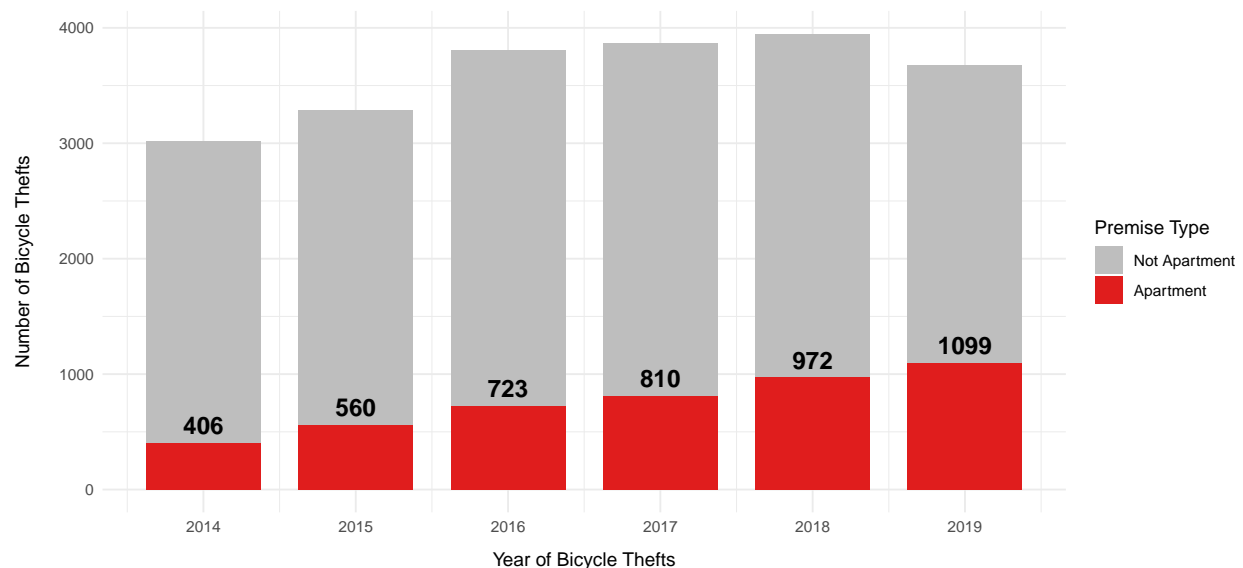
The result makes sense. It is not hard to guess that the University region has a large overlap with University of Toronto St. George campus, and hence the region has less residents but a great number of students who use bikes to commute.

The region ranked in second place is Bay Street Corridor. There is an interesting detail: if we make Dundas the middle line and divide Bay Street Corridor into two parts, we can notice that the rate of bike theft incidents of the south part are almost triple the rate of the north part. This is because the south part, which mainly consists of Nathan Phillips Square, Toronto City Hall, Eaton Center, and the financial district, is much less populated than the north part. As a matter of fact, the two parts share a similar number of theft occurrences, but the south part only has one third of the other's population.

Other regions in downtown Toronto still have a higher rate of bike theft occurrences, but the difference between these regions and others becomes more subtle compared to what we got in the first section, suggesting that except for the University and Bay Street Corridor districts, the possibility difference of bike thefts among each region might be less than expected.

Now we know it is better to think twice before locking our bikes on street sides in the financial district or near the university. But does the risk also change by building types? For example, is it more likely for bike theft to happen in front of condos than houses?

## What kinds of bike thefts are on the rise?



From the visualization, bike thefts are the most likely to happen outside in public areas and they are least likely to happen near commercial areas. The amount of cases that happened outside account for approximately one third of the incidents each year.

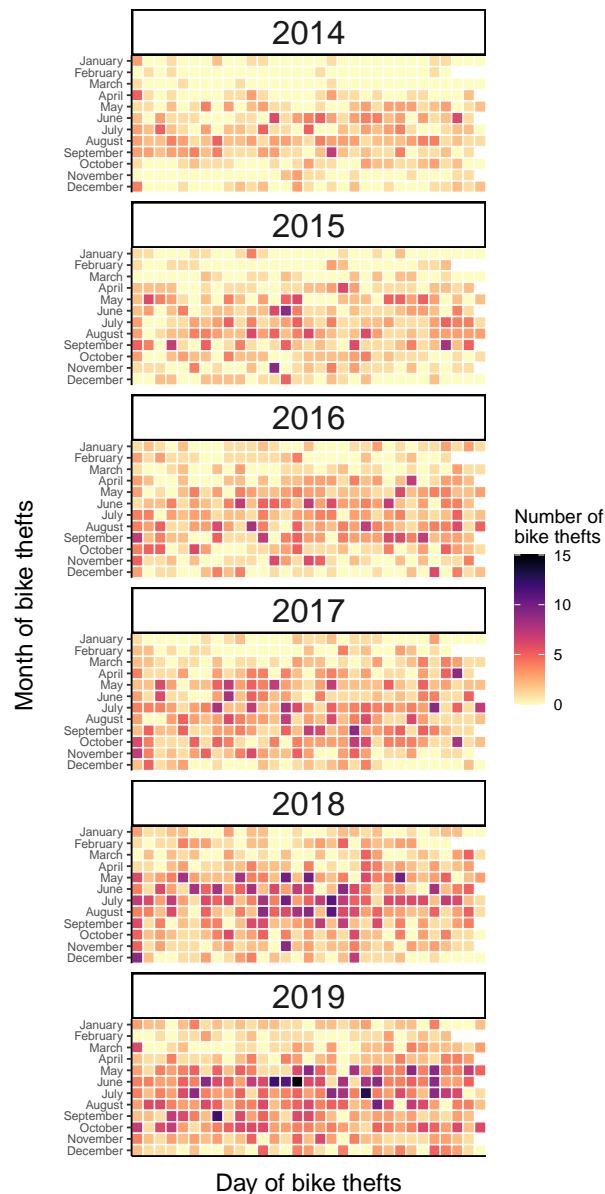
It is worth mentioning that only the number of bike theft incidents that happened outside apartments is on a steady rising trend, while the number of thefts that happened elsewhere appear to be random in time. In 2014, the number of thefts that occurred near apartments was less than half of the number of bikes that were stolen outside, and in 2019, there were more bikes stolen near apartments than outside. The result indicates that for residents living in apartments, it is not as safe as before to leave your bikes unattended.

The amount of bike theft cases that happened near houses experienced an increase beginning in 2014, reaching its peak in 2015, then started to decrease. Cases of premise type 'other' have a similar tendency:

the number increased from 2014 to 2016 and then began to fall.

From our analysis, apartment residents who cycle should be more aware of bike thefts. To give them further advice, the next question we are going to focus on is apartment bike thefts and the investigation of how it changes over time.

## Are apartment bike thefts changing over time?



We first notice that this visualization is consistent with the one of the previous section: as years have gone by, the total number of bike theft incidents that happened near apartments each year has increased.

It is also obvious that the number of bike thefts varied from month to month. In each year, the number of bike theft incidents rose greatly in May, and began to fall in September or October, which suggests bikes were more frequently stolen in the summer period.

Another less intuitive finding is that thefts also became more common in autumn and in the beginning of winter over the years. In 2014, there was a noticeable gap between September and October. However in later years, the presence of the gap weakened, and almost vanished in 2019. In contrast, in 2019 the number of bike thefts in September, October, and November were not significantly different from each other. This tendency indicates there is a more subtle decay of bike theft incidents in autumn and the beginning of winter.

For days within the same month, the frequency did not appear to be equivalent. Compared with the beginning and the end of a month, there were more bike thefts happening in the middle of the month. This is particularly evident in 2018, in which dark blocks clustered together in the middle of the graph.

## Conclusion and Actionable Insights

There are some limitations from the conclusions we can draw from the dataset. There is a lack of information about the distribution of ownership of bikes in Toronto, which prevents us from drawing conclusions about the frequency of thefts of different bike types as well as rates of thefts of differently coloured bikes. In addition, the census data used for population corrected rates of bike thefts is only for the year 2016, which prevents crucial analysis over time. We also lack data about times when people use their bikes, which prevents analysis of times of day where thefts are most likely to occur.

According to our analysis, there are more bike theft incidents that have happened in downtown Toronto, but if we account for population, the frequencies are generally higher in downtown areas, but there are no remarkable differences between neighborhoods except for University and Bay Street Corridor. These two neighborhoods have a notably higher frequency of bike thefts after we adjusted for population. The number of bike theft incidents increases near apartments. Analysis also showed that near apartments, bike thefts are more likely to occur in the summer period and in the middle of a month.

Hence our advice for cyclists in Toronto are:

1. Avoid locking your bike on street sides in downtown, especially in University and Bay Street Corridor if possible.
2. Be extra alert if you live in an apartment or often leave your bike near apartments, these places have a growing concern about bike thefts.
3. For apartment residents, maybe you have already realized that the chance of bike thefts are greater in the summer period, but you also need to pay more attention in autumn and in the beginning of winter now. Moreover, the likelihood also differs even in the same month, and a cyclist should be more careful when it is the middle of a month.

## References

Population density. Census Mapper. Retrieved November 17, 2022, from <https://censusmapper.ca/>

Nanos. (2019, July). City of Toronto Cycling Study. Retrieved from <https://www.toronto.ca/wp-content/uploads/2021/04/8f76-2019-Cycling-Public-Option-Survey-City-of-Toronto-Cycling.pdf>

Robinson, M., & Davis, W. (2016, April 25). Bike theft: Toronto's Worst Streets to lock up your wheels. thestar.com. Retrieved November 17, 2022, from <https://www.thestar.com/news/gta/transportation/2016/04/25/bike-theft-here-are-the-worst-streets-for-locking-up-your-bike-in-toronto.html>