Traffic Tactics:

Steering Clear of Montgomery County's Traffic Pitfalls

Don’t be that guy…

We want to address trends in traffic violations in the community and make life easier on students (and their wallets).

190,813

Number of traffic violations in Montgomery County last year.

89,094

Number of citations given out last year.

Traffic violations can be life threatening and should be taken seriously.

2,741

Number of accidents in Montgomery County last year.

20

Number of fatalities in Montgomery County last year.

Meet the Team

Donovan Downie

Chien-Jui Huang

Tanmay Sakharkar

Devni Shah

Sepehr B.Shirazi

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Data Methods

Data Description

Montgomery County

- Latitude/Longitude
- Time of Stop
- Accident
- Gender/Race
- Make/Model

Fairfax County

- Latitude/Longitude
- Time of Stop
- Accident
- Gender/Race
- Warnings, Arrests, Citations

Data Methods

- Montgomery County data was joined with Fairfax county data based on longitude and latitude.
  - Date, time, type of violation, gender, and race.
- Shapefiles of Montgomery County, Fairfax County were added.
- Line Geometries of roads in MD and VA were also added.

02

Location

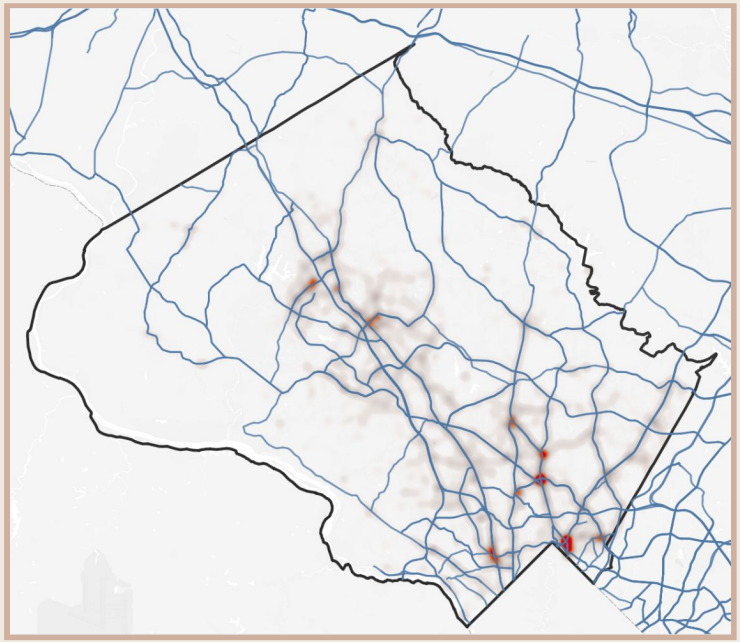
Does the Area matter?

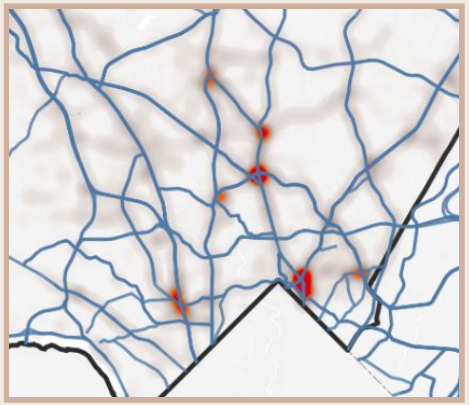
Hypotheses regarding location in Montgomery County

Traffic Violations are more prevalent in dense areas and close to DC.

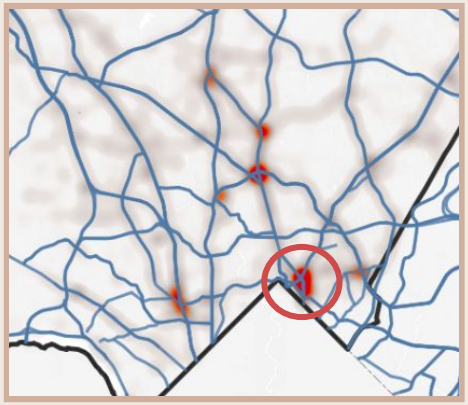
Alcohol related incidents occur more in suburban areas than urban areas.

Traffic violations happen more in congested areas.

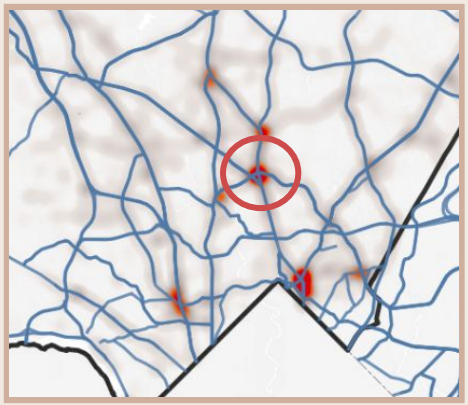


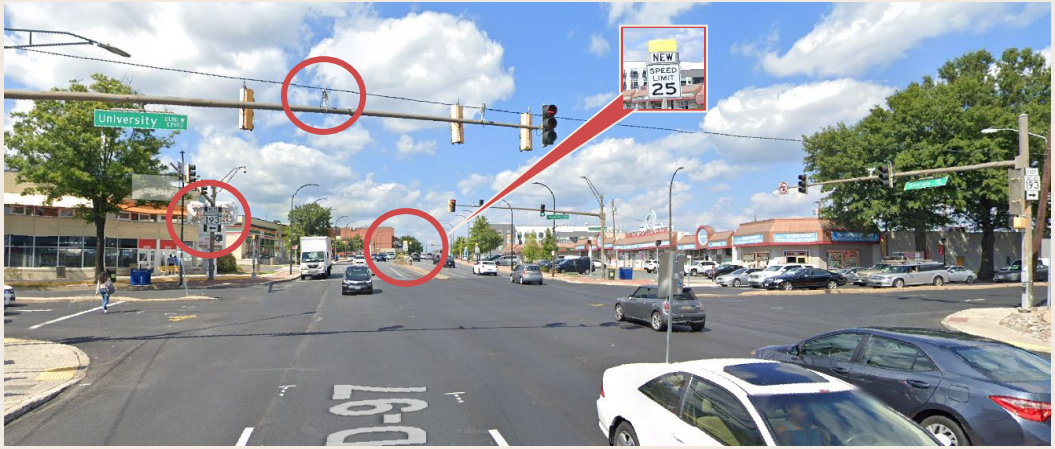


Intersection of Colesville Rd. and Georgia Ave.

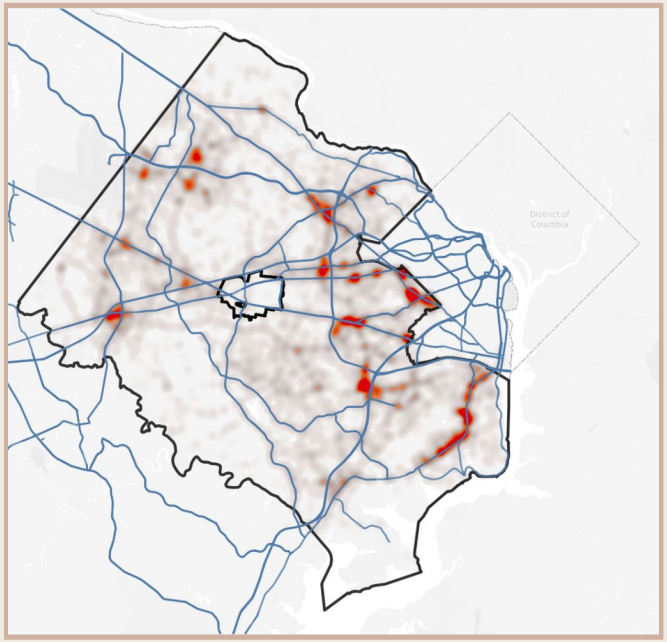


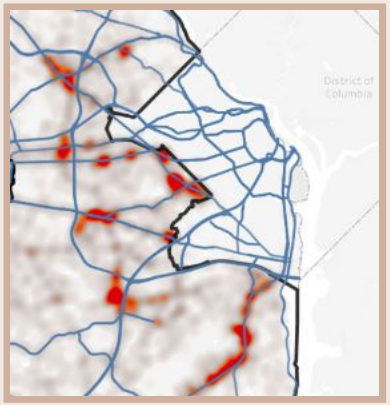
Intersection of University Blvd. and Georgia Ave.



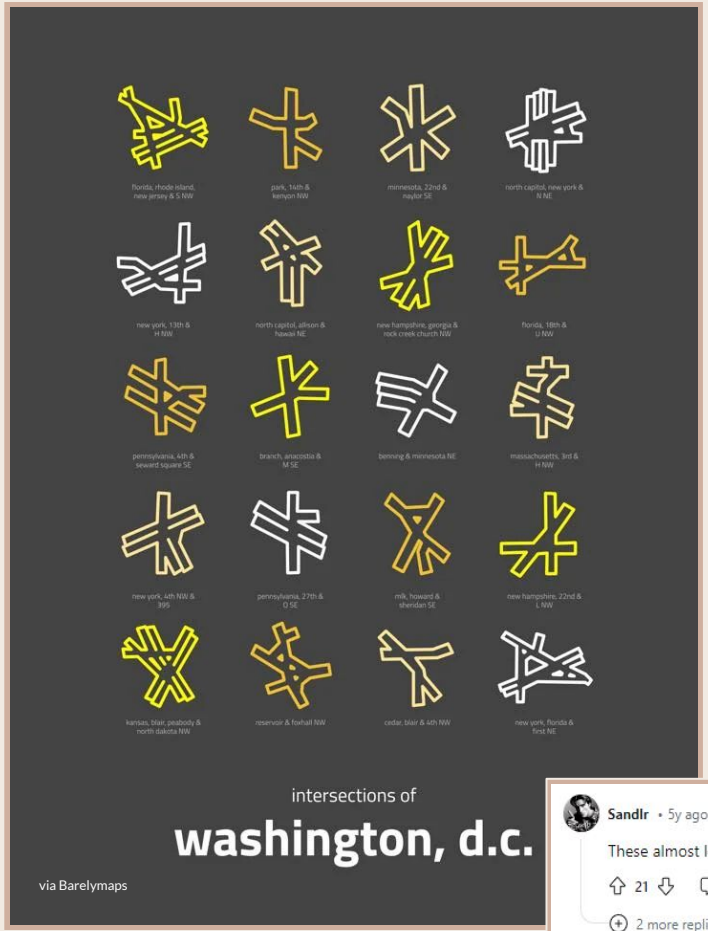


Fairfax County shows a similar trend, where roads leading to DC show much higher violation numbers.

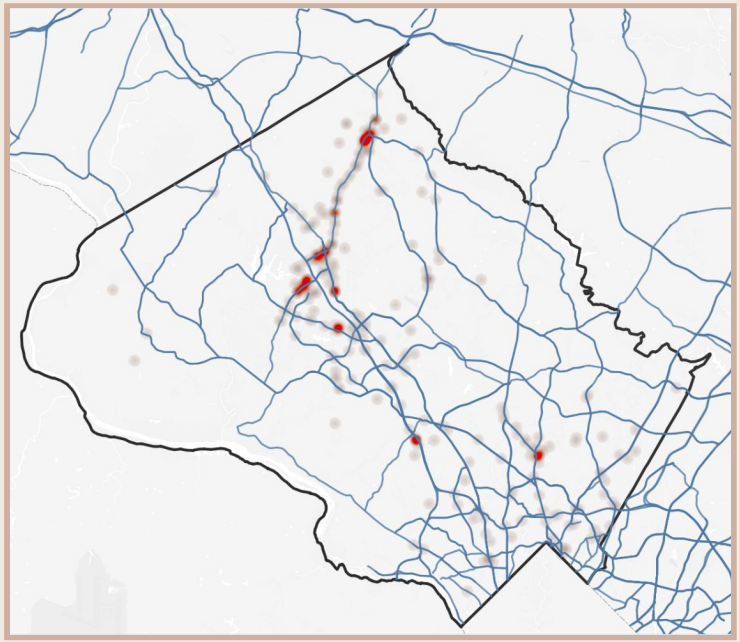


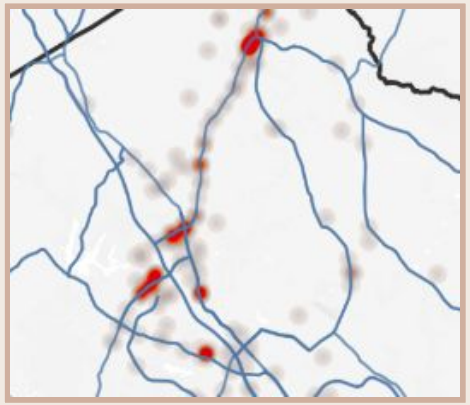


Congested roads and complicated traffic patterns lead to more traffic violations.

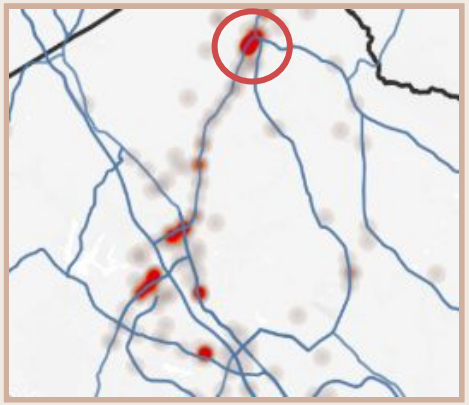


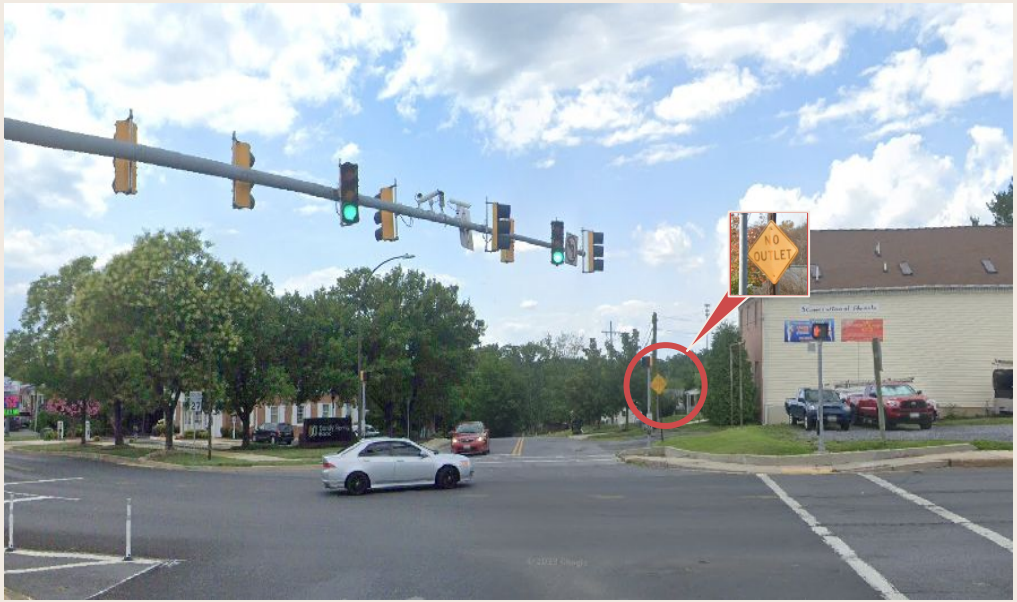
Alcohol violations occur in less populated areas.



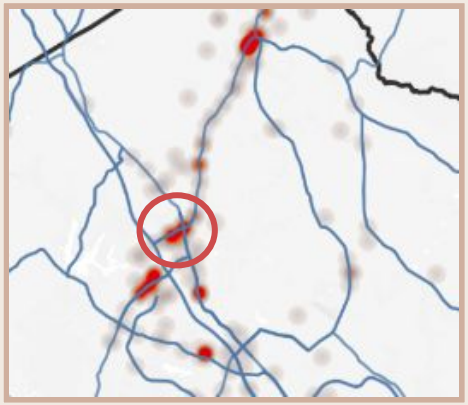


Intersection of Main St. and Ridge Rd.

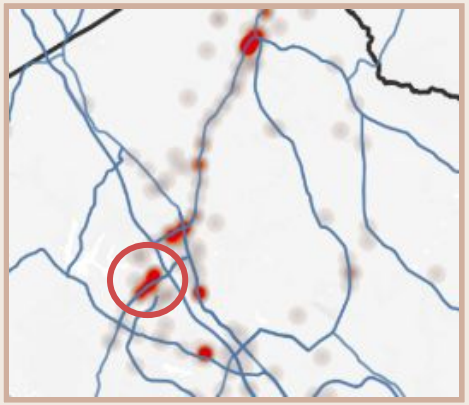




Intersection of Frederick Rd. and Ridge Rd.

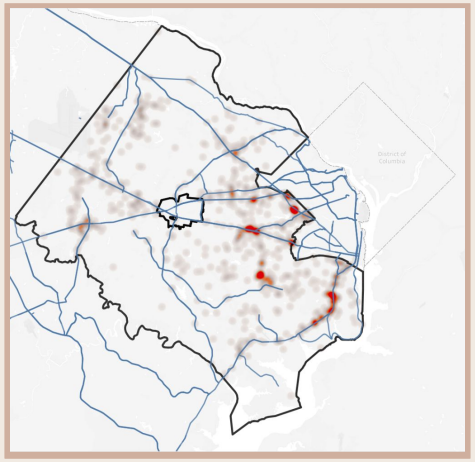


Intersection of Germantown Rd. and Crystal Rock Rd.

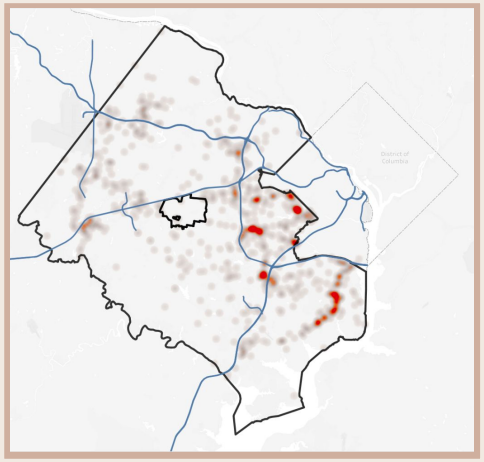


Fairfax County's alcohol violations overlapped, but primary roads still had less violations than secondary.

Secondary Roads



Primary Roads

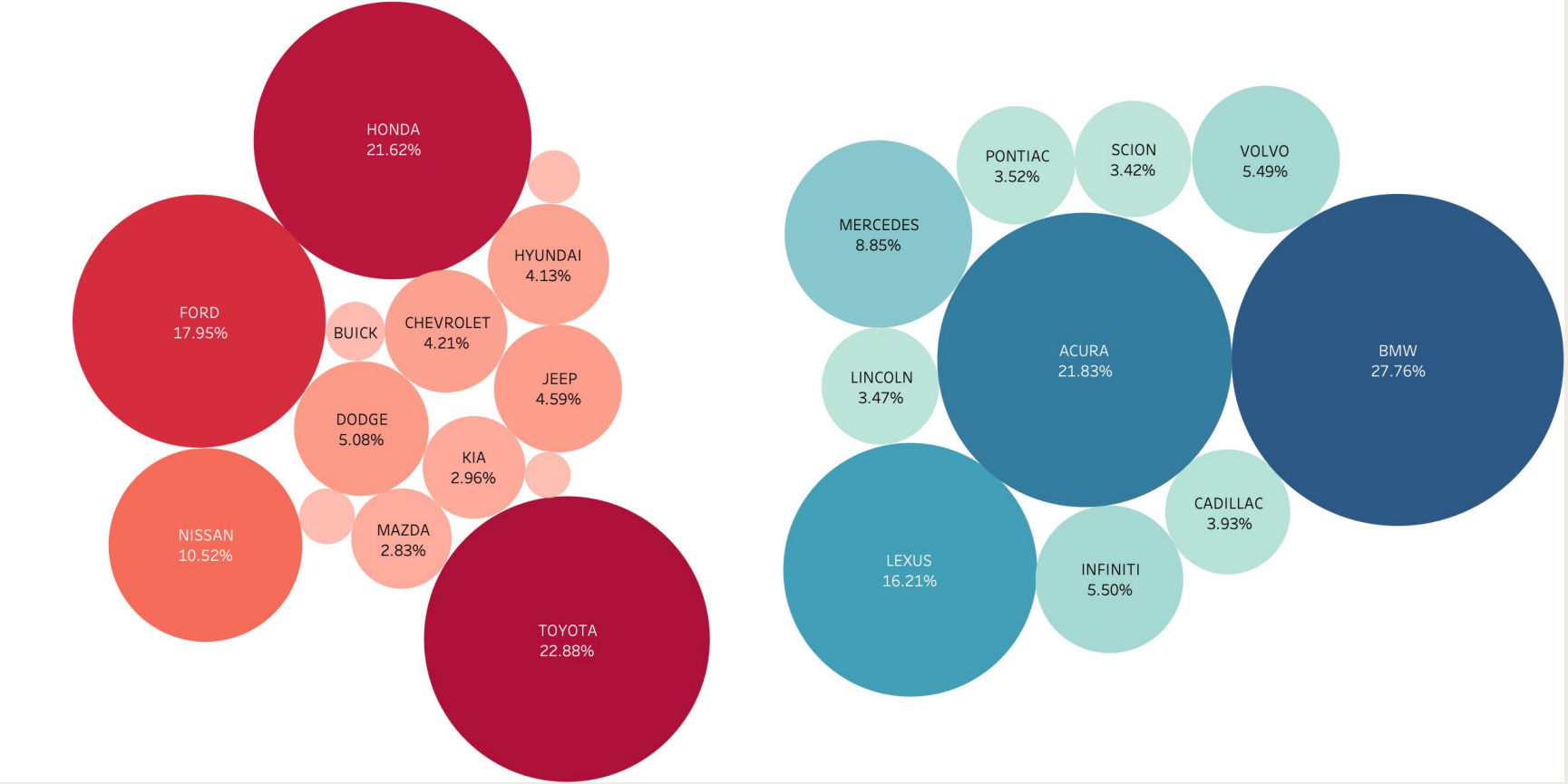


03

Demographics

Does the Car you drive make a difference?

Does the car you drive make a difference?

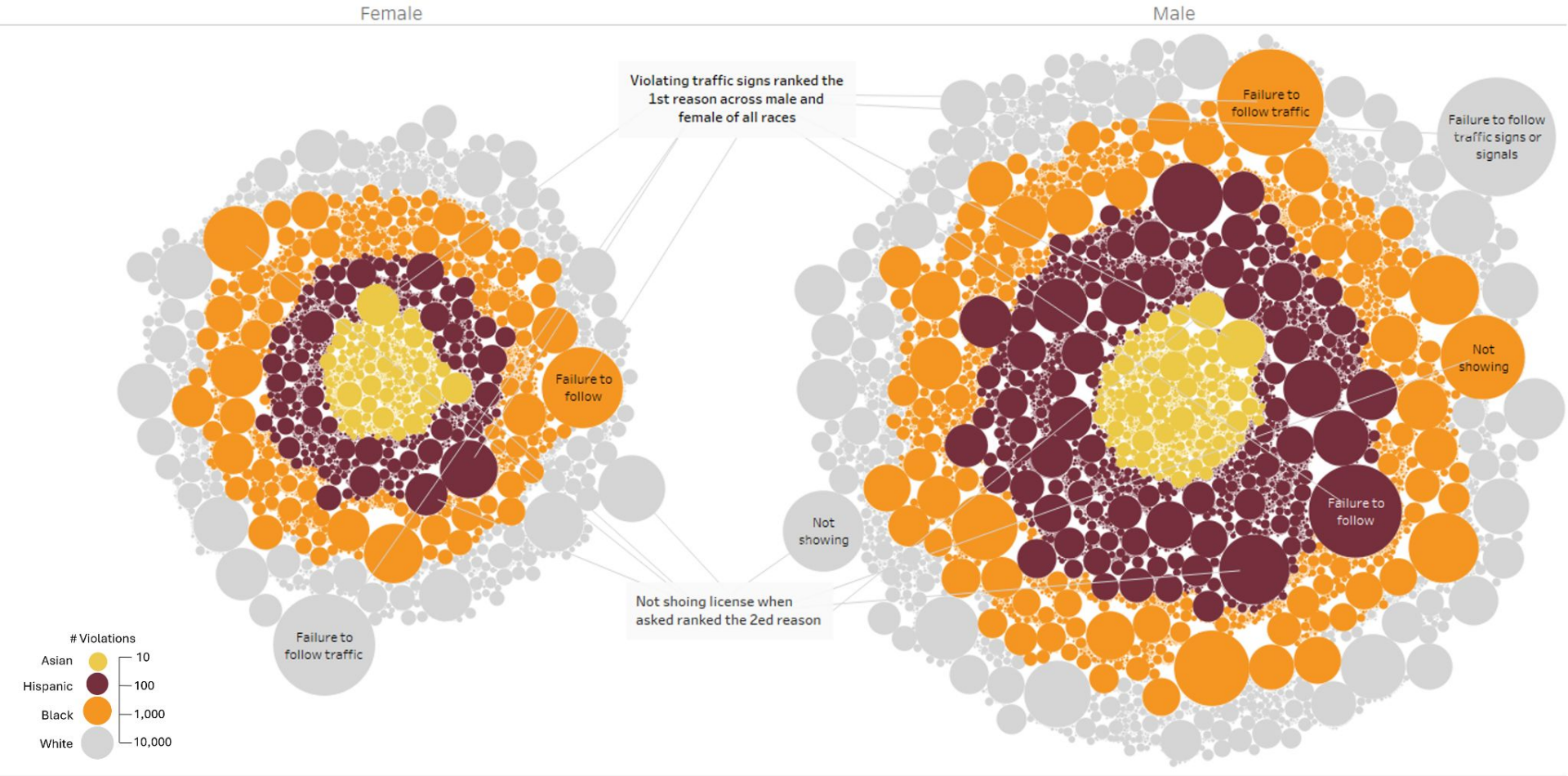


03

Demographics

Are Male or Female More Likely to Get Violations?

Montgomery Traffic Violation Overview 2014-2024



Each bubble represents one type of violation

Are Males or Females More Likely to Get Violations?

H0: Gender does not affect the likelihood of getting traffic violations
H1: Male is more likely to get traffic violations than female

With 1000 simple random sample, the result shows:

- Chi-Square Statistic: 119.716
- P-value: 7.3*10^-28

Hypothesis testing shows significant difference !!

04

Accidents/DUI

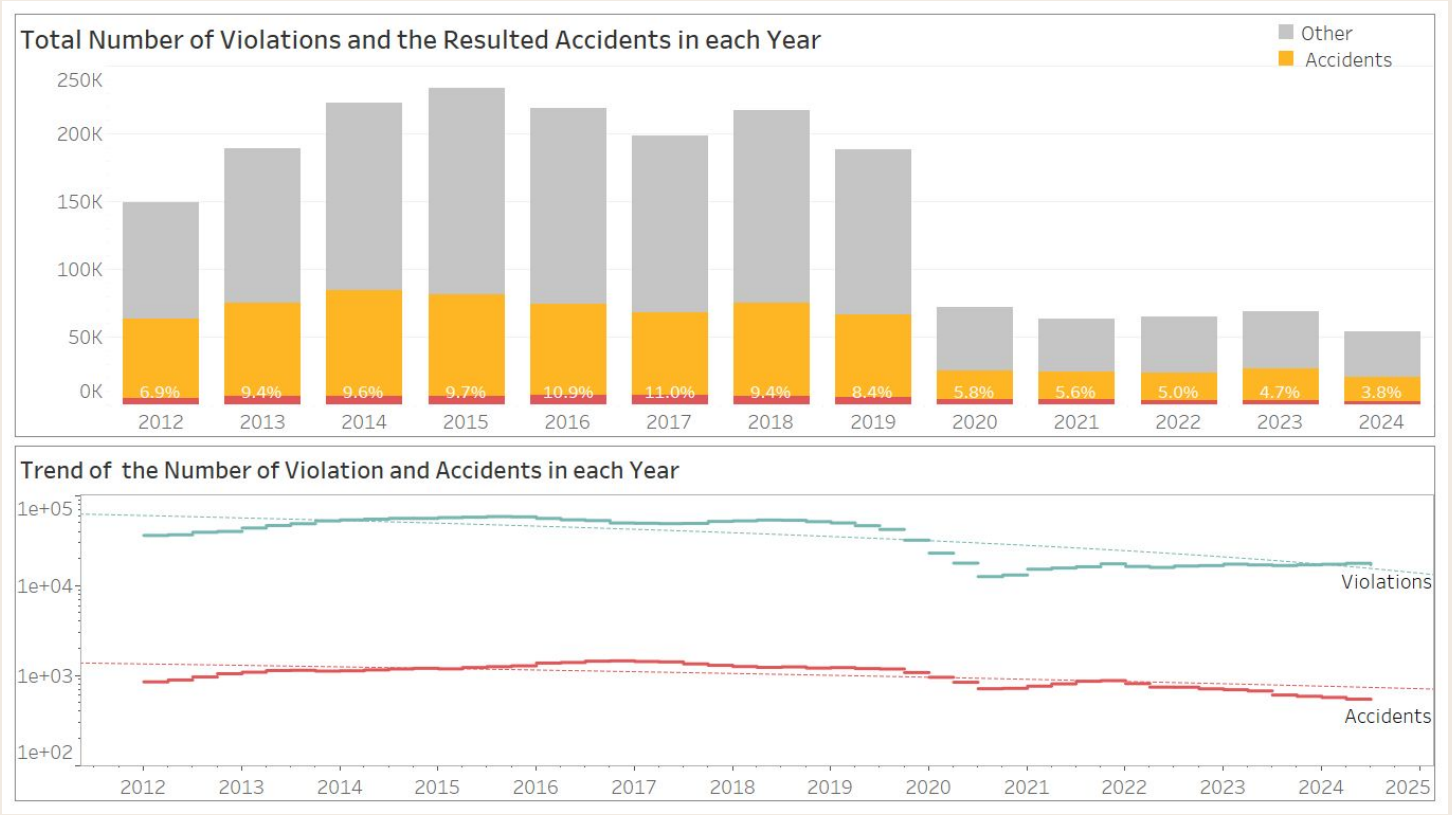
Hypotheses regarding accidents in Montgomery County.

The total number of violation is declining in recent years.

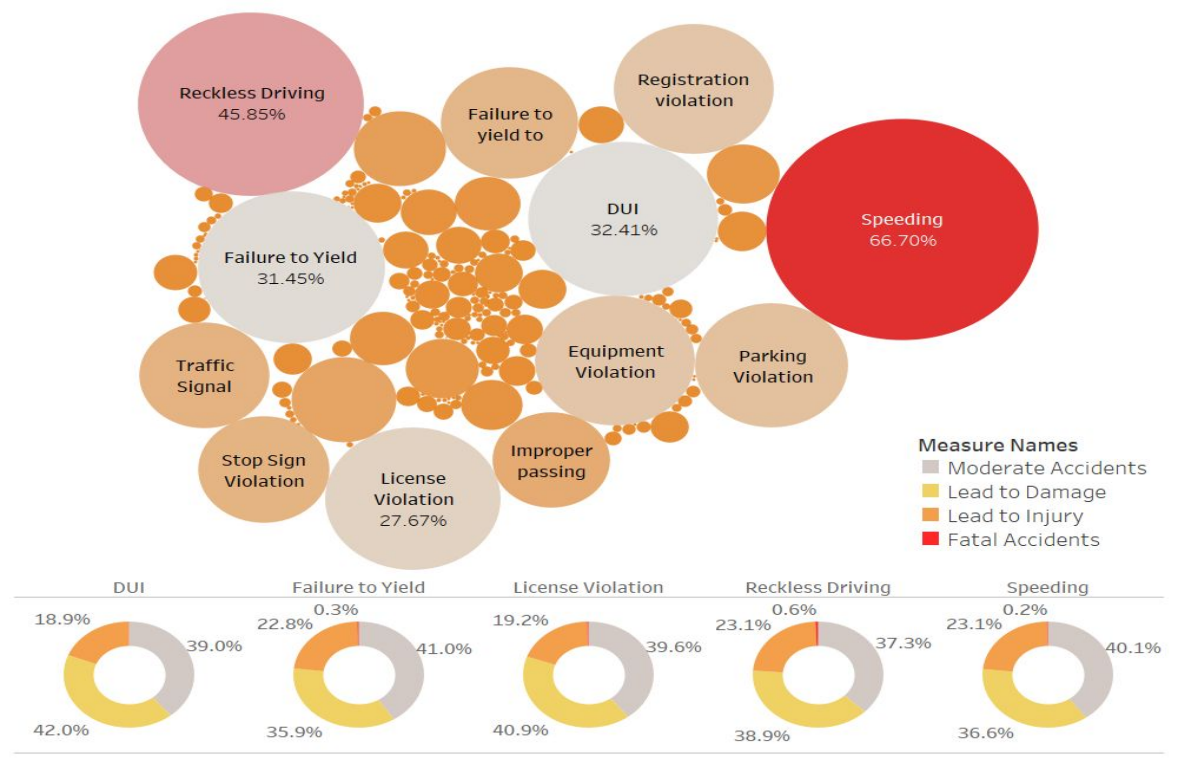
Speeding is the most dangerous violation, leading to higher rates of severe accidents.

The rate of traffic accidents is influenced by the time of day, location, and type of violation committed.

Is Traffic Violation Decreasing Over the Years?

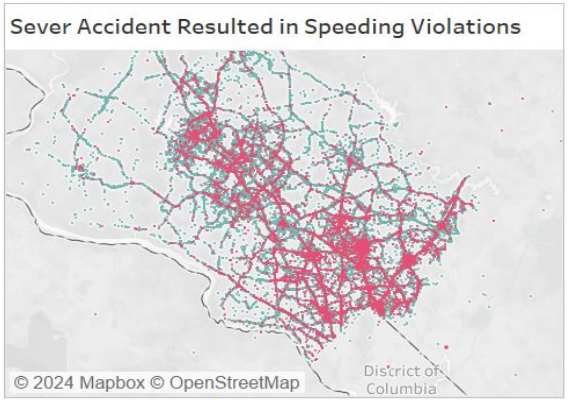


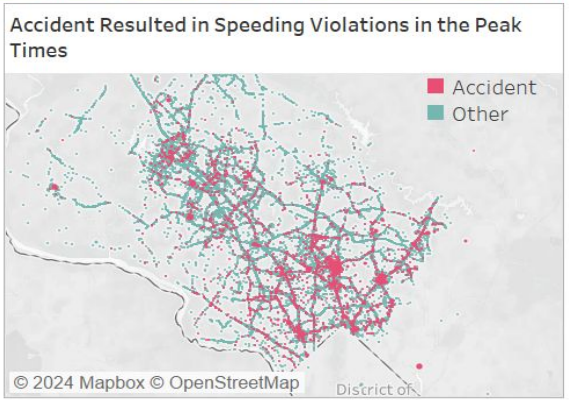
Avoid These Dangerous Violations



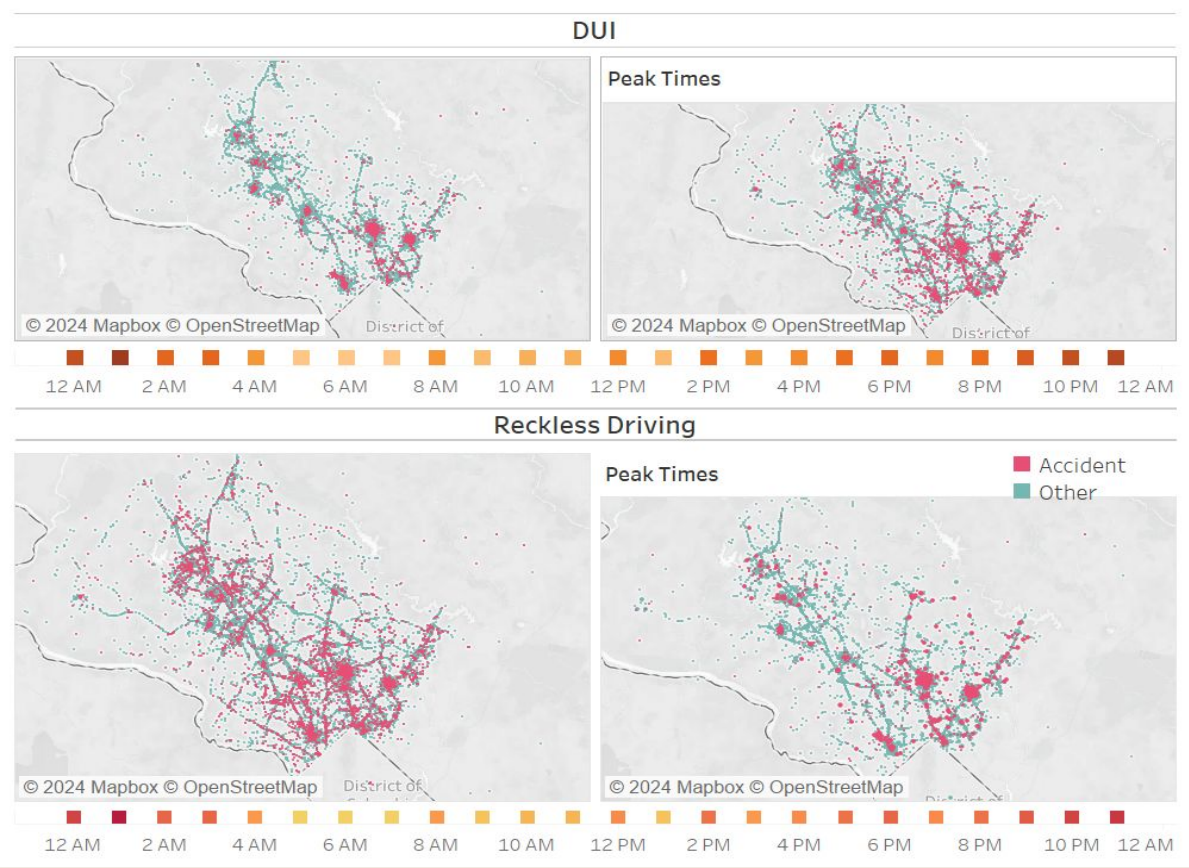
Peak Times and Hotspots

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
12 AM	3.5%	3.5%	4.0%	5.2%	3.1%	4.9%	3.8%	3.0%	5.9%	5.0%	4.4%	4.7%	4.5%
1 AM	2.9%	3.5%	2.2%	4.3%	2.6%	3.4%	3.2%	5.6%	4.5%	4.5%	4.3%	3.9%	3.5%
2 AM	2.6%	2.8%	4.7%	1.9%	2.6%	3.7%	3.1%	2.7%	5.0%	3.3%	6.5%	7.6%	3.7%
3 AM	2.6%	3.5%	3.7%	3.7%	2.6%	3.5%	3.1%	4.0%	5.0%	4.8%	3.7%	4.0%	3.0%
4 AM	2.0%	1.5%	2.3%	4.4%	1.6%	2.6%	3.3%	2.8%	2.0%	2.9%	3.5%	3.7%	2.5%
5 AM	1.9%	1.8%	2.2%	1.4%	2.2%	2.1%	3.0%	2.1%	2.1%	3.6%	3.1%	3.0%	4.1%
6 AM	2.2%	2.8%	2.5%	2.5%	2.9%	3.0%	3.1%	2.6%	2.0%	2.2%	2.0%	1.8%	1.1%
7 AM	4.3%	4.6%	3.6%	4.1%	4.1%	4.0%	3.4%	3.8%	2.2%	2.0%	3.5%	3.2%	1.5%
8 AM	5.8%	5.8%	4.3%	4.4%	5.4%	4.8%	4.7%	5.0%	2.3%	3.8%	3.7%	3.1%	4.0%
9 AM	4.9%	4.0%	4.6%	4.6%	4.3%	3.6%	4.4%	3.7%	2.6%	2.6%	2.5%	4.4%	1.7%
10 AM	3.1%	4.1%	3.3%	3.4%	3.2%	3.7%	3.7%	2.7%	2.3%	2.6%	1.4%	3.4%	4.1%
11 AM	3.2%	4.8%	3.4%	4.6%	4.6%	3.1%	3.0%	2.4%	2.8%	3.2%	1.7%	2.7%	2.2%
12 PM	5.5%	4.5%	4.0%	3.9%	3.9%	3.3%	3.3%	4.6%	4.0%	2.5%	4.2%	3.7%	3.6%
1 PM	4.3%	4.0%	3.7%	2.9%	4.0%	4.3%	4.1%	3.1%	3.2%	2.9%	2.3%	2.9%	2.9%
2 PM	4.4%	4.1%	4.2%	4.6%	4.1%	4.4%	4.5%	3.8%	5.3%	3.3%	3.5%	3.1%	3.2%
3 PM	4.4%	5.2%	6.5%	4.4%	4.8%	4.5%	4.4%	5.3%	4.5%	3.8%	2.9%	3.6%	5.0%
4 PM	5.8%	6.0%	6.1%	5.5%	6.6%	4.9%	5.9%	4.3%	4.9%	5.6%	4.1%	5.4%	6.9%
5 PM	7.6%	6.0%	5.2%	7.2%	6.1%	6.3%	6.5%	5.7%	4.5%	5.5%	5.3%	5.6%	3.9%
6 PM	7.7%	5.0%	5.0%	5.3%	6.2%	5.1%	5.2%	6.6%	6.8%	5.0%	6.1%	5.7%	7.2%
7 PM	4.7%	4.5%	4.1%	4.5%	5.5%	6.5%	5.6%	4.9%	4.1%	5.4%	6.1%	3.7%	5.1%
8 PM	3.3%	4.1%	4.8%	3.8%	5.3%	3.7%	4.9%	3.7%	4.9%	5.6%	8.0%	4.3%	6.0%
9 PM	4.0%	5.1%	5.6%	4.7%	5.6%	5.7%	4.1%	5.7%	5.4%	6.0%	5.1%	4.5%	10.4%
10 PM	6.6%	4.9%	5.7%	4.9%	5.1%	3.8%	4.3%	5.3%	6.3%	7.8%	6.5%	5.5%	5.3%
11 PM	2.7%	4.0%	4.2%	3.8%	3.7%	5.1%	5.4%	6.7%	7.5%	6.1%	5.6%	6.5%	4.5%





Peak Times and Hotspots



04

Rush Hours and Violations

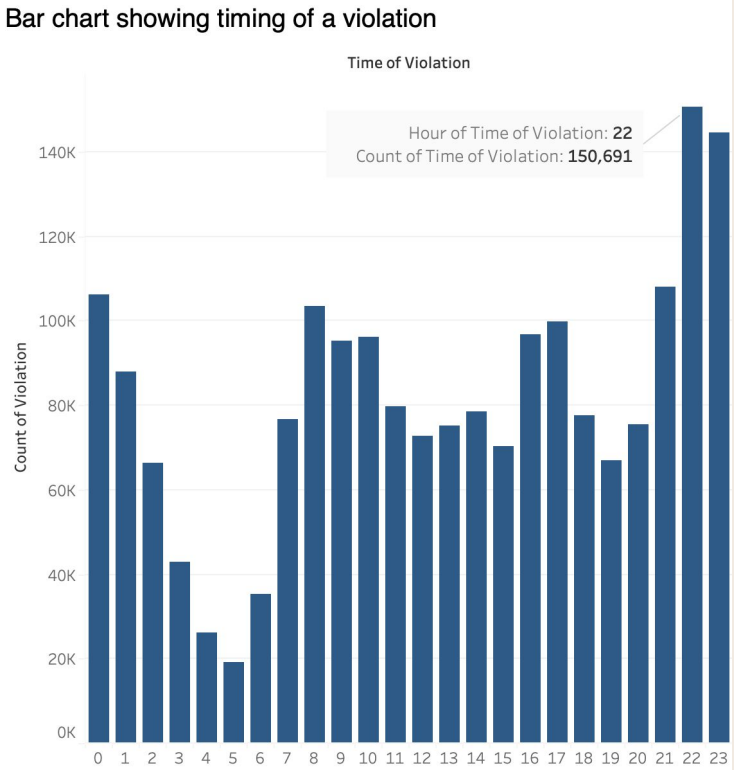
Hypothesis regarding DUI in Montgomery County

Violations occur more during rush hour times (7:30-9:30) than at night.

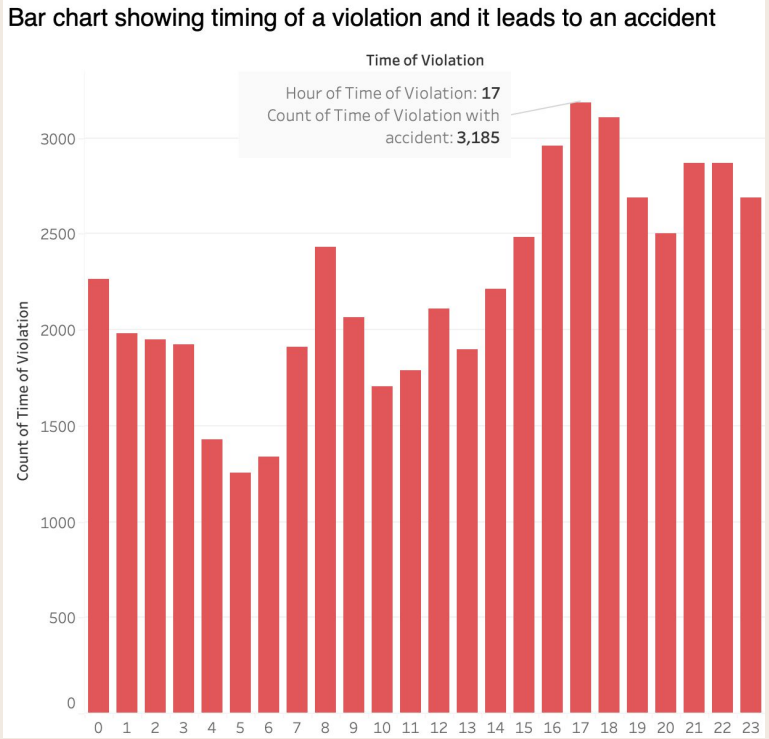
Drunk drivers wearing seat belts are less likely to be in accidents, despite a high rate of driving violations.

Late-night driving is riskier due to higher violation rates.

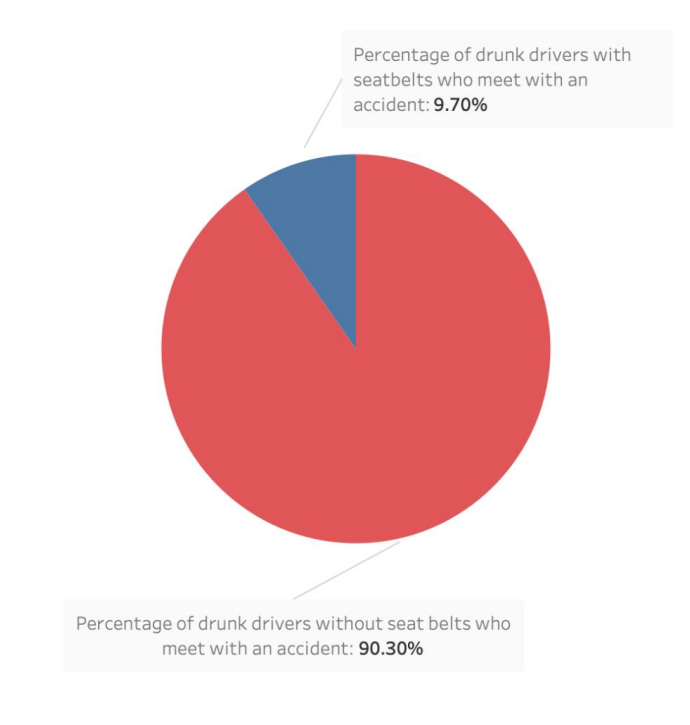
Bar chart showing timing of a violation

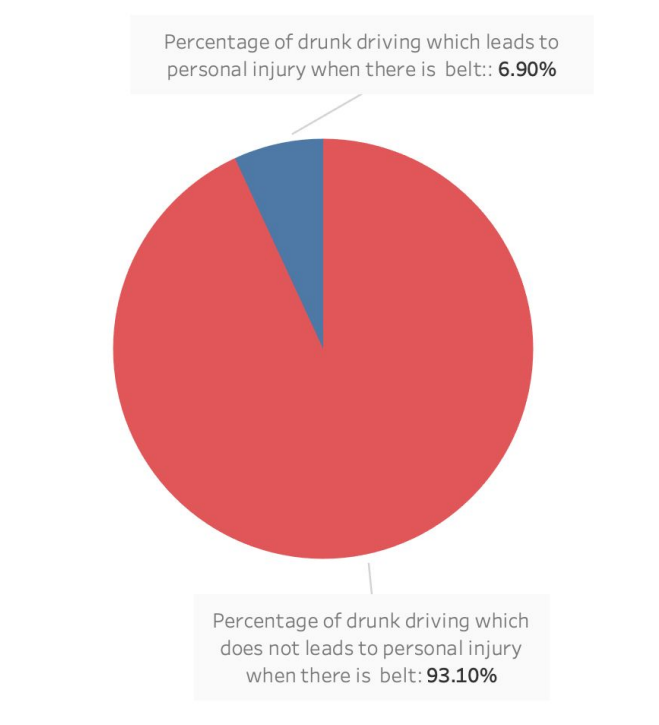


Bar chart showing timing of a violation and it leads to an accident



Even when driving under the influence, wearing a seatbelt can increase your chances of surviving an accident.





05

Data Limitations

You can enter a **subtitle** here if you need it

- The data focuses on drunk driving and overlooks other factors like drug use, fatigue or tiredness, which also lead to traffic violations and accidents.
- Data for other counties were relatively sparse, making comparison rather challenging.
- Data for other counties also had different parameters and key performance indicators.

In order to avoid becoming Montgomery County's "Florida Man", keep the following things in mind:

- Take extra care when driving in congested areas.
- Don't drink and drive, even if you have no other option.
- Be a patient driver if you are male.
- Take extra care if you drive a **BMW**. You are a worse driver.
- Stay alert at night as there are more risks than Rush Hour.
- Keep your speed in check at all times.
- Always wear a seatbelt.

Or this might be you...

The Latest Nominees For the [redacted] Man Hall of Fame Are....

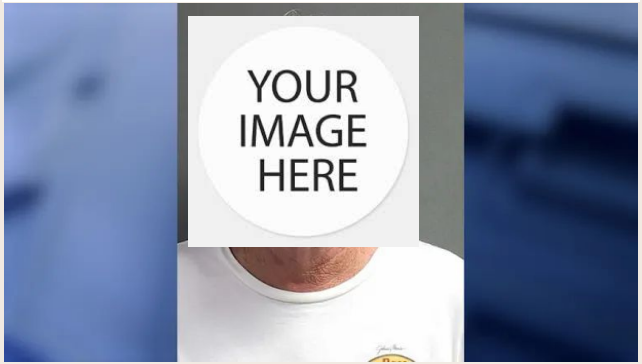
Montgomery County

Author Jim Monaghan

September 16th, 2022 8:15 AM

Montgomery County

[redacted] man caught driving on I-95 at 108 mph was in a hurry to see his girlfriend: deputies



Appendices

Hypothesis Testing of Traffic Violation likelihood on Gender by Colab

EDA HT.ipynb

File Edit View Insert Runtime Tools Help Last saved at October 4

+ Code + Text

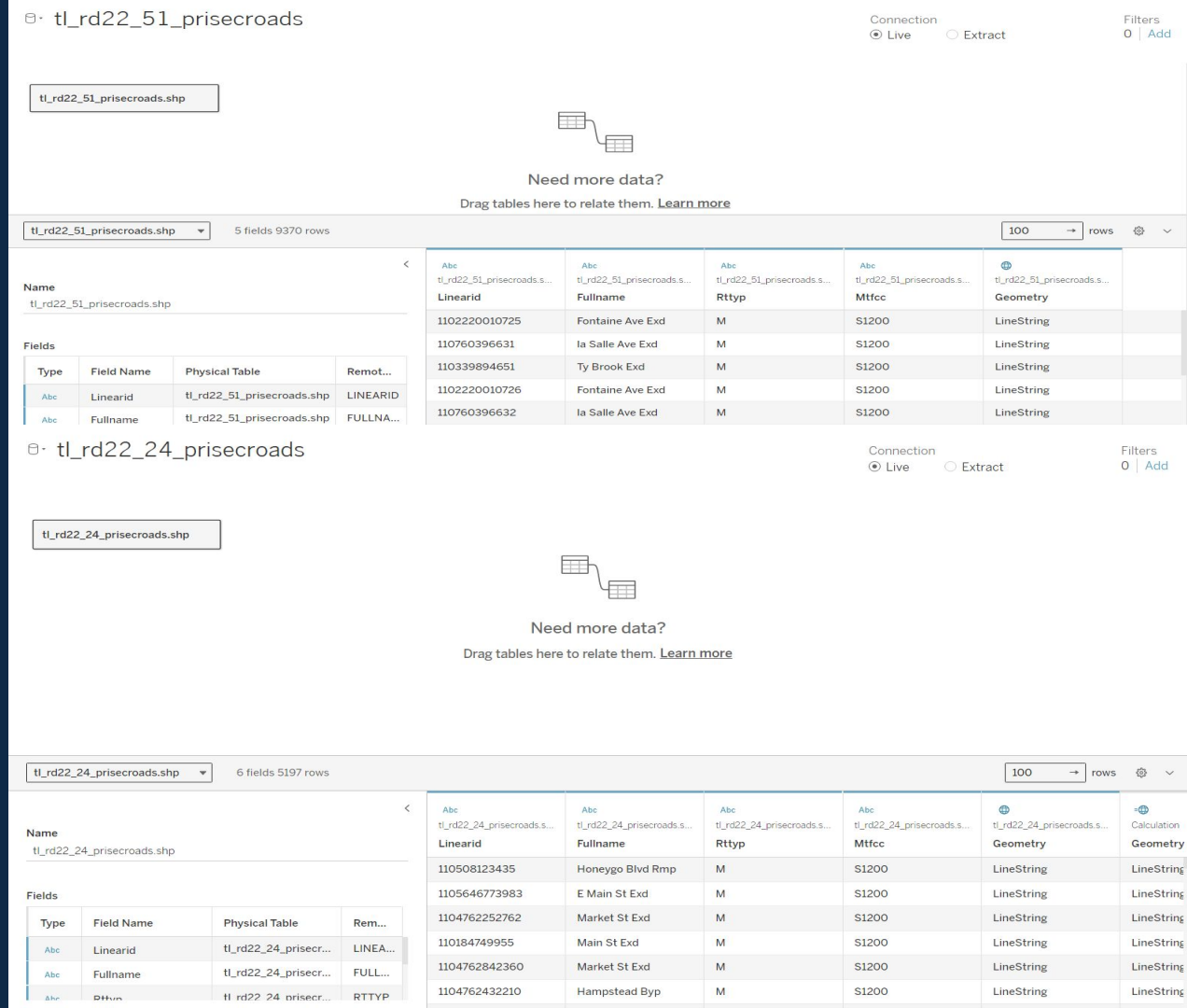
Null Hypothesis (H0): Gender (male or female) and traffic violations are independent, meaning neither gender is more likely to get violations.

Alternative Hypothesis (H1): Gender and traffic violations are dependent, meaning one gender is more likely to get traffic violations than the other.

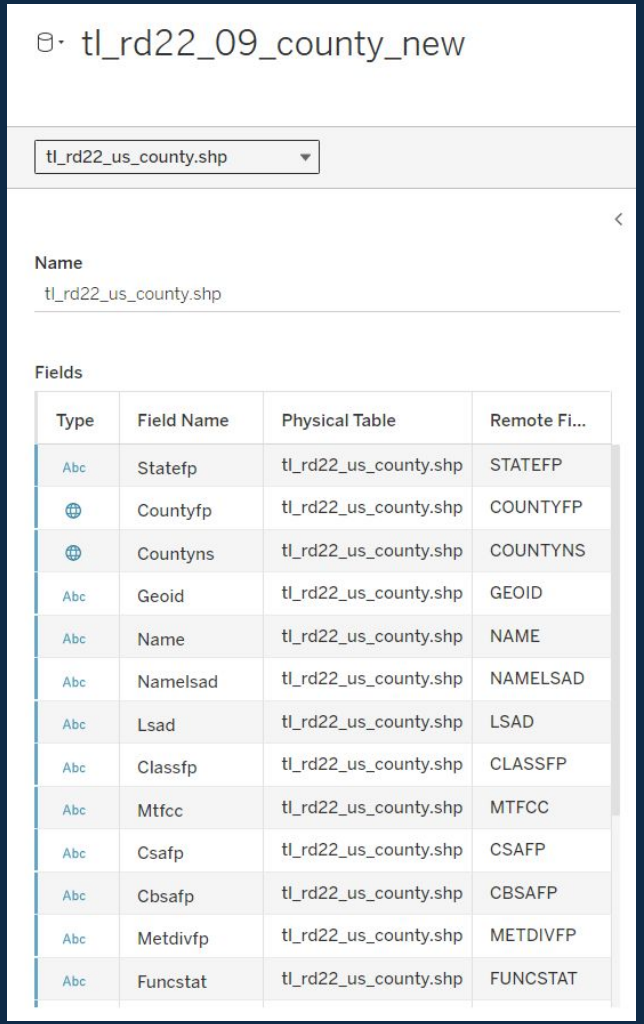
```
import pandas as pd
from scipy import stats

traffic_violations_df = pd.read_csv('Traffic_Violations_cleaned.csv')

# Step 1: Remove rows where 'Gender' is 'Not specified'
traffic_filtered = traffic_violations_df[traffic_violations_df['Gender'].isin(['M', 'F'])]

# Step 2: Randomly sample 1000 rows from the filtered dataset
traffic_sample = traffic_filtered.sample(n=1000, random_state=1)

# Step 3: Create the contingency table for the sampled data
contingency_table = pd.crosstab(traffic_sample['Gender'], columns='Count')

# Step 4: Print the contingency table to visualize counts of Males and Females in the sample
print(contingency_table)

# Step 5: Perform the Chi-Square Test of Independence
chi2, p_value, dof, expected = stats.chi2_contingency(contingency_table)

observed = np.array([327, 673])
expected = np.array([500, 500])

# Perform Chi-Square test
chi2_stat, p_value = chisquare(f_obs=observed, f_exp=expected)

print(f"Chi-Square Statistic: {chi2_stat}")
print(f"P-value: {p_value}")
```

```
<ipython-input-11-768c2011310f>:4: DtypeWarning: Columns (34) have mixed types. Specify dtype option on import or set low_memory=False.
  traffic_violations_df = pd.read_csv('Traffic_Violations_cleaned.csv')
col_0   Count
Gender
F         327
M         673
Chi-Square Statistic: 119.716
P-value: 7.2997832802869885e-28
```

Shapefile for Roads in MD & VA



Shapefile for countylines



Type	Field Name	Physical Table	Remote Fi...
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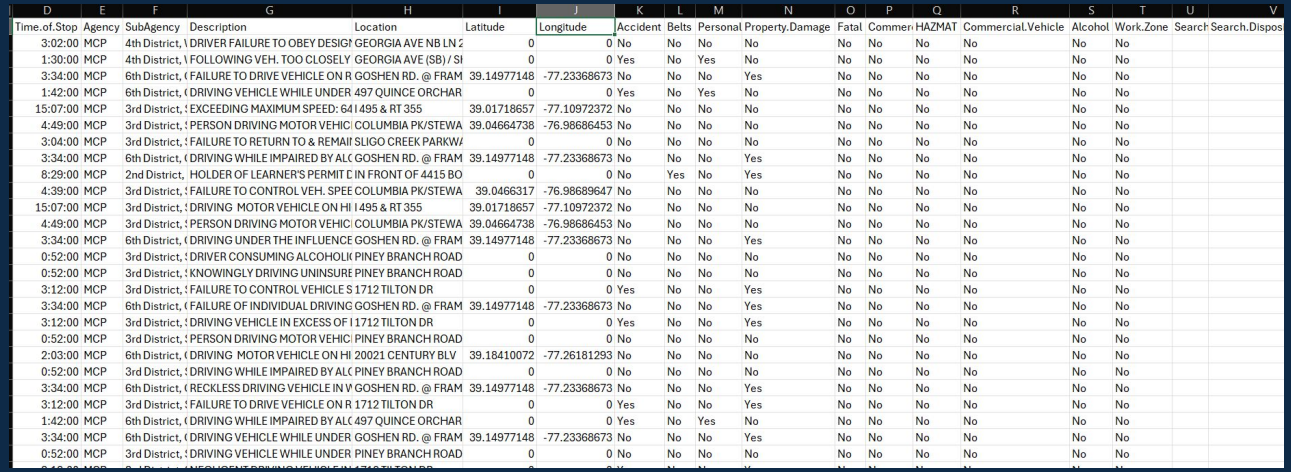
🌐	Countyfp	tl_rd22_us_county.shp	COUNTYFP
🌐	Countyns	tl_rd22_us_county.shp	COUNTYNS
Abc	Geoid	tl_rd22_us_county.shp	GEOID
Abc	Name	tl_rd22_us_county.shp	NAME
Abc	Namelsad	tl_rd22_us_county.shp	NAMELSAD
Abc	Lsad	tl_rd22_us_county.shp	LSAD
Abc	Classfp	tl_rd22_us_county.shp	CLASSFP
Abc	Mtfcc	tl_rd22_us_county.shp	MTFCC
Abc	Csafp	tl_rd22_us_county.shp	CSAFP
Abc	Cbsafp	tl_rd22_us_county.shp	CBSAFP
Abc	Metdivfp	tl_rd22_us_county.shp	METDIVFP
Abc	Funcstat	tl_rd22_us_county.shp	FUNCSTAT

Combined Dataset



D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
Time.of.Stop	Agency	SubAgency	Description	Location	Latitude	Longitude	Accident	Belts	Personal	Property.Damage	Fatal	Commer	HAZMAT	Commercial.Vehicle	Alcohol	Work.Zone	Search	Search.Dispos
3:02:00	MCP	4th District, \	DRIVER FAILURE TO OBEY DESIGI	GEORGIA AVE NB LN 2	0	0	No	No	No	No	No	No	No	No	No	No		
1:30:00	MCP	4th District, \	FOLLOWING VEH. TOO CLOSELY	GEORGIA AVE (SB) / SI	0	0	Yes	No	Yes	No	No	No	No	No	No	No		
3:34:00	MCP	6th District, (	FAILURE TO DRIVE VEHICLE ON R	GOSHEN RD. @ FRAM	39.14977148	-77.23368673	No	No	No	Yes	No	No	No	No	No	No		
1:42:00	MCP	6th District, (	DRIVING VEHICLE WHILE UNDER	497 QUINCE ORCHAR	0	0	Yes	No	Yes	No	No	No	No	No	No	No		
15:07:00	MCP	3rd District, !	EXCEEDING MAXIMUM SPEED: 64	I 495 & RT 355	39.01718657	-77.10972372	No	No	No	No	No	No	No	No	No	No		
4:49:00	MCP	3rd District, !	PERSON DRIVING MOTOR VEHIC	COLUMBIA PK/STEWA	39.04664738	-76.98686453	No	No	No	No	No	No	No	No	No	No		
3:04:00	MCP	3rd District, !	FAILURE TO RETURN TO & REMAI	SLIGO CREEK PARKWA	0	0	No	No	No	No	No	No	No	No	No	No		
3:34:00	MCP	6th District, (	DRIVING WHILE IMPAIRED BY ALC	GOSHEN RD. @ FRAM	39.14977148	-77.23368673	No	No	No	Yes	No	No	No	No	No	No		
8:29:00	MCP	2nd District,	HOLDER OF LEARNER'S PERMIT D	IN FRONT OF 4415 BO	0	0	No	Yes	No	Yes	No	No	No	No	No	No		
4:39:00	MCP	3rd District, !	FAILURE TO CONTROL VEH. SPEE	COLUMBIA PK/STEWA	39.0466317	-76.98689647	No	No	No	No	No	No	No	No	No	No		
15:07:00	MCP	3rd District, !	DRIVING MOTOR VEHICLE ON HI	I 495 & RT 355	39.01718657	-77.10972372	No	No	No	No	No	No	No	No	No	No		
4:49:00	MCP	3rd District, !	PERSON DRIVING MOTOR VEHIC	COLUMBIA PK/STEWA	39.04664738	-76.98686453	No	No	No	No	No	No	No	No	No	No		
3:34:00	MCP	6th District, (	DRIVING UNDER THE INFLUENCE	GOSHEN RD. @ FRAM	39.14977148	-77.23368673	No	No	No	Yes	No	No	No	No	No	No		
0:52:00	MCP	3rd District, !	DRIVER CONSUMING ALCOHOLI	PINEY BRANCH ROAD	0	0	No	No	No	No	No	No	No	No	No	No		
0:52:00	MCP	3rd District, !	KNOWINGLY DRIVING UNINSURE	PINEY BRANCH ROAD	0	0	No	No	No	No	No	No	No	No	No	No		
3:12:00	MCP	3rd District, !	FAILURE TO CONTROL VEHICLE S	1712 TILTON DR	0	0	Yes	No	No	Yes	No	No	No	No	No	No		
3:34:00	MCP	6th District, (	FAILURE OF INDIVIDUAL DRIVING	GOSHEN RD. @ FRAM	39.14977148	-77.23368673	No	No	No	Yes	No	No	No	No	No	No		
3:12:00	MCP	3rd District, !	DRIVING VEHICLE IN EXCESS OF I	1712 TILTON DR	0	0	Yes	No	No	Yes	No	No	No	No	No	No		
0:52:00	MCP	3rd District, !	PERSON DRIVING MOTOR VEHIC	PINEY BRANCH ROAD	0	0	No	No	No	No	No	No	No	No	No	No		
2:03:00	MCP	6th District, (	DRIVING MOTOR VEHICLE ON HI	20021 CENTURY BLV	39.18410072	-77.26181293	No	No	No	No	No	No	No	No	No	No		
0:52:00	MCP	3rd District, !	DRIVING WHILE IMPAIRED BY ALC	PINEY BRANCH ROAD	0	0	No	No	No	No	No	No	No	No	No	No		
3:34:00	MCP	6th District, (	RECKLESS DRIVING VEHICLE IN V	GOSHEN RD. @ FRAM	39.14977148	-77.23368673	No	No	No	Yes	No	No	No	No	No	No		
3:12:00	MCP	3rd District, !	FAILURE TO DRIVE VEHICLE ON R	1712 TILTON DR	0	0	Yes	No	No	Yes	No	No	No	No	No	No		
1:42:00	MCP	6th District, (	DRIVING WHILE IMPAIRED BY ALC	497 QUINCE ORCHAR	0	0	Yes	No	Yes	No	No	No	No	No	No	No		
3:34:00	MCP	6th District, (	DRIVING VEHICLE WHILE UNDER	GOSHEN RD. @ FRAM	39.14977148	-77.23368673	No	No	No	Yes	No	No	No	No	No	No		
0:52:00	MCP	3rd District, !	DRIVING VEHICLE WHILE UNDER	PINEY BRANCH ROAD	0	0	No	No	No	No	No	No	No	No	No	No		