

Do Black people be treated differently when arrested with strip search practices?

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INF2178: Experimental Design for Data Science

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Do Black people be treated differently when arrested with strip search practices?

1. Introduction

Strip search is a controversial police practice that involves an official performing intimate person search and inspecting their personal effects and body cavities. Thus, this type of search method is often seen as more intrusive than other types of searches, and their usage is normally restricted to circumstances in which there is a reasonable suspicion that the suspect is hiding contraband on their person. Though strip search is legalized in different nations and regions, it is still widely considered traumatic, unnecessary, and ineffective, particularly when performed on individuals who have not been convicted of a crime. Despite the constraints and limitations on using strip search practices, it is still evident that this method may be used disproportionately that affects certain race groups, specifically the black ethnicity.

According to Lemke (Lemke, 2022), black people make up around 10 percent of the City of Toronto's population and nearly one in three of the people who were strip-searched were black. Studies found that strip searches can also leave a long-term impact on the mental health of those who have undergone them, feelings like ashamed, humiliated and angry often arise after searching. In the past 20 years, courts and agencies were trying to regulate how police perform strip searches in order to reduce the overall frequency of it since people often feel traumatic after being searched (Lemke, 2022). The supreme court has recognized this issue and stated that it is "likely to represent a disproportionate number of those who are arrested by police and subjected to personal searches, including strip searches" with the absence of statistics (Lemke, 2022).

1.1 Objective

It is quite clear that little research has been conducted on the relationship between the black race, arrests and strip searches. This report aims to fill the gap in these areas by exploring factors that may be related to the disproportionate impact of strip searches on perceived race occurrence categories, especially on black individuals.

1.2 Methodology

This study will use secondary quantitative data obtained from Toronto Public Services which is considered official police records to explore the relationships between race, occurrence category, strip searches when at arrests. Tests will be used in this study including T-test, One-way ANOVA test, and Two-way ANOVA test. In addition, posthoc tests will also be used to further enhance the results of our experimental data.

1.3 Research Question

The main research question of this study is: Do Black people be treated differently when arrested with strip search practices? In addition to the main research question, the following sub-questions will also be discussed:

- Are there differences between means in perceived races when being strip-searched at arrest?

- Are there differences between means in occurrence categories when being strip-searched at arrest?

2. Literature Review

Discrimination against Black people during the arrest, strip search, and booking process is a significant problem that has been extensively studied by scholars and practitioners. This literature review analyzes three sources to provide key insights into the issue: a legal resource from FindLaw, a research paper from the National Institutes of Health, and a report from the Sentencing Project.

FindLaw's article states that strip searches are typically conducted on people being arrested and taken to jail to prevent the introduction of contraband. However, they can also be a form of humiliation or punishment, particularly for people arrested for minor offenses. The article notes that Black people are disproportionately affected by these types of searches and may be subject to racial profiling by law enforcement officers (Piquero & Brame, 2008). Furthermore, according to the Kruse Law, a strip search should be deemed necessary to check for weapons or evidence to ensure a lawful arrest, but there should be reasonable and probable grounds to justify both the search and the arrest (Kruse Law Firm, n.d.).

The National Institutes of Health's research paper explores the impact of race-based data collection in the criminal justice system. The authors argue that Black people are overrepresented in the criminal justice system as victims and defendants due to systemic racism and discriminatory practices, such as racial profiling. The paper also highlights that Black people are more likely to receive bias on assault due to their street culture, have higher proportions in drug-related and robbery/theft cases because of poverty and low income, and more likely to have mental health issues and behaviors when arrested or searched (Phan, 2021). The consequences of discrimination include higher rates of arrest and incarceration, harsher sentences, and trauma from degrading treatment.

The Sentencing Project's report to the United Nations on racial disparities in the criminal justice system provides further evidence of the discrimination faced by Black people. The report highlights that Black people are more likely to be arrested and incarcerated than white people, even when they have committed the same crime, due to the prevalence of racial bias in the criminal justice system. The report also discusses the negative impact of strip searches on Black people as traumatizing, humiliating, and a form of punishment (Interactive, 2022).

In summary, the literature on this topic suggests that Black people are subjected to discrimination and mistreatment during the arrest and booking process, including strip searches. This discrimination stems from systemic racism and discriminatory practices, such as racial profiling. The negative consequences of this discrimination include higher rates of arrest and incarceration, harsher sentences, and trauma from degrading treatment. Further research and action are necessary to address these issues and ensure that the criminal justice system is fair and just for all people, regardless of race.

3. EDA

We first conducted Exploratory data analysis to figure out relationships among exploratory variables and detect any mistake to help us select appropriate models for the next step.

3.1 Descriptive Statistics

Table 1. *The counts for categories of Sex, Perceived Race, Strip Search, and Occurrence Category.*

Variables	Categories	Counts
Sex	M	52502
	F	12576
	U	9
Perceived_Race	White	27635
	Black	17487
	Unknown or Legacy	5044
	East/Southeast Asian	4402
	South Asian	3603
	Middle-Eastern	3227
	Indigenous	1926
	Latino	1759
StripSearch	0	57287
	1	7800
Occurrence_Category	Assault	7724
	Assault & Other crimes against persons	7234
	Robbery & Theft	4580
	Robbery/Theft	3753
	Warrant	4378
	FTA/FTC/Compliance Check/Parollee	4246
	FTA/FTC, Compliance Check & Parollee	3877
	Police Category - Administrative	3885
	Drug Related	2751
	Other Statute	944
	Other Statute & Other Incident Type	2339
	Vehicle Related	768
	Vehicle Related (inc. Impaired)	1977
	Other Offence	1972
	Mischief & Fraud	1732
	Mischief	1321
	Impaired	1362
	Harassment/Threatening	1346
	Harassment & Threatening	1268
	Weapons	1106
	Weapons & Homicide	1105
	Break & Enter	916
	Break and Enter	868
	Sexual Related Crime	839
	Sexual Related Crimes & Crimes Against Children	793
	LLA	586
	Police Category - Incident	562
	Fraud	474
	Mental Health	239
	Homicide	73
	Crimes against Children	69

Figure 1. *Line Graph Of Total Amount of Strip Searches in Arrest Location*

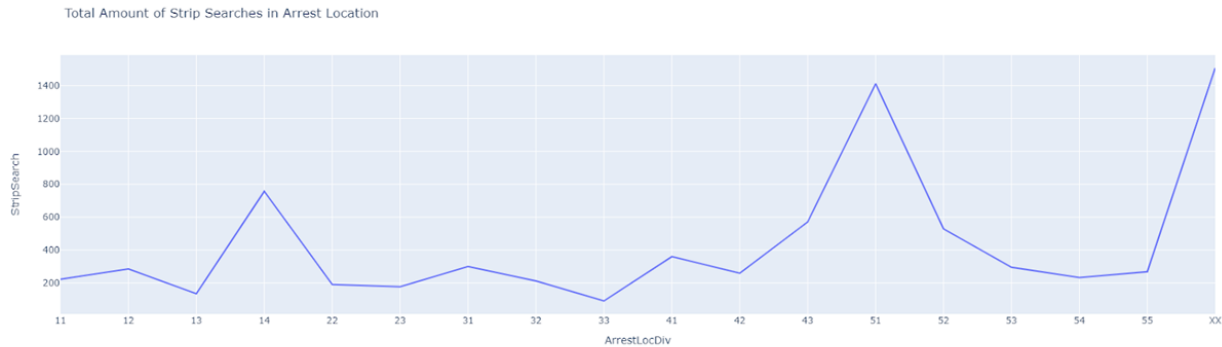


Figure 1 helps us to tell the trend of Strip Search happening in different Arrest Locations. Generally, different divisions have similar amounts of strip searches. The Division XX (the location is not geo-coded or the arrest took place outside of City of Toronto boundaries in other jurisdictions) has the highest strip search of 1500 cases. The Division 51 also has high strip searches of 1400 cases, and the Division 14 has obvious high strip searches of nearly 800 cases. The Division 33 has the lowest high strip search of 100 cases.

Figure 2. *Line Graph Of Total Amount of Strip Searches in Occurrence Category*

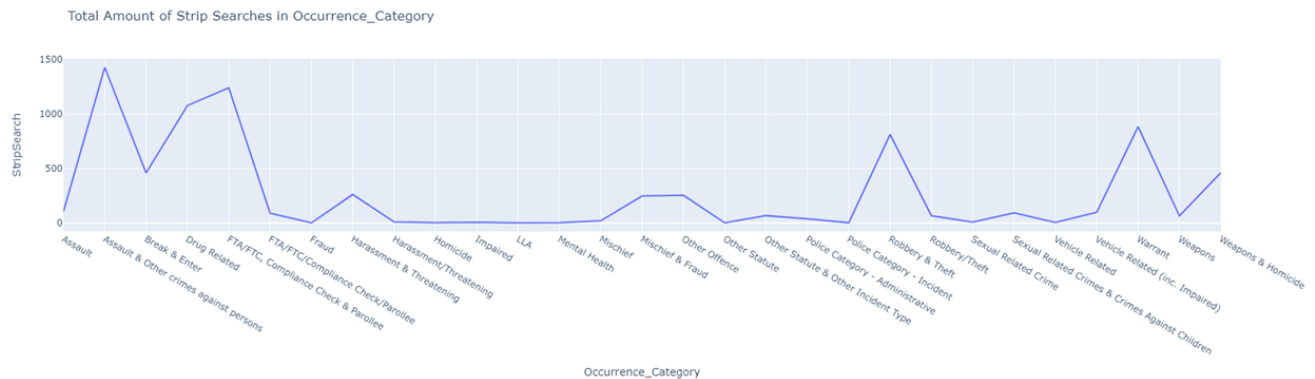


Figure 2 shows the trend of Strip Search happening on various Occurrence Categories. Most occurrence categories have low strip searches. The Assault & Other crimes against persons have highest strip search happenings of nearly 1500. The FTA/ FTC, Compliance Check & Parollee has the second highest strip searches of 1300. The Drug Related also has high strip search happenings of 1000. Then the Robbery & Theft and Warrant has an obvious peak of strip searches of nearly 800. This Line Graph helps us to figure out the high level occurrence category among all categories to conduct further analysis for the following steps.

Figure 3. *Barplot Of Race vs. Strip Search*

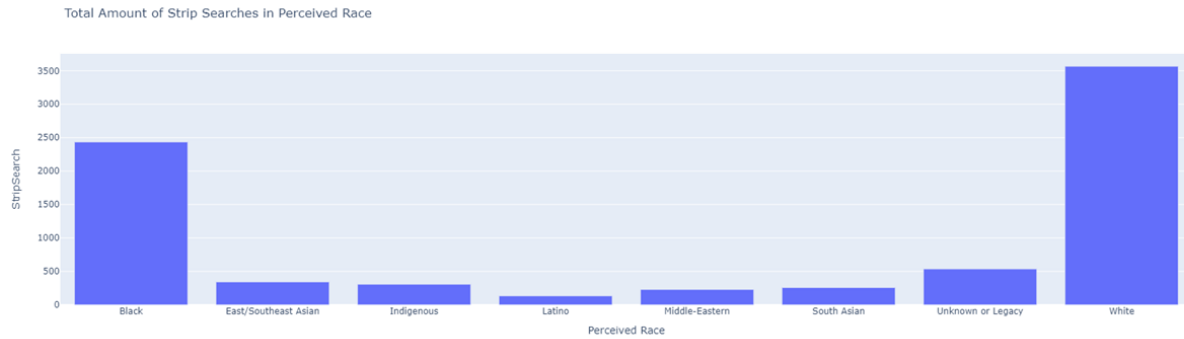
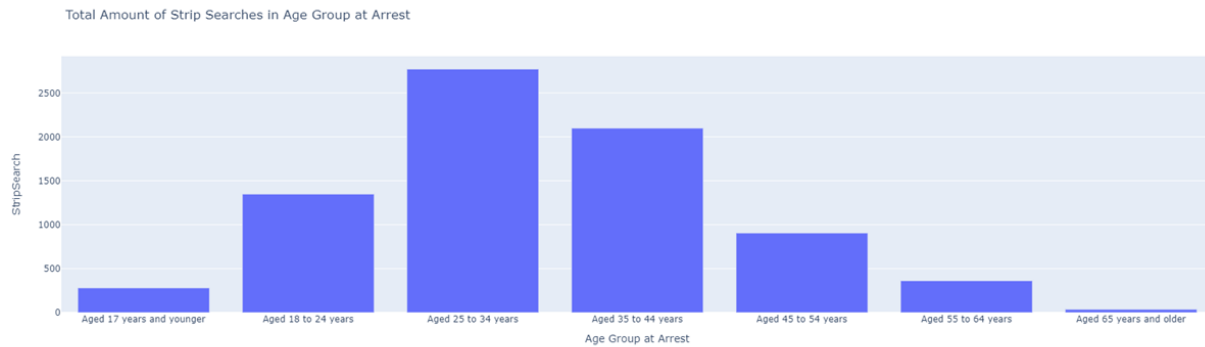


Figure 3 compares the strip search amount between each perceived race group. The White people have the highest strip search amount of 3500. The Black people have the second highest strip search of nearly 2500. In general, race groups except Black and White have average strip searches. We might conduct further analysis focusing on only Black and White groups.

Figure 4. *Barplot Of Age Group at Arrest vs. Strip Search*



We can compare the strip search amounts between each Age Group at Arrest by Figure 4. Aged 25 to 34 years people have the highest strip searches of nearly 2800. Aged 35 to 44 years people have the second highest strip searches of nearly 2100. Aged 65 years and older has the lowest strip searches. Strip searches mainly concentrate in the young and middle-aged people, aged 25 to 44 years.

Figure 5. *Histogram Of Total Amount Of Strip Searches In Perceived Race With Different Age Groups At Arrest*

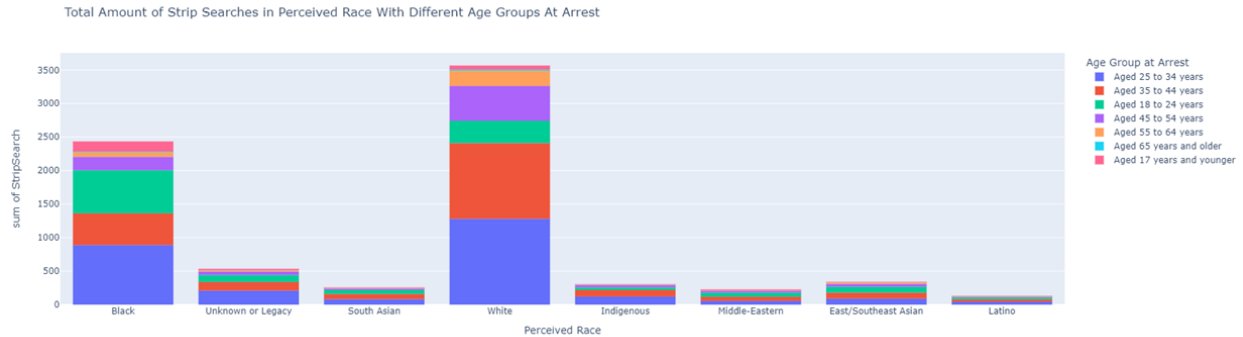
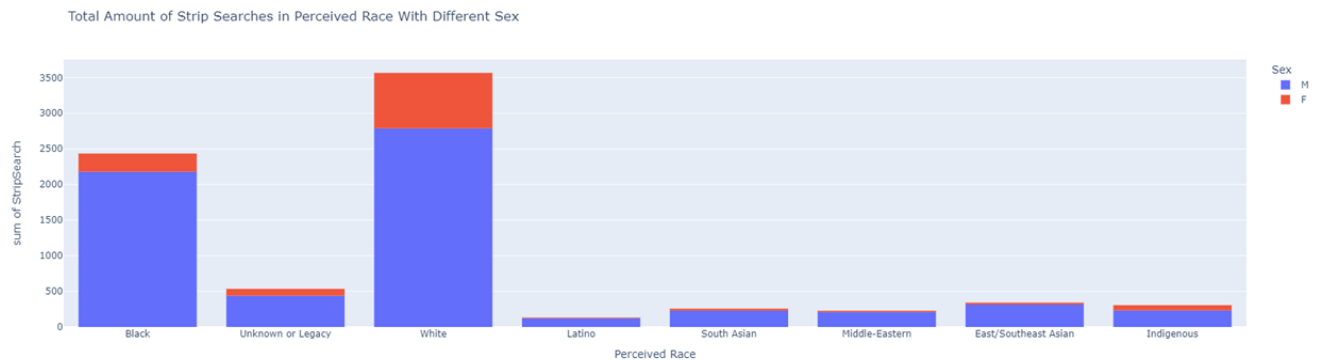


Figure 5 compares the distribution of strip searches of perceived race groups with different Age groups at arrest within each race. Aged 18 to 24 years, Aged 25 to 34 years, and Aged 35 to 44 years occupy the majority of strip searches within each race group. Black people have the highest juvenile strip searches, Aged 17 years and younger. Indigenous have the highest elderly crime, Aged 65 years and older. Although Black people have lower strip searches than White people, Black Aged 18 to 24 years people have higher strip searches than White Aged 18 to 24 years. Black people are committing crimes at a younger age.

Figure 6. *Histogram Of Total Amount Of Strip Searches In Perceived Race With Different Sex*



We can compare the distribution of strip searches among different perceived race groups with sex from Figure 6. The majority of strip searches for each race group are male, but White people have higher female strip searches. Black females have the second highest strip searches.

Figure 7. *Histogram Of Total Amount Of Strip Searches In Perceived Race With Different Occurrence Category*

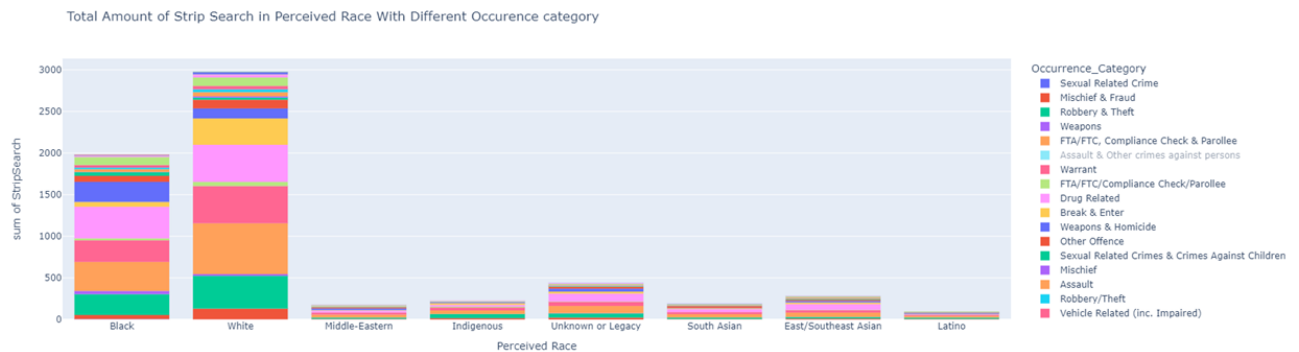


Figure 7. shows the distribution of strip searches among different perceived race groups within different occurrence categories. Drug Related, Warrant, Robbery & Theft, FTA/FTC, Compliance Check & Parollee, and Robbery & Theft occupy the majority of strip searches for almost all race groups. Weapons & Homicide and Drug Related occupy a higher proportion in Black people than other groups.

Figure 8. *Sub-Barplots Of Difference Actions At Arrest*

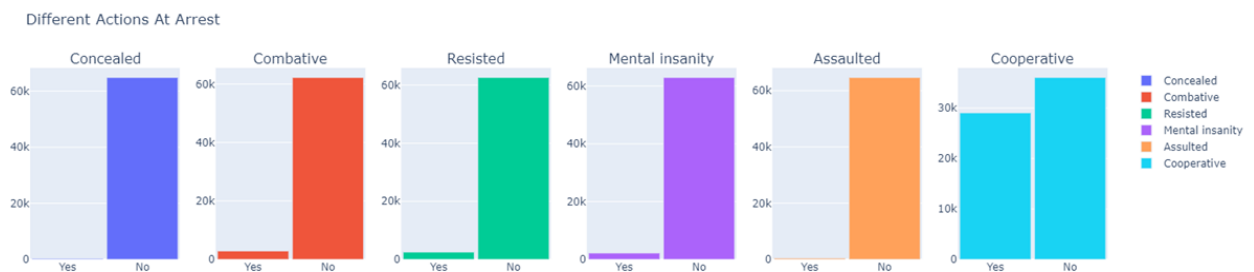
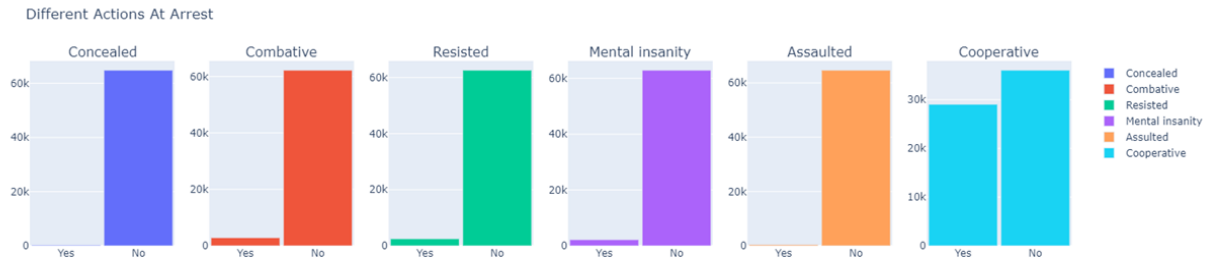


Figure 8. compares all different actions at arrest at the same time. Merely suspects choose to conceal or assault when being arrested. A fraction of suspects have combative, resisted behavior and mental insanity when being arrested. Although nearly half of suspects are cooperative while more than a half of suspects are not.

Figure 9. *Sub-Barplots Of Difference Search Reason*

We can compare all different search reasons at one time from Figure 9 that the highest suspects are searched due to the cause of injury. Lowest suspects are searched because of assisted escape. But in general, it has the average trend of being searched for the four reasons.

3.2 T-tests

The t-test enables us to further compare the means of strip searches between different groups.

3.2.1 T-tests - Strip Search & Perceived Race (Black and White)

Since our research question is do Black people be treated differently when arrested with strip search practices, the t-test enables us to compare the means of strip searches of black and white groups firstly.

- Null Hypothesis: the strip searches mean of black people has no difference from the strip searches mean of white people.
- Alternative Hypothesis: the strip searches mean of black people is different from the strip searches mean of white people.

Table 2. *t-test results – Strip Search at arrest & Perceived Race (Black and White)*

		t	p-value	df	Mean	Std	95% Confidence Interval of the Difference	
StripSearch	Perceived_Race Black	3.071610180453053	0.002130649916393232	36309	0.13918911191170583	0.3461536582484367	Lower	Upper
	Perceived_Race White				0.1290392618056812	0.3352494559905298	0.003673115544414145	0.0166265846676351

Checking the two tailed t-distribution table, when df is 36309, p is 0.05, the t is 1.96. The t value given by the t test above is 3.07, which is greater than the critical value found in the table, so we can reject the null hypothesis of the t-test and conclude that the results of the test are statistically significant. Besides, our p value of 0.002 is much smaller than 0.05, so we can reject the null hypothesis of no difference and say with a high degree of confidence that there is a true difference in group means. Also, we can see that the difference in means for our sample data is 0.01 (0.14 – 0.13), and the confidence interval shows that the true difference in means is between 0.004 and 0.017. So, 95% of the time, the true difference in means will be different from 0.

In conclusion, the mean score of black people's strip searches is different from the mean score of white people's strip searches. We will conduct further research among perceived race groups.

3.2.2 T-tests - Strip Search & Sex of Black

Next, we want to compare the means of strip searches of black male and black females continuously with t-test.

- Null Hypothesis: the strip searches mean of black male has no difference from the strip searches mean of females.
- Alternative Hypothesis: the strip searches mean of black male is different from the strip searches mean of black females.

Table 3. *t-test results – Strip Search at arrest & Sex of Black*

		t	p-value	df	Mean	Std	95% Confidence Interval of the Difference	
StripSearch	Black Male	11.113359 41878437 7	2.2289548736 58051e-28	5267	0.1504314808 422506	0.35750618 745837903	Lower	Upper
	Black Female				0.0849433710 859427	0.27884385 5038139	0.05393590 196246025	0.0770403 175501555 6

Checking the two tailed t-distribution table, when df is 36309, p is 0.05, the t is 1.96. The t value given by the t test above is 11.11, which is greater than the critical value found in the table, so we can reject the null hypothesis of the t-test and conclude that the results of the test are statistically significant. Besides, our p value of 2.228954873658051e-28 is much smaller than 0.05, so we can reject the null hypothesis of no difference and say with a high degree of confidence that there is a true difference in group means. Also, we can see that the difference in means for our sample data is 0.07 (0.15 – 0.08), and the confidence interval shows that the true difference in means is between 0.005 and 0.007. So, 95% of the time, the true difference in means will be different from 0.

In conclusion, the mean score of black male's strip searches is different from the mean score of black female's strip searches.

3.2.3 T-tests - Strip Search & Young Age of Black and White (Aged 18 to 24 years)

From Figure 5. *Histogram Of Total Amount Of Strip Searches In Perceived Race With Different Age Groups At Arrest*, we observed although Black people have lower strip searches than White people, Black Aged 18 to 24 years people have higher strip searches than White Aged 18 to 24 years. Black people are committing crimes at a younger age. We apply t-test to compare the means of strip searches of young black and young white with those aged 18 to 24 years when being arrested.

- Null Hypothesis: the strip searches mean of young black has no difference from the strip searches mean of young white.
- Alternative Hypothesis: the strip searches mean of young black is different from the strip searches mean of young white.

Table 4. *t-test results – Strip Search at arrest & Young Age of Black and White (Aged 18 to 24 years)*

		t	p-value	df	Mean	Std	95% Confidence Interval of the Difference	
StripSearch	Young Black	4.9143733 15491719	9.1410076007 14139e-07	6057	0.1699260042 2832982	0.37561741 55235836	Lower	Upper
	Young White				0.1261877613 0748766	0.33212397 66035393	0.02629094 9392460836	0.0611855 364492234 9

Checking the two tailed t-distribution table, when df is 6057, p is 0.05, the t is 1.96. The t value given by the t test above is 4.91, which is greater than the critical value found in the table, so we can reject the null hypothesis of the t-test and conclude that the results of the test are statistically significant. Besides, our p value of 9.141007600714139e-07 is much smaller than 0.05, so we can reject the null hypothesis of no difference and say with a high degree of confidence that there is a true difference in group means. Also, we can see that the difference in means for our sample data is 0.04 (0.17 – 0.13), and the confidence interval shows that the true difference in means is between 0.026 and 0.061. So, 95% of the time, the true difference in means will be different from 0.

In conclusion, the mean score of young black's strip searches is different from the mean score of young white's strip searches, which is not conflicted with our observation before.

3.2.4 T-tests - Strip Search & Weapons & Homicide Occurrence in Black and White

From Figure 7. *Histogram Of Total Amount Of Strip Searches In Perceived Race With Different Occurrence Category*, we observed that Weapons & Homicide and Drug Related occupy a higher proportion in Black people than other groups. Then we first conduct a t-test to compare the means of strip searches of Weapons & Homicide Occurrence in Black and White.

- Null Hypothesis: the mean of strip search for Weapons & Homicide occurrence of black has no difference from the mean of strip search for Weapons & Homicide occurrence of white.
- Alternative Hypothesis: the mean of strip search for Weapons & Homicide occurrence of black is different from the mean of strip search for Weapons & Homicide occurrence of white.

Table 5. *t-test results – Strip Search at arrest & Weapons & Homicide Occurrence in Black and White*

		t	p-value	df	Mean	Std	95% Confidence Interval of the Difference	
Strip Search	Weapons & Homicide Occurrence in Black	2.826713094996788	0.004838813905529319	690	0.47534516765285995	0.49988499585638047	Lower	Upper
	Weapons & Homicide Occurrence in Black				0.3761755485893417	0.48518599872885093	0.030287509815978123	0.16805172831105836

Checking the two tailed t-distribution table, when df is 490, p is 0.05, the t is 1.645. The t value given by the t test above is 2.83, which is greater than the critical value found in the table, so we can reject the null hypothesis of the t-test and conclude that the results of the test are statistically significant. Besides, our p value of 0.0048 is smaller than 0.05, so we can reject the null hypothesis of no difference and say with a high degree of confidence that there is a true difference in group means. Also, we can see that the difference in means for our sample data is 0.10 (0.47 – 0.37), and the confidence interval shows that the true difference in means is between 0.03 and 0.17. So, 95% of the time, the true difference in means will be different from 0.

In conclusion, the mean score of Weapons & Homicide Occurrence of black's strip searches is different from the mean score of Weapons & Homicide Occurrence of white's strip searches, which is not conflicted with our observation from EDA graph.

3.2.5 T-tests - Strip Search & Drug Related Occurrence in Black and White

Then we conduct another t-test to compare the means of strip searches of Drug Related Occurrence in Black and White.

- Null Hypothesis: the mean of strip search for Drug Related occurrence of black has no difference from the mean of strip search for Drug Related occurrence of white.
- Alternative Hypothesis: the mean of strip search for Drug Related occurrence of black is different from the mean of strip search for Drug Related occurrence of white.

Table 6. - *t-test results – Strip Search at arrest & Drug Related Occurrence in Black and White*

		t	p-value	df
StripSearch	Drug Related Occurrence in Black	0.48501680332410596	0.6277176461428181	1996
	Drug Related Occurrence in Black			

Checking the two tailed t-distribution table, when df is 1996, p is 0.05, the t is 1.96. The t value given by the t test above is 0.48, which is smaller than the critical value found in the table, so we cannot reject the null hypothesis of the t-test and conclude that the results of the test are not statistically significant. Besides, our p value of 0.63 is greater than 0.05, so we cannot reject the null hypothesis of no difference and say with a high degree of confidence that there is no difference in group means.

In conclusion, the mean score of Drug Related Occurrence of black's strip searches has no difference from the mean score of Drug Related Occurrence of white's strip searches. This is conflicted with our observation from the previous EDA graph and our literature review. We need further research and analysis on Drug Related occurrences with perceived race groups.

4. Method

4.1 Dataset Description

The dataset contains information about 65276 entries and 25 variables related to all arrests and strip searches. Based on the research fact that black people suffer from discrimination during the arrest, strip searches, and booking process, this paper tends to explain the booked and strip searches by the following factors. These are Age, Sex, Perceived Race (we only extract Black and White), Occurrence Category, Actions at arrest - Concealed items, Actions at arrest - Combative, violent or spitter/biter, Actions at arrest - Resisted, defensive or escape risk, Actions at arrest - Mental instability or possibly suicidal, Actions at arrest - Assaulted officer, Actions at arrest – Cooperative, SearchReason-CauseInjury, SearchReason-AssistEscape, SearchReason-PossessWeapons, and SearchReason-PossessEvidence (2022). For this study, we analyzed Arrests

and Strip Searches (RBDC-ARR-TBL-001) updated in 2022 and considered the demographic characteristics and arrested behaviors to illustrate the relationship between the strip search and book taking place and the above 14 factors.

- Outcome Variables - DV

The outcome variable of the dataset is “StripSearch”. A strip search is a type of search performed by a law enforcement officer on an individual that involves the removal of some or all of their clothing and a visual examination of their body. It has 0 (not receive strip search) and 1 (receive strip search). In probability theory, 0 and 1 are used to represent the probability of an event occurring, so we assume this dummy variable to be equivalent to continuous variable. Therefore, we chose to use strip search as our outcome variable.

- Exploratory Variables - IV

Perceived_Race: perceived race is the race group suspects are treated by police when being arrested. It has eight categorical groups - White, Black, Unknown or Legacy, East/Southeast Asian, South Asian, Middle-Eastern, Indigenous, and Latino.

Occurence_Category: Occurrence categories are taxonomies or classifications of accidents and incidents happening at a high level to permit analysis of the data in support of safety (2011). It has 31 categorical levels, including Assault, Assault & Other crimes against persons, Robbery & Theft, Robbery/Theft, Warrant, FTA/FTC/Compliance Check/Parollee, FTA/FTC, Compliance Check & Parollee, Police Category - Administrative, Drug Related, Other Statute, Other Statute & Other Incident Type, Vehicle Related, Vehicle Related (inc. Impaired), Other Offence, Mischief & Fraud, Mischief, Impaired, Harassment/Threatening, Harassment & Threatening, Weapons, Weapons & Homicide, Break & Enter, Break and Enter, Sexual Related Crime, Sexual Related Crimes & Crimes Against Children, LLA, Police Category - Incident, Fraud, Mental Health, Homicide, and Crimes against Children, and NaN. We will clean the dataset to combine Break & Enter and Break and Enter together and remove NaN.

5. ANOVA tests

5.1 One-way ANOVA

Research Question: Are there differences between means in perceived races when being strip-searched at arrest?

One-way ANOVA is used here to determine if the difference in means in strip search practices for the group of perceived races is statistically significant.

- Null Hypothesis: The mean value of strip search practices at arrest for all perceived races is equal.
- Alternative Hypothesis: The mean value of the strip search practices at arrest for at least one group of all perceived races is significantly different from the mean values of the other groups.

Table 7. ANOVA results – Strip Search at arrest & Perceived Race

	S	P
One-way ANOVA	58.058223392284496	5.564494390694148e-72

With a significance value of 5.564494390694148e-72 (< 0.05), the ANOVA test suggests that the null hypothesis can be rejected and that the mean value between strip search practices at arrest for different groups of perceived races is statistically different. Based on the one-way ANOVA test result, we could conclude there are differences found between perceived race and the mean probabilities of being strip searched which indicated that there is potential for some races to be treated differently.

5.2 Posthoc tests - Tukey's HSD

To further explore the differences of means within perceived race groups, Tukey's test is used here to determine multiple comparisons within all perceived race groups and to determine which group has different means of probabilities.

Table 8. - *Tukey's results – Strip Search at arrest & Perceived Race*

Multiple Comparison of Means - Tukey HSD, FWER=0.05						
group1	group2	meandiff	p-adj	lower	upper	reject
Black	East/Southeast Asian	-0.0617	0.001	-0.0783	-0.0452	True
Black	Indigenous	0.0197	0.1814	-0.0039	0.0433	False
Black	Latino	-0.0641	0.001	-0.0887	-0.0396	True
Black	Middle-Eastern	-0.0685	0.001	-0.0873	-0.0497	True
Black	South Asian	-0.0679	0.001	-0.0858	-0.0499	True
Black	Unknown or Legacy	-0.0331	0.001	-0.0488	-0.0174	True
Black	White	-0.0101	0.026	-0.0196	-0.0007	True
East/Southeast Asian	Indigenous	0.0814	0.001	0.0546	0.1082	True
East/Southeast Asian	Latino	-0.0024	0.9	-0.0301	0.0253	False
East/Southeast Asian	Middle-Eastern	-0.0068	0.9	-0.0296	0.0159	False
East/Southeast Asian	South Asian	-0.0061	0.9	-0.0282	0.0159	False
East/Southeast Asian	Unknown or Legacy	0.0286	0.001	0.0084	0.0488	True
East/Southeast Asian	White	0.0516	0.001	0.0356	0.0675	True
Indigenous	Latino	-0.0838	0.001	-0.1162	-0.0515	True
Indigenous	Middle-Eastern	-0.0882	0.001	-0.1165	-0.06	True
Indigenous	South Asian	-0.0875	0.001	-0.1153	-0.0598	True
Indigenous	Unknown or Legacy	-0.0528	0.001	-0.0791	-0.0265	True
Indigenous	White	-0.0298	0.0023	-0.053	-0.0067	True
Latino	Middle-Eastern	-0.0044	0.9	-0.0335	0.0247	False
Latino	South Asian	-0.0037	0.9	-0.0323	0.0248	False
Latino	Unknown or Legacy	0.031	0.0126	0.0038	0.0582	True
Latino	White	0.054	0.001	0.0299	0.0781	True
Middle-Eastern	South Asian	0.0007	0.9	-0.0231	0.0245	False
Middle-Eastern	Unknown or Legacy	0.0354	0.001	0.0133	0.0575	True
Middle-Eastern	White	0.0584	0.001	0.0401	0.0766	True
South Asian	Unknown or Legacy	0.0347	0.001	0.0133	0.0561	True
South Asian	White	0.0577	0.001	0.0403	0.0751	True
Unknown or Legacy	White	0.023	0.001	0.0079	0.038	True

The above Tukey's test results clearly illustrated that there are differences within perceived race groups based on the mean value of the probability of getting strip searched on a statistical level. As indicated in the reject column, each race has received some Trues as test results when contrasted

to other races, which demonstrates that each race was handled differently with at least one other race group on strip search techniques. When comparing Black groups to other races, it is clear that, with the exception of indigenous communities, all other races had negative mean differences to be strip-searched when arrested, which means that they are less likely to be strip searched on an average level. Same as indigenous groups, all other race communities also hold negative mean differences except the black community on strip searching practices. However, the reject column, on the other hand, demonstrated that white communities have a true value for all racial groups, and this group has a positive mean difference of probabilities than the other groups, implying that they are more likely to be strip searched on an average level.

As a result, we can conclude that, while every race is treated differently in terms of the mean probability of experiencing strip search methods when arrested alongside at least one other group, black and indigenous tribes are treated differently than all other racial groups while remaining no difference within them on a statistical level.

5.3 Two-way ANOVA

Research Question: Are there differences between means in occurrence categories and perceived races when being strip-searched at arrest?

Two-way ANOVA is used here to determine how the mean of strip search at arrest changes according to the perceived races and occurrence category.

Null Hypothesis	Alternative Hypothesis
1. The mean value of strip search at arrest for all perceived races group are equal.	1. The mean value of the strip search practices at arrest for at least one group of all perceived races is significantly different from the mean values of the other groups.
2. The mean value of strip search at arrest for all occurrence categories are equal.	2. The mean value of the strip search practices at arrest for at least one group of all occurrence categories is significantly different from the mean values of the other groups.
3. There is no interaction between perceived race and occurrence category.	3. There is interaction between perceived race and occurrence category.

Table 9. ANOVA results – Strip Search at arrest & Perceived Race & Occurrence Category

	sum_sq	df	f	PR(>F)
Occurrence_Category	929.939363	29.0	355.597163	0.000000e+00
Perceived_Race	24.475598	7.0	38.773671	9.984104e-55

Occurrence_Category: Perceived_Race	46.614283	203.0	2.546388	4.031139e-29
Residual	5847.381718	64843.0	NaN	NaN

Based on the above test result table, the null hypothesis 2 can be rejected with value $P = 9.984104e-55$ (< 0.05) and $F = 38.77$. That is at least one group of all perceived races' mean value significantly differs from the other groups. Hypothesis 3 can also be rejected with a value of $F = 2.55$ and $P = 4.031139e-29$ (< 0.05), indicating that there is an interaction between perceived race and occurrence category, or that the effect of one variable depends on the influence of the other. Moreover, the significance value of hypothesis 1 is $p = 0.000000e+00$ normally recorded as extremely small, indicating that the observed results are so extreme that they are practically impossible under the null hypothesis which offers very strong evidence against it.

Taking everything into consideration, there are significant differences in the mean value of probabilities of being strip searched within perceived race groups and occurrence category groups. In addition to it, the independent variables' perceived race and occurrence category have interacted with each other which underlies a relationship between these two variables.

5.4 Posthoc tests - Tukey's HSD

To further explore the differences of means within the occurrence category, Tukey's test is used here to determine multiple comparisons within all occurrence categories and to determine which group has different means of probabilities.

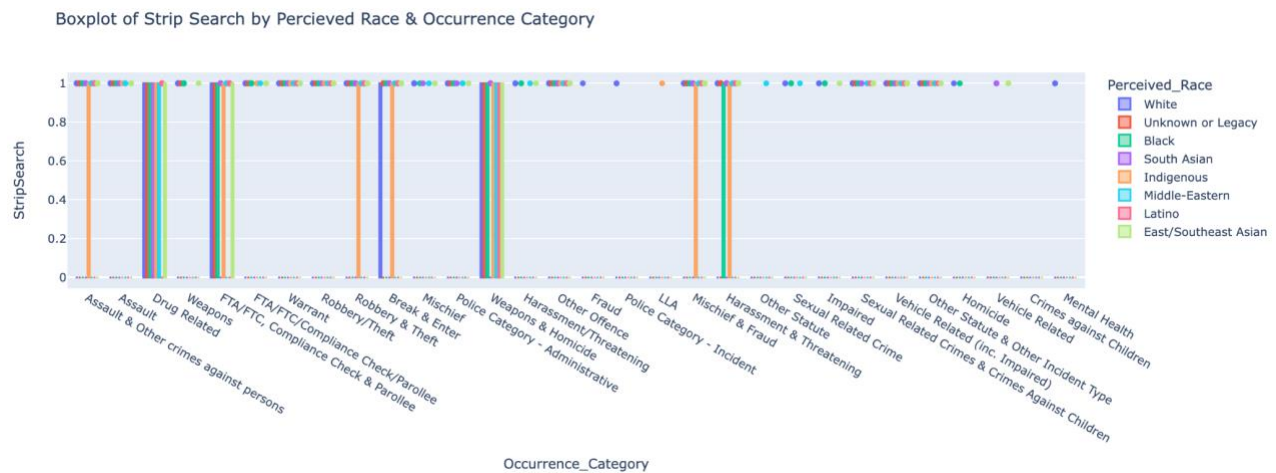
As discussed in the section on the literature review, black community, as the low-income group, whose street cultures are frequently connected with drugs and weapons. This is demonstrated by the Figure 5 Histogram Of Total Amount Of Strip Searches In Perceived Race With Different Occurrence Category in the EDA section. It shows that while the white community has the highest number of individuals strip searched, the black community has the highest proportion of people strip searched in the occurrence categories of weapons and homicide with the second largest proportion of drug-related.

Tukey's test results clearly illustrated that there are differences within the occurrence category based on the mean value of the probability of getting strip searched on a statistical level. As indicated in the reject column, each occurrence category has received some Trues as test results when contrasted to other groups, which demonstrates that each occurrence category was handled differently with at least one other group on strip search techniques (see Appendix 1).

As for the mean difference between groups, with the exception of weapons and homicide, all other categories showed negative mean differences in being strip-searched when arrested, indicating that they are less likely to be strip-searched on average than the drug-related group. Furthermore, because the weapons and homicide category has a higher value of mean difference than all other categories, persons in this group tend to have a higher probability of being strip searched than others on average.

In conclusion, there are significant differences in the mean value of probabilities of being striped searched within the occurrence category. In addition to it, within the categories, drug related, weapons and homicide groups have higher mean differences of being strip searched at arrest which reflected our histogram results and literature review findings of black street cultures.

5.5 Interaction Plot



Since strip search is a categorical variable and we made the assumption that considered it as a continuous variable as a probability to accommodate the ANOVA test. This interaction Boxplot does not perform as usual because it requires a continuous numerical number to determine the mean, max, and min. Still, in this graph, we can tell that there are more variations in drug related and weapons & Homicide categories which reflect our test results and research questions.

6. Results and Findings

As mentioned in the EDA and Methods part, we checked if there are mean differences of strip searches among different race groups and various occurrence categories. Referring to the summarized output from our selected models, there are several interesting findings. First, Black and Indigenous people are treated differently when being arrested with strip searches, indicated by results of t-test and One-way ANOVA, and Tucky's HSD. It confirms the necessity of our research by giving a general conclusion matching the point of views we gained from the primary research in our literature review. Second, there is a relationship between perceived race groups and occurrence categories based on results from Two-way ANOVA. It enables us to establish relationships between racism and arresting occurrence categories and provides a direction for our following research. Third, to figure out which strip search means the occurrence category is different from others, Tucky's HSD results tell us that suspects in the drug-related and weapons and homicide occurrence category have a higher probability to be strip searched than other groups. It matches our observation of a higher proportion of drug-related and weapons and homicide in Black people's bin in the Figure 5 Histogram Of Total Amount Of Strip Searches In Perceived Race With Different Age Groups At Arrest. It also reflects the insights in our literature review that

strip search should be reasonable and legal by checking for weapons or evidence to ensure a lawful arrest. Combining the second and third findings, it is easy to deduce that black people's treated differently when being arrested on strip search has a relation to drug-related and weapons and homicide crime occurrence. It might be because of their low income and street culture.

7. Discussion

7.1 limitation

This dataset contains a sufficient amount of information with several columns and rows, but no numerical data can be discovered in it, making it difficult to utilize since the ANOVA test requires numerical data to compare means between groups and to provide insights with real meaning.

Initially, we wish to integrate all search reason categories and rank them in severity order, assuming that they are continuous numerical variables. Because this variable may offer us some insight into if there are underlying relationships between perceived race groups and the reasons why people are strip searched. Yet, there isn't enough research to back up our assumptions and provide a guide on the severity of each search reason, which might render this assumption useless and so contribute nothing to the research subject. Therefore, we decide to assume the strip search column as a numerical value where it represents the probability of getting strip searched. The probability of this event that is certain to occur is represented by 1, while the probability of an event that is impossible to occur is represented by 0.

7.2 Future Work

As mentioned in previous sections, studies have shown that strip searches are considered traumatic experiences for individuals and can lead to long-lasting emotional and psychological damage. As a result, there is an urgent need for more study to better understand the experiences of various racial groups during strip searches and to identify viable solutions that might mitigate the harm caused.

Furthermore, a study done by Reventlow (2020) argued that while statistics can give significant insights into the amount and character of racism, relying solely on data collection is insufficient to address and mitigate the systematic bias in racism. Comprehensive plans that comprehend the complexities of problems and involve various parties and techniques are essential to accomplish long-term change. For example, by collaborating with people of color and other marginalized communities and emphasizing their needs and viewpoints, society may develop more effective ways for combating racism and establishing a more inclusive environment (Reventlow, 2020).

8. Conclusion

This study is an attempt to explore the question of "Do Black people being treated differently when arrested with strip search practices?". Regardless of the limits, there is still considerable evidence to demonstrate that black communities are treated differently than other races when it comes to strip searches upon arrest. Strip searches have regularly been demonstrated to be more common in black communities than in white ones, as well as in other races such as Latino, East/Southeast Asian, and others. Additionally, combining histogram and test results, drug-related, weapons, and homicide are the most common reasons for black people being strip searched. This should be investigated further with a direct test between perceived race and the occurrence category. Further

study is clearly required to better understand the mechanisms underlying these inequalities in strip search procedures and to discover viable strategies to rectify them. Only then can we hope to build a system that truly serves the needs and interests of all members of the society.

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Appendices -1 Tukey's Test Result

[illegible]

Harassment & Threatening	Robbery/Theft	-0.1982	0.001	-0.225	-0.1515	True
Harassment & Threatening	Sexual Related Crime	-0.1943	0.001	-0.244	-0.144	True
Harassment & Threatening	Sexual Related Crimes & Crimes Against Children	-0.0886	0.001	-0.1398	-0.0374	True
Harassment & Threatening	Vehicle Related	-0.1993	0.001	-0.251	-0.1474	True
Harassment & Threatening	Vehicle Related (inc. Impaired)	-0.1563	0.001	-0.1965	-0.1156	True
Harassment & Threatening	Warrant	-0.0041	0.0	-0.0402	0.032	False
Harassment & Threatening	Weapons	-0.148	0.001	-0.1945	-0.1034	True
Harassment & Threatening	Weapons & Homicide	0.2114	0.001	0.1448	0.2579	True
Harassment & Threatening	Homicide	0.0344	0.0	-0.1033	0.1029	False
Harassment & Threatening	Impaired	-0.0015	0.0	-0.045	0.0419	False
Harassment & Threatening	LIA	-0.005	0.0	-0.0509	0.051	False
Harassment & Threatening	Mental Health	0.0017	0.0	-0.0777	0.0811	False
Harassment & Threatening	Mischief	0.0085	0.0	-0.0353	0.0521	False
Harassment & Threatening	Mischief & Fraud	0.136	0.001	0.0949	0.1771	True
Harassment & Threatening	Other Offense	0.1221	0.001	0.0821	0.1621	True
Harassment & Threatening	Other Statute	-0.0036	0.0	-0.0346	0.0434	False
Harassment & Threatening	Other Statute & Other Incident Type	0.022	0.0	-0.0167	0.0806	False
Harassment & Threatening	Police Category	0.0031	0.0	-0.0327	0.0385	False
Harassment & Threatening	Police Category - Incident	-0.0021	0.0	-0.0559	0.0537	False
Harassment & Threatening	Robbery & Theft	0.1704	0.001	0.1253	0.2004	True
Harassment & Threatening	Robbery/Theft	0.0189	0.0	-0.025	0.0468	False
Harassment & Threatening	Sexual Related Crime	0.0028	0.0	-0.0469	0.0526	False
Harassment & Threatening	Sexual Related Crimes & Crimes Against Children	0.1108	0.001	0.08	0.1612	True
Harassment & Threatening	Vehicle Related	-0.0002	0.0	-0.0513	0.051	False
Harassment & Threatening	Vehicle Related (inc. Impaired)	0.0429	0.018	0.0028	0.0828	True
Harassment & Threatening	Warrant	0.195	0.001	0.1598	0.2303	True
Harassment & Threatening	Weapons	0.0512	0.001	0.0033	0.0911	True
Harassment & Threatening	Weapons & Homicide	0.4155	0.001	0.3648	0.4554	True
Harassment & Threatening	Impaired	-0.016	0.0	-0.1118	0.0999	False
Harassment & Threatening	LIA	-0.0394	0.0	-0.1797	0.101	False
Harassment & Threatening	Mental Health	-0.0327	0.0	-0.1839	0.1185	False
Harassment & Threatening	Mischief	-0.026	0.0	-0.1619	0.11	False
Harassment & Threatening	Mischief & Fraud	0.1016	0.0244	-0.0335	0.2367	False
Harassment & Threatening	Other Offense	0.0877	0.015	-0.0471	0.2225	False
Harassment & Threatening	Other Statute	-0.04	0.0	-0.1774	0.0973	False
Harassment & Threatening	Other Statute & Other Incident Type	-0.075	0.0	-0.1782	0.1212	False
Harassment & Threatening	Police Category - Administrative	-0.0313	0.0	-0.1449	0.1023	False
Harassment & Threatening	Police Category - Incident	-0.0375	0.0	-0.1782	0.1212	False
Harassment & Threatening	Robbery & Theft	0.136	0.039	0.0026	0.2694	True
Harassment & Threatening	Robbery/Theft	-0.0235	0.0	-0.1571	0.1101	False
Harassment & Threatening	Sexual Related Crime	-0.0316	0.0	-0.1485	0.106	False
Harassment & Threatening	Sexual Related Crimes & Crimes Against Children	0.0762	0.0	-0.0621	0.2145	False
Harassment & Threatening	Vehicle Related	-0.0348	0.0	-0.1731	0.1039	False
Harassment & Threatening	Vehicle Related (inc. Impaired)	0.0805	0.0	-0.1263	0.1432	False
Harassment & Threatening	Warrant	-0.1408	0.0024	0.0272	0.294	False
Harassment & Threatening	Weapons	0.0148	0.0	-0.1199	0.1534	False
Harassment & Threatening	Weapons & Homicide	0.3761	0.001	0.3295	0.412	True
Harassment & Threatening	LIA	-0.0034	0.0	-0.0593	0.0524	False
Harassment & Threatening	Mental Health	0.0032	0.0	-0.0761	0.0925	False
Harassment & Threatening	Mischief	0.01	0.0	-0.0337	0.0337	False
Harassment & Threatening	Mischief & Fraud	0.1178	0.001	0.0944	0.1785	True
Harassment & Threatening	Other Offense	-0.1237	0.001	0.0838	0.1431	False
Harassment & Threatening	Other Statute	-0.0041	0.0	-0.052	0.0438	False
Harassment & Threatening	Other Statute & Other Incident Type	0.0235	0.00855	-0.015	0.062	False
Harassment & Threatening	Police Category - Administrative	0.0046	0.0	-0.031	0.0402	False
Harassment & Threatening	Police Category - Incident	-0.0018	0.0	-0.0383	0.0351	False
Harassment & Threatening	Robbery & Theft	0.1719	0.001	0.137	0.2068	True
Harassment & Threatening	Robbery/Theft	0.0125	0.0	-0.0233	0.0482	False
Harassment & Threatening	Sexual Related Crime	0.0046	0.0	-0.0452	0.054	False
Harassment & Threatening	Sexual Related Crimes & Crimes Against Children	0.1121	0.001	0.0616	0.1626	True
Harassment & Threatening	Vehicle Related	-0.0014	0.0	-0.0497	0.0524	False
Harassment & Threatening	Vehicle Related (inc. Impaired)	0.0444	0.0399	0.0044	0.0842	True
Harassment & Threatening	Warrant	-0.1946	0.001	0.1615	0.2317	True
Harassment & Threatening	Weapons	0.0527	0.0036	0.007	0.0985	True
Harassment & Threatening	Weapons & Homicide	-0.4121	0.001	0.3643	0.4578	True
Harassment & Threatening	LIA	0.0087	0.0	-0.0801	0.0934	False
Harassment & Threatening	Mental Health	0.0138	0.0	-0.0427	0.0484	False
Harassment & Threatening	Mischief	0.141	0.001	0.0869	0.195	True
Harassment & Threatening	Mischief & Fraud	-0.1271	0.001	0.0739	0.1803	False
Harassment & Threatening	Other Offense	-0.0006	0.0	-0.0601	0.0598	False
Harassment & Threatening	Other Statute	0.0469	0.0	-0.1448	0.0793	False
Harassment & Threatening	Other Statute & Other Incident Type	0.0081	0.0	-0.042	0.0592	False
Harassment & Threatening	Police Category - Administrative	0.0019	0.0	-0.0449	0.0486	False
Harassment & Threatening	Police Category - Incident	-0.1754	0.001	0.1258	0.227	True
Harassment & Threatening	Robbery & Theft	0.0139	0.0	-0.0243	0.0661	False
Harassment & Threatening	Robbery/Theft	0.0078	0.0	-0.053	0.0687	False
Harassment & Threatening	Sexual Related Crime	0.1156	0.001	0.054	0.1772	True
Harassment & Threatening	Sexual Related Crimes & Crimes Against Children	0.0019	0.0	-0.0572	0.0648	False
Harassment & Threatening	Vehicle Related	0.0479	0.1591	-0.0553	0.101	False
Harassment & Threatening	Vehicle Related (inc. Impaired)	0.2	0.001	0.1393	0.2498	True
Harassment & Threatening	Warrant	0.0562	0.0715	-0.0016	0.1139	False
Harassment & Threatening	Weapons & Homicide	0.4155	0.001	0.3577	0.4733	True
Harassment & Threatening	Mischief	0.0068	0.0	-0.0772	0.086	False
Harassment & Threatening	Mischief & Fraud	0.1343	0.001	0.0563	0.2124	True
Harassment & Threatening	Other Offense	0.1204	0.001	0.04	0.187	True
Harassment & Threatening	Other Statute	-0.0073	0.0	-0.0892	0.0745	False
Harassment & Threatening	Other Statute & Other Incident Type	-0.0203	0.0	-0.0823	0.0571	False
Harassment & Threatening	Police Category - Administrative	0.0014	0.0	-0.0739	0.0768	False
Harassment & Threatening	Police Category - Incident	-0.0048	0.0	-0.0921	0.082	False
Harassment & Threatening	Robbery & Theft	0.001	0.0	-0.0937	0.0827	False
Harassment & Threatening	Robbery/Theft	0.0092	0.0	-0.0662	0.0847	False
Harassment & Threatening	Sexual Related Crime	0.0012	0.0	-0.0817	0.084	False
Harassment & Threatening	Sexual Related Crimes & Crimes Against Children	0.1089	0.001	0.0255	0.1923	True
Harassment & Threatening	Vehicle Related	-0.0019	0.0	-0.0846	0.079	False
Harassment & Threatening	Vehicle Related (inc. Impaired)	0.0412	0.0	-0.0362	0.1186	False
Harassment & Threatening	Warrant	0.1934	0.001	0.1183	0.1685	True
Harassment & Threatening	Weapons	0.0495	0.0758	-0.0312	0.1302	False
Harassment & Threatening	Weapons & Homicide	0.4088	0.001	0.3282	0.4895	True
Harassment & Threatening	Mischief & Fraud	0.1276	0.001	0.0863	0.1848	True
Harassment & Threatening	Other Offense	0.1137	0.001	0.0725	0.1539	True
Harassment & Threatening	Other Statute	-0.0141	0.0	-0.0623	0.054	False
Harassment & Threatening	Other Statute & Other Incident Type	0.0135	0.0	-0.0254	0.0524	False
Harassment & Threatening	Police Category	-0.0004	0.0	-0.0414	0.0307	False
Harassment & Threatening	Police Category - Incident	-0.0116	0.0	-0.0885	0.0454	False
Harassment & Threatening	Robbery & Theft	0.1419	0.001	0.1246	0.1973	True
Harassment & Threatening	Robbery/Theft	0.0025	0.0	-0.0337	0.0366	False
Harassment & Threatening	Sexual Related Crime	-0.0056	0.0	-0.0555	0.0443	False
Harassment & Threatening	Sexual Related Crimes & Crimes Against Children	0.1021	0.001	0.0513	0.1527	True
Harassment & Threatening	Vehicle Related	-0.0086	0.0	-0.0599	0.0427	False
Harassment & Threatening	Vehicle Related (inc. Impaired)	0.0344	0.2409	-0.008	0.0743	False
Harassment & Threatening	Warrant	0.1844	0.001	0.1511	0.2221	True
Harassment & Threatening	Weapons	0.0427	0.119	-0.024	0.1021	False
Harassment & Threatening	Weapons & Homicide	0.4021	0.001	0.358	0.4482	True
Harassment & Threatening	Other Offense	-0.0139	0.0	-0.0511	0.0428	False
Harassment & Threatening	Other Statute	-0.1416	0.001	-0.1874	-0.0959	True
Harassment & Threatening	Other Statute & Other Incident Type	-0.114	0.001	-0.1499	-0.0782	True
Harassment & Threatening	Police Category - Administrative	-0.1229	0.001	-0.1456	-0.1002	True
Harassment & Threatening	Police Category - Incident	0.1391	0.001	0.194	0.0842	True
Harassment & Threatening	Robbery & Theft	0.0344	0.0174	0.0029	0.0662	True
Harassment & Threatening	Robbery/Theft	-0.1251	0.001	-0.158	-0.0922	True
Harassment & Threatening	Sexual Related Crime	-0.1332	0.001	-0.1807	-0.0971	True
Harassment & Threatening	Sexual Related Crimes & Crimes Against Children	-0.0294	0.0	-0.0739	0.0231	False
Harassment & Threatening	Vehicle Related	-0.1362	0.001	-0.1852	-0.0972	True
Harassment & Threatening	Vehicle Related (inc. Impaired)	-0.0931	0.001	-0.103	-0.059	True
Harassment & Threatening	Warrant	0.059	0.001	0.0268	0.0911	True
Harassment & Threatening	Weapons	-0.0848	0.001	-0.1286	-0.0413	True
Harassment & Threatening	Weapons & Homicide	0.2745	0.001	0.231	0.318	True
Harassment & Threatening	Other Statute	0.1277	0.001	0.1729	0.081	True
Harassment & Threatening	Other Statute & Other Incident Type	-0.1892	0.001	-0.1347	-0.0856	True
Harassment & Threatening	Police Category - Administrative	-0.119	0.001	-0.1503	-0.0878	True
Harassment & Threatening	Police Category - Incident	-0.1352	0.001	-0.1793	-0.0712	True
Harassment & Threatening	Robbery & Theft	0.0483	0.001	0.0178	0.0787	True
Harassment & Threatening	Robbery/Theft	-0.1112	0.001	-0.1427	-0.0748	True
Harassment & Threatening	Sexual Related Crime	-0.1193	0.001	-0.1459	-0.0727	True
Harassment & Threatening	Sexual Related Crimes & Crimes Against Children	-0.0115	0.0	-0.0591	0.0346	True
Harassment & Threatening	Vehicle Related	-0.1223	0.001	-0.1704	-0.0742	True
Harassment & Threatening	Vehicle Related (inc. Impaired)	-0.0782	0.001	-0.1152	-0.0432	True
Harassment & Threatening	Warrant	0.0729	0.001	0.0423	0.1036	True
Harassment & Threatening	Weapons	-0.0799	0.001	-0.1134	-0.0285	True
Harassment & Threatening	Weapons & Homicide	0.2884	0.001	0.2459	0.3109	True
Harassment & Threatening	Other Statute	0.0276	0.2878	-0.034	0.0712	False
Harassment & Threatening	Other Statute & Other Incident Type	0.0087	0.0	-0.0323	0.0481	False
Harassment & Threatening	Police Category - Administrative	0.0025	0.0	-0.0577	0.0627	False
Harassment & Threatening	Police Category - Incident	-0.116	0.001	-0.1384	-0.0501	True
Harassment & Threatening	Robbery & Theft	0.0165	0.0	-0.0248	0.0577	False
Harassment & Threatening	Robbery/Theft	0.0085	0.0	-0.0452	0.0421	False
Harassment & Threatening	Sexual Related Crime	0.1182	0.001	0.0617	0.1707	True
Harassment & Threatening	Sexual Related Crimes & Crimes Against Children	0.0035	0.0	-0.0495	0.0404	False
Harassment & Threatening	Vehicle Related	0.0489	0.018	0.0038	0.091	True
Harassment & Threatening	Vehicle Related (inc. Impaired)	0.2007	0.001	0.1601	0.2413	True
Harassment & Threatening	Warrant	0.0548	0.0079	0.0047	0.0917	True
Harassment & Threatening	Weapons & Homicide	0.4151	0.001	0.366	0.4682	True
Harassment & Threatening	Police Category - Administrative	-0.0187	0.0155	-0.0485	0.0107	False
Harassment & Threatening	Police Category - Incident	-0.0251	0.0	-0.0782	0.028	False
Harassment & Threatening	Robbery & Theft	0.1484	0.001	0.1197	0.1778	True
Harassment & Threatening	Robbery/Theft	-0.0111	0.0	-0.0408	0.0187	False
Harassment & Threatening	Sexual Related Crime	-0.0191	0.0	-0.0648	0.0264	False
Harassment & Threatening	Sexual Related Crimes & Crimes Against Children	0.0886	0.001	0.0422	0.135	True
Harassment & Threatening	Vehicle Related	-0.0221	0.0	-0.0692	0.0249	False
Harassment & Threatening	Vehicle Related (inc. Impaired)	0.0208	0.0886	0.0136	0.055	False
Harassment & Threatening	Warrant	0.1731	0.001	0.1441	0.2021	True
Harassment & Threatening	Weapons	0.0392	0.0327	-0.012	0.0705	False
Harassment & Threatening	Weapons & Homicide	0.3895	0.001	0.3473	0.4298	True
Harassment & Threatening	Police Category - Incident	-0.0078	0.0	-0.0513	0.0448	