20/05/2025

NYPD Vehicle Stop Analysis

1. Intro

This analysis explores the relationship between police-initiated vehicle stops and demographics in New York City, focusing on whether stops are equitably distributed across age, gender and race and identifying patterns and results of these stops.

The results can be used to:

- Reallocate police officers to busier precincts
- Identify common traffic issues per precinct
- Evaluate equity in traffic enforcement
- Inform strategies to improve resource use and community relations

Data Sources

This dataset contains vehicle stop reports from the New York Police Department (NYPD), I obtained the data on 12/05/2025 and it will be collected and updated quarterly by New York City Police Department.

Each row has unique 'Event Key' which represents an individual vehicle stop, this data covers from January 2023 to March 2025.

The records include:

- Demographic information: age, race and gender
- Occurrence date and time
- Precinct number
- Flags indicating whether force was used, an arrest was made or a summon was issued.

Data Limitations:
Although the dataset contains latitude and longitude, over half of the entries are missing this information, which prevented geographical analysis.
The dataset does not include the cause of the stop or any contextual details. Deeper analysis would require supplementary data such as crime, historical crime rates. Therefore, some points in this analysis remain indeterminate.

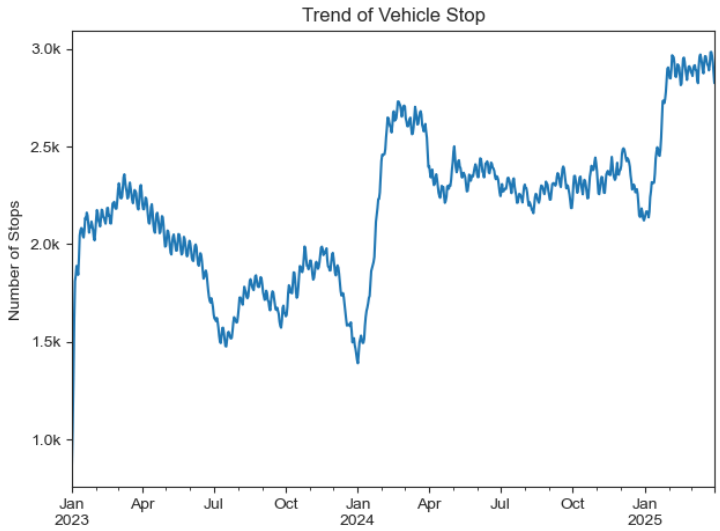
Objectives

- Identify when vehicle stops most commonly occur and observe trends over time.
- Investigate the relationship between driver demographics and vehicle stops.
- Analyse the result of vehicle stops, focusing on: Arrest Made, Summon Issued and Force Used.
- Determine which precincts have the highest vehicle stop activity.

Note: This report presents an overview of the analysis. Full code and results are available on my GitHub.
This analysis presents observed patterns in vehicle stop data but does not draw conclusions about causality or intent.

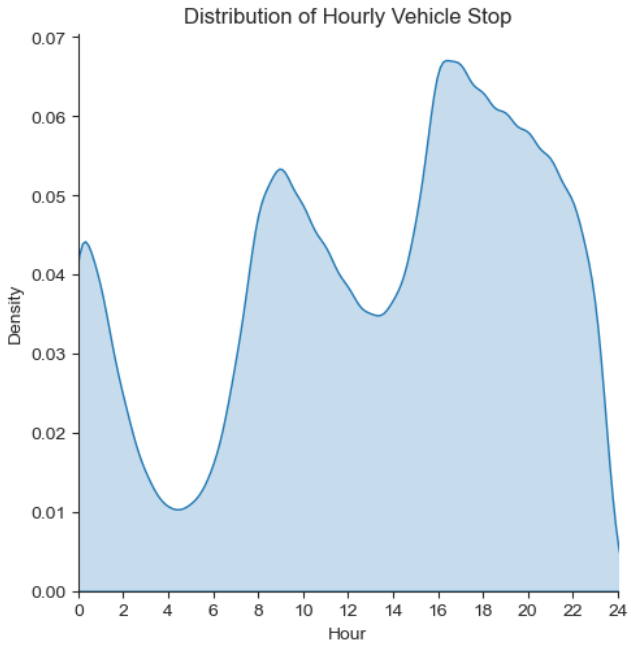
2. Analysis

1. Is there a specific time when vehicles are most likely to be stopped?



Monthly Trends in Total Vehicle Stops

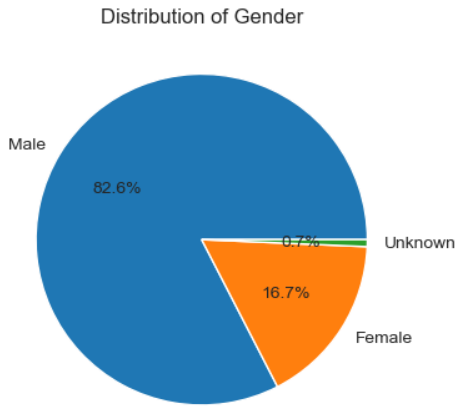
Vehicle stop counts were higher at the beginning of each year, and have increased overall since 2023. By early 2025, monthly stops reached approximately 3,000, almost double the number from 2023. This indicates an increase of proactive enforcement or police officers to conduct vehicle stops.

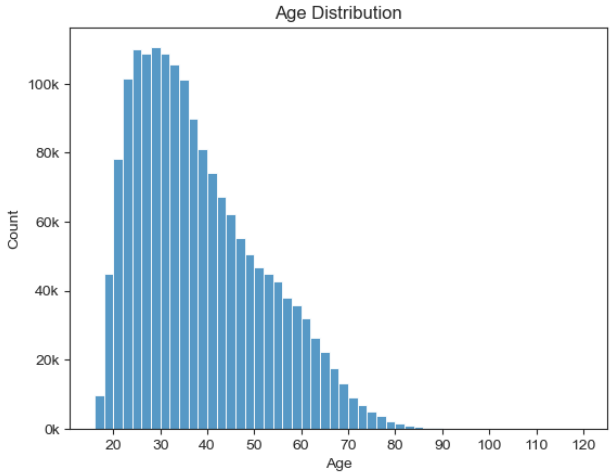


Hourly Distribution of Vehicle Stops

Most stops occur during commuting hours and in the evenings until around 2am, aligning with peak traffic and common safety enforcement hours.

2. Are certain demographics more likely to be stopped?



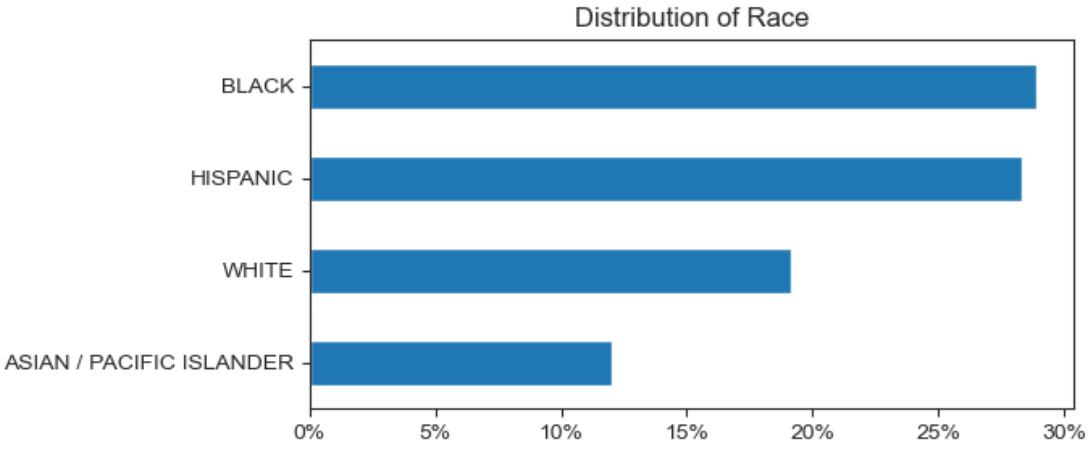


A pie chart of driver gender distribution

Although the driving population in New York is approximately 50/50 male and female[1], over 80% of stopped drivers are male.
This could reflect differences in driving exposure of enforcement patterns. Statistically, men are more likely to be involved in crime activity[2], however further analysis is needed to confirm whether this explains the disparity.

A histogram of driver's age

The majority of stopped drivers are between 20 and 70 years old, which aligns with the USA driver age distributions.[3]



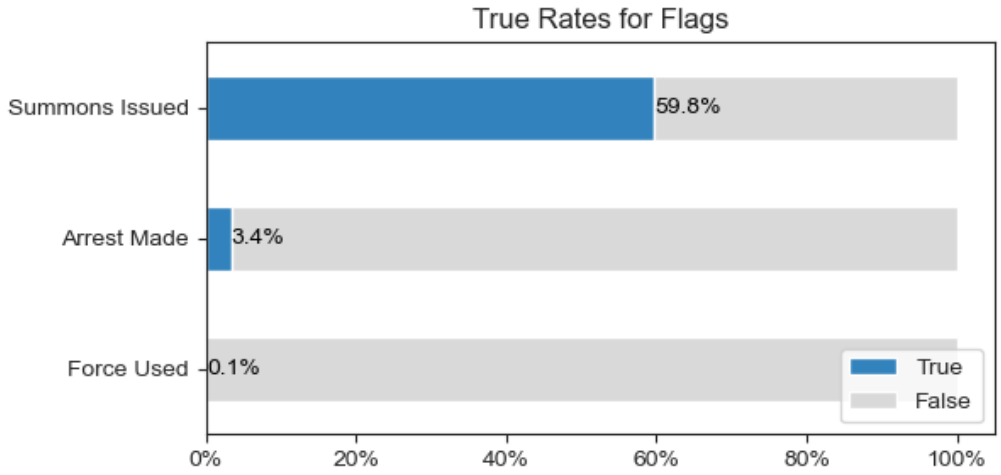
A horizontal bar chart of race distribution

Black and Hispanic drivers represent a combined proportion of 60%, compared to their representation in New York City's residents:

17.6% Black, **19.5%** Hispanic and **54.7%** White.[4]

This disparity may reflect a combination of factors, including differences in driving patterns and traffic exposure. Importantly, the data does not indicate intent or causality, further investigation is required to determine the underlying causes and ensure transparency in enforcement practices.

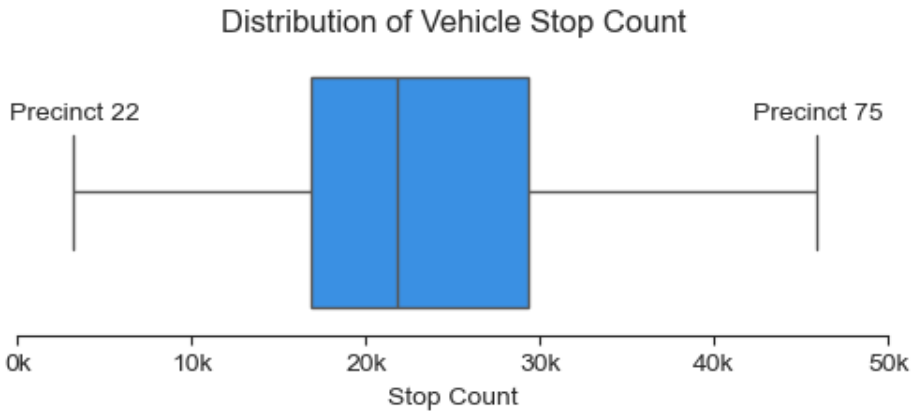
3. What are the results of vehicle stops?



Result per flag

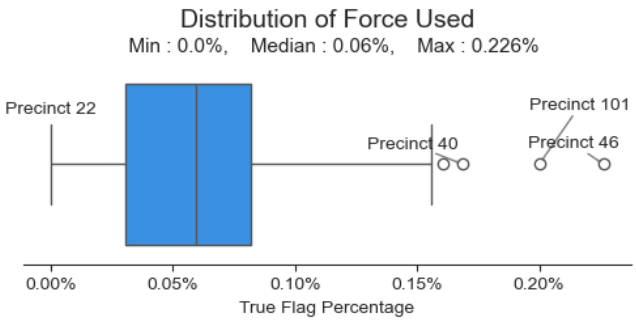
Most stops result in Summon Issued, nearly 60% of stopped vehicle drivers and Arrest rate is 3% and Force Used rate is 0.1%. This suggests that such as running red lights, speeding or other minor traffic violations are more common than serious vehicle related crime.
Those minor violations could potentially be managed by automated systems (e.g., cameras), which could increase efficiency and reduce the need for officer involvement.

4. Which precincts have the highest vehicle stop activity?



A box plot of stop counts per precinct

Most precincts recorded over 20,000 vehicle stops in the last two years.
Precinct 75 recorded the highest number with nearly 50,000 stops. This may indicate the need to review staffing and resource for efficient operation.
Precinct 22 has the lowest, with about 3,000 stops. This raises question about its resource allocation or if they are processing in different enforcement style.

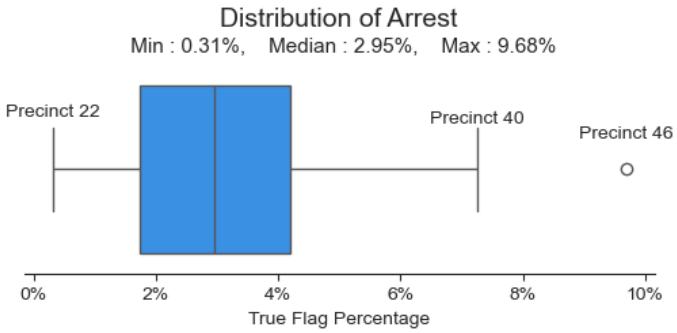


Force Used Rates per Precinct

The box plot shows distribution with outliners in Precinct 46, 101 and 40.

The overall force used on driver rate is low (under 1%) and median of 0.06%.

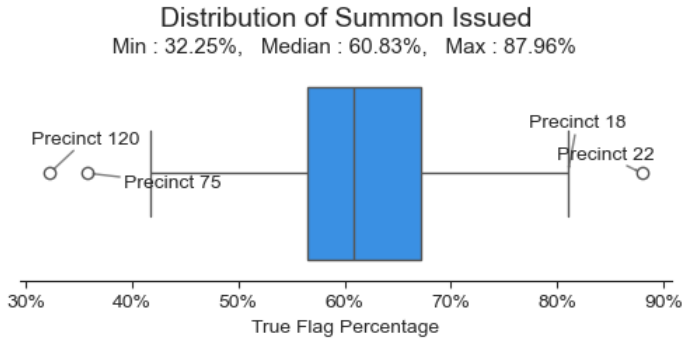
Precinct 22: reported 0% of force used.
Precinct 101: second highest at 0.2%
Precinct 46: highest rate at 0.23%
which is 4 times more than majority others.



Arrest Rates per Precinct

Most precincts arrest 2.95% of drivers.

Precinct 46: highest at nearly 10% arrest made
Precinct 22: lowest at 0.31%.



Summon Issued Rates per Precinct

Most precincts Issued summons to around 60% of drivers.

Precinct 75: second lowest summon issued rate, despite the highest number of total stops.

Precinct 22: the highest summon Issued rate at nearly 90%.

These figures may indicate Precinct 46 and 40 have higher rate of serious offenses or engaging in more intense policing.

For Precinct 22, almost 0% of Arrest and Force used and high rates of Summon issued, this could suggest that most stops involve minor traffic violations, such as speeding or expired documentation, or possibly a pattern of officers defaulting to issuing summons regardless of the situation's complexity.

However, without additional qualitative context like internal NYPD reports or detailed stop reasons, it is not possible to conclude the cause definitively.

3. Insights

- The police-initiated vehicle stops have increased since 2023, reaching 3,000 per month in 2025.
- Nearly 60% of drivers received summons, 3% are arrested and 0.1% experience use of force.
- Precinct 75 leads in total stops, with 50,000 in the last two years.
- Precinct 46 has the highest Arrest and Force Used, whether due to crime severity or enforcement practices, cannot be determined from this data alone. Further analysis will be need for example, with crime data per precinct to conduct analysis of crime pattern.
- Precinct 22 relies heavily on issuing summons at nearly 90%, with minimal Force used and 0% of Arrest.
- Racial and gender disparities exist in the data, but causality cannot be determined from this dataset alone.

4. Recommendation

- Precinct 22: Consider an internal audit or review to assess stop classifications and to ensure reporting practices align with department standards.

- Precinct 46 and 40: Additional analysis and resources may be required to manage serious crime and evaluate enforcement strategies.

- Minor violations could be automated with speed cameras or red-light cameras to improve efficiency and reduce on human resources. This will be also able to lead reallocation of police officer to higher-priority tasks.

5. Conclusion

This analysis reveals:

- Police-initiated vehicle stop in New York is increasing over the time.
- There are demographic disparities by race and gender, while age distribution of stopped vehicle drivers is aligning with total USA driver's age distribution.
- Over half of stopped drivers had summoned, and force use and arrest made are relatively low.
- Precinct 40 and 46 maybe handle heavier crimes, Precinct 22 has the lowest vehicle stop counts and nearly 90% of stops result in summon issue.

References

1) USA Drivers Gender Distribution 2019

2) Gender distribution of crime

3) USA Drivers Age Distribution 2021

4) New York Diversity 2020