Study on Demographic Attributes' Impact on Strip Search Reasons and the Chance of Being Booked at a Police Station

By

Group 27

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1. Introduction

1.1 Overview and Literature Review

The impact of demographic attributes on strip search reasons and the likelihood of being booked at a police station is always a contentious social issue. Some argue that police may need to enforce such actions on suspects to maintain social order and protect other lawful citizens, especially when there is reason to suspect that suspects are involved in the possession of an illegal substance or contraband. However, others contend that these actions can be seen as intrusive, degrading, and a violation of an individual's human rights, especially when there is insufficient justification, particularly for individuals who belong to certain demographic groups (Lemke, M., 2022). More specifically, it has been noted that the disproportionate use of police stops and strip searches against people in minority communities or young men presents a significant challenge to equality (Newburn, T., Shiner, M., & Hayman, S., 2004). Strip searches are considered to be privacy-violating and dignity-hurting, and while they can sometimes yield critical evidence leading to criminal charges, Grewcock and Sentas (2019) argued that there are multiple disadvantages associated with strip searches, and we should carefully consider our decisions before proceeding. Furthermore, Liptak and Souter (2009) recorded a court case in which the judge ruled that children's rights were violated by strip searches, leading to further debates on the topic.

Radley Balko (2020) argued that the criminal justice system is racist, and people of color are more likely to be treated unfairly. Besides, extensive research has been systematically conducted to identify various potential factors affecting the decision to arrest or book suspects. These factors include but are not limited to the suspects' demeanor, the seriousness of the offense, victims' requests, race and sex of suspect and victim, and the occurrence neighborhood (Black, 1971; Brooks, 1986; Klinger, 1997; Lundman, 1994; Mastrofski, Snipes, & Parks, 2000; Mastrofski, Snipes, & Supina, 1996; Smith, 1986; Smith & Visher, 1981; Visher, 1983; Worden, 1989). Therefore, it would be meaningful to investigate if different factors are associated with being booked and the reasons justifying the strip searches and further improve our understanding of this complex and contentious issue.

1.2 Research Objective and Questions

This study has two main objectives. The first main objective is to explore the relationships between the sex of the arrestees and their reasons for being strip-searched if

they were strip-searched, controlling their age. The second main objective is to test if the ages of the arrestees will have a main effect on whether or not the arrestees will be booked. Therefore, we have formulated two research questions based on the knowledge gained in the initial analysis of the dataset (see the Descriptive statistics and T-test section below for our initial exploration of the data):

- RQ1: How does the sex of the arrestee affect the number of reasons for being strip-searched, controlling for their actions at arrest? That is, are arrestees from a particular sex more likely to be strip-searched when their actions during an arrest are held constant?
- RQ2: How does the arrestees' information predict if the police can find illegal/dangerous items? That is, what information can we use to predict if illegal/dangerous items can be found during the search?

We believe these research questions can show the relationships between different variables in the arrest dataset and identify any potential biases or discriminatory practices that could impact the fairness and impartiality of law enforcement.

2. Exploratory Data Analysis

2.1 Univariate Analyses

2.1.1 Sex of the Arrestees

First, we conducted univariate analyses to get the descriptive statistics of our variables. Our first variable is the Sex of the arrestee. In total, we have 52,650 male arrestees and 12,617 female arrestees from 2020 to 2021, as shown in the table below. We have removed sex labeled as "*unknown*". The rationale for this operation is further explained in the Method section later in this paper. We have noticed that there are much more males arrested than females from 2020 to 2021, so we think there might be a sex difference in how individual suspects/arrestees are treated. Based on this difference and our literature review regarding sex differences within the criminal justice system. So, we have decided to choose sex as one of the independent variables for our study.

Table 1

Number of Arrestees for Each Sex

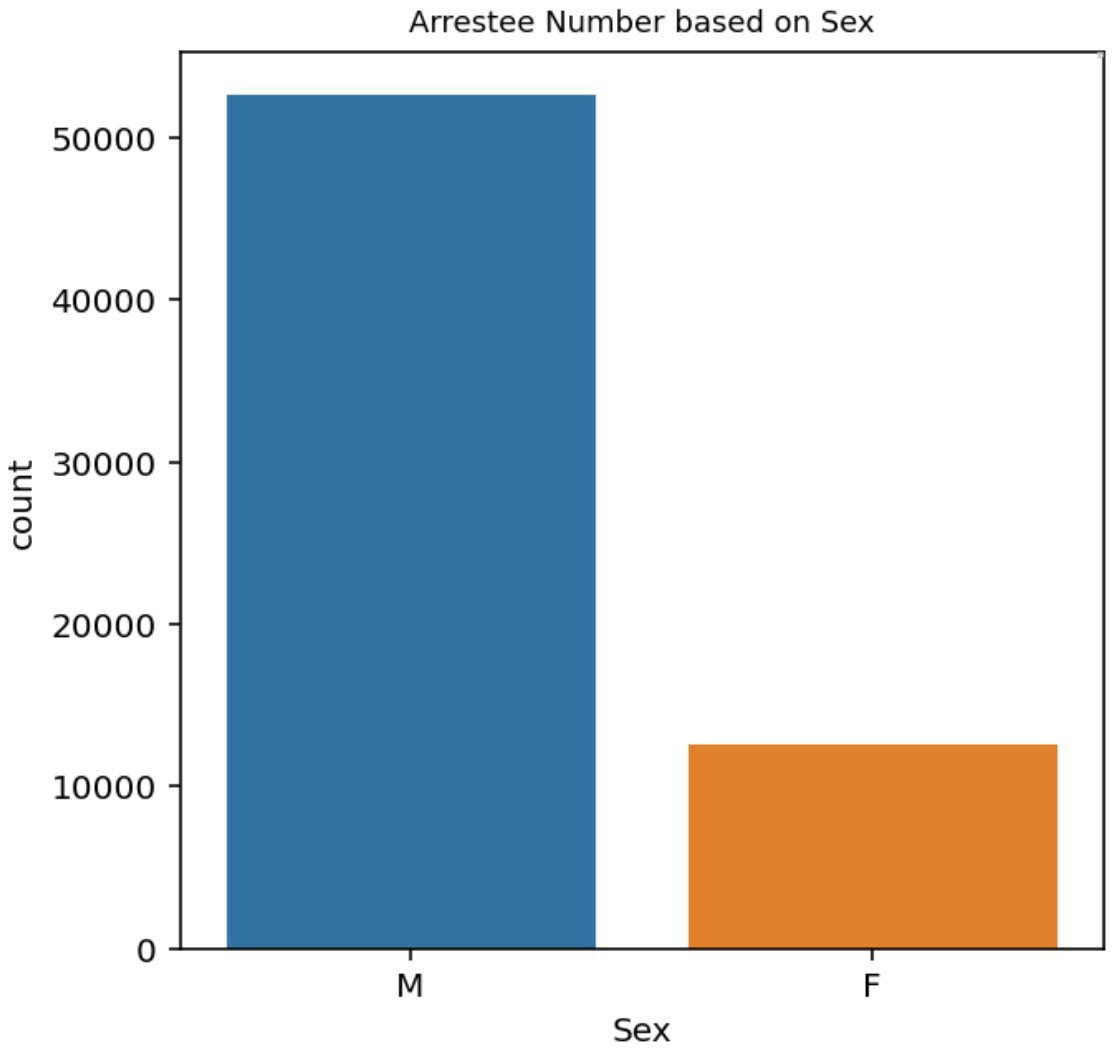
Sex of the Arrestee	Count
Male	52,650
Female	12617

This table shows the number of arrestees for each sex, excluding arrestees with Sex labeled as "*unknown*".
Toronto Police Service applies this binary coding of the arrestees' sex. The authors are not supporting this method of categorizing the sex of any individual.

We have also plotted this information into a bar chart to show the sex difference in the number of arrestees more directly:

Graph 1

Number of Arrestees for Each Sex



2.1.2 Aggregated Negative Actions during the Arrest

Our control variable for the first research question is aggregated negative actions during the arrest. We formulated this new attribute by summing all the arrest behaviors other than being cooperative. The Method-Variable section explains the details of this variable's formation. The mean of this variable is 0.153247, and the median is 0. The central tendency of aggregated negative actions is shown below. As suggested, most arrestees displayed no negative behaviors during the arrest. The maximum amount of negative displayed during the arrest is 4.

Table 1

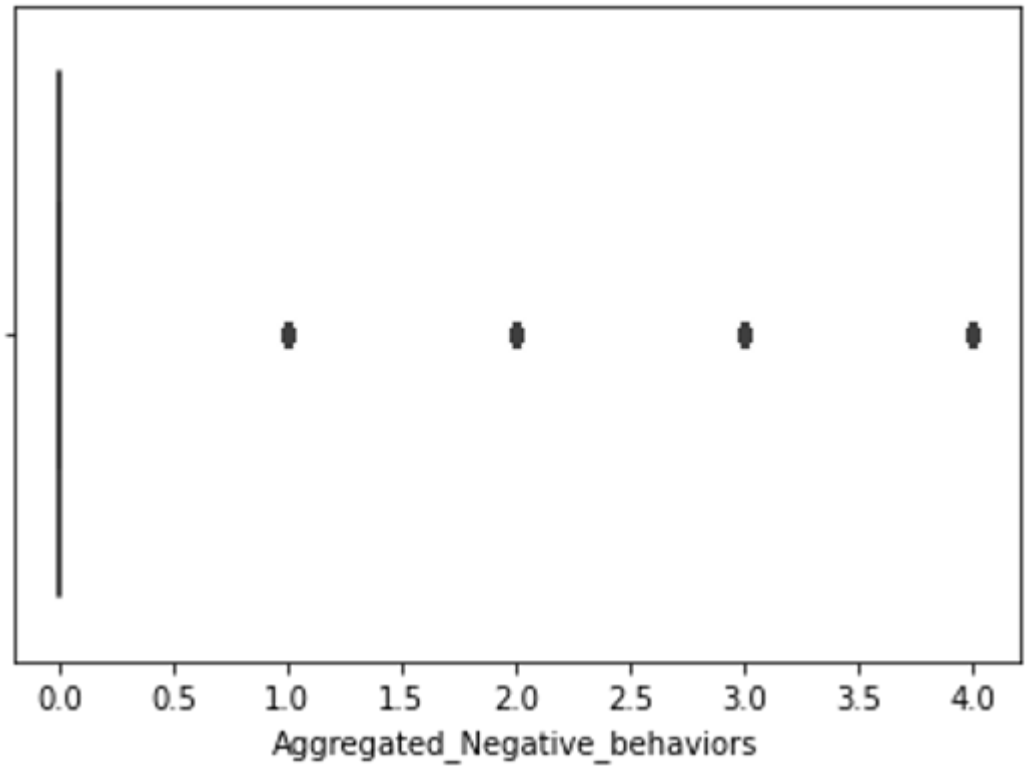
Statistical Summary of Aggregated Negative Actions During the Arrest

Sample Statistics	Values
Mean	0.153247
Standard Deviation	0.534204
Minimum Value	0
25th Percentile	0
Median	0
75th Percentile	0
Maximum Value	4

We have also drawn a box plot of this variable. But because 90.58% (59,121 out of 65,267 arrestees) displayed no negative behaviors during the arrest, the box shrank into a line concentrated on 0, as shown below, and arrestees with any negative behaviors are considered outliers.

Graph 2

Boxplot of Aggregated Negative Actions during Arrest



2.1.3 Aggregated Reason for Strip Searches

Our first dependent variable for the first research question is aggregated reason for strip searches. We formulated this attribute by summing all the strip search reasons. The Method-Variable section explains the details of this variable's formation.

There were a total of 7,016 arrestees strip-searched. The mean aggregated search reason is 2.20, and the standard deviation is 1.07. The range of this variable is [1,4], and the details of this variable are shown below.

Table 2

Statistics Summary of Aggregated Reason for Strip Searches

Sample Statistics	Value
Count	7,016
Mean	2.20
Standard Deviation	1.07
Minimum Value	1

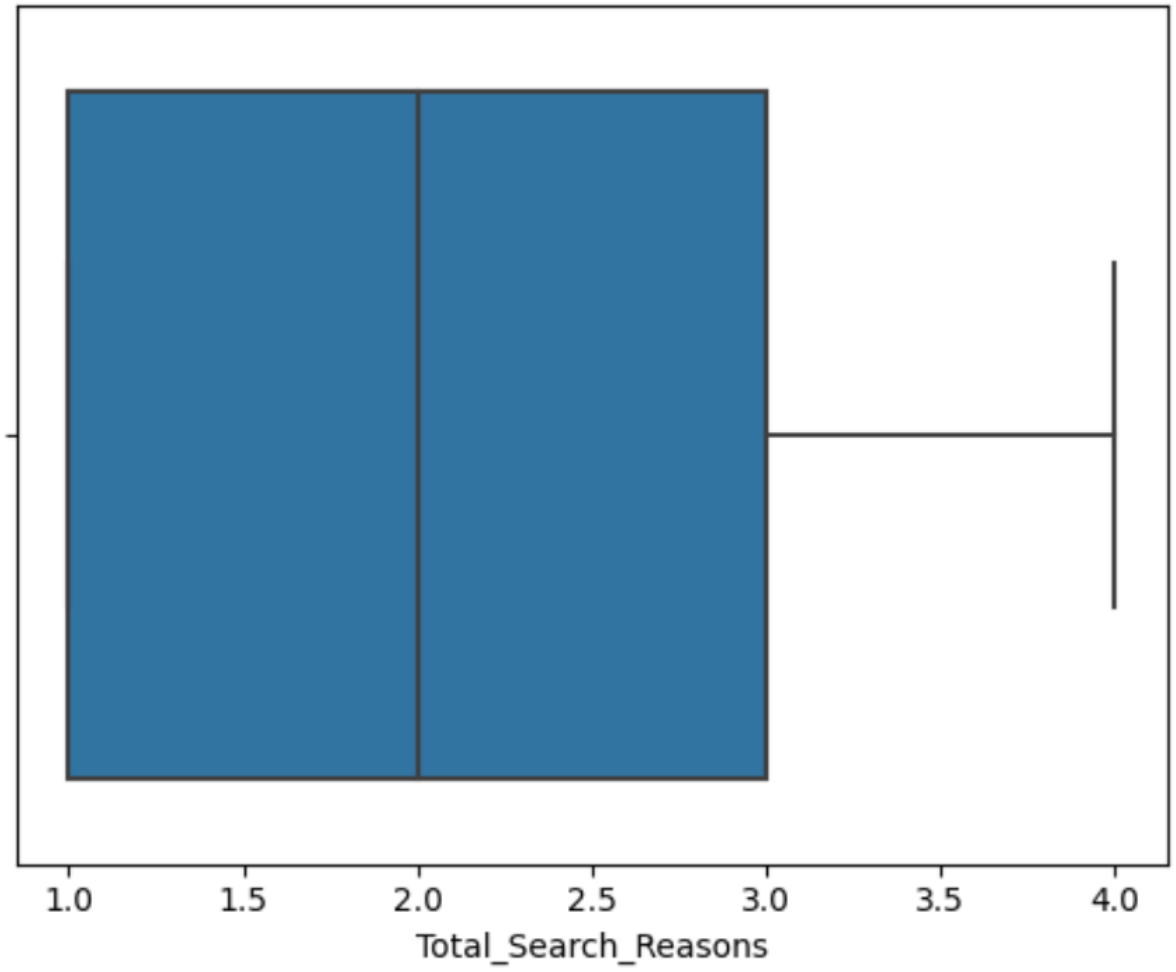
25th Percentile	1
Median	2
75th Percentile	3
Maximum Value	4

This table shows the statistics of the aggregated reason for strip searches for arrestees who were strip-searched. Arrestees who were not strip-searched are not included in this sample statistic.

We also drew a boxplot for this variable, and the result is centered on two search reasons, and most arrestees being searched fall between 1 to 3 search reasons. The boxplot is shown in the graph below.

Graph 3

Boxplot of Aggregated Reasons for Strip Searches

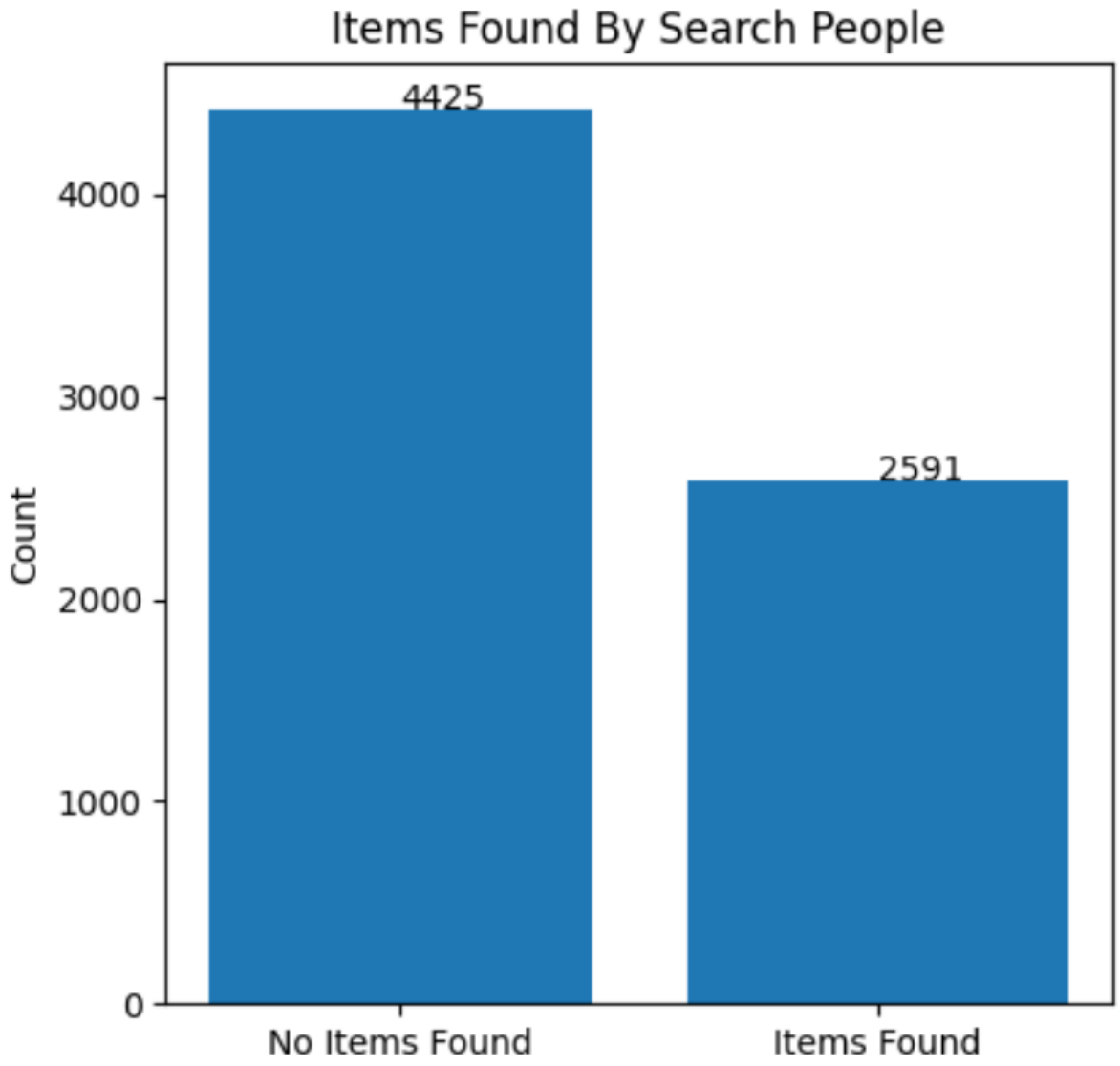


2.1.4 Whether Items Were Found During the Strip Searches

The dependent variable of the second research question is whether the police found dangerous/illegal items during the strip searches. This is a binary variable because the police can either find or not find an item or items from the strip searches. There are a total of 65,267 arrestees in the dataset. Among them, 7,016 arrestees were strip-searched. Of these searches, 4,425 found no items, whereas 2,591 found at least one item. In other words, there is a 37% chance of finding items during a strip search. The sample size is large enough to divide the dataset into training and testing sets. Therefore we have chosen this variable as our second dependent variable. Here we have plotted booked and non-booked arrestees in a bar chart.

Graph 4

Barchart of Items Found versus No Items Found Arrestees



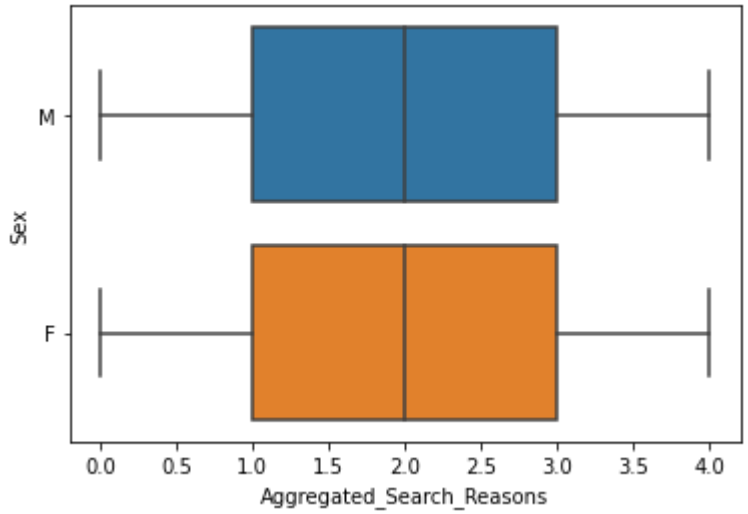
2.2 Bivariate Analyses

2.2.1 Paired Box-Plot

We would like to see if males and females were considered to have different amounts of reasons for being strip-searched. The mean for male aggregated strip-search reasons is 2.0044, and for females is 1.8628. We have drawn a box plot for their aggregated strip-search reasons respectively.

Graph 5

Pairwise Boxplot of Aggregated Reasons for Strip Searches by Sex



They look identical on the graph, but their means are different. This may be because this attribute's values are discrete, and a 0.15 mean difference cannot be reflected on a box plot. As a result, we have conducted a t-test to test if there are any meaningful differences between male and female aggregated strip-search reasons in Section 2.3.

2.3 T-test

Due to sex differences in the criminal justice system mentioned above, we would like to conduct a t-test to see if any differences exist in reasons for strip searches between male and female arrestees if they were strip-searched. Therefore, our research hypotheses are

- Ho: Males and females are perceived to have the same amount of reasons to be strip searched.
- Ha: Males are more likely to be perceived to have more reasons to be strip searched than females.

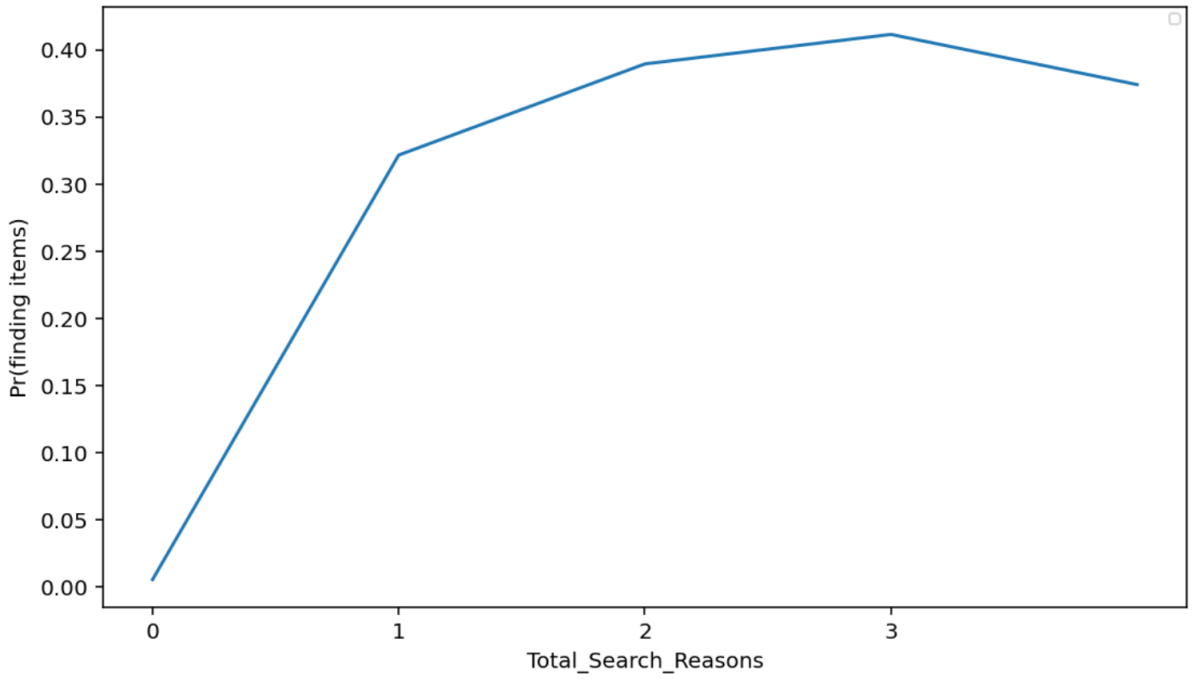
First, we ran the t-test, and the result shows that at a 5% significance level, our p-value is 0.0125%. We have enough evidence to reject the null hypothesis. Male arrestees are perceived to have more reasons to be strip-searched than their female counterparts. Therefore, we should dig deeper to see if controlling the arrestees' ages will affect its impact on the dependent variable.

2.4 Line Graph for EDA of the Logistic Regression

Because our second research question's dependent variable is a binary variable, and our independent variable is a continuous variable, we have drawn a line graph plotting the percentage of finding items or not against their aggregated search reasons. This graph can help in identifying the general pattern of any relationship. The graph is shown below. The graph shows that the chance of finding items increases when the aggregated search reasons increase and shows a linear pattern. Therefore, we will look deeper to see if more information can be used to predict if we can find items during the searches.

Graph 6

Search Reasons versus Probability of Finding Items



We have cross-tabulated this information.

Table 3

Cross-tabulation of Finding Items for Arrestees with Different Aggregated Search Reasons

		Found Items or Not		
		Found	Not Found	Total
Aggregated Search Reasons	0	320 1%	57931 99%	58251 100%
	1	5327 32%	4712 68%	10039 100%
	2	11685 39%	9260 61%	20945 100%
	3	8879 41%	7362 59%	16241 100%
	4	4701 37%	4365 63%	9066 100%

3. Method

3.1 Dataset Description

In our project, we will use a dataset that shows arrest information such as demographic attributes of arrestees (race, sex, age at arrest), reasons for arrest, time of arrest, strip searches, actions during the arrest, and so on. The dataset is publicly available on the Toronto Police Service Public Safety Data Portal. This dataset is being updated consistently, and it was last updated on Nov. 10th, 2022, as of Feb 17th, 2023. Currently contains information on 65,276 arrestees that were arrested from 2020 to 2021. The data was collected to record different information related to all arrests and strip searches conducted by the Toronto Police Service. Arrests outside the city boundary were recorded if the Toronto Police Service completed them. Some key demographic attributes of the arrestee include their age at arrest, sex, and race. Other notable information is the arrest date, location if the arrestees were booked at a police station within 24 hours of the arrest, and the reason for the arrest.

Furthermore, the behaviors displayed by the arrestee during the occurrence and the reasons for the strip search. Different actions were displayed during the arrest, and reasons for strip searches were coded in binary format. Other variables were coded in string and/or datetime format that fits their respective type of information. We have attached all the attributes in the appendix.

3.2 Data Cleaning

3.2.1 *Data error:* "Due to issues with the booking template, there may be some records where a person was strip-searched, but the data does not indicate a booking (i.e., value = 0); in those cases, the user should presume a booking took place. (Toronto Police Service)" The above paragraph comes from the explanation of Booked on the official website of the Toronto Police. If the suspect is stripped for inspection, then Booked should be 1. However, there are some cases in the data where the stripped inspection is true, but the value of Booked is 0. We used the following code to correct this error:

```
ass_table.loc[ass_table["StripSearch"] == 1, "Booked"] = "1"
```

3.2.2 *Inconsistent format*: From the picture below, we can see that the police did not use a uniform format when recording the age information of the arrested suspects. We can see that two terms indicate that the suspect is 17 years old or younger, and we will uniformly name them "Youth (aged 17 and younger)". The same problem applies to records of suspects aged sixty-five and older. We used the same method for modification. We used the following codes to modify these inconsistencies:

```
ass_table = ass_table.replace('Aged 65 years and older', 'Aged 65 and older')

ass_table = ass_table.replace('Aged 17 years and under', 'Aged 17 years and younger')
```

3.2.3 *Empty value:* The police arrest data uses 1 and 0 to indicate whether the suspect has committed a certain behavior, 1 means yes, and 0 means no. But in the data record, only 1 is recorded, and some of the behaviors that have not been performed are filled with 0, and some have nothing. The data with empty values looked like the following:

Break and Enter	Crimes against Children	Drug Related	...	Police Category - Incident	Robbery & Theft	Robbery/Theft	Sexual Related Crime	Sexual Related Crimes & Crimes Against Children	Vehicle Related	Vehicle Related (inc. Impaired)	War
NaN	NaN	33.0	...	NaN	255.0	NaN	NaN	7.0	NaN	47.0	
NaN	NaN	28.0	...	NaN	28.0	NaN	NaN	5.0	NaN	3.0	
NaN	NaN	7.0	...	NaN	83.0	NaN	NaN	1.0	NaN	17.0	
NaN	NaN	5.0	...	NaN	1.0	NaN	NaN	NaN	NaN	1.0	
NaN	NaN	10.0	...	NaN	30.0	NaN	NaN	NaN	NaN	3.0	
...	...	...	...	...	...	...	...	...	...	...	

For the convenience of analysis and statistics, we uniformly replaced the null values with 0 with the following codes:

Strip_Search_Sex = Strip_Search_Sex.fillna(0)

Now, all the NaN are replaced with 0, making our analysis possible.

3.2.4 *Data removal:* The dataset contained three values for sex. They are male, female, and unknown. We have removed unknowns since there are only nine occurrences (compared to 52,650 males and 12,617 females), which accounts for roughly only 0.014% of the subjects. Removing this additional level will make the statistical analysis more valid (too small sample size) and make the interpretation more straightforward. Therefore, we have removed the unknowns using the following code:

arrest_f_table = ass_table.lic[ass_table[‘Sex’] == “F”]

arrest_m_table = ass_table.lic[ass_table[‘Sex’] == “M”]

The code above only includes subjects with the attribute “sex” equal to either “F” (female) or “M” (male), leaving out the subjects with unknown sex.

3.2.5 *Data Transformation:* We have combined all the negative behaviors during arrest and formed a new variable called *Aggregated Negative Behaviours*. We have also combined all search reasons to form a new variable called *Aggregated Search Reasons*. The details of how these two new variables were formed are explained in Section 3.4 - Measurement.

3.3 Variables

As mentioned before, this database was initially collected and created by the Toronto Police Service. The spreadsheet contains the records of 65,276 occurrences of arrests at that time. We have manipulated the data to fit our research question. In our study, the main variables are the following:

perceived sex: the perceived biological sex of the arrestee

strip search: if the arrestee is strip-searched

actions at arrest - concealed items: if the arrestee had concealed items during the arrest

actions at arrest - combative, violent or spitter/biter: if the arrestee had combative, violent, spitting, or biting behaviors during the arrest

actions at arrest - resisted, defensive or escape risk: if the arrestee showed resistant, defensive, or escaping signs during the arrest

actions at arrest - mental instability or possibly suicidal: if the arrestee displayed mental instability or suicidal tendency during the arrest

actions at arrest - assaulted officer: if the arrestee assaulted or attempted to assault the officer during the arrest

aggregated negative behaviors: the total counts of any negative behaviors during the arrest, including concealed items, combative, violent or spitter/biter, resisted, defensive or escape risk, mental instability or possibly suicidal, assaulted officer

search reason - cause injury: the arrestee was strip-searched because they caused injury

search reason - assist escape: the arrestee was strip-searched because they were trying to escape

search reason - possess weapons: the arrestee was strip-searched because they were believed to possess weapons

search reason - possess evidence: the arrestee was strip-searched because they were believed to possess evidence

aggregated search reasons: the total counts of any strip search reasons, including *cause injury, assist escape, possess weapons, possess evidence*

items found: if the strip search found any dangerous/illegal items

3.4 Measurement

Variables and Value Categories

Variable	Categories
Independent and Control Variables	
Sex (sex, nominal)	The biological sex of the arrestee (Male, Female, Unknown [removed from analysis]).
Aggregated Negative Behaviors (aggregated_negative_behaviors, ratio)	The sum of all the behaviors during arrest other than being cooperative (ranging from 0 to 5).
Dependent Variables	
Aggregated Search Reasons (aggregated_search_reasons, ratio)	The sum of all the strip search reasons (ranging from 0 to 4).
Items Found (items_found, nominal)	If any dangerous/illegal items were found during the strip search (yes and no coded as 1 and 0).

Source: Arrests and Strip Searches (RBDC-ARR-TBL-001) by Toronto Police Service

3.4.1 Sex

The first independent variable is sex (*sex*, nominal). This one describes the biological sex of the arrestee. In many social settings, it can take many different values. In our dataset,

the set of this variable is *Male, Female, or Unknown*. We have excluded *Unknown* from our dataset because of the reason mentioned in the Data Cleaning section. We have to disclaim that this method of coding an individual's sex is used by the Toronto Police Service. We do not support or oppose this method of coding an individual's sex.

3.4.2 Aggregated Negative Behaviors

The control variable is the total count of each arrestee's negative behaviors (if any) displayed during the arrest (*aggregated_negative_behaviors*, ratio). We have summed all the behaviors during the arrest other than being cooperative to formulate this variable (i.e., *aggregated_negative_behaviors = 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*). In theory, the range of this variable is from 0 to 5. In our dataset, the range is 0 to 4.

3.4.3 Aggregated Search Reasons

The first dependent variable is the total count of each arrestee's reasons for being strip-searched if they were strip-searched (*aggregated_search_reasons*, ratio). We have summed all the strip search reasons to formulate this variable (i.e., *aggregated_search_reasons = search reason - cause injury + search reason - assist escape + search reason - possess weapons + search reason - possess evidence)*. The range of this variable is from 0 to 4.

3.4.4 Items Found

The second dependent variable is whether any items were found during the strip searches (*items_found*, nominal). In the dataset, if any items were found, it is coded as 1 (successful). It is coded as 0 (unsuccessful) if no items were found. Therefore, it is a binary variable, and the range of this variable is from 0 and 1.

3.4.5 Potential Predictors for Logistic Regression

We have identified all the potential predictors for our logistic regression and included all of them in our first iteration of the logistic regression analysis. These variables include *perceived_race, sex, age_group, arrestlocdiv,* all the *action_at_arrest,* and *search reason*.

3.5 ANCOVA Test

We completed an ANCOVA for our first research question. In the ANCOVA analysis, the independent variable is the arrestees' sexes. The control variable is the aggregated negative behaviors. The dependent variable is their aggregated search reasons. We have also conducted posthoc tests to determine which combination(s) of the independent variable significantly differs from the others and checked the assumptions of ANCOVA tests.

3.6 Logistic Regression

We also conducted a logistic regression for our second research question. We applied a machine learning technique to this test and included 14 potential predictors for the algorithm. The dependent variable is whether any items were found during the search.

4. Results

4.1 The Effect of Sex on Aggregated Search Reasons

We have conducted a one-way ANCOVA on the effect of sex on aggregated search reasons.

4.1.1 Assumption Checks

4.1.1.1 Independent Observations

Because some of the arrestees may act in groups, we cannot conclude that the observations are independent. In our study, we have assumed that the observations are independent so that we can proceed with our one-way ANCOVA test.

4.1.1.2 Homogeneity of Variance

We have conducted Levene’s test to check if the assumption of equal variance is met. The results of Levene’s test for sex are pasted below

Table 4

Levene’s Test on Arrestees’ Sex

Test Statistics	p-value
3.008	0.083

Because the p-value for the first test is greater than 0.05, we fail to reject the null hypothesis of Levene's test. The assumption of equal variance is not violated. Therefore, we will proceed with a regular one-way ANCOVA analysis.

4.1.1.3 Normality

We also did a Shapiro-Wilk normality test to check the normality assumption for ANOVA. The result is suggested that the assumption is violated. However, ANOVA is considered to be robust against the normality assumption if the sample size is large enough. In our case, this normality violation does not significantly impact our analysis because our sample size is enough (more than 7,000 observations for this research question).

4.1.2 ANCOVA Results

As mentioned above, we have conducted an interaction model studying the effects of the sex of the arrestees and their aggregated search reasons, controlling for their negative behaviors during the arrest. The result looks like the following.

Table 5

ANCOVA Summary

Predictor	Sum of Squares	Degrees of Freedom	F	p-value	Partial Eta-Squared
Sex	17.662341	1	15.540128	0.000082	2.21E-03
Aggregated Negative Behaviours	0.006228	1	0.00548	0.940991	7.81E-07
Residual	7970.71936	7013	NaN	NaN	NaN

According to the results, at a 5% significance level, we can conclude that sex (p-value = 0.000082) significantly affects the arrestee's aggregated search reasons. However, the aggregated negative behaviors (p-value < 0.940991) do not significantly affect the arrestee's aggregated search reasons.

4.1.3 Post-Hoc Test

Because only sex is a significant variable with two groups, there is no need for a posthoc test to see which group is different from the other. We have done a Tukey's HSD test anyway; the result is shown below. It turns out that males are more likely to be strip-searched than female arrestees.

Table 6

Tukey's HSD Test Summary

Group 1	Group 2	Mean Difference	p-value Adjusted	Lower	Upper	Decision
F	M	0.1416	0.001	0.0693	0.214	Reject

4.1.4 Effect Size

The partial eta-squared of sex is 0.0021, suggesting a small effect size. Therefore, the effect size of sex on aggregated search reasons is small.

4.2 The Effect of Aggregated Search Reasons on Whether Items Were Found

We conducted a logistic regression on the effect of aggregated strip search reasons on whether items were found during the search.

4.2.1 Assumption Checks

4.2.1.1 Independent Observations

Same as for the previous research question, because some of the arrestees may act in groups, we cannot conclude that the observations are independent of each other. In our study, we have assumed that the observations are independent so that we can proceed with our logistic regression test.

4.2.2 Logistic Regression Predictor Results

We have done a logistic regression method to include all potential predictors and remove the ones which are not significant. When we included all the predictors in the first iteration, the prediction accuracy was 66.08%. However, after we excluded the insignificant predictors and reran the logistic regression, the prediction accuracy remained at 65.11%. The results of the second iteration are shown here.

Table 7

Logistic Regression Summary and Confidence Interval at 95% Confidence

	Test Statistics					
Attribute Name	beta	Standard Error	z	P>|z|	Lower Limit	Upper Limit
Intercept	-0.132	0.241	-0.546	0.585	-0.604	0.341
Sex [Baseline: Female]						
Male	-0.186	0.080	-2.333	0.020	-0.341	-0.030
Arrest Location Division [Baseline: 11]						
12	-0.0838	0.218	-0.385	0.7	-0.511	0.343
13	-0.0553	0.266	-0.208	0.835	-0.576	0.465
14	-0.4986	0.189	-2.645	0.008	-0.868	-0.129
22	-0.2437	0.244	-0.999	0.318	-0.722	0.235
23	-0.6202	0.261	-2.379	0.017	-1.131	-0.109
31	-0.3424	0.222	-1.544	0.123	-0.777	0.092
32	-0.893	0.251	-3.556	0	-1.385	-0.401
33	-1.1776	0.352	-3.347	0.001	-1.867	-0.488
41	-0.2959	0.208	-1.423	0.155	-0.703	0.112
42	0.1573	0.221	0.713	0.476	-0.275	0.59
43	-1.0066	0.202	-4.981	0	-1.403	-0.611
51	0.1392	0.177	0.787	0.431	-0.208	0.486
52	-0.2396	0.195	-1.227	0.22	-0.622	0.143
53	-0.5297	0.224	-2.366	0.018	-0.969	-0.091
54	-0.3803	0.229	-1.659	0.097	-0.83	0.069
55	-0.6316	0.23	-2.743	0.006	-1.083	-0.18
XX	-0.496	0.176	-2.822	0.005	-0.84	-0.151
Actions at Arrest						
Cooperative	0.1317	0.06	2.18	0.029	0.013	0.25
Search Reasons						
Assist Escape	0.2535	0.06	4.193	0	0.135	0.372

We also analyzed odds ratios at a 95% confidence level. The results are below.

Table 8

Odds Ratio Summary at a 95% Confidence Interval

Attribute	Test Statistics			
	Lower Limit	Upper Limit	Odds Ratio	Probability
Sex [Baseline: Female]				
Intercept	0.6086	0.7706	0.6848	40.65%
Male	0.7283	0.9435	0.8290	45.32%
Arrest Location Division [Baseline: 53]				
Intercept	0.0994	0.5128	0.2258	18.42%
11	0.2754	3.0489	0.9163	47.81%
12	0.2252	2.7775	0.7908	44.16%
13	0.1028	2.9801	0.5536	35.63%
14	0.3976	2.7140	1.0388	50.95%
22	0.0000	inf	0.0000	0.00%
23	0.0921	2.6280	0.4921	32.98%
31	0.0503	1.3498	0.2605	20.67%
32	0.0204	1.5368	0.1771	15.05%
33	0.0444	3.6528	0.4026	28.70%
41	0.2585	2.8421	0.8571	46.15%
42	0.0856	1.5068	0.3591	26.42%
43	0.2502	2.1777	0.7381	42.47%
51	0.2633	1.7251	0.6739	40.26%
52	0.1491	1.5658	0.4831	32.57%
54	0.1294	2.3687	0.5536	35.63%
55	0.2109	2.5829	0.7381	42.47%
XX	0.1678	1.1844	0.4458	30.84%
Actions at Arrest				
Intercept	0.1056	0.1945	0.1433	12.53%
Cooperative	0.6331	1.4072	0.9438	48.56%
Search Reasons				
Intercept	0.4872	0.5523	0.5187	34.16%
Assist Escape	1.2354	1.5067	1.3643	57.71%

Due to the length of the paper, we will only report some noticeable results. Based on our sample, male arrestees, when searched, are more likely to possess items than their female

counterparts (β = -0.186, z = -2.333, standard error = 0.080, 95% C.I. = [-0.341, -0.030]). The odds ratio of males possessing items is 0.8290 (95% C.I. = [0.7283, 0.9435], probability = 45.32%) compared to female arrestees who were searched. Arrest location division has a significant implication in predicting the result of strip searches. It is least likely to find any items from arrestees from Division 32 (β = -0.893, z = -3.556, standard error = 0.251, 95% C.I. = [-1.385, -0.401]). The odds ratio of arrestees from Division 32 to possess items is 0.1771 (95% C.I. = [0.0204, 1.5368], probability = 15.05%). On the other hand, it is most likely to find items from arrestees from Division 14 (β = -0.4986, z = -2.645, standard error = 0.189, 95% C.I. = [-0.868, -0.129]). The odds ratio of arrestees from Division 14 to possess items is 1.0388 (95% C.I. = [0.3976, 2.7140], probability = 50.95%). When arrestees are cooperative at arrest, they are more likely to possess items than if they are not cooperative (β = 0.1317, z = 2.18, standard error = 0.060, 95% C.I. = [0.013, 0.250]). The odds ratio of arrestees who were cooperative during the arrest to possess items is 0.9438 (95% C.I. = [0.6331, 1.4072], probability = 48.56%). Lastly, if the arrestee was searched because they were believed to have items that would assist their escape, they were more likely to possess items (β = 0.2535, z = 4.193, standard error = 0.060, 95% C.I. = [0.135, 0.372]). The odds ratio of arrestees who escape risks to possess items is 1.3643 (95% C.I. = [1.2354, 1.5067], probability = 57.71%).

5. Conclusion

Through the study of the dataset, which currently contains information on 65,276 arrestees that were arrested from 2020 to 2021, we have addressed two main research questions. Firstly, we investigated the potential relationship between the demographic attributes of arrestees (sex) and arrestee's aggregated search reasons. By conducting a One-way ANCOVA and graphical analysis, we could draw conclusions. We found that most arrestees did not display negative behaviors during the arrest, which is positive. So, it appears that sex is associated with the arrestee's aggregated search reasons without the influence of aggregated negative behaviors. And the result shows that male arrestees are perceived to have more reasons to be strip-searched than their female counterparts. For the interpretation of this question, the explanatory variables are the sex of arrestees, the control variable is the aggregated negative behavior, and the outcome is aggregated search reasons. And we found that there was a significant interaction between sex and the arrestee's aggregated search reasons when the arrestee's actions during an arrest were held constant.

Secondly, we use logistic regression to solve the research question: How does the arrestees' information predict if the police can find illegal items? We find there are 7,016 arrestees being strip-search in all arrestees in the dataset. And a 37% chance of finding items during a strip search. On the arrestee being searched, we examined the relationship between aggregated strip reasons and the items that were found. And the line graph indicates that chance of finding items increases when the aggregated search reasons increase. So for the logistic regression method we have done, we get the prediction accuracy at 65.11% after excluding the insignificant predictors. To interpret this question, the dependent variable is whether any items were found during the search. The findings of the logistic regression analysis imply that the aggregated strip search reasons are predictive of the outcome of finding items during the search and that an increase in the number of reasons for conducting the strip search is associated with a higher probability of finding items.

The validity of these conclusions is confirmed by checking several assumptions. Firstly, we assumed that the observations were independent of conducting our one-way ANCOVA tests. Then, we performed Levene's test to verify if the assumption of equal variance is met and a Shapiro-Wilk normality test to confirm the normality assumption for ANCOVA.

6. Discussion

After we have done one-way ANCOVA and logistic regression for two research questions separately. We discussed the difference and applied situations between them. In short, ANCOVA and logistic regression are statistical methods used for data types and research questions. ANCOVA is more suitable for analyzing continuous outcome variables while controlling for the influence of continuous covariates. At the same time, logistic regression is more suitable for analyzing binary outcome variables and estimating the probability of an event occurring based on predictor variables. This study on the arrest information dataset further deepened our understanding and application scope of the two research methods.

Then, through the process of data processing and collection, we believe that although the sample size of the processed data set is sufficient for the study, data obtained in the real world during the study was not ideal, and we had to undertake data processing and compromises. We discovered inconsistent formats and empty values in the dataset, indicating

that the data collection process may have been either inaccurate or incomplete. As such, we recommend that future data collection processes be made more comprehensive to enhance the accuracy of the results. This may include implementing more robust and standardized data collection procedures, utilizing advanced technology to automate data collection, and ensuring that data is validated and checked for completeness and accuracy before analysis. Ultimately, taking these steps can help ensure that the data collected is of the highest quality, essential for drawing accurate conclusions and making informed decisions.

Besides, the results show that male arrestees are perceived to have more reasons to be strip-searched than females could potentially indicate a gender bias in the decision-making process related to strip searches. It means society needs to increase the safeguarding of equal treatment and protection for all individuals during law enforcement practices. Law enforcement agencies must avoid unfairly treating arrested persons and people who are being strip searched based on their race or gender and instead strive to uphold diverse and inclusive policies that better serve and represent the community as a whole.

Through more scientific and practical research, law enforcement agencies can be reminded to make the right decisions without prejudice. And modern AI technologies can develop more targeted interventions and policies that address possible inequities and inequalities and ensure that all individuals are treated fairly and equally. Utilizing data-based methods, such as statistical analysis methods such as ANCOVA and logistic regression, and leveraging artificial intelligence for analysis and policy development, law enforcement agencies can gain insights from large data sets, uncovering patterns and trends. The findings of these studies can serve as evidence, raise concern, and advocate for fair and equitable treatment in the criminal justice system for all individuals involved. AI technologies can help identify potential biases and inequalities by analyzing large-scale data sets, detecting patterns, and providing objective insights. Being impartial, transparent, and accountable in conducting such research and policy development is important. By identifying and addressing potential bias and inequities in law enforcement practices, we can work towards a more just and equitable criminal justice system that upholds the principles of fairness, equality, and respect for all individuals.

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