NYPD Stop, Question and Frisk

Jamil Mirabito

Agenda

- Introduction
- Data & Methodology
- Sample Description
- Model Development
- Feature Exploration
- Summary & Recommendations

Introduction

- **Business Case:** Policing crime in the United States has long been a highly controversial practice given the disproportionate surveillance, arrest, and imprisonment of individuals from communities of color. While these disparities are largely a result of systemic racism, research suggests that there are likely individual biases that may contribute to disparities in arrests as well. *This analysis aims to determine which individual-level factors contribute most to an arrest in the hopes that, if biases are present, they may be addressed.*

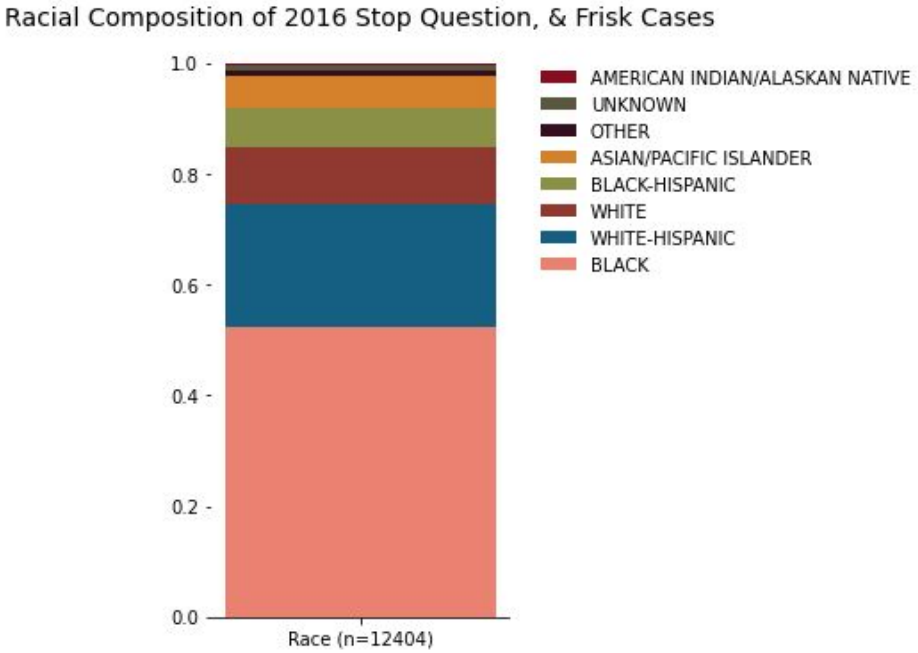
- **Research Questions:**
  - How large are the disparities in arrests resulting from a Stop, Question, and Frisk incident?
  - What are the most common factors resulting in an arrest?

Data & Methodology

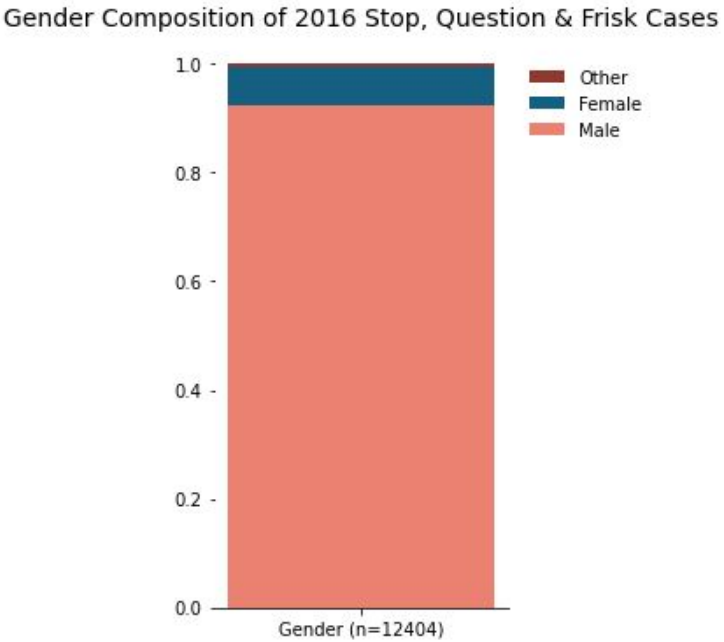
- **Data:**
  - NYC Stop, Question, and Frisk Data (2016)
  - 2016 was the most recent year with understandable documentation
  - Sample size: 12,404
  - 113 features (before creating dummy variables)
- **Methods:**
  - Target: The target outcome that we are predicting is arrest. For the sake of model development, we grouped *arrest* and *summons issued* into one outcome *arrest* given the low numbers of summons issued.
  - Sample Description: High-level descriptive analysis of all 2016 Stop, Question, and Frisk incidents
  - Model Development:
    - Statistical Analysis: Analysis to determine statistical significance of all features. This method was used to trim down the feature set to a more interpretable number of features
    - Classification model development and training:
      - 14 different iterations of logistic regression and decision tree models
      - Model performance metrics and model selection
    - Exploration of feature importance: 26 features found to be most “important”

Sample Description

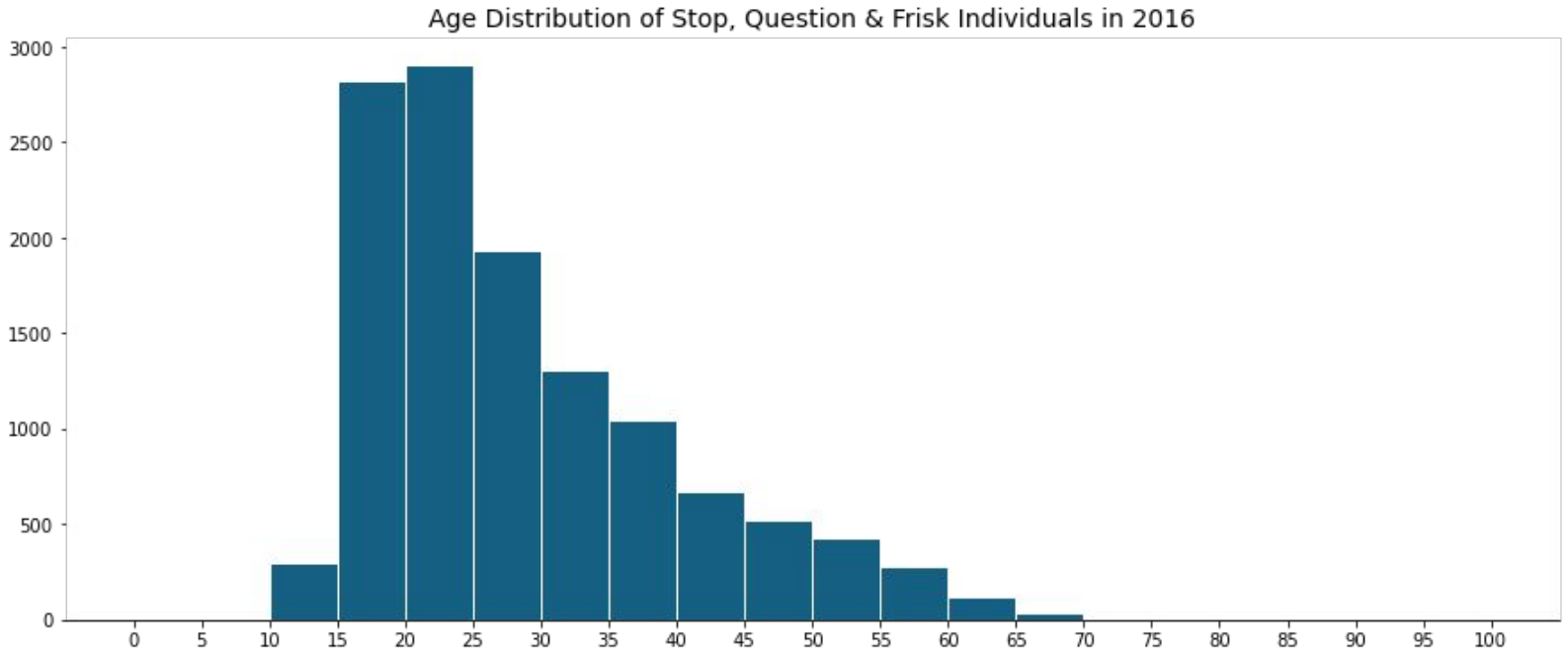
Black and Hispanic individuals make up the majority of 2016 SQF incidents



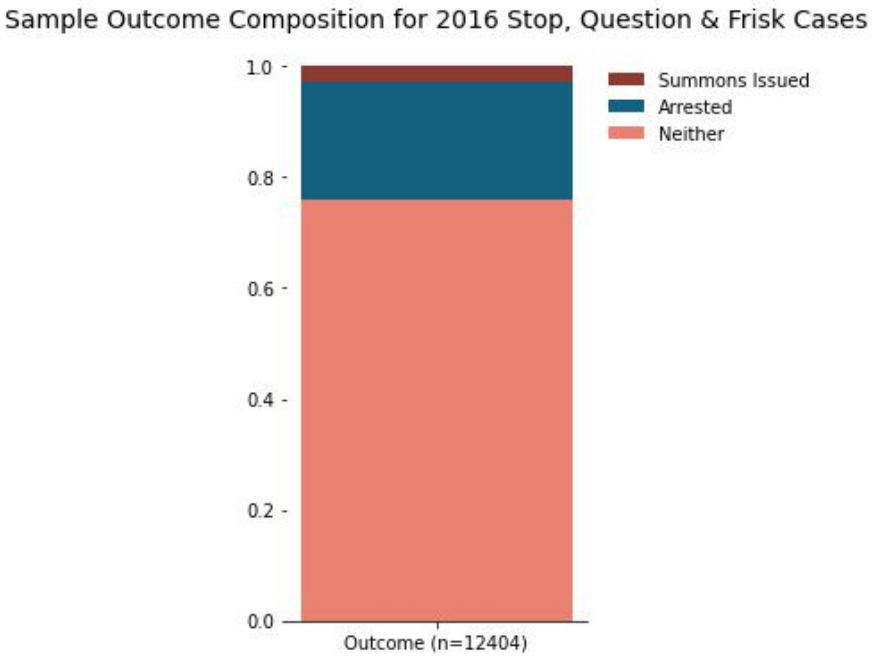
More than 90 percent of incidents in 2016 involved males



The average suspect in SQF incidents is 28 years old



Roughly 75 percent of SQF incidents resulted in neither an arrest or issuance of a summons



See **Appendix** for an explanation of the difference between an arrest and an issuance of a summons for court.

Model Development

Model development

- **Statistical Analysis:**
  - **Difference of two means t-test** to compare the means of arrested vs not arrested for continuous variables (e.g., age, weight)
  - **Difference of 2 proportions Z test** to compare the percentages of positive cases for each feature (e.g., comparing the percentage of individuals carrying a weapon in the arrested group vs the not arrested group)
    - Insignificant features ($p>0.05$) were pruned from later models to facilitate model interpretability
- **Classification Models:**
  - **Logistic Regression** and **Decision Tree** models were tested for this analysis given their high level of interpretability for classification problems
  - **GridSearchCV** was used to tune hyperparameters for both Logistic Regression and Decision Tree Models
  - **Recursive Feature Elimination** was used to select the most important features from Logistic Regression Models

Model performance

	model	# Features	Train Accuracy	Test Accuracy	Train Recall	Test Recall	Train Precision	Test Precision	Train F1	Test F1
0	Basic Logistic Regression	231	0.861635	0.858525	0.801843	0.796694	0.680171	0.678873	0.736012	0.733080
1	GridSearchCV Logistic Regression	231	0.860425	0.855300	0.788018	0.796694	0.681522	0.674221	0.730911	0.726163
2	Basic Logistic Regression Selected	99	0.859216	0.858928	0.795140	0.793388	0.676408	0.680851	0.730984	0.732824
3	Basic LogReg w/ Selected Features & RFECV	15	0.860828	0.863362	0.760369	0.780165	0.691692	0.696165	0.724406	0.735776
4	Basic Decision Tree Model	231	1.000000	0.851270	1.000000	0.700826	1.000000	0.692810	1.000000	0.696795
5	GridSearchCV Decision Tree Model	231	0.905271	0.875050	0.803519	0.740496	0.802846	0.745424	0.803183	0.742952
6	Basic Decision Tree Selected Features	99	1.000000	0.836356	1.000000	0.676033	1.000000	0.660743	1.000000	0.668301
7	GridSearchCV Decision Tree Model w/ Selected F...	99	0.894891	0.868198	0.775450	0.735537	0.784987	0.727124	0.780190	0.731306
8	GridSearchCV Decision Tree Model w/ Feature Im...	66	0.895697	0.869811	0.775869	0.737190	0.787415	0.731148	0.781599	0.734156
9	Basic LogReg w/ Final Features & RFECV	29	0.858007	0.851270	0.772937	0.780165	0.680310	0.666667	0.723671	0.718964
10	GridSearchCV Decision Tree Model w/ Final Feat...	29	0.887232	0.875050	0.753666	0.748760	0.772103	0.741408	0.762773	0.745066
11	Final GridSearchCV Decision Tree Model w/ Feat...	24	0.887232	0.875050	0.753666	0.748760	0.772103	0.741408	0.762773	0.745066
12	GridSearchCV Decision Tree Model w/ Poly Features	464	0.887937	0.865377	0.782572	0.752066	0.759041	0.712050	0.770627	0.731511
13	Poly GridSearchCV Decision Tree Model w/ Featu...	71	0.888340	0.864571	0.783829	0.752066	0.759643	0.709828	0.771546	0.730337

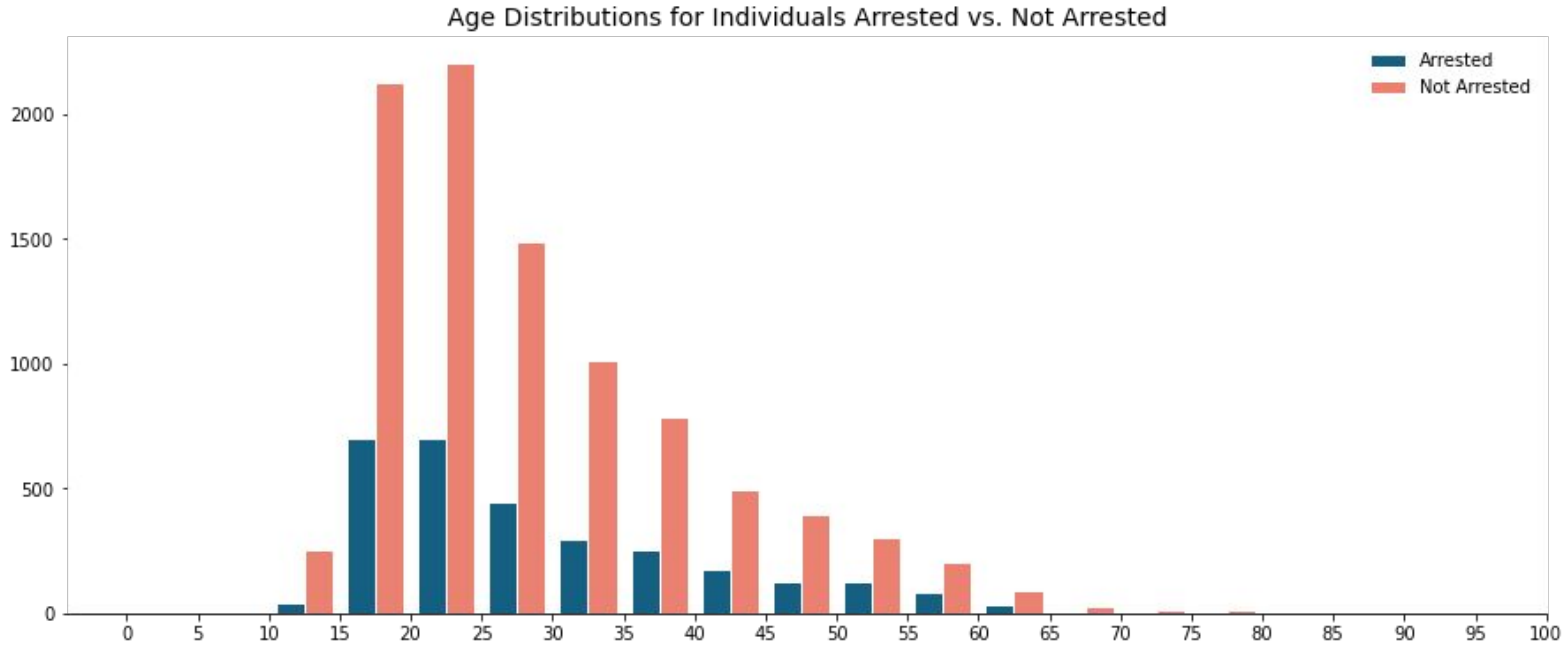
Feature Exploration

Feature importance

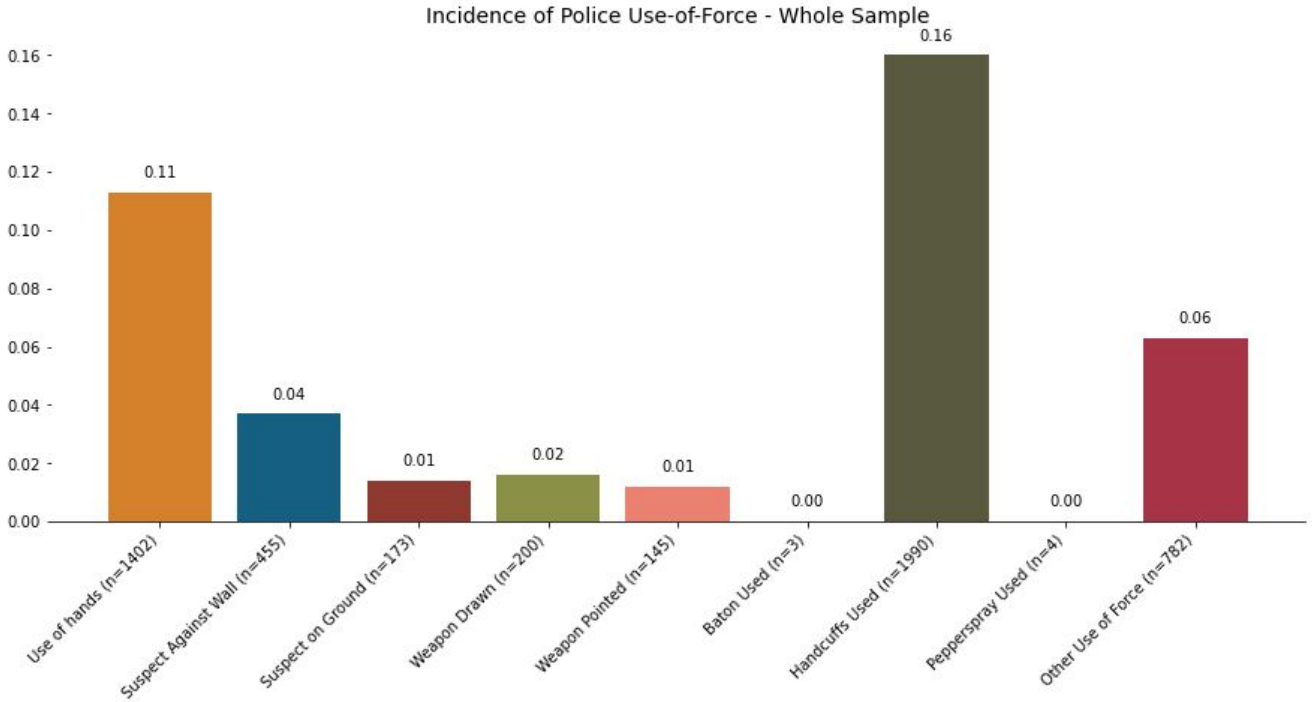
Twenty-four features were found to be most predictive of an arrest. They are grouped below into a few themes in no particular order:

- **Physical characteristics:** Age and weight were among the strongest predictors of arrest.
- **Police Use-of-Force:** Officers tend to use force in instances where they are going to arrest an individual. Force is often used in response to resistance (in most cases).
- **Ongoing investigation:** Whether the suspect was already being surveilled for involvement in a previous crime or if they fit a description of someone who committed a crime.
- **Geography:** Three precincts (13, 52, and 61) were among the strongest predictors of arrest. It's likely that racial and socioeconomic factors are tied to these precincts as well.
- **Searched:** Whether a suspect was searched and if any contraband was found on their body.
- **Suspicion of Particular Crimes:** Four criminal acts were strong predictors of arrest - theft of services, Trespassing, Criminal Possession of a Weapon, and Petit Larceny

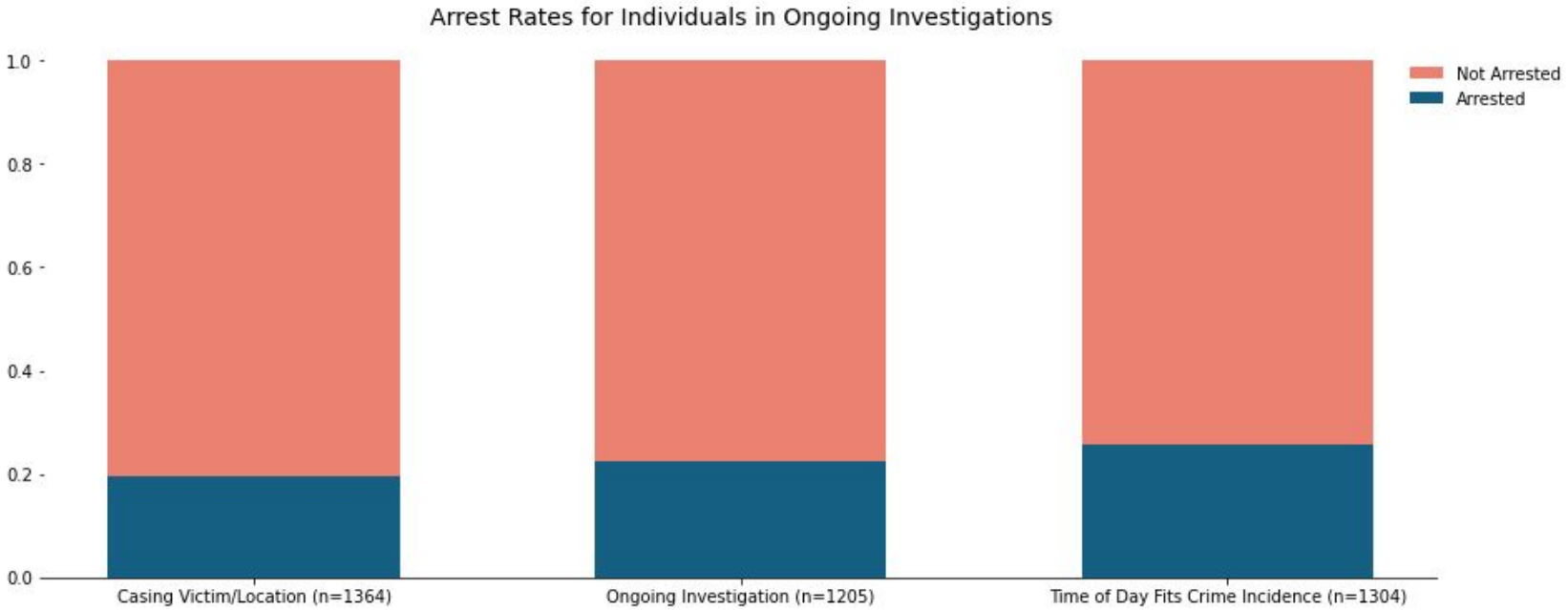
Age appears similarly distributed for individuals arrested and not arrested - the difference is statistically significant



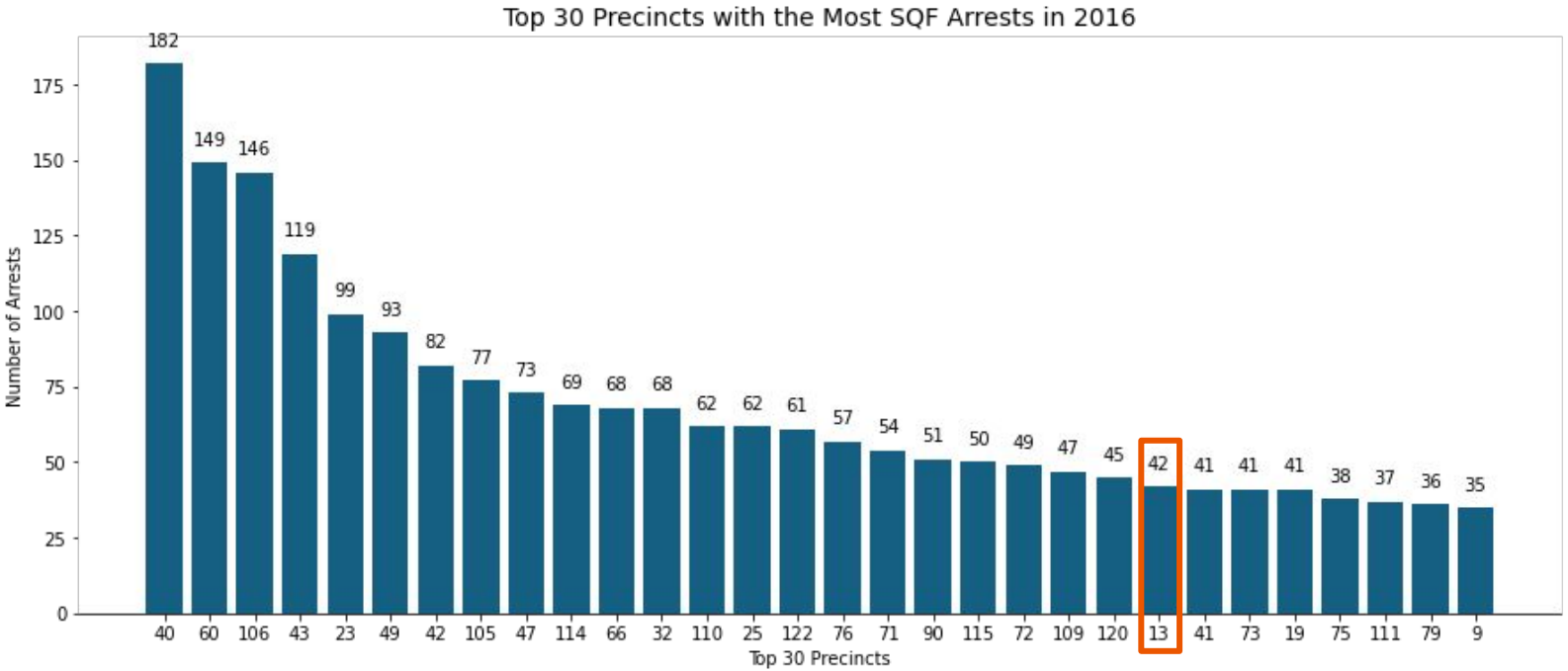
Among all individuals in SQF cases, the most common police use of force is applying handcuffs



Among suspects in ongoing investigations, roughly 20% - 25% of individuals are arrested

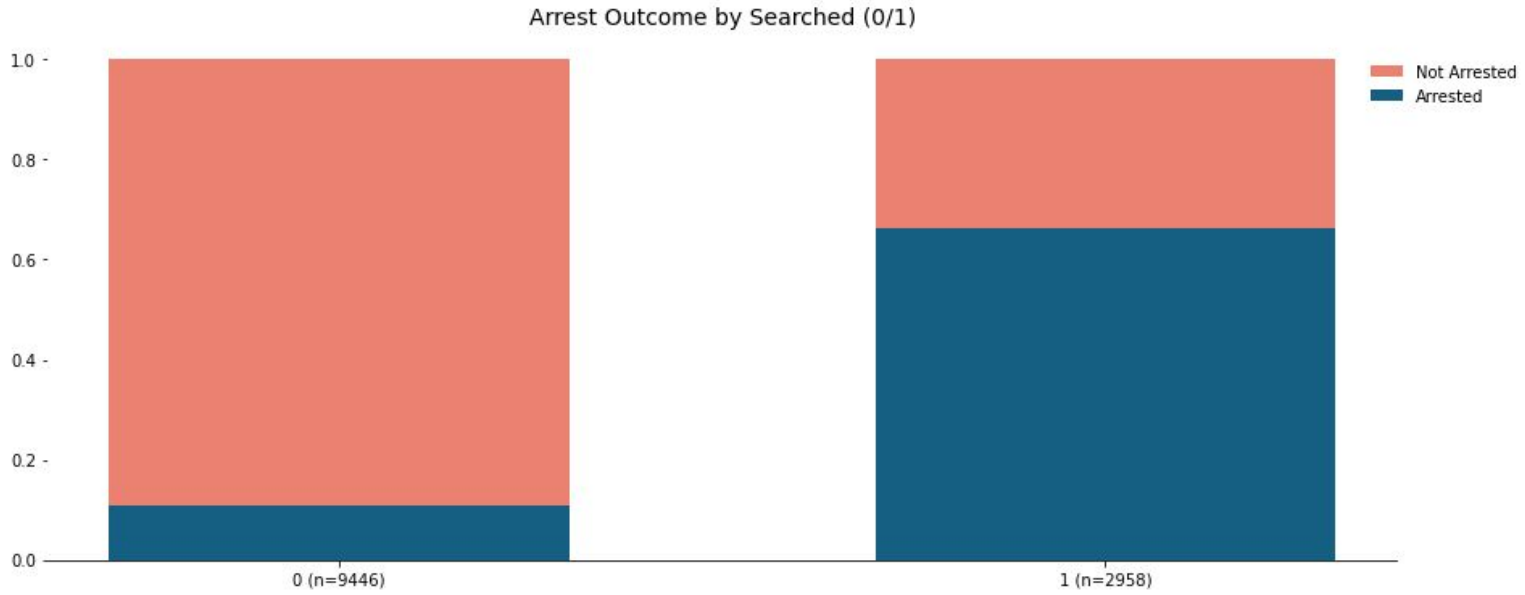


Precincts 13, 52, and 61 were identified as strong predictors of arrest, but only precinct 13 makes the top 30 for total arrests in 2016



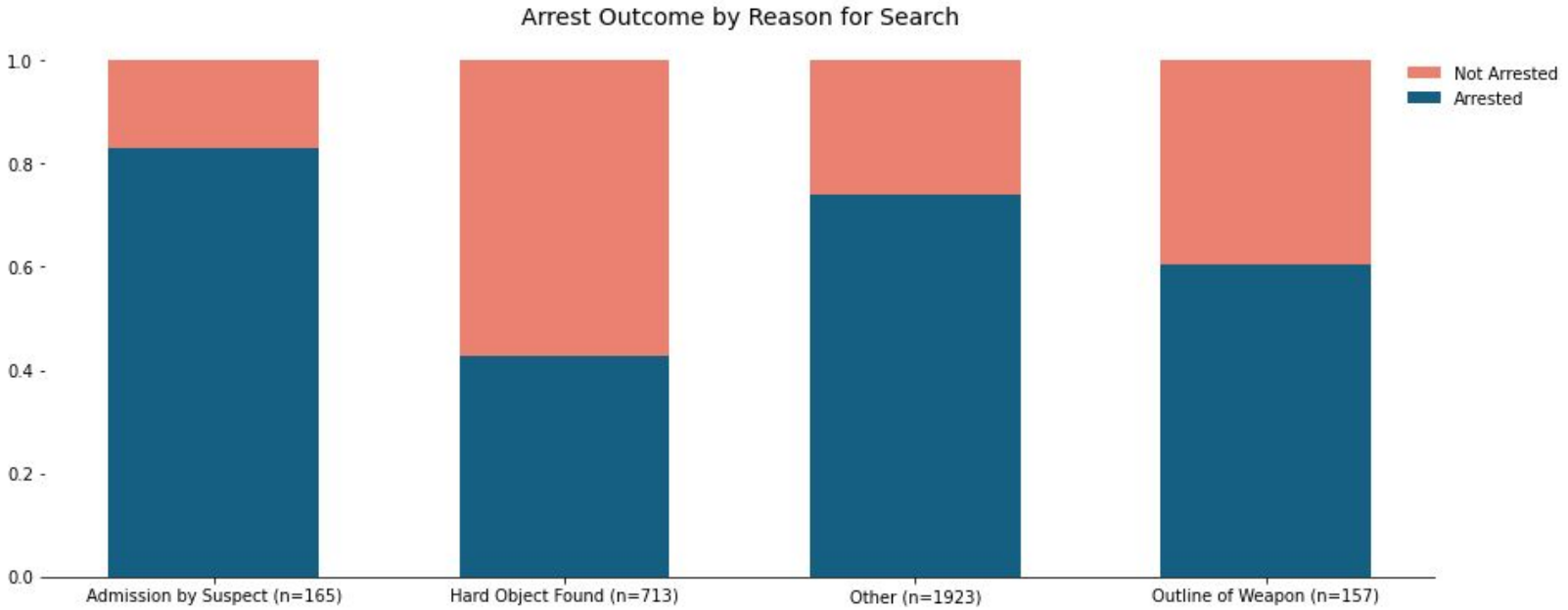
See **Appendix** for information on the three precincts listed above.

Whether someone is searched is a strong predictor of arrest



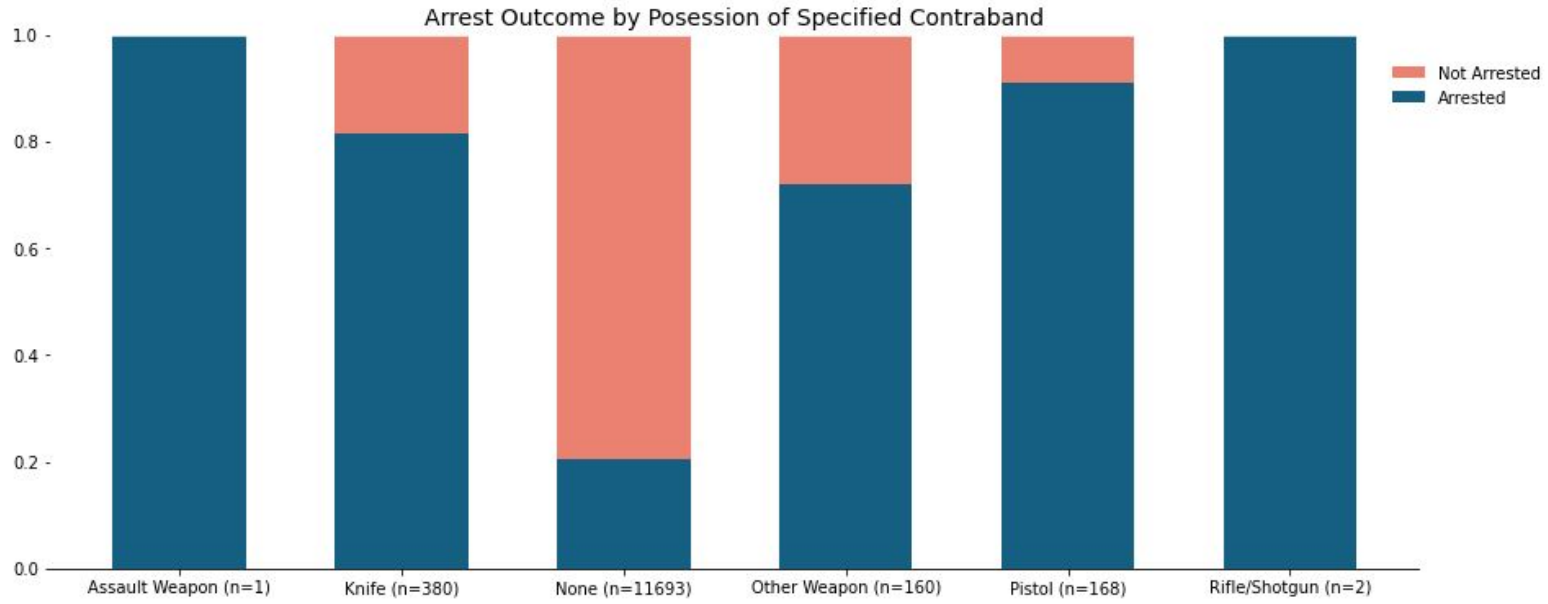
See **Appendix** for explanation of difference between *search* and *frisk*.

Admission by suspect results in the highest likelihood of arrest from a search

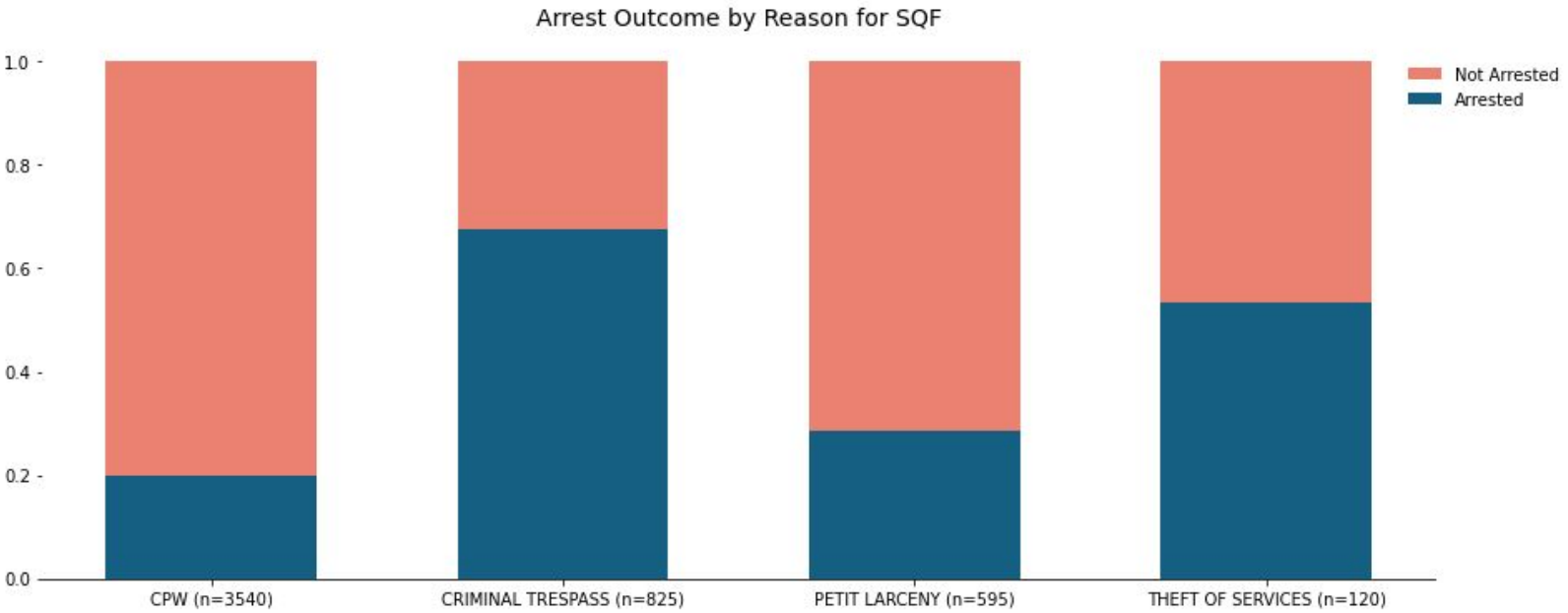


See **Appendix** for explanation of difference between *search* and *frisk*.

Possession of a weapon is a very strong predictor of arrest



Each of the features below make the list for optimal feature importance, but criminal trespass and theft of services result in the highest likelihood of arrest



Summary & Recommendations

Summary & Next Steps:

- Given the data we have access to, it seems that arrests from SQF incidents are made on observable characteristics such as the presence of a weapon, involvement in a crime, or the need for police use of force. That's not to say that bias is not present, it is just hard to measure given the limitations of the data. *There does, however, seem to be suggestive evidence that bias is present in the reason for SQF.* While this analysis examines the factors resulting in arrest from an SQF incident, it seems that bias may be a more prevalent factor in predicting SQF rather than arrest from SQF.
- **Future work** might investigate the bias in approaching individuals for SQF incidents incorporating qualitative research as well.

Recommendations:

- Collecting qualitative data on officer biases via survey materials, focus groups, or interviews
- Engaging with researchers and community leaders to understand how officers can better serve their communities

Thank you.

Appendix

Terminology

Arrest: An arrest is made when an individual is deemed an immediate threat to society.

Issuing a Summons: When an officer issues a summons to appear in court, the suspect has done something to break the law and are being asked to appear in front of a judge. They are not, however, an immediate threat to society. Often times, a summons does result in an arrest.

Frisk: An officer may frisk a suspect if they have reason to believe that they may be carrying some illegal contraband. This may involve a pat down or visual inspection of the suspect. If the officer sees the outline of an object or feels a hard object on the suspect, this may warrant a more in-depth search.

Search: a search is an in-depth probe for evidence. If after feeling a hard object on a suspect leads the officer to believe it may be some form of illegal contraband, the officer may ask to search the suspect and their belongings for additional evidence of wrongdoing.

Most important features

- **pf_drwep**: Police force used - weapon drawn
- **ac_inves**: Additional Circumstances - ongoing investigation (i.e., the person was potentially a suspect in an ongoing investigation)
- **cs_casng**: Reason for stop - casing a victim or location
- **ac_time**: Additional Circumstances - time of day fits additional crime incidence
- **sb_admis**: Basis of search - admission by suspect
- **sb_other**: Basis of search - other
- **age**: suspect's age was a strong predictor of arrest. Younger individuals were more likely to be stopped and arrested.
- **pct_13**, **pct_52**, **pct_61**: The precinct nearest to the incident. These precincts must have higher arrest rates as a proportion of SQF incidents.
- **searched**: The fact that an individual was searched
- **contrbn**: Some form of contraband was found on the suspect (this could include a weapon, drugs, etc).
- **descr_CRIMINAL TRESPASS**: Individuals found trespassing were more likely to be arrested.
- **pf_hcuff:** The fact that an individual was placed in handcuffs makes it more likely that they would be arrested. It should be noted there were also individuals who were placed in handcuffs who were not ultimately arrested.
- **sb_hdobj:** Basis of search - hard object (likely found during frisk).
- **knifcuti:** Individuals with knives found in their possession were more likely to be arrested.
- **pistol:** pistol found in the suspect's possession is more likely to result in an arrest.
- **pct_106:** This precinct likely arrests individuals at higher rates than others likely to due to location and crime rate in that area.
- **weight:** An individual's weight is a likely contributor to likelihood of arrest. This could be due to the correlation between weight and age.
- **descr_THEFT OF SERVICES:** When an individual obtains services without compensating the provider.
- **descr_CPW:** Criminal possession of a weapon
- **othrweap:** Suspect is in possession of another weapon other than those listed.
- **trhsloc_Neither:** Location of arrest (options are Transit, Public Housing, Neither). Neither is more likely to result in arrest (likely because most crimes are committed in the street).
- **descr_PETIT LARCENY:** theft of property less than $1,000.

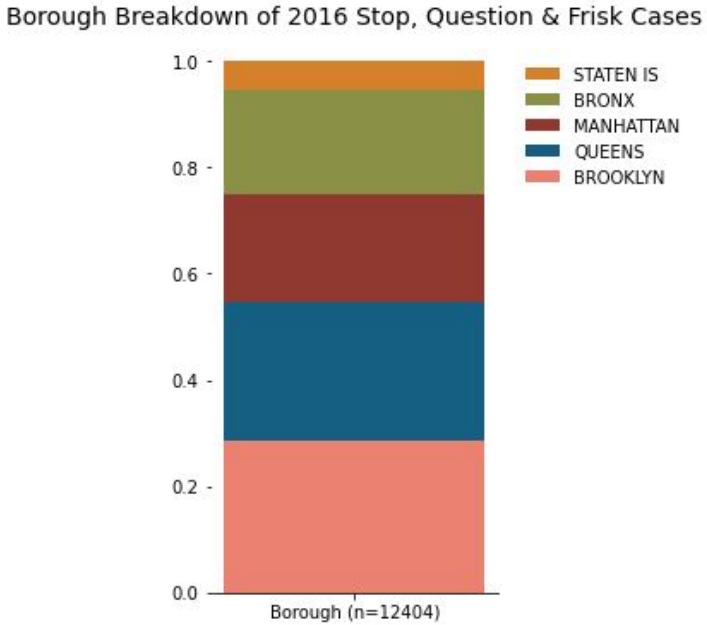
Feature Importance - Precincts

Precinct 13: Serving a southern portion of Midtown, Manhattan. The precinct features the Peter Cooper Village/Stuyvesant Town residential complex, Gramercy Park, the lower portion of Rosehill, Madison Square Park, and Union Square Park.

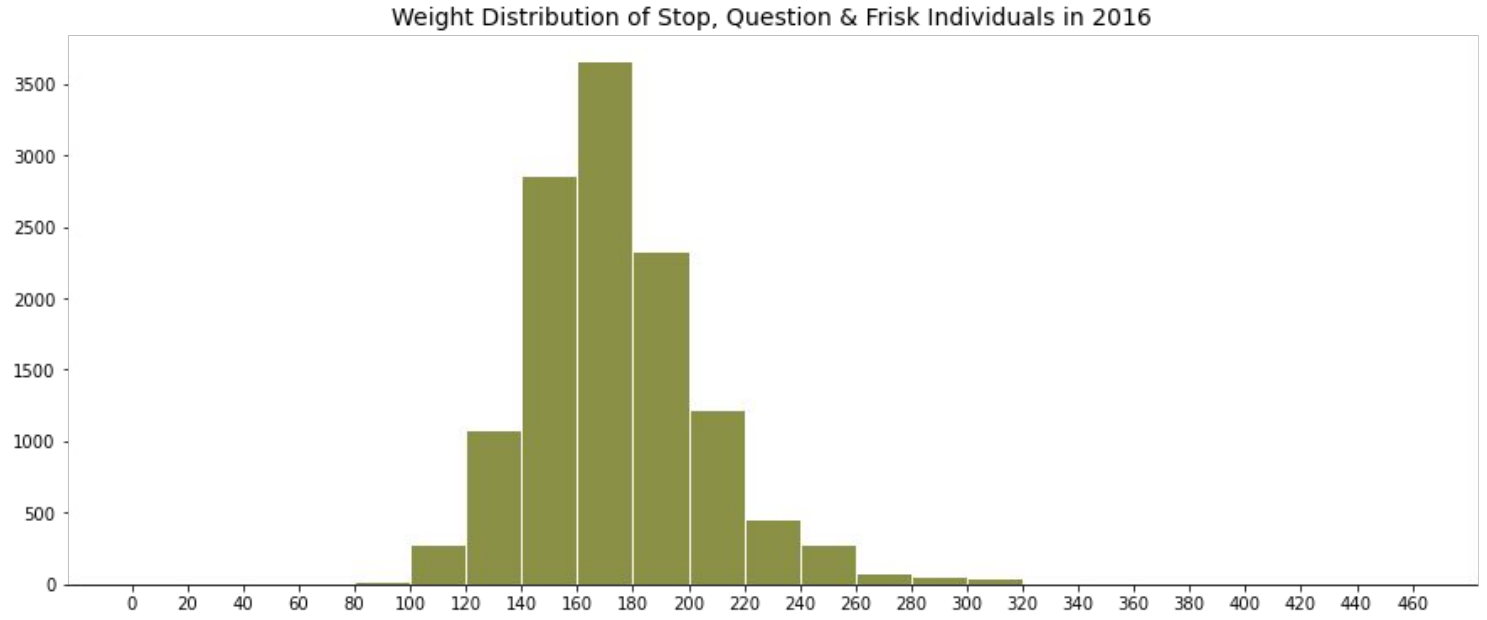
Precinct 52: Serving a northern portion of the Bronx. The precinct is home to Bedford Park, Fordham, Kingsbridge, Norwood, Bronx Park, and University Heights.

Precinct 61: Serving a southern portion of Brooklyn and encompasses Kings Bay, Gravesend, Sheepshead Bay, and Manhattan Beach.

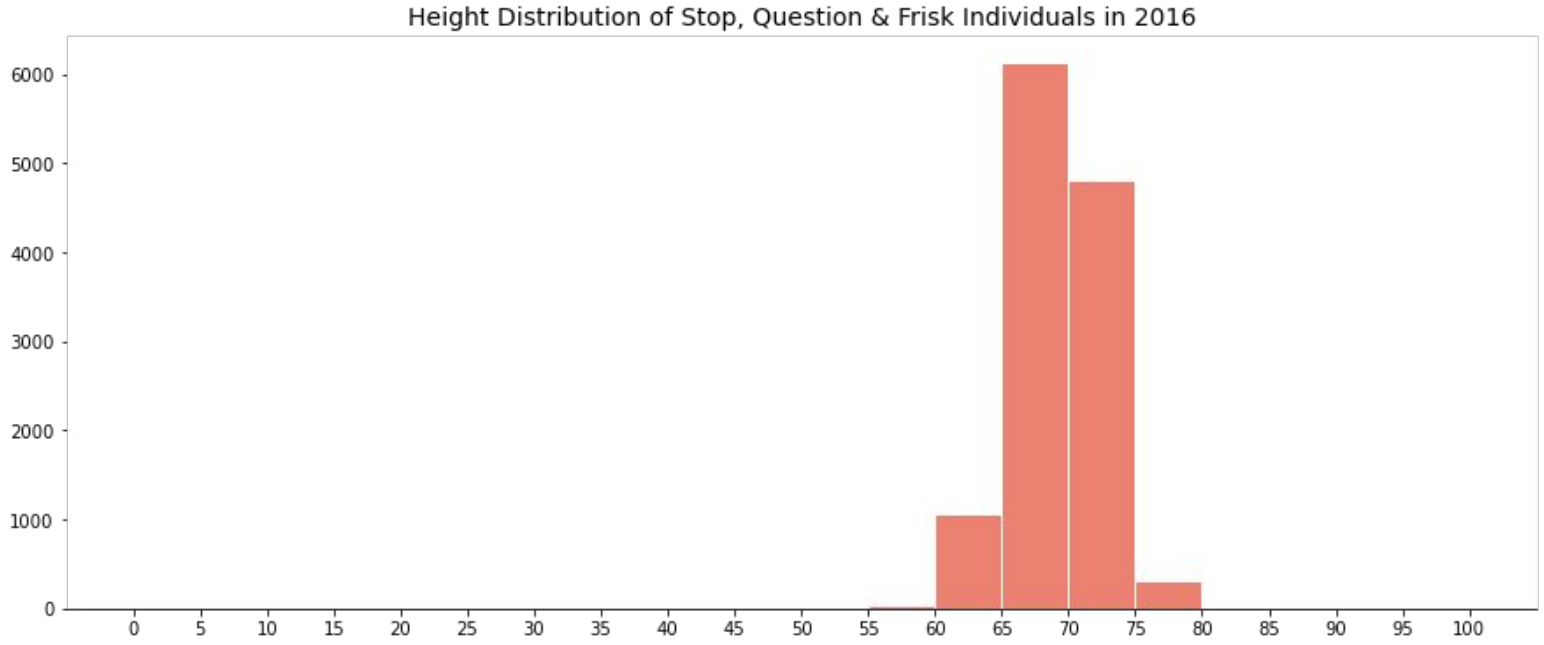
The number of SQF incidents is distributed fairly evenly across boroughs



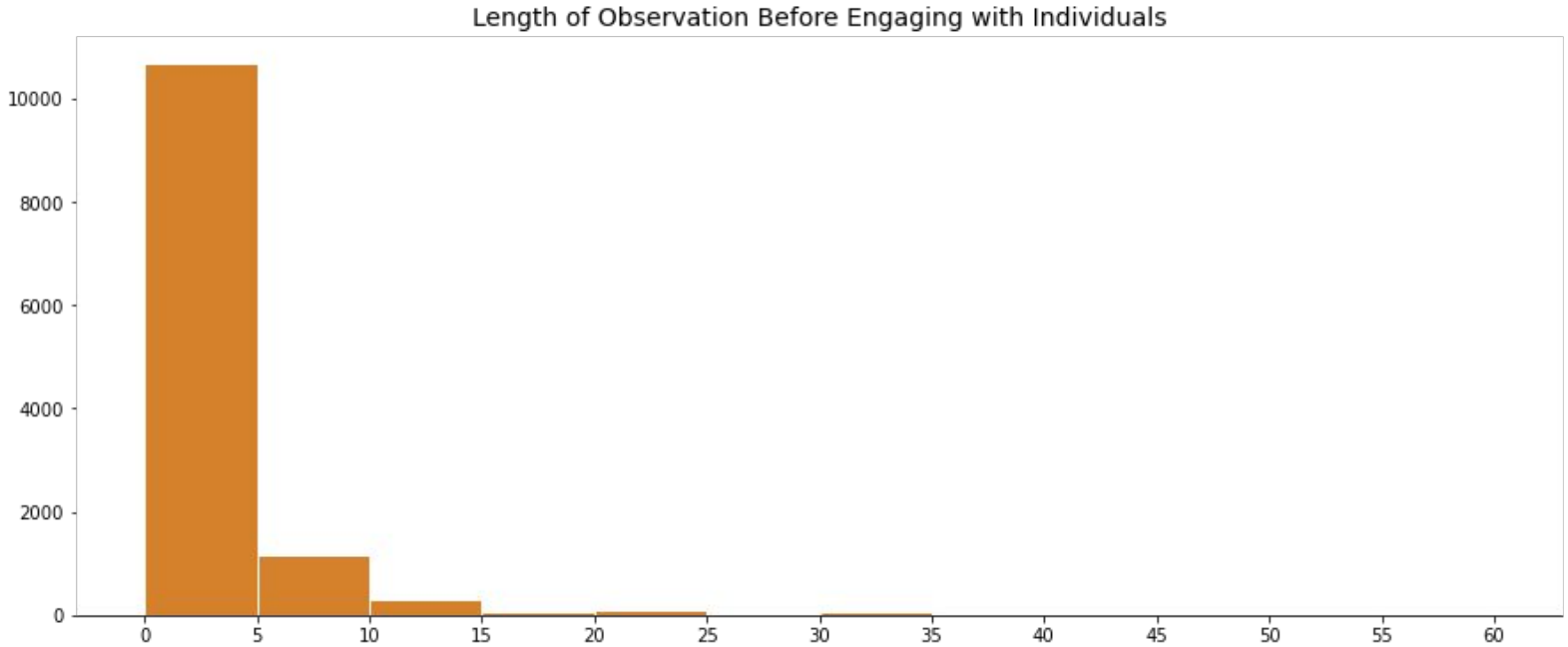
Suspect weights are normally distributed



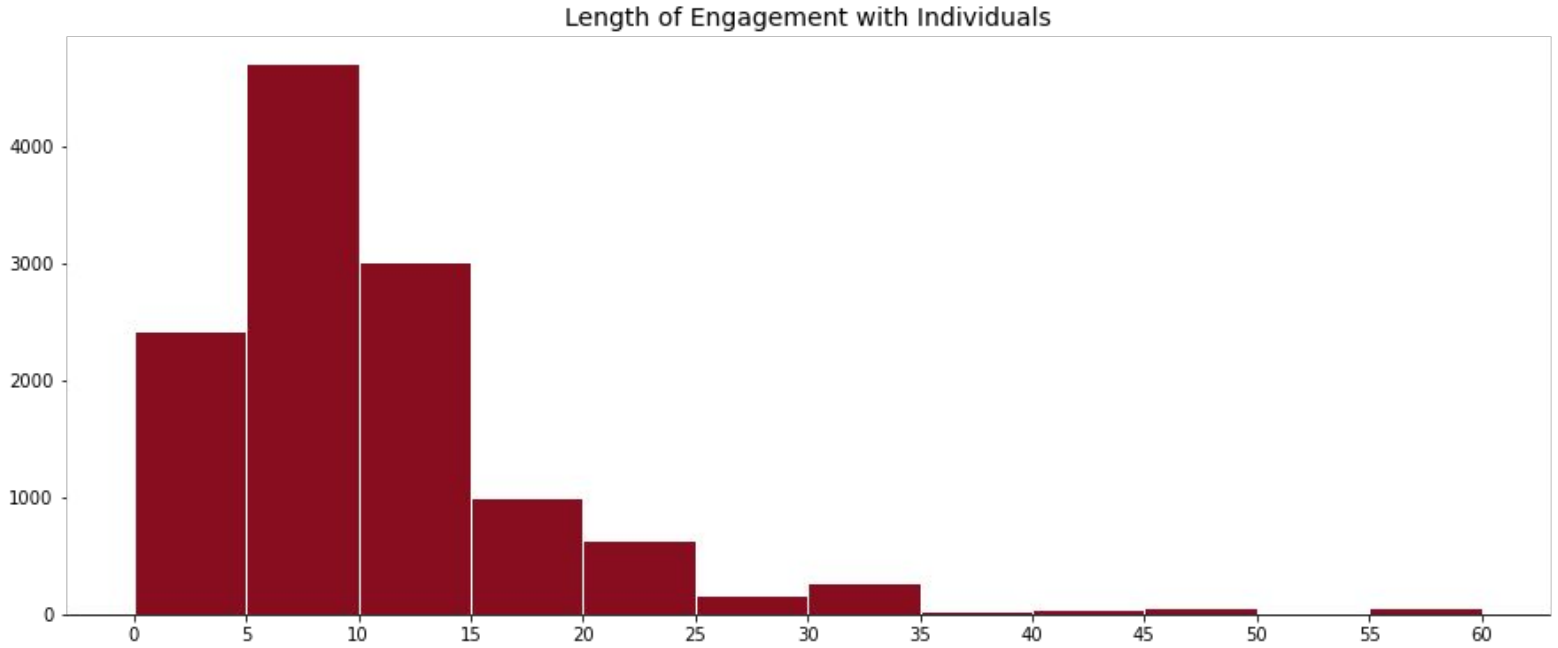
Most individuals are between 65 and 70 inches tall



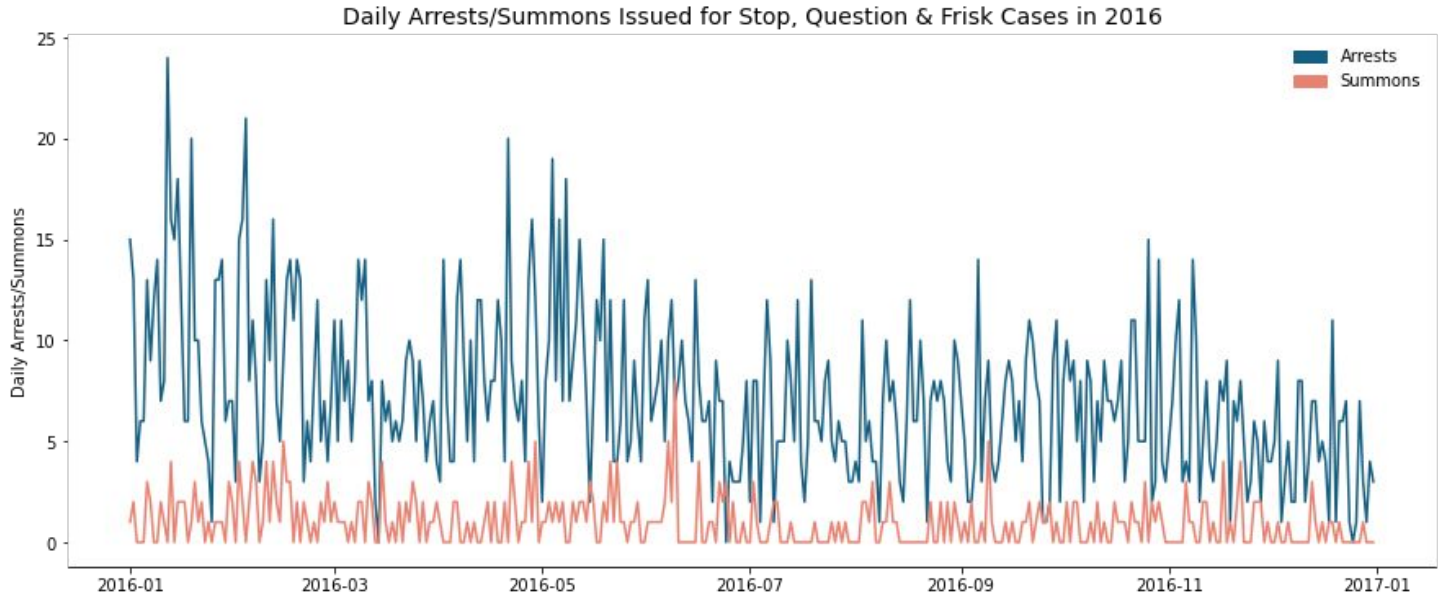
Most interactions are initiated in fewer than 5 minutes



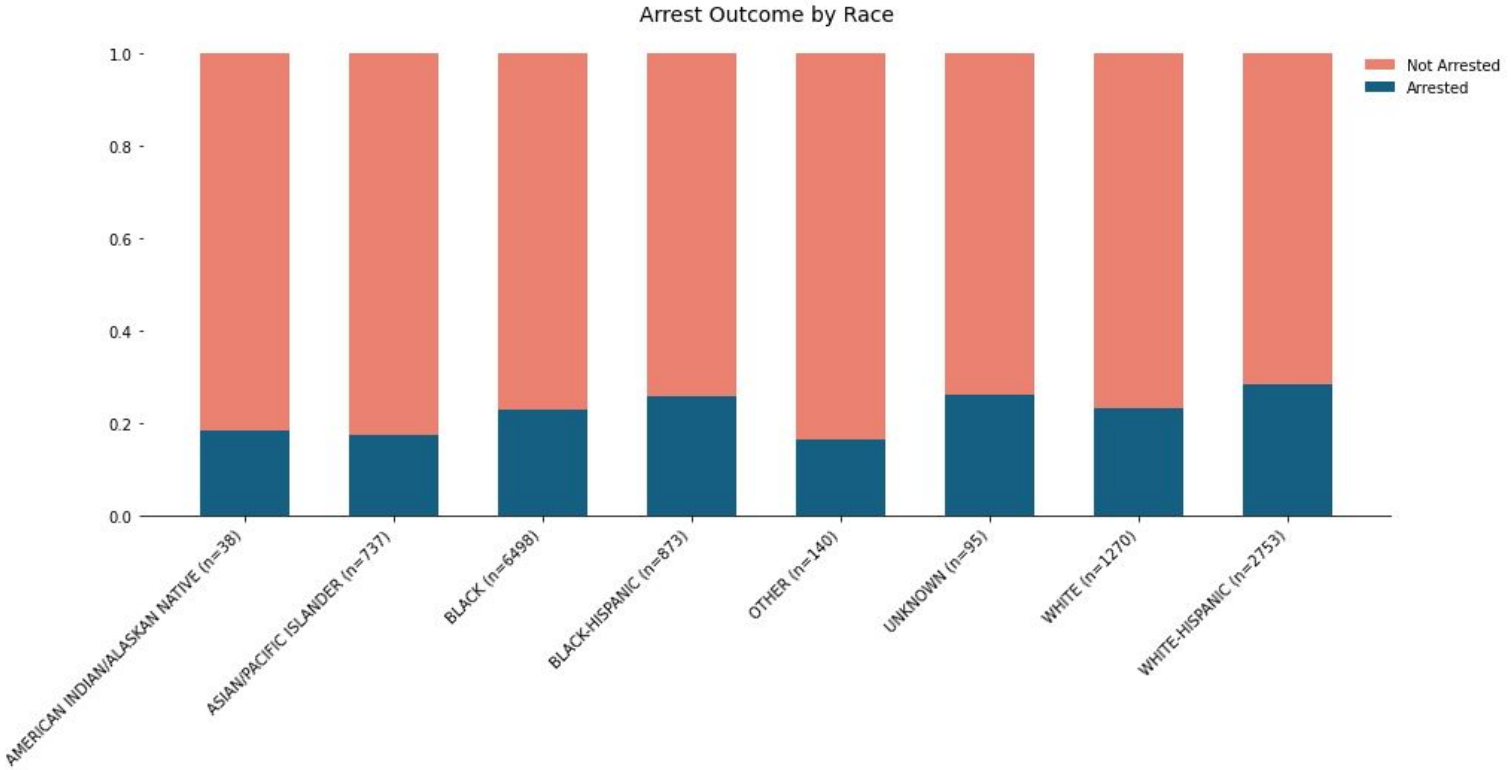
Most interactions last less than 15 minutes



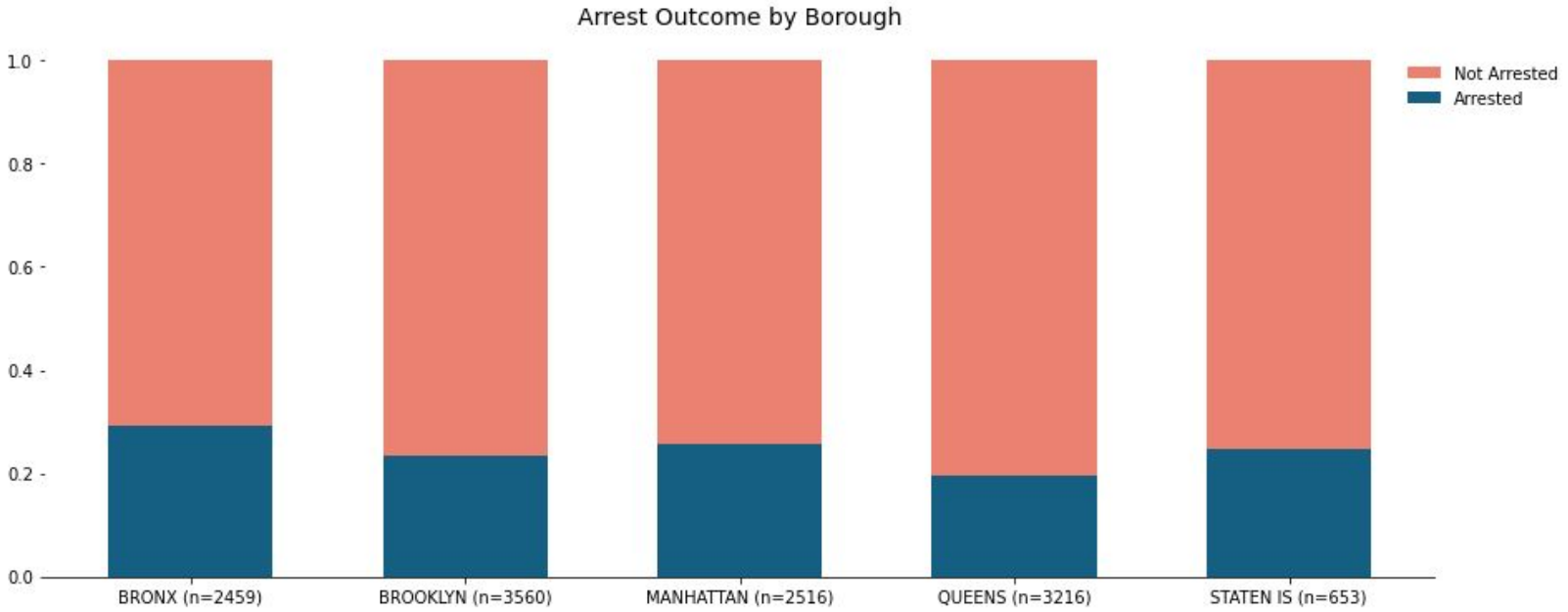
There seems to be a slight downward trend in arrests from January to December



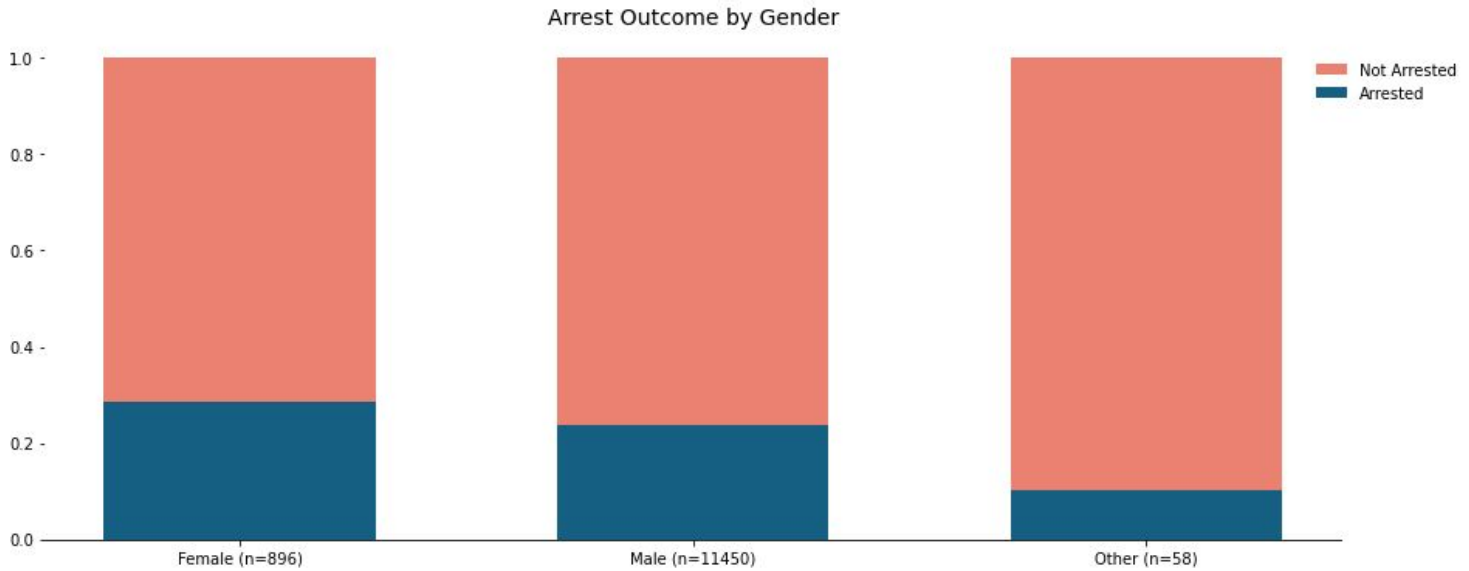
Black-Hispanic and White-Hispanic seem to be arrested at slightly higher rates than other races



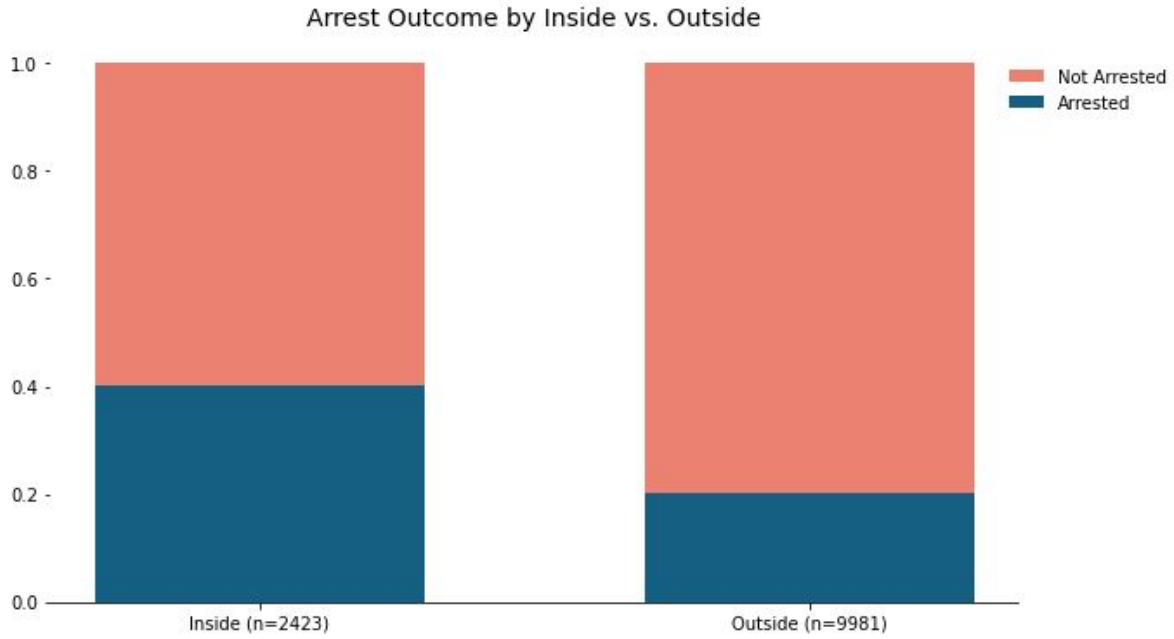
SQF incidents in the Bronx and in Manhattan are more likely to result in arrest



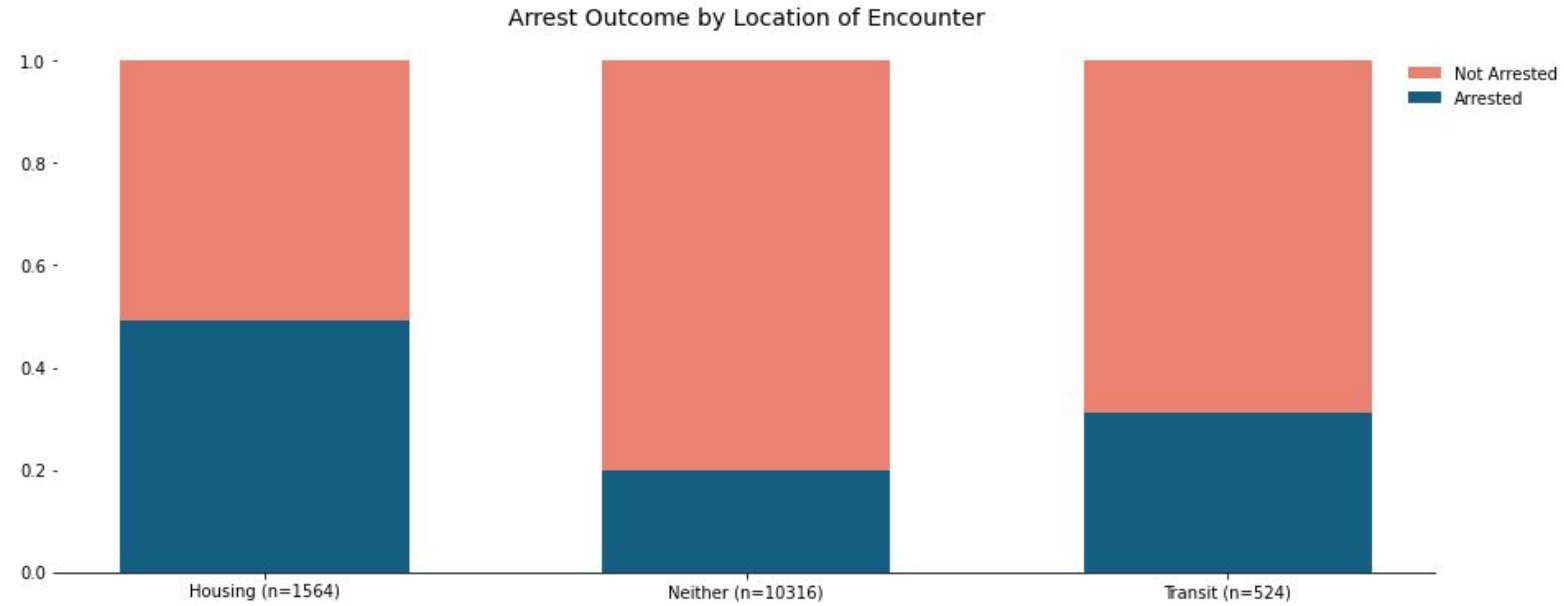
Females seems to be arrested at higher rates, but also make up a much smaller portion of the sample



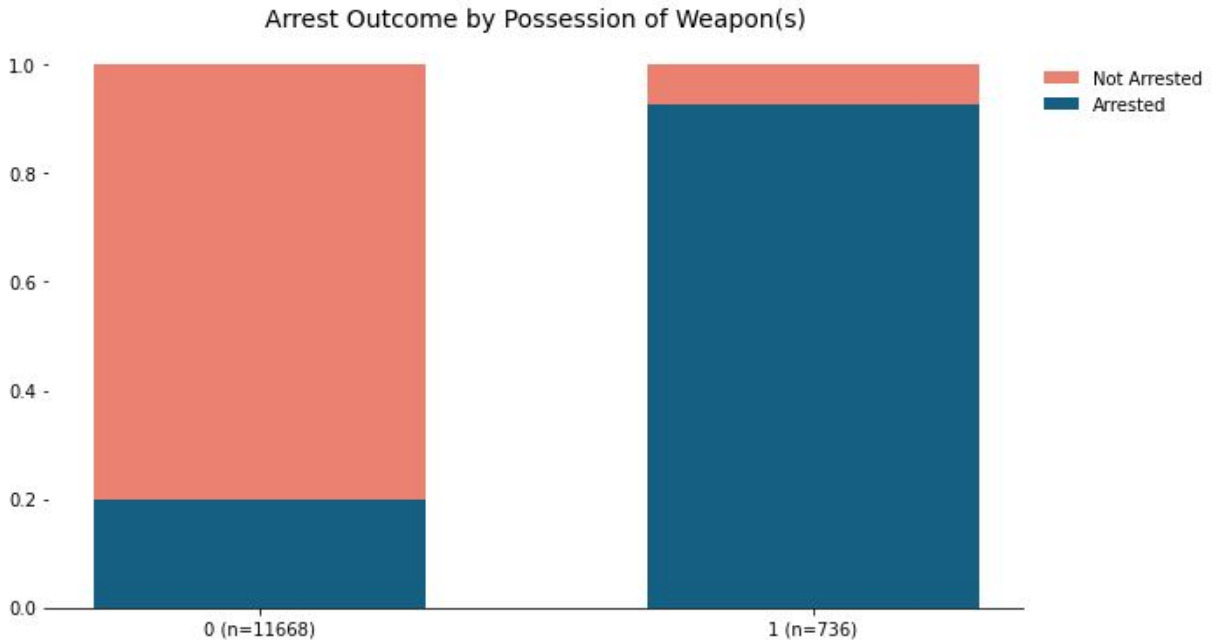
Individuals are more likely to be arrests indoors than outside



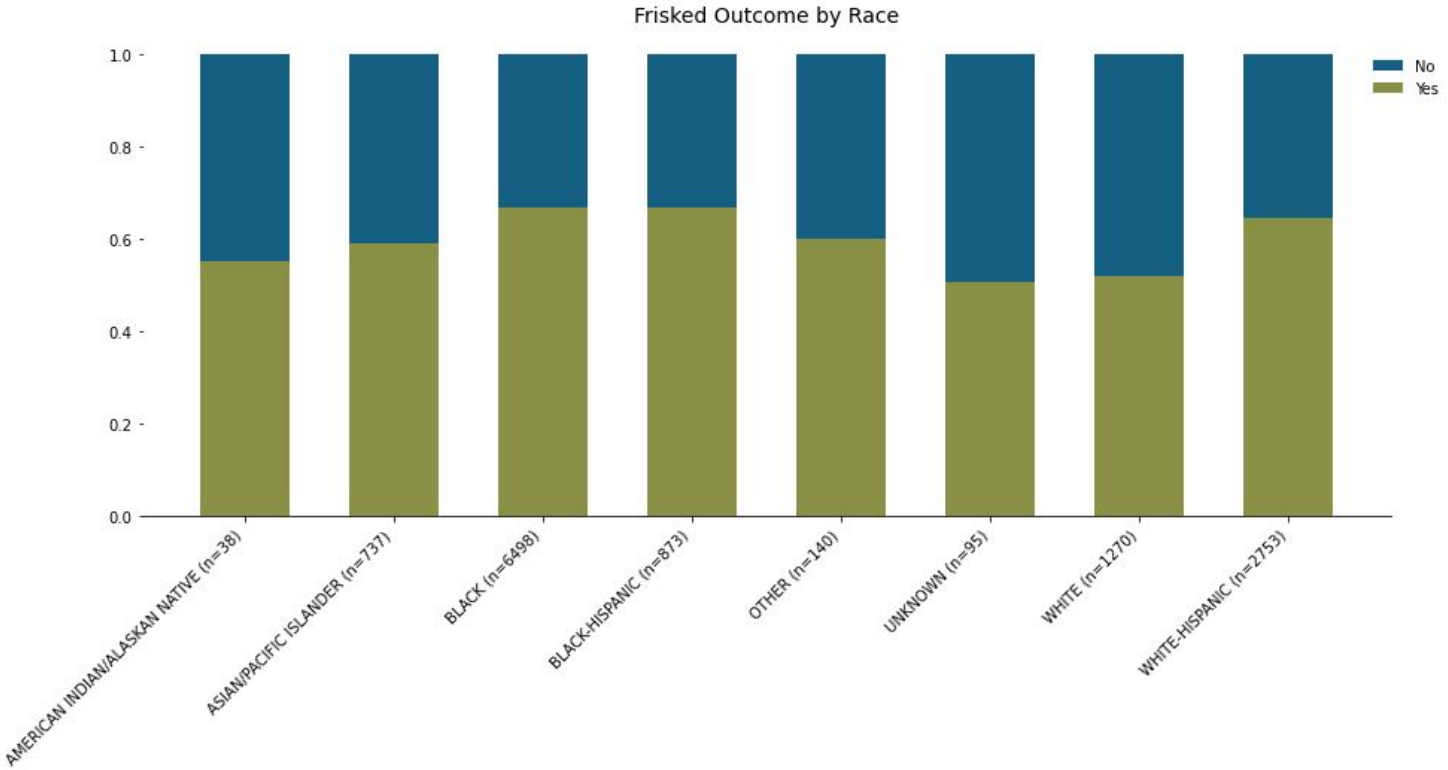
Individuals are more likely to be arrested in public housing



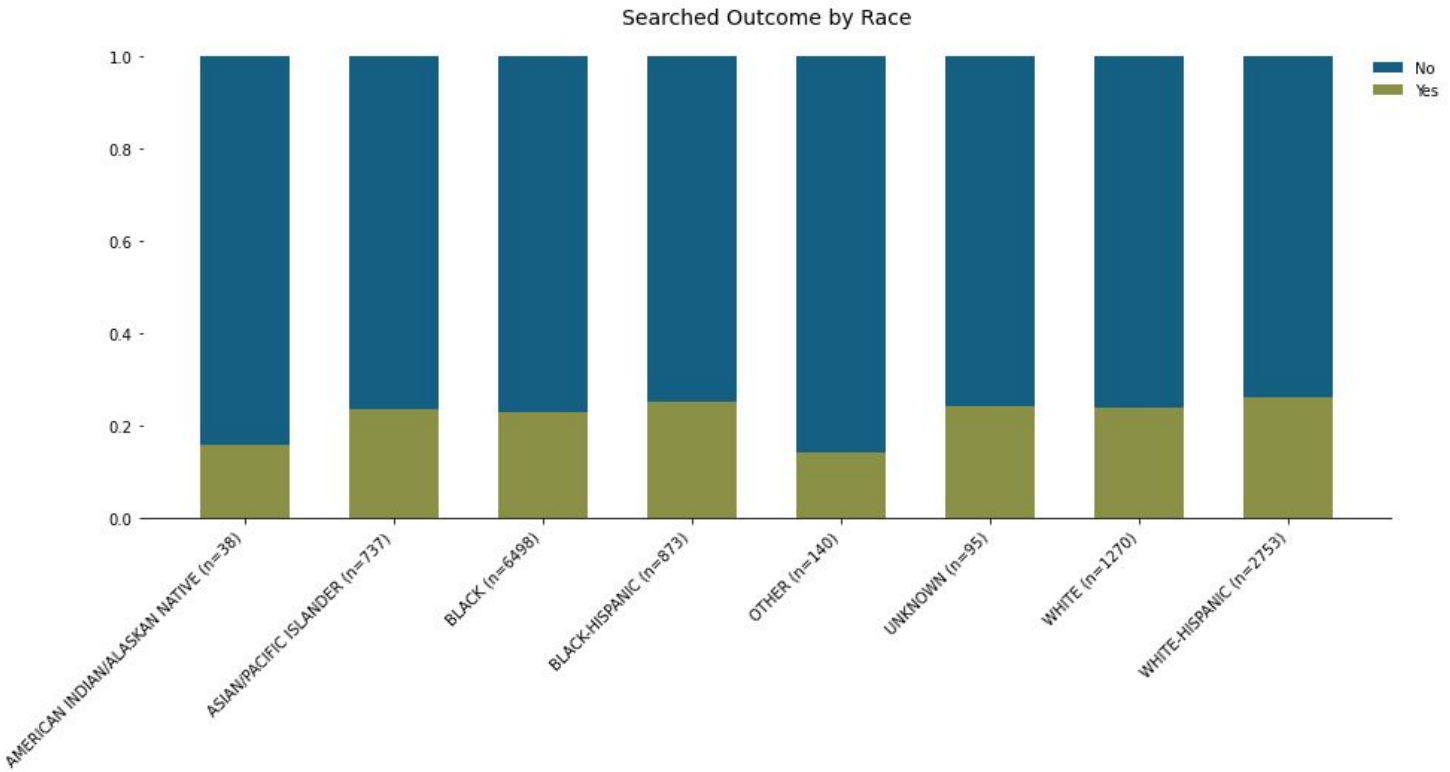
Individuals possessing a weapon are substantially more likely to be arrested



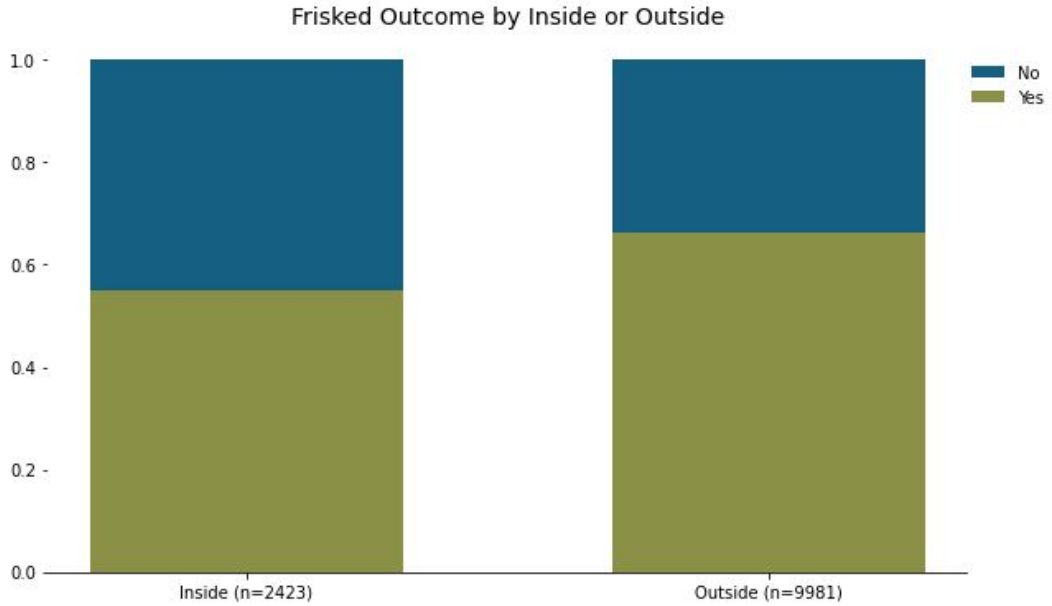
Black and Latinx individuals are more likely to be frisked than others



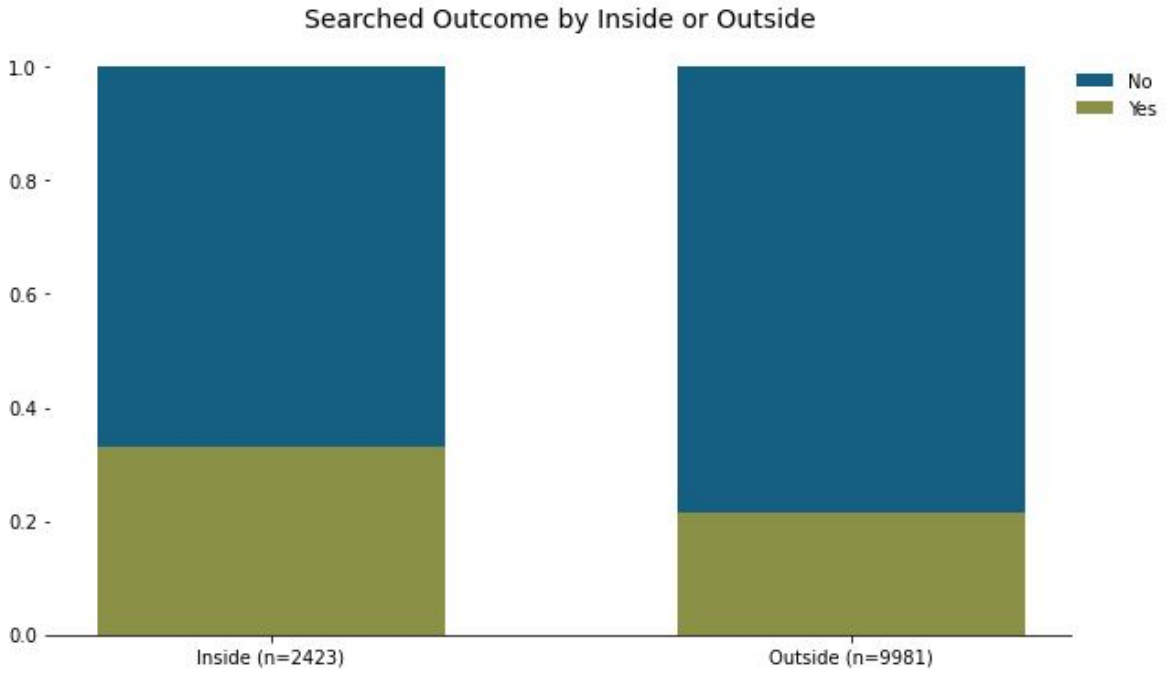
Likelihood of search is fairly even across races

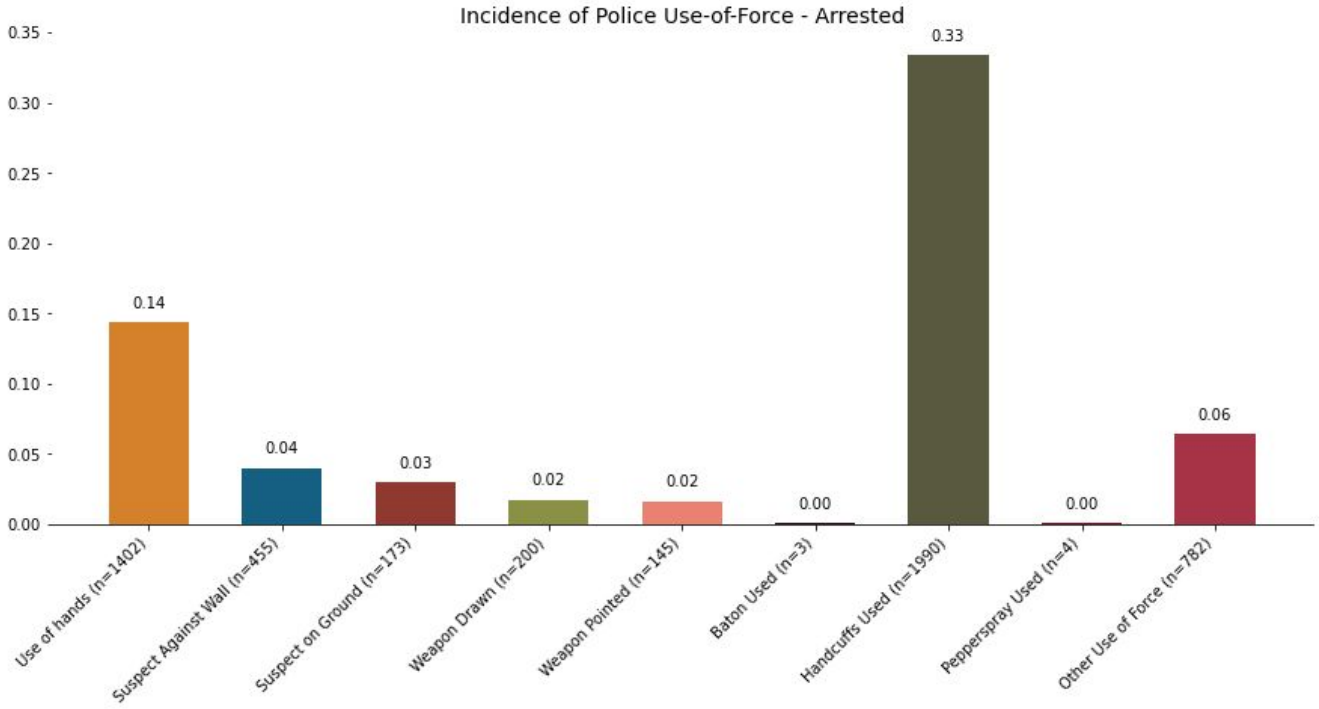


Likelihood of frisk is greater outdoors



Likelihood of search is greater inside




Incidence of Police Use-of-Force - Arrested
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.14
0.04
0.03
0.02
0.02
0.00
0.33
0.00
0.06
Use of hands (n=1402)
Suspect Against Wall (n=455)
Suspect on Ground (n=173)
Weapon Drawn (n=200)
Weapon Pointed (n=145)
Baton Used (n=3)
Handcuffs Used (n=1990)
Pepperspray Used (n=4)
Other Use of Force (n=782)

Handcuffs and use of hands are still prevalent in non-arrested individuals