

# Premistype Population Time

## Allocation of Police Resource

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# Introduction

- The number of occurrences of car theft is proportional to the population.
- The most popular place to have burglary is at outside.
- The denser the district, the more likely to have burglary except at apartment.
- The auto theft rate is a different between weekdays and weekend.
- Use confidence interval, regression model and hypothesis test to verify those findings.
- Identify trends which the police can use to prevent auto theft in Toronto in the future.
- Strengthen police force during weekdays in outside with high

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# Objectives

- Do the number of auto-theft occurrences is proportional to the population?
- Where are the crime occurrences most likely to happen? Outside? Apartment? House or commercial?
- Is there an association between the population and the location of burglary?
- When is the burglary most likely to happen?
- How can we allocate our police resources to help provide a better living environment?

# Data Summary

- “type” : store the premistype of each case in auto-theft
- “Premise\_type”: a new data frame to find the confidence interval for the 4 different locations of auto-theft rate
- “occ\_dayOfWeek”: store the variables of occurrences of auto theft in weekend and weekdays for Outside.
- “difference\_occurrence”: test statistics for the difference between auto theft rate in weekdays and in weekends.
- “hood\_and\_type”: a new data frame contains Hood\_ID and premistype in 2016 from auto\_thefts
- “num”: number of theft occurrences in each neighbourhood

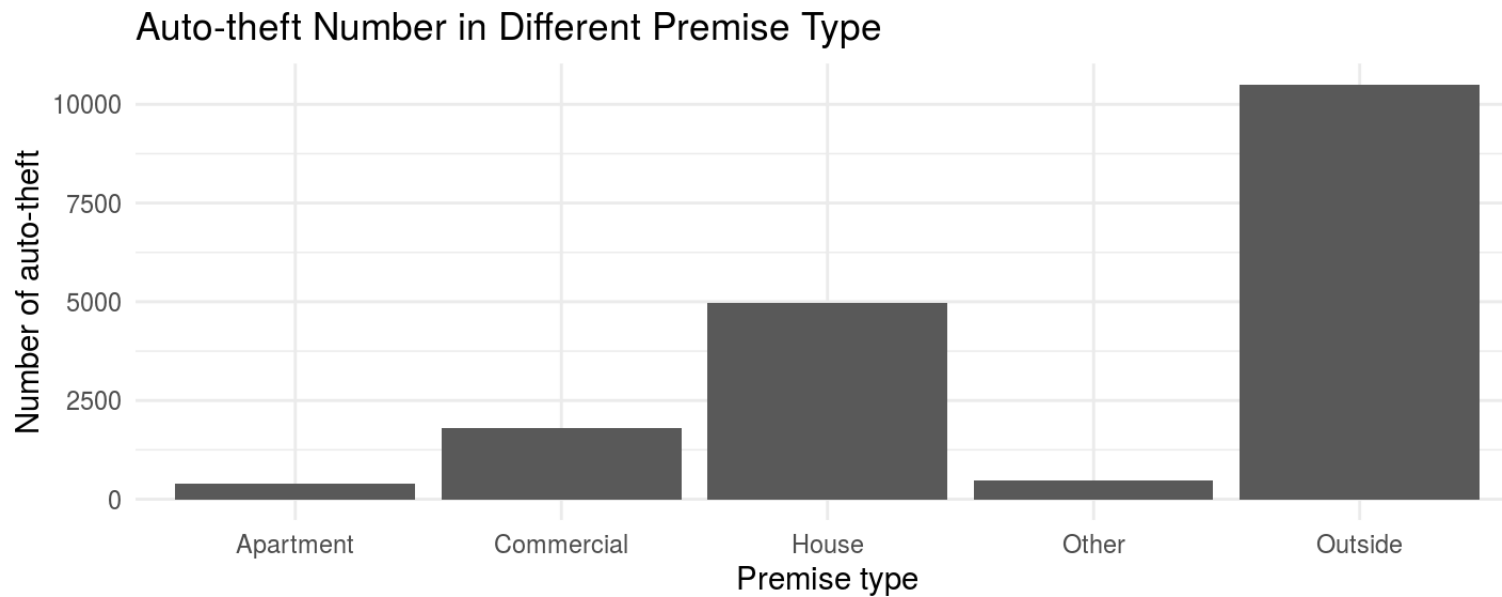
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# Data Summary

- “num\_of\_occur\_outside”: number of theft occurrences in outside
- “num\_of\_occur\_apartment”: number of theft occurrences in apartment
- “num\_of\_occur\_house”: number of theft occurrences in house
- “num\_of\_occur\_commercial”: number of theft occurrences in commercial
- “weekend”: theft occurrences happend in weekend
- “weekday”: theft occurrences happend in weekday
- “weekendpro”: probability of theft occurrences happend in weekend
- “weekdaypro”: probability of theft occurrences happend in weekday

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# Premise Type



## Statistical Method

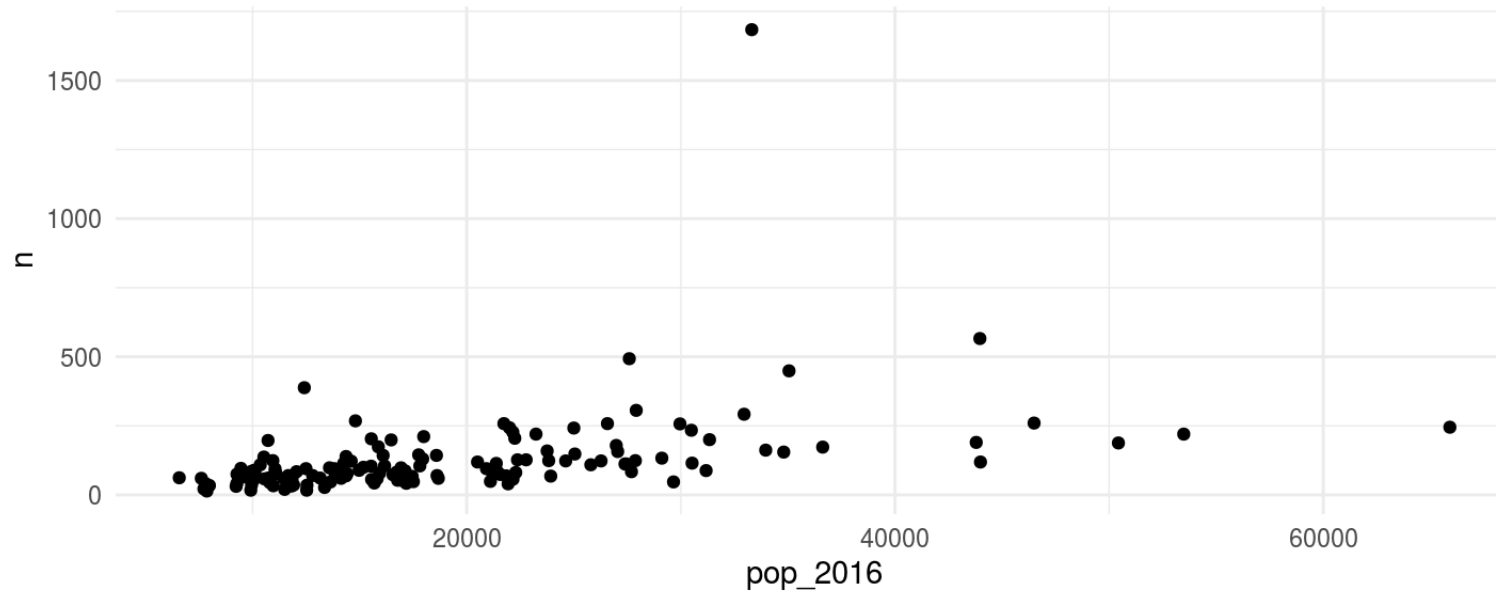
- Create a new variable called "type" : store the premistype of each case in auto-theft
- Using bar graph since it is categorical variable

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# Population

## Result

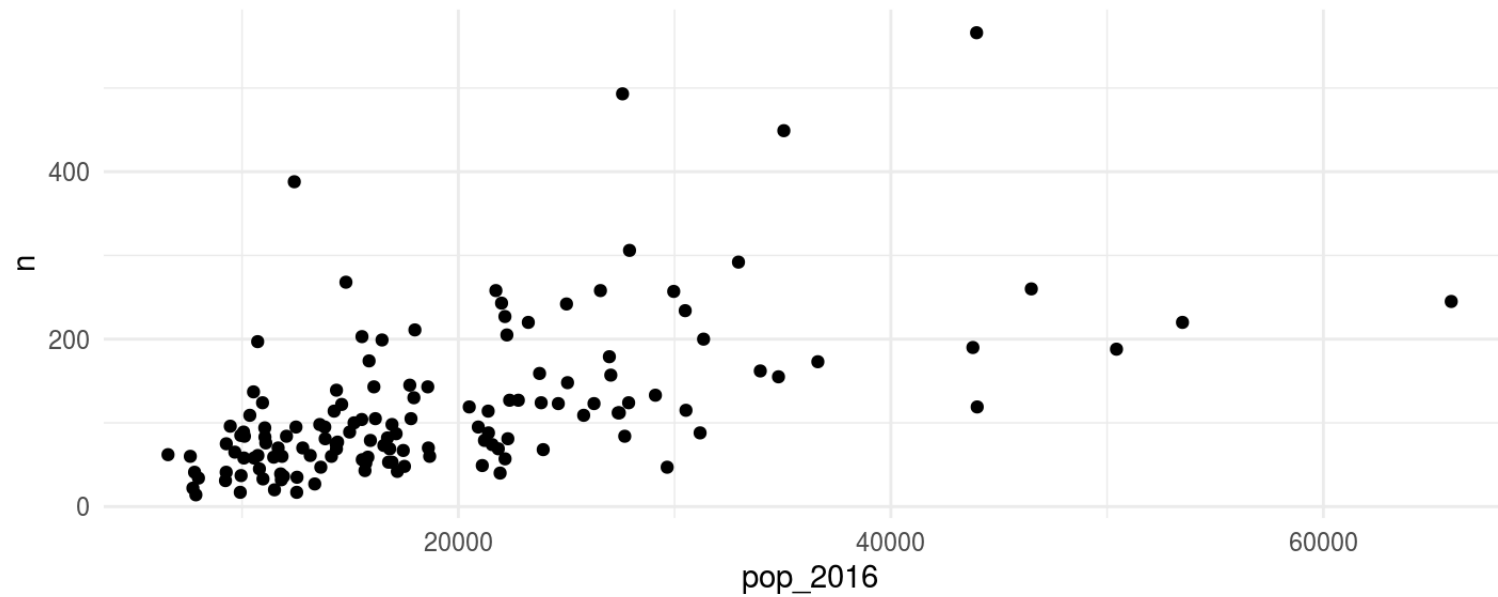
### Population VS Count



An extreme data -> **OUTLIER** To see a clearer trend

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# REMOVE IT



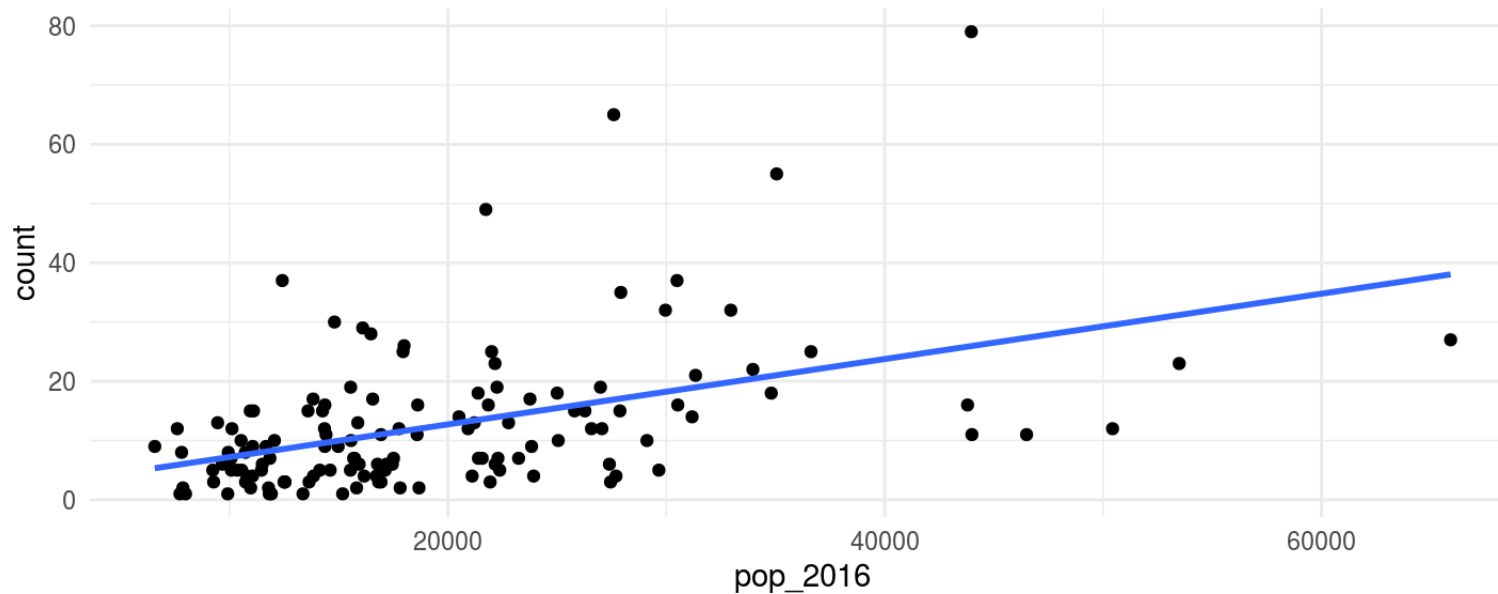
- Positive, linear, relatively strong relationship



# Outside & Population

## Result

##		Estimate	Std. Error	t value	Pr(> t )
##	(Intercept)	-0.8156639685	3.8974380306	-0.2092821	8.345459e-01
##	pop_2016	0.0007567892	0.0001765716	4.2860189	3.450859e-05



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## Statistic Method

- Create a new data frame: "hood\_and\_type": contains Hood\_ID and premisetype in 2016 from auto\_thefts
- In auto\_thefts, choose all the data in 2016 including Hood\_ID and premisetype (ignore the outlier)
- Create another data frame: "hood": contains Hood\_ID and population in 2016 from neighbourhood\_profiles\_2016
- select occurrences happened in outside
- count the number of occurrences of theft in different neighbourhood

## Conclusion

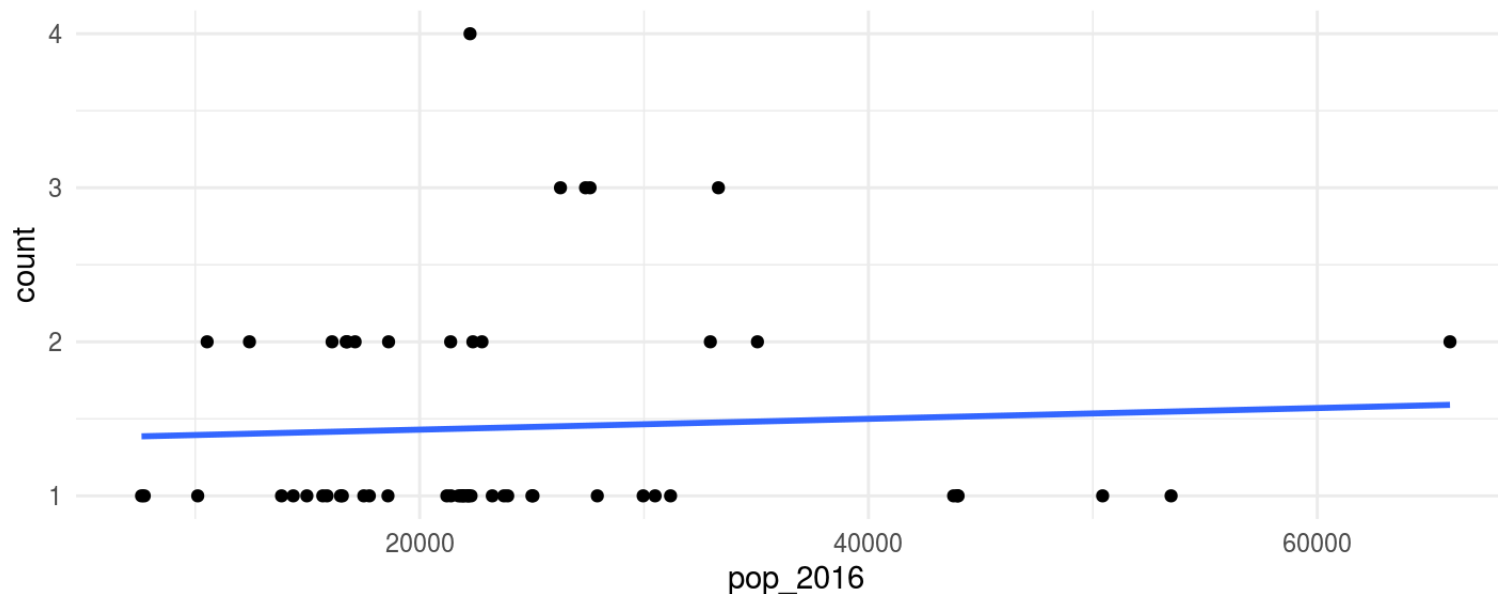
- p-value for the null hypothesis (there is no relationship) is 0.0000345 => reject!

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# Apartment & Population

## Result

##	Estimate	Std. Error	t value	Pr(> t )
## (Intercept)	1.359758e+00	2.317996e-01	5.8660938	3.130710e-07
## pop_2016	3.502821e-06	8.678916e-06	0.4036012	6.881609e-01



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## Statistic Method

- In auto\_thefts, choose all the data in 2016 including Hood\_ID and premisetype (ignore the outlier)
- select occurrences happened in apartment
- count the number of occurrences of theft in different neighbourhood

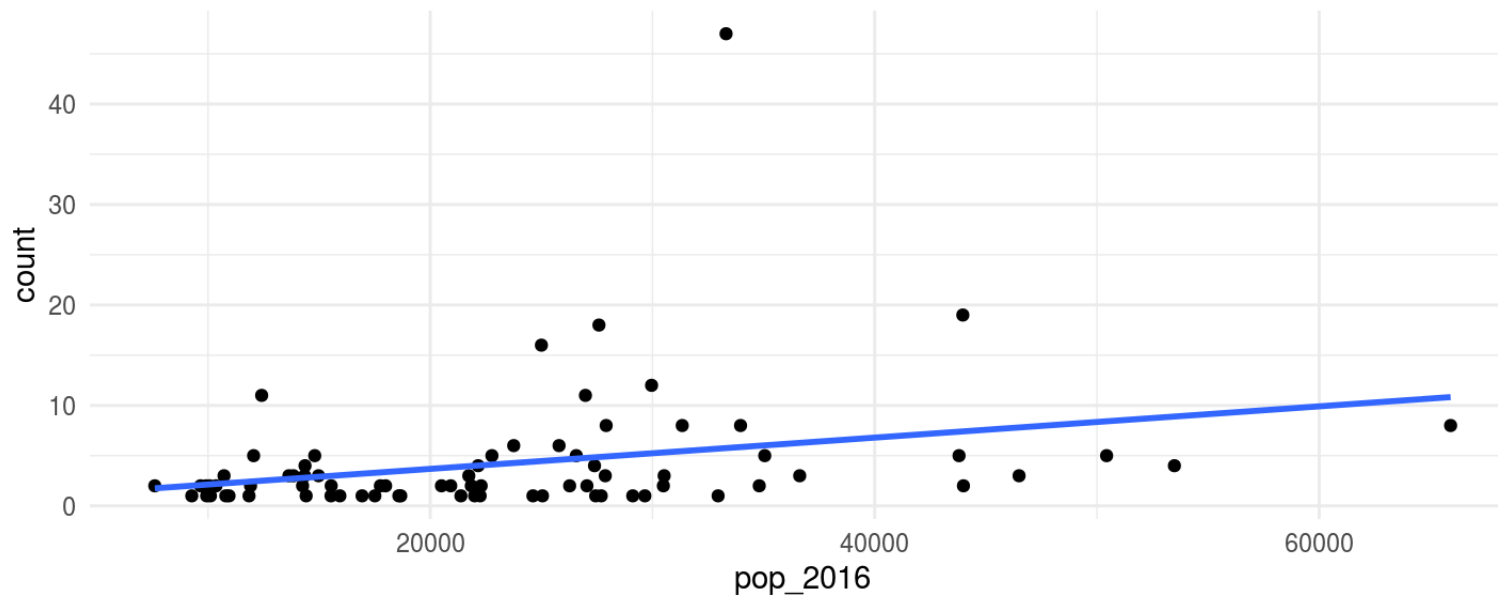
## Conclusion

- p-value for the null hypothesis (there is no relationship) is 0.688  
=> not reject
- no relationship

# Commercial & Population

## Result

```
##              Estimate Std. Error  t value  Pr(>|t|)
## (Intercept) 0.5702052562 1.574778e+00 0.3620861 0.71831963
## pop_2016    0.0001556437 6.045606e-05 2.5744926 0.01203736
```



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## Statistic Method

- In auto\_thefts, choose all the data in 2016 including Hood\_ID and premisetype (ignore the outlier)
- select occurrences happened in commercial
- count the number of occurrences of theft in different neighbourhood

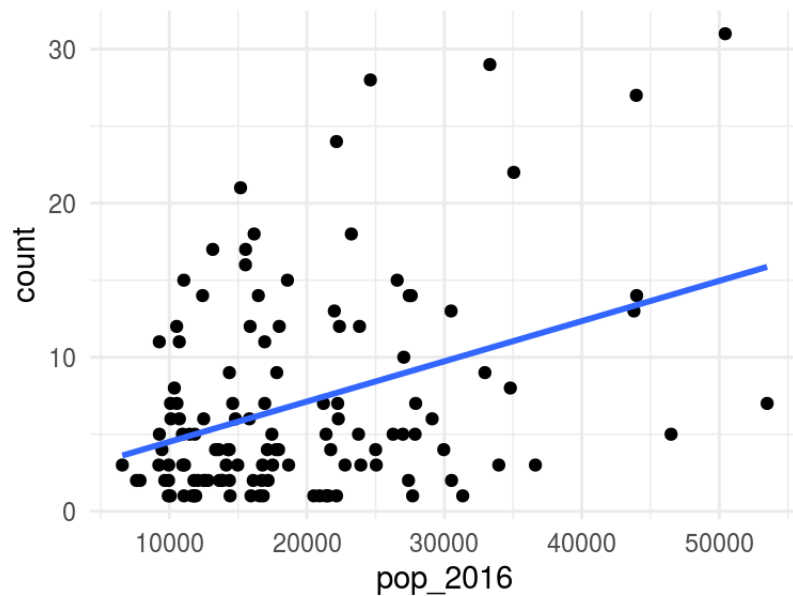
## Conclusion

- p-value for the null hypothesis (there is no relationship) is 0.012  
=> reject
- strong relationship

# House & Population

## Result

```
##              Estimate Std. Error t value    Pr(>|t|)
## (Intercept) 1.8996776914 1.260882e+00 1.506626 1.344915e-01
## pop_2016     0.0002611357 5.854873e-05 4.460143 1.834486e-05
```



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## Statistic Method

- choose all the data in 2016 including Hood\_ID and premisetype (ignore the outlier)
- select occurrences happened in house
- count the number of occurrences of theft in different neighbourhood

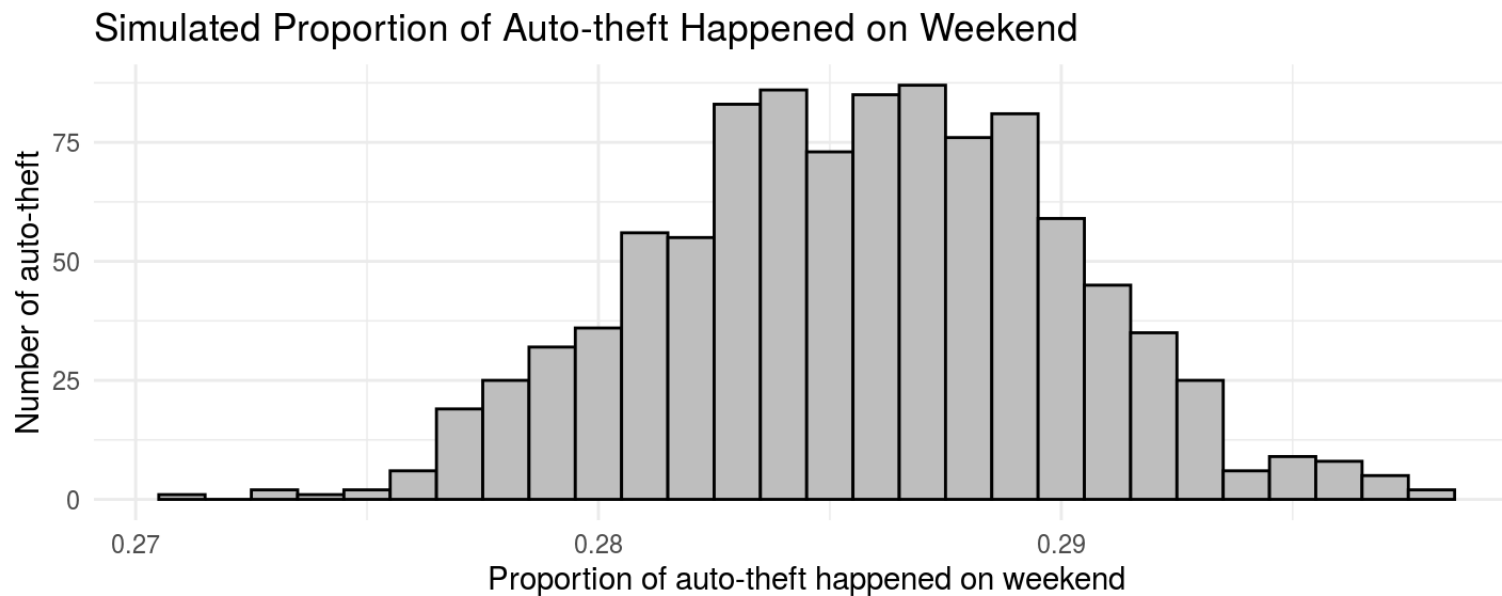
## Conclusion

- p-value for the null hypothesis (there is no relationship) is 0.0000183 => reject
- strong relationship



# Weekend VS Weekday

## Result



```
## # A tibble: 1 x 1
##   p_value
##   <dbl>
```

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# Statistic Method

- “weekend”: theft occurrences happend in weekend
- “weekday”: theft occurrences happend in weekday
- “weekendpro”: probability of theft occurrences happend in weekend
- “weekdaypro”: probability of theft occurrences happend in weekday
- select “premisetype” and “occurencedayofweek” and filter “Outside” from “Premisetype”
- name “Saturday” and “Sunday” as “weekend”, otherwise it is “weekday”
- calculate the probability of “weekend” and “weekday” and find the difference between them
- find the difference between weekdaypro and weekendpro
- use hypothesis test to see whether the auto theft rate is same on weekdays and weekends (5/7 on weekday and 2/7 on weekend)
- calculate the probability of “weekend”
- repeat for 1000 times

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# Conclusion

- make a prediction in the future
- police should pay more attention to outside
- more resources should be allocated in the weekdays
- raise public awareness to help the police to build a nice living condition

*THANK YOU FOR YOUR TIME*