Abstract

The New York Civilian Complaint Review Board ("CCRB") has jurisdiction to "receive, investigate, mediate, hear, make findings, and recommend action" regarding non-criminal accusations against New York City Police Department ("NYPD") officers.When a complaint is substantiated, the CCRB then recommends a disciplinary action to the police commissioner, who can accept or modify the recommendation. The June 2020 repeal of New York State law CVR § 50-a, which shielded police disciplinary records from public disclosure, made CCRB's findings subject to public access. The purpose of this research is to identify patterns in the types of cases reported to the CCRB, their investigative outcomes, and ultimately, NYPD's decisions to impose discipline in response to substantiated allegations. The CCRB classifies complaints into four categories: Force, Abuse of Authority, Discourtesy, and Offensive Language. Given the differing nature of these cases and their associated evidence, we hypothesized that the CCRB would substantiate allegations of these types at different rates. While the categories of these allegations are broad, we expected to see substantiated Force allegations penalized more severely than other types of allegations. Finally, we hypothesized that NYPD would impose discipline on substantiated CCRB complaints at similar rates across categories. In addition to the CCRB's complaint categorization, we aimed to create our own complaint classifications using the CCRB's case categorization combined with the number of allegations contained in the case.

Background & Literature Review

In May 2020, nationwide protests emerged in response to the police-involved killings of George Floyd, Breonna Taylor, and numerous others. These protests emerged at a time when public trust in policing reached a precarious low (Brenan 2020). In response, state and local governments across the country began considering new legislation aimed at creating more robust oversight and accountability mechanisms for police.

Throughout its history, New York City has had multiple forms of police oversight, including federal monitors, temporary commissions, and city agencies (United States Commission on Civil Rights). Currently, New York City's primary agency dedicated to individual complaints is the CCRB. Established (in its current form) in 1993, the CCRB has jurisdiction to "receive, investigate, mediate, hear, make findings, and recommend action" regarding non-criminal accusations against NYPD officers (New York City Civilian Complaint Review Board).

Under the New York City Charter, the CCRB has jurisdiction to investigate the following categories of policy misconduct: Force, Abuse of Authority, Discourtesy, and Offensive Language, collectively known as "FADO" (New York City Civilian Complaint Review Board):

- **Force** refers to the use of excessive or unnecessary force. This behaviour includes punching or shoving and up to and including the use of deadly force.
- **Abuse of Authority** refers to the abuse of policy powers to intimidate and mistreat a civilian. Allegations can include improper street stops, frisk, searches, the issuance of retaliatory summonses, and unwarranted threats of arrest.
- **Discourtesy** refers to inappropriate communicative conduct including vulgar words, curses, or obscene gestures.
- **Offensive Language** refers to inappropriate expressive conduct regarding a person's sexual orientation, race, ethnicity, religion, gender or disability (Clarke 2009).

After a complaint is filed alleging officer misconduct, the CCRB investigates and rules each allegation "substantiated", "unsubstantiated", "unfounded" or "exonerated" based on their examination of the evidence. When a complaint is substantiated, the CCRB recommends a disciplinary action to the police commissioner, who can accept, modify, or decline the recommendation (New York City Civilian Complaint Review Board).

While critical for ensuring the integrity of its investigation, the CCRB's independence from NYPD has been associated with multiple shortcomings in NYPD oversight. First, the NYPD has also been accused of withholding significant evidence and undermining investigations of alleged abuse, despite their legal obligations to cooperate with the CCRB. For example, NYPD has inconsistently allowed officers to refuse interviews with CCRB investigators and, in some cases, has stopped sharing paper records and body-camera footage (Simon and Umansky). In addition, the police commissioner still maintains the final say over resulting discipline for noncriminal allegations against officers, leaving the commissioner with "unchecked power" in their decision making (Simon et al.). Between 2014 and 2018, around 220 of the most serious cases investigated by the CCRB resulted in a reduced form of punishment, while other cases had no penalties (Simon et al.).

Historically, detailed public information about the CCRB's disciplinary findings and recommendations had been shielded from public view. In June 2020, the state legislature repealed NY CVR § 50-a, a 1976 law colloquially known as "50-a" that shielded police disciplinary records from public disclosure. As a result, two organizations obtained versions of the CCRB's misconduct database. The first, published by the independent, non-profit newsroom ProPublica, contains the misconduct history of all active NYPD officers. The second, published by the New York Civil Liberties Union (NYCLU), contains less detailed information about individual officers, but does contain information about allegations against both active and retired officers.

Data

For our research, we used NYCLU's *NYPD Misconduct Complaint Database,* which NYCLU obtained through a Freedom of Information Law request in July 2020. The NYCLU data contains 323,911 unique allegation records involving 81,550 active or former NYPD officers. Each record includes information about a complaint (incident ID, date, complaint category, allegation, CCRB's final disposition regarding the complaint, and discipline NYPD imposed based on the findings) as well as basic information about the accused officer(s).

Incidents may appear in multiple records as they may include multiple allegations of different types. Considering each allegation separately, the CCRB offers an investigative finding (substantiated or otherwise) and recommendations for disciplinary action. When an officer receives allegations in multiple cases over time, NYCLU overwrites information about the officer's rank and assigned precinct with the most recent information for each. As a result, rank and assigned precinct were not reliable features for analysis.

For our analysis, we aggregated the dataset at the officer-case level, with each observation representing the allegation(s) against one officer in one case. Following aggregation, our dataset had 153,296 unique incident records. The incident records were further filtered to keep only incidents from 2010 onwards, leaving 44,488 incident-officer entries.

While NYPD is still developing a standardized "disciplinary matrix" to provide a framework for mapping misconduct to disciplinary outcomes, it does have a public list of all possible disciplinary outcomes (New York City Police Department). Mapping this information to the NYCLU dataset, we created an artificial scale, ranking potential disciplinary actions from 0 (no punishment given) to 5 (officer dismissal). Using this information, we attached a discipline "score" to each allegation that received NYPD discipline to measure the severity of NYPD's response.[1] We then summed the discipline score for each substantiated accusation within an incident to measure the severity of discipline for the incident as a whole.

Methods

Using the following methods, we compared entries belonging to each of the four FADO groups to identify differences in substantiation rate, disciplinary decisions, and disciplinary severity:

> *Chi-square tests:* We ran a series of pairwise chi-square tests to compare complaint types with one another to determine whether there were significant differences between normalized substantiation rates. The purpose of this analysis was to test our hypothesis that the rates would vary among the four types.

[1] A complete table of penalties and their associated scores can be found in Appendix A

Kolmogorov-Smirnov (KS) tests: We performed a series of pairwise KS tests on the penalty distributions for substantiated cases in each complaint type. Each complaint type will undergo this test with each other type individually to determine which types differ significantly in the distributions of their punishments after substantiation. The purpose of this is to confirm or reject our hypothesis that substantiated Force complaints are punished differently (ie. more severely) than other case types.

Multiple linear regression: We fit five multiple regression models to the data to analyze the relationship between the number of substantiated allegations and the discipline severity associated with the case. Four of our regression models measured whether substantiated allegations affected the discipline score outside of their FADO type. The fifth model measured the relative impact of the number of substantiated allegations on the overall discipline severity.

Gaussian clustering: Finally, we used Gaussian clustering to identify six implicit categories of cases. The purpose of this method was to identify groupings that could be used in future analyses to identify meaningful patterns. The methodology of this analysis and its implications for future analyses can be found in Appendix B.

Results

Substantiated vs. Unsubstantiated

Our first analysis examined differences in substantiation rates among FADO categories. Our findings showed that Abuse of Authority allegations were substantiated at the highest rate (Appendix C, table 2a), followed by Discourtesy allegations, Offensive Language, and Force. A chi-square (Appendix C, table 2b) showed the only comparison resulting in an insignificant difference was substantiation rates of Offensive Language vs. Force. This finding confirms our hypothesis that the CCRB substantiates these allegations at different rates, aside from the combination of the Offensive Language and Force types.

Discipline Imposed

After analyzing which complaints were substantiated, we analyzed whether NYPD imposed discipline for the substantiated allegations. Our chi-squared calculations (Appendix D, Table 3b) show a mix of significant and insignificant differences. Force allegations were disciplined at the

lowest rate (45.7%) of all four FADO categories, with Discourtesy (68.2%) and Abuse of Authority (65.9%) at the highest.

Discipline Severity

Our analysis showed that the average discipline of substantiated Force allegations was significantly higher (2.07 out of 5) than all other allegation categories. Discourtesy allegations (1.74) and Offensive Language allegations (1.76) were not disciplined at significantly different rates from each other, but were disciplined less severely than Force and more severely than Abuse of Authority allegations (1.54) (Appendix E, table 4a, table 4b).

We analyzed whether there was a relationship between substantiated allegations and discipline severity between types. Our regression analysis (Appendix E, table 5) did not show meaningful effects between categories. Finally, we analyzed how the penalties combined to create the final discipline score. We found that, despite contributing the highest penalty per allegation, Force allegations had the smallest coefficient in our final regression.

Closing Thoughts and Recommendations

We hypothesized that the CCRB would substantiate allegations of different FADO types at different rates. This hypothesis was confirmed by our chi-square tests, which revealed that, when comparing each allegation type (Force, Abuse of Authority, Discourtesy, and Offensive Language) in pairs, each pair showed a significant difference in substantiation rate except the pair of Offensive Language and Force. Abuse of Authority allegations were substantiated most frequently (11.79%) and Force allegations were substantiated least frequently (2.87%) (Appendix E, table 4a, table 4b).

We expected to see substantiated Force allegations penalized more severely than other types of allegations. We confirmed this hypothesis using our quantified 1-5 penalty scale and a sequence of two-sample KS tests, which revealed significant differences in penalty distributions between substantiated Force allegations and all other types. When penalized, the distribution for Force revealed a mean penalty of 2.07 on our scale, while the mean penalties of all other allegation types were equal to or below 1.76. Interestingly enough, while penalties for substantiated Force allegations were the strongest, they were the least likely type to receive any penalty after substantiation. This went against our hypothesis that NYPD would follow the CCRB's disciplinary recommendations at similar rates across categories.

In summary, Force complaints from the last ten years were substantiated by the CCRB least often of the four FADO types, and when substantiated were met with discipline the least often. However, when disciplined, the officers involved received the strongest penalty of the four types. These findings suggest that the NYPD may be hesitant to follow through on legitimizing and penalizing officers for Force allegations.

While these findings are revelatory of the manners in which different types of officer misconduct complaints are handled, there is ample room for more research. One idea for a future study on the NYCLU-published CCRB complaint database would be comparing findings on actualized penalties to an NYPD-designed disciplinary matrix. If the NYPD were to create and publish a rubric for how they handle and penalize allegations of officer misconduct, the NYCLU database would allow for a direct and perhaps revealing comparison between the claims of the department regarding discipline and the actual fact patterns. In general, further research using NYCLU's data may help hold the NYPD more accountable for officer misbehavior and encourage it to follow through on substantiated allegations in a more consistent manner.

Appendices

Appendix A

Table 1: Penalties and Associated Discipline Scores

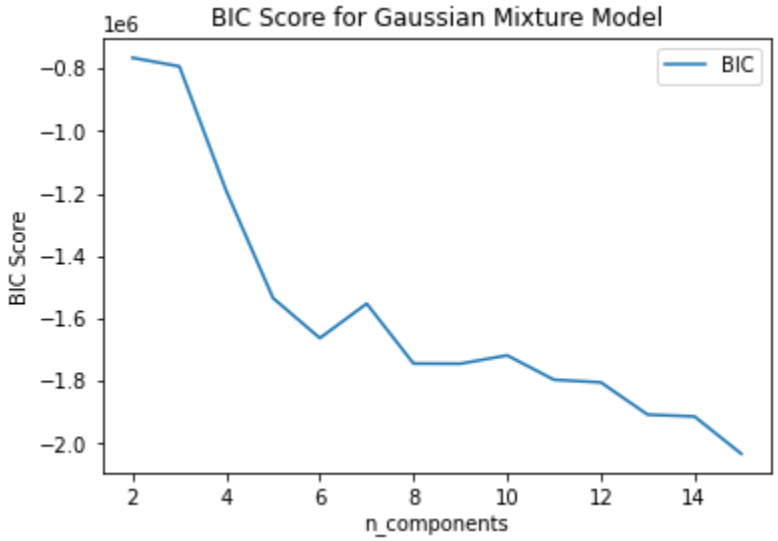
Penalty	Scale	Penalty	Scale	Penalty	Scale	Penalty	Scale	Penalty	Scale
APU - Decision Pending	0	Command Discipline - A 7	2	Forfeit vacation: 8	3	Forfeit vacation: 25 + Suspen. days: 15	3	Suspen. days: 32 + Probation months:	3
Charges Dismissed - DCT	0	Command Discipline - B	2	Forfeit vacation: 9	3	Forfeit vacation 30 days	3	Suspen. days: 32 + Vacation days: 20	3
NA	0	Command Discipline - B + Command Level Instructions	2	Forfeit vacation 9 days	3	Forfeit vacation: 30 + Probation months:	3	Suspen. days: 34	3
no penalty	0	Command Discipline - B + Instruction	2	Forfeit vacation 10 days	3	Forfeit vacation: 30	3	Suspen. days: 40	3
No penalty	0	Command Discipline - B + No penalty	2	Forfeit vacation: 10	3	Forfeit vacation: 30 + Probation months: 12	3	Suspen. days: 45	3
Not Guilty - DCT	0	Command Discipline A	2	Forfeit vacation: 10 + Instruction	3	Forfeit vacation: 32 + Probation months:	3	Suspen. days: 60	3
Instruction	1	Command Discipline B	2	Forfeit vacation: 10 + Suspen. days: 15	3	Forfeit vacation: 35	3	Suspen. days: 62 + Probation months:	3
Instruction + Command Discipline - A	1.5	Command Level Instructions	2	Forfeit vacation 11 days	3	Forfeit vacation: 35 + Probation months:	3	Suspen. days: 99 + Probation months:	3
Instruction + Formalized Training	1.5	Forfeit vacation 1 days	3	Forfeit vacation 12 days	3	Forfeit vacation: 35 + Suspen. days: 5	3	Suspension	3
Instruction + Instruction	1	Forfeit vacation: 1	3	Forfeit vacation: 12	3	Forfeit vacation: 40	3	Forfeit vacation	3
Instructions	1	Forfeit vacation: 1 + Command Discipline - B	3	Forfeit vacation 13 days	3	Forfeit vacation: 45	3	Dismissal Probation	4
No penalty + Command Level Instructions	1.5	Forfeit vacation 2 days	3	Forfeit vacation: 13	3	Forfeit vacation: 45 + Instruction	3	Dismissal Probation 30 days	4
Reprimand	1	Forfeit vacation: 2	3	Forfeit vacation 15 days	3	Forfeit vacation: 45 + Probation months:	3	Dismissed	5
Formalized Training	1	Forfeit vacation 3 days	3	Forfeit vacation: 15	3	Forfeit vacation: 45 + Probation months: 12	3	Resigned	5
Formalized Training + Command Level Instructions	1.5	Command Discipline - A + Vacation days: 3	3	Forfeit vacation: 15 + Instruction	3	Forfeit vacation: 53 + Probation months: 12	3	Retire	5
W&A (Verbally)	1	Forfeit vacation: 3	3	Forfeit vacation: 16	3	Forfeit vacation: 90	3	Terminated	5
W&A (Verbally) + Instruction	1	Forfeit vacation 4 days	3	Forfeit vacation 17 days	3	Suspen. days:	3	Termination	5
W&A (Written)	1	Forfeit vacation 5 days	3	Forfeit vacation: 17	3	Suspen. days: 20	3		
Warned and admonished	1	Forfeit vacation: 5	3	Forfeit vacation 18 days	3	Suspen. days: 20 + Vacation days: 15	3		
Formalized Training + Instruction	1	Forfeit vacation: 5 + Instruction	3	Forfeit vacation 20 days	3	Suspen. days: 27 + Vacation days: 13	3		
Command Discipline - A	2	Forfeit vacation 6 days	3	Forfeit vacation: 20	3	Suspen. days: 30 + Probation months: 12	3		
Command Discipline - A + Command Level Instructions	2	Forfeit vacation 7 days	3	Forfeit vacation: 21	3	Suspen. days: 30 + Vacation days: 15 + Probation months:	3		
Command Discipline - A + Formalized Training	2	Forfeit vacation: 7	3	Forfeit vacation 25 days	3	Suspen. days: 30 + Vacation days: 30	3		
Command Discipline - A + Instruction	2	Forfeit vacation 8 days	3	Forfeit vacation: 25	3	Suspen. days: 31 + Vacation days: 29	3		

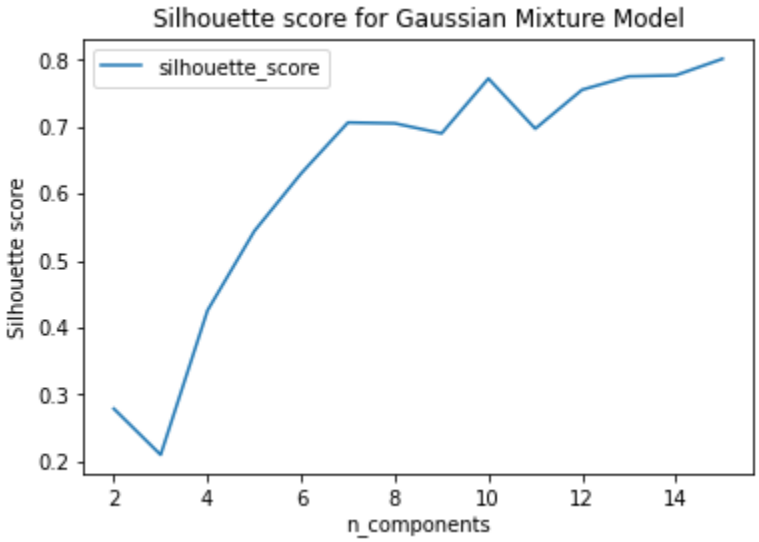
This table shows a list of all possible disciplinary outcomes matched with a discipline score on a scale of 0 (no punishment given) to 5 (officer dismissal) to measure the severity of NYPD's response.

Appendix B: Clustering Methodology

In addition to our primary analysis, we implemented gaussian clustering, using complaint type (four variables, each one indicating the percent of the respective FADO type of total complaints filed per case) and complaint severity (number of complaints) as our five feature dimensions. Gaussian was chosen over K-means to provide the model with flexibility, as visualizing the data in pairwise across the fifteen total possible feature combinations did not point to any intuitive spherical groupings. Additionally, when running silhouette scoring for both a Gaussian and K-means version of the model, we found Gaussian's scoring to be higher at our local area of interest (n=5-7).

We focused on two heuristics to help determine n: the silhouette coefficient and Bayesian information criterion (BIC). BIC, in particular, was chosen for its penalization of higher complexity, a key feature for determining that the n we selected would provide useful in categorizing types of complaints. We calculated both for n values of 2–15.





While our silhouette continued to grow through n=4-15, our largest jump was from n=5 (~.56) to n=6 (~.67). Our BIC score behaved similarly, reaching a local minima at n=6 before increasing at 7 and beginning a more steady decline from n=8-15.

Once we had a range of potentially useful n-values, we ran the gaussian mixture model with n=5, 6, and 7 and analyzed the results, grouping by cluster and averaging of each of our five feature dimensions. We ultimately chose n=6 to maximize interpretability.

cluster	perc_Force	perc_Abuse_of_Authority	perc_Discourtesy	perc_Offensive_Language	allegation_num
0	0.950766	0.000000	0.000000	0.049234	1.000000
1	0.162863	0.277082	0.214309	0.345746	3.950986
2	0.000000	0.000000	1.000000	0.000000	1.057528
3	0.000000	1.000000	0.000000	0.000000	1.000000
4	0.277866	0.573780	0.148354	0.000000	2.000000
5	0.226784	0.619610	0.153607	0.000000	3.755157

Our clustering algorithm created 3 clusters (0,2, and 3) that were made up largely or entirely of Force, Discourtesy, or Abuse of Authority. The other clusters varied on allegation number and composition. One cluster (cluster 4) averaged two allegations per case, while clusters 1 and 5 averaged 3.95 and 3.75 allegations per case. Clusters 1 and 5 differed on the presence of Offensive Language in the composition. Notably, Offensive Language alleged alone was not one of the clusters created.

Our clusters can be further used in future research. These models could be relevant for predicting discipline rate, variance from disciplinary recommendations, or could be used in training materials for future CCRB investigators.

Appendix C: Substantiation Rate Visualizations

Table 2a: Substantiated and Unsubstantiated Allegation Counts by Type (yr. 2010 - Present)

Offense Type	**Substantiated/Total**	**Substantiated Allegations**	**Unsubstantiated Allegations**
Force	2.87%	680	22945
Abuse of Authority	11.79%	5160	38590
Discourtesy	6.28%	820	12228
Offensive Language	4.17%	103	2367

This table shows the substantiation rate between different FADO categories. Taken with the findings in table 2, Abuse of Authority allegations are substantiated significantly higher than all other allegations, and Force allegations are substantiated at a lower rate than Abuse of Authority and Discourtesy allegations.

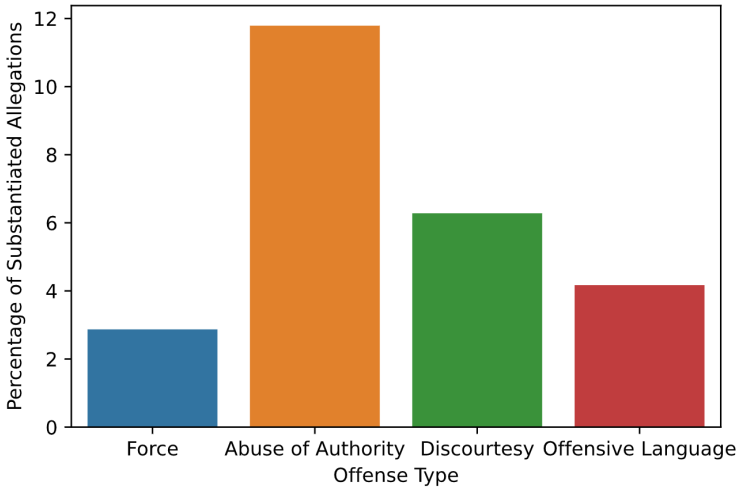


Table 2b: Chi-Square Results for Substantiation per 1000 Allegations (Result, P-Value)
(Test Statistic, P-Value)
(Critical >= 3.841, Significant <= 0.05)

Offense Type	**Force**	**Abuse of Authority**	**Discourtesy**	**Offensive Language**
Force	-	(54.179, 1.83e-13)	(12.662, 3.73e-04)	(2.367, 0.124)
Abuse of Authority	(54.179, 1.83e-13)	-	(16.792, 4.17e-05)	(36.412, 1.60e-09)
Discourtesy	(12.662, 3.73e-04)	(16.792, 4.17e-05)	-	(4.277, 0.038)

Offensive Language	(2.367, 0.124)	(36.412, 1.60e-09)	(4.277, 0.038)	-

Differences in substantiation rates among FADO categories. The only comparison resulting in an insignificant difference was substantiation rates of Offensive Language vs. Force, confirming our hypothesis that, aside from this combination, the CCRB substantiates these allegations at different rates.

Appendix D: Discipline Rate Visualizations

Table 3a: Discipline and No Discipline Imposed Allegation Counts by Type (yr. 2010 - Present)

Offense Type	Discipline Imposed/Total	Discipline Imposed	No Discipline Imposed	Total
Force	45.7%	246	292	538
Abuse of Authority	65.9%	2246	1160	3406
Discourtesy	68.2%	505	235	740
Offensive Language	56.0%	51	40	91
Overall	63.8%	3048	1727	4775

Table 3b: Chi-Square Results for Discipline vs. Non-Discipline (Result, P-Value)
(Test Statistic, P-Value)
(Critical >= 3.841, Significant <= 0.05)

Offense Type	Force	Abuse of Authority	Discourtesy	Offensive Language
Force	-	(80.77, <0.00001)	(64.26, <0.00001)	(2.9244, 0.087252)
Abuse of Authority	(80.77, <0.00001)	-	(1.3402, 0.246995)	(3.4262, 0.064171)
Discourtesy	(64.26, <0.00001)	(1.3402, 0.246995)	-	(4.9097, 0.026706)
Off. Lang.	(2.9244, 0.087252)	(3.4262,0.064171)	(4.9097, 0.026706)	-

Force allegations were disciplined at the lowest rate of all four FADO categories, with Discourtesy at the highest. While these discipline rates may seem high, these rates do not take into account the NYPD opting for a different discipline than the CCRB suggests.

Appendix E: Discipline severity by FADO type

Table 4a: Penalty Distributions of Substantiated Allegations

Offense Type	Mean	75%	Std. Deviation
Force	2.07	3.0	0.98
Abuse of Authority	1.54	2.0	0.78
Discourtesy	1.74	2.0	0.90
Offensive Language	1.76	2.0	1.07

Table 4b: KS Two Sample Test Results for Penalty Distributions of Substantiated Allegations
(D Stat., P-Value)
Significant if P-Value <=0.05

Offense Type	Force	Abuse of Authority	Discourtesy	Offensive Language
Force	-	(0.275, <0.00001)	(0.277, <0.00001)	(0.193, 0.005)
Abuse of Authority	(0.275, <0.00001)	-	(0.081, 0.0007)	(0.143, 0.049)
Discourtesy	(0.277, <0.00001)	(0.081, 0.0007)	-	(0.084, 0.589)
Offensive Language	(0.193, 0.005)	(0.143, 0.049)	(0.084, 0.589)	-

These tables show that substantiated use of force complaints are disciplined more severely than other complaint categories.

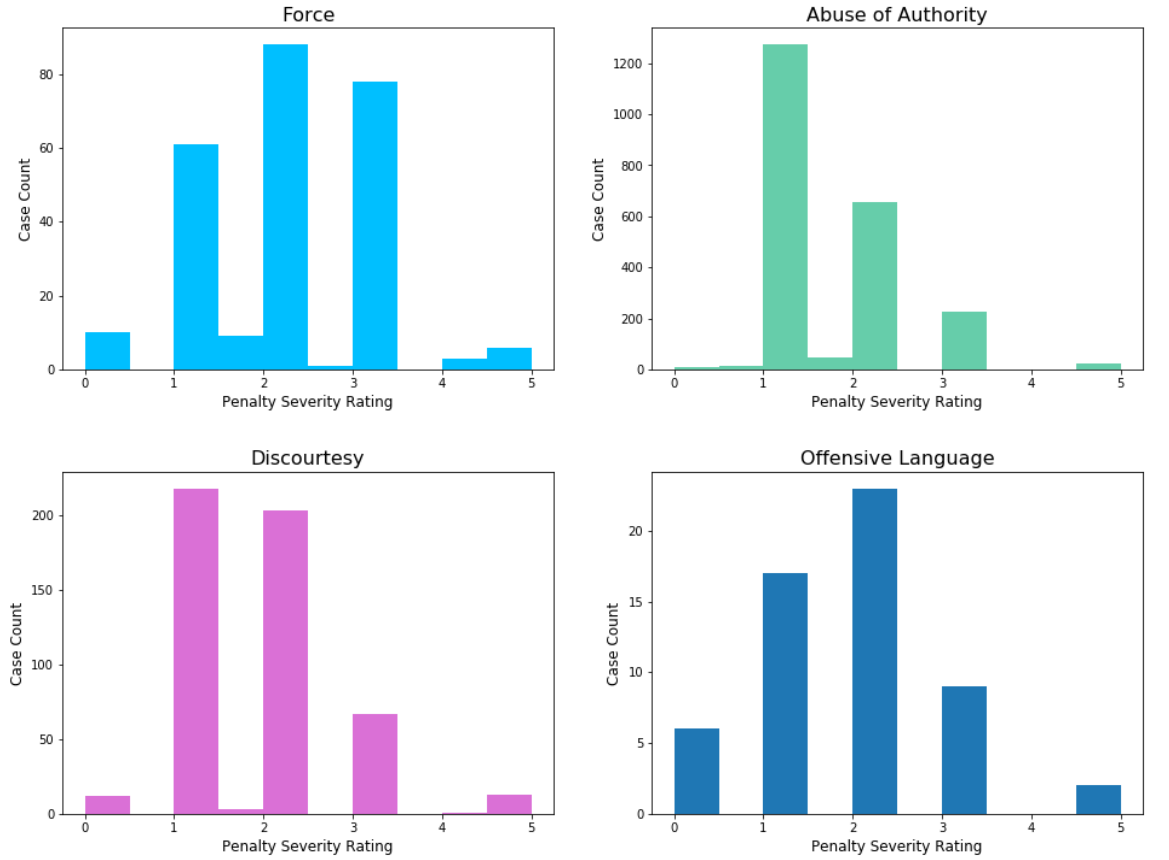


Table 5: Impact on FADO Category Penalties

Dependent Variable	**Independent Variables**	**R-Squared**	**Co-efficient**	**t**	**P-value** (sig. if < .05)
Penalty - Force	Substantiated - F	0.817	2.0859	108.33	0.000
	Substantiated - A	"	-0.0245	-3.025	0.003
	Substantiated - D	"	-0.0206	-1.144	0.253
	Substantiated - O	"	-0.0642	-1.383	0.167
Penalty - Abuse of Authority	Substantiated - F	0.648	0.1737	2.932	0.003
	Substantiated - A	"	1.7231	**69.029**	0.000
	Substantiated - D	"	0.2917	**5.27**	0.000
	Substantiated - O	"	0.3288	2.3	0.022
Penalty - Discourtesy	Substantiated - F	0.731	0.0566	2.438	0.015
	Substantiated - A	"	0.0502	**5.129**	0.000
	Substantiated - D	"	1.8083	**83.332**	0.000
	Substantiated - O	"	0.0853	1.523	0.128
Penalty -	Substantiated - F	0.754	-0.0119	-1.502	0.133

Offensive Language	Substantiated - A	“	-0.0018	-0.539	0.590
	Substantiated - D	“	0.012	1.634	0.102
	Substantiated - O	“	1.7098	89.748	0.000
All Penalties	Substantiated - F	0.524	0.8389	31.443	0.000
	Substantiated - A	“	1.1260	143.354	0.000
	Substantiated - D	“	1.4186	52.587	0.000
	Substantiated - O	“	0.9719	12.173	0.000

The first four regressions show that there was not a meaningful cross-category effect on penalty severity. The final regression shows that although Force allegations are punished most severely, the low frequency at which they are disciplined results in a lower coefficient than other categories.

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Percentage of Substantiated Allegations by Number of Allegations

No. of Allegations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
No. of Substantiated Allegations																			
0	95.44	90.27	84.29	77.29	70.14	65.57	58.37	56.00	56.25	48.15	50.00	58.33	33.33	66.67	0.00	75.00	50.00	33.33	0.00
1	4.56	6.32	7.42	9.67	11.66	12.50	15.02	13.60	7.81	7.41	18.75	16.67	11.11	0.00	0.00	25.00	0.00	0.00	0.00
2	0.00	3.41	5.37	6.35	8.15	7.99	9.01	4.80	7.81	11.11	18.75	8.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	2.92	4.32	6.07	6.76	5.15	9.60	6.25	7.41	0.00	0.00	22.22	33.33	0.00	0.00	0.00	0.00	100.00
4	0.00	0.00	0.00	2.37	2.65	4.10	4.29	5.60	9.38	3.70	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	1.33	1.64	2.58	0.80	1.56	3.70	0.00	0.00	11.11	0.00	25.00	0.00	50.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.43	3.43	4.00	6.25	7.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	2.15	3.20	0.00	7.41	6.25	8.33	11.11	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	3.13	3.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56	0.00	0.00	0.00	11.11	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.25	0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.33	0.00	0.00	25.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.33	0.00
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Percentage of Penalties Meted by Number of Allegations

No. of Allegations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Penalty																			
0	97.13	93.68	89.11	85.15	81.42	77.87	74.68	71.20	65.63	66.67	81.25	66.67	66.67	100.00	75.00	100.00	50.00	100.00	0.00
1	1.60	2.67	3.19	3.67	4.55	4.92	5.15	4.00	4.69	7.41	12.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.5	0.02	0.01	0.10	0.04	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.91	2.11	3.31	4.02	4.55	4.92	6.44	5.60	3.13	7.41	6.25	8.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.33	0.44	1.78	1.51	2.56	2.66	2.15	4.00	7.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.69	0.96	1.68	1.80	1.64	1.72	3.20	6.25	0.00	0.00	8.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.5	0.00	0.00	0.00	0.04	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.02	0.07	0.04	0.09	0.19	0.41	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	50.00	0.00	0.00
6	0.00	0.26	1.02	1.90	3.03	3.07	3.00	4.00	1.56	11.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.02	0.82	0.47	1.43	0.86	1.60	1.56	3.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.39	0.47	0.28	1.23	1.29	0.80	4.69	0.00	0.00	8.33	11.11	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.06	0.08	0.04	0.47	0.61	0.86	0.80	1.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.39	0.28	0.82	1.72	1.60	3.13	0.00	0.00	8.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.00	0.00	3.70	0.00	0.00	11.11	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.09	0.09	0.20	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.20	0.86	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.09	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.11	0.00	0.00	0.00	0.00	0.00	0.00
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Percentage of Penalties Meted by Number of Substantiated Allegations

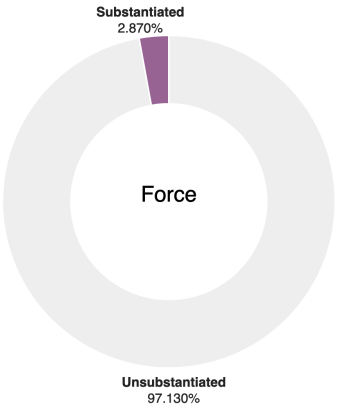
No. of Substantiated	0	1	2	3	4	5	6	7	8	9	10	12	17
Penalty													
0	100.00	36.36	34.31	27.89	31.25	38.24	30.77	42.86	28.57	100.00	100.00	50.00	100.00
1	0.00	38.14	1.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.5	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	18.64	33.16	0.00	0.78	2.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	5.68	3.77	30.53	4.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.04	18.93	0.00	16.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.5	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.68	0.10	0.00	0.00	14.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	6.80	28.95	4.69	2.94	19.23	0.00	14.29	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.14	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.10	0.26	27.34	0.00	0.00	0.00	14.29	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	11.05	2.34	2.94	3.85	7.14	14.29	0.00	0.00	0.00	0.00
10	0.00	0.00	1.46	0.00	0.00	29.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.26	10.16	2.94	30.77	0.00	14.29	0.00	0.00	50.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.43	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.53	0.00	2.94	3.85	0.00	14.29	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	11.54	14.29	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	2.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.14	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	2.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

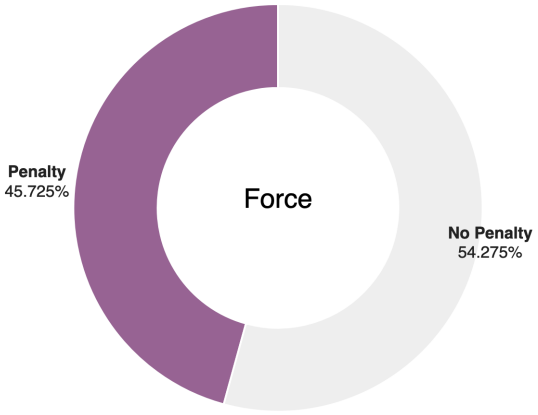
Logistic Regression

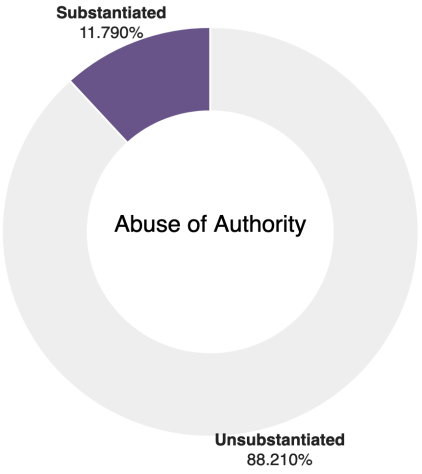
Logistic Regression: Prediction of Penalty Imposed Based on Substantiated Category

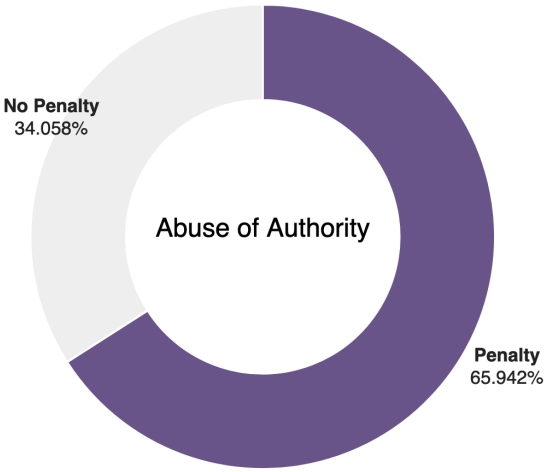
Substantiation Type	Accuracy	Precision	Recall
Force	93.95%	44.44%	1.79%
Abuse of Authority	94.66%	68.75%	28.21%
Discourtesy	94.39%	67.54%	18.67%
Offensive Language	93.81%	100.00%	0.72%

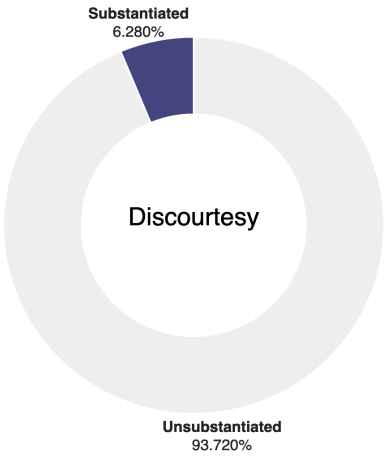
The analysis was performed to assess the impact of category types of substantiated allegations on the likelihood that the allegation would result in an eventual penalty. The binary dependent variable was coded as positive (received a penalty, value > 0) or negative (did not receive a penalty, value = 0). By deriving the confusion matrices, the models were found to be accurate in predicting true negative values, resulting in high accuracy rates. This is possibly due to the dataset containing mostly negative entries. Notably, a significant number of false positives were generated, resulting in the low recall rates.

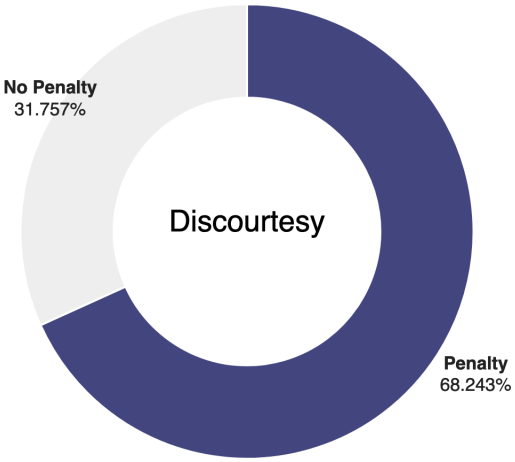

Substantiated
2.870%
Force
Unsubstantiated
97.130%

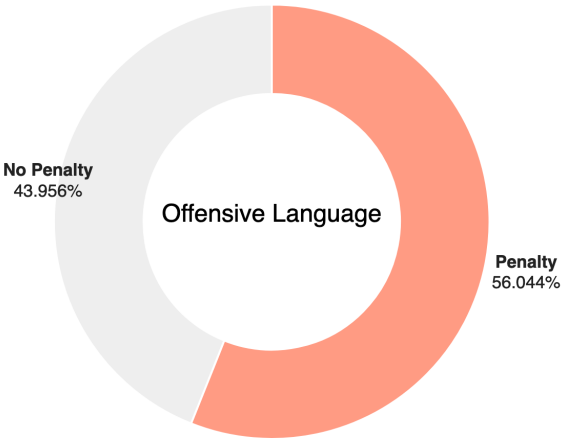

Penalty
45.725%
Force
No Penalty
54.275%


Substantiated
11.790%
Abuse of Authority
Unsubstantiated
88.210%


No Penalty
34.058%
Abuse of Authority
Penalty
65.942%


Substantiated
6.280%
Discourtesy
Unsubstantiated
93.720%


No Penalty
31.757%
Discourtesy
Penalty
68.243%



These charts show the percentage of substantiated allegations for each FADO category that were disciplined with some penalty and those not. Raw numbers associated can be found in Table 3.