



# CITY OF CLEVELAND

Mayor Justin M. Bibb

## PUBLIC SAFETY

To: Cleveland City Council

Date: July 4, 2026

Re: Case Closure Rate Following Flock ALPR Implementation

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### I. Executive Summary

Cleveland Division of Police data shows a statistically significant difference in case closure rate when comparing the closure rate percentage of reviewed cases both before and after the Flock ALPR system was implemented in Cleveland in the summer of 2023. The robbery, felonious assault, assault, and burglary combined closure rate increased from 15.5% in the pre-Flock period to 18.7% in the post-Flock period. That represents a 3.2-percentage-point increase (20.4% relative increase), and the change is statistically significant (two-proportion z-test,  $z = 12.90$ ,  $p < 0.001$ ). A confirmatory Poisson regression also found a statistically significant post-Flock increase: adjusted incidence rate ratio = 1.21 (95% CI 1.17-1.26,  $p < 0.001$ ).

Each individual offense category reviewed also showed a statistically significant post-Flock closure rate increase. These findings support the statement that the observed post implementation increase is not limited to a single offense type. The statistical analysis confirms that the post-Flock closure rate increased by more than would be expected from ordinary sampling variation under a simple pre/post proportion comparison.

### II. Methodology

The analysis focused on offense categories of Robbery, Felonious Assault, Assault, and Burglary. These categories were selected because they were identified as categories where Flock ALPRs were used and where LERMS<sup>1</sup> arrest entry data was considered sufficiently reliable. The analysis defined a case closed when a charged arrestee was added to the case in LERMS. The analysis excluded homicides because arrest entry data may be unreliable due to inconsistencies in when an arrest is added to avoid premature release of information in sensitive investigations, and it excluded grand theft motor vehicle because the Kia theft pattern during the relevant period may distort the data. The analysis treated 2021 and 2022 as the pre-Flock period and 2024 and 2025 as the post-Flock period. The data set excluded 2023 because Flock was implemented during that year, making it a partial implementation year.

It is important to note that the case closure percentages provided are most likely an undercount because arrestee data is not always added to LERMS consistently or at the same point in an investigation by various different criminal justice entities. In addition, data from December of 2025 is missing because a new RMS system was implemented at that time.

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<sup>1</sup> LERMS is the Division's electronic records management system.



Our analysis used a two-proportion z-test and a Poisson regression. The two proportion z-test compared the pre-Flock and post-Flock percentage of cases closed with an arrestee added to the case. It directly tested whether the observed difference in the closure rate is larger than would be expected from random variation alone. The Poisson regression is a confirmatory count rate model. The monthly arrest added counts were modeled using a Poisson generalized linear model with a log link. The model used the log of total cases as an offset, so the dependent measure was the arrest added rate rather than the raw count alone. The combined model included offense category and month-fixed effects and used robust standard errors.

### III. Two-Proportion Z-Test Results

The two-proportion z-test shows that the post-Flock closure rate was statistically higher for each reviewed offense category and for the combined reviewed categories.

Category	Pre Flock Cases	Pre Flock Closures	Pre Flock Rate	Post Flock Cases	Post Flock Closures	Post Flock Rate	Change / p-value
Robbery	3,569	426	11.9%	2,779	451	16.2%	+4.3 pp; p < 0.001
Felonious Assault	6,190	1,313	21.2%	4,689	1,211	25.8%	+4.6 pp; p < 0.001
Assault	34,827	5,530	15.9%	29,013	5,484	18.9%	+3.0 pp; p < 0.001
Burglary	7,301	782	10.7%	6,157	819	13.3%	+2.6 pp; p < 0.001
<b>Combined</b>	<b>51,887</b>	<b>8,051</b>	<b>15.5%</b>	<b>42,638</b>	<b>7,965</b>	<b>18.7%</b>	<b>+3.2 pp; p &lt; 0.001</b>

Table 1. Two-proportion z-test comparison of pre-Flock and post-Flock closure rates.

The case-weighted rates from the raw case-number data show a higher post-Flock closure rate in each reviewed offense category.

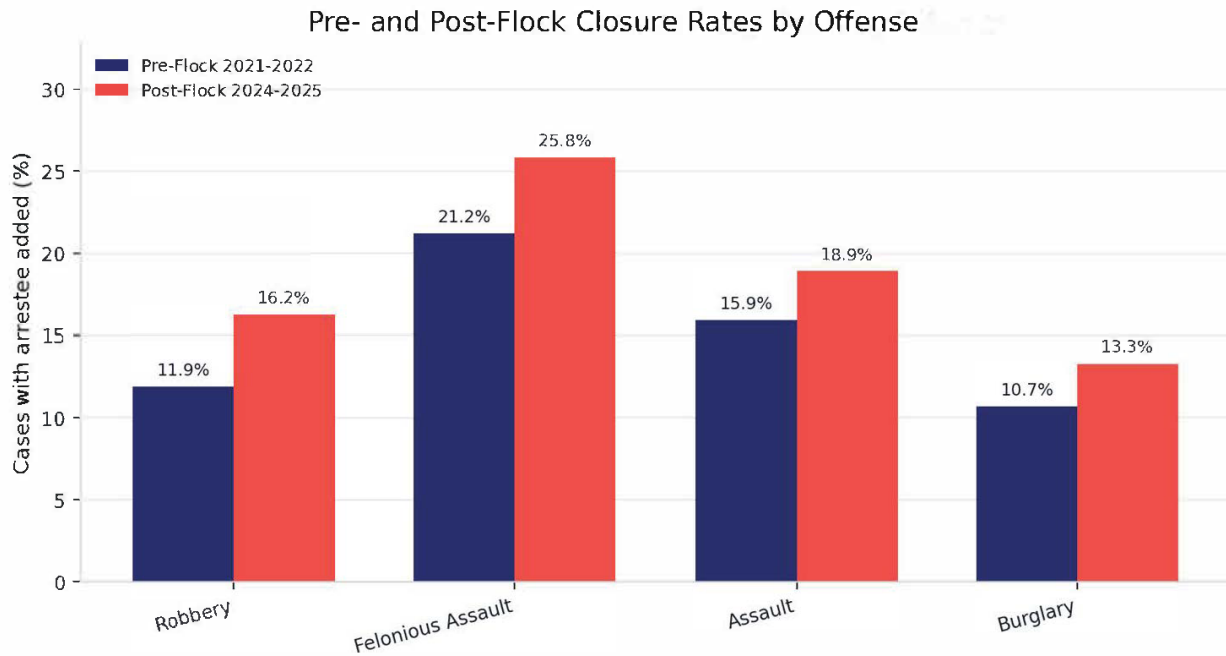


Figure 1. Pre- and post-Flock closure rates by offense category.



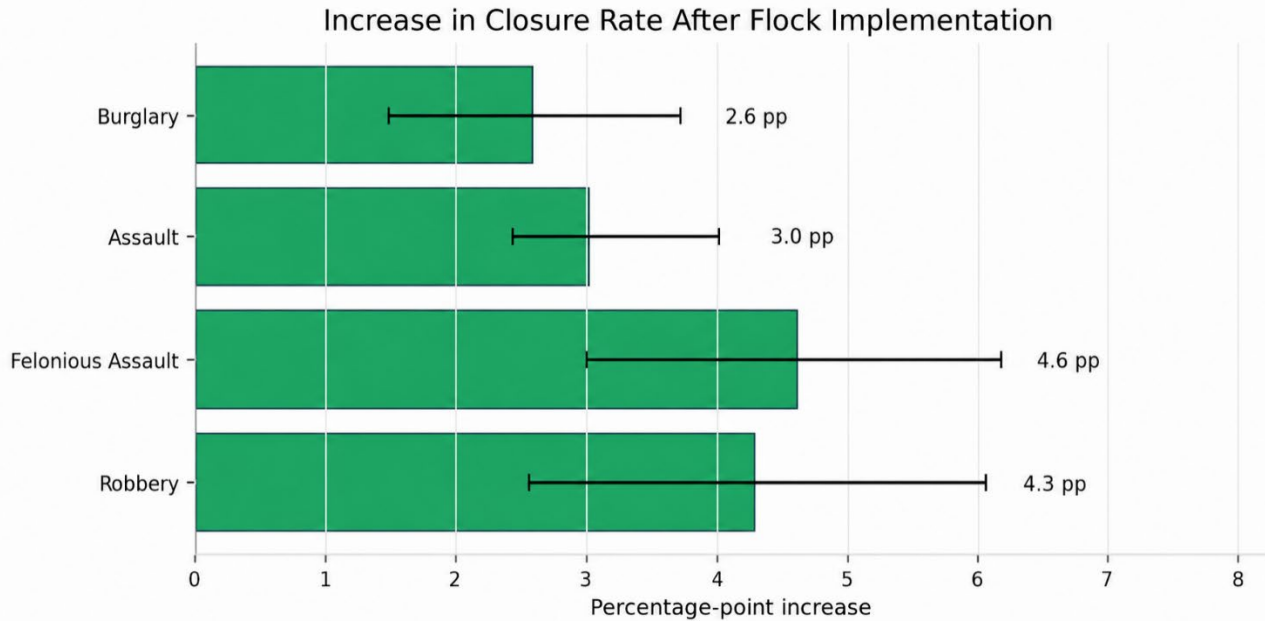


Figure 2. Percentage-point increase after Flock implementation, with 95% confidence intervals.

#### IV. Poisson Regression Results

The Poisson regression provides an additional statistical test using the monthly raw count data. In the combined adjusted model, the post-Flock indicator was statistically significant ( $p < 0.001$ ). The adjusted incidence rate ratio was 1.21, meaning the post-Flock closure rate was approximately 21% higher than the pre-Flock rate after adjusting for offense category and month.

Model	Months Observed	IRR	95% CI	z	p-value
<b>Combined adjusted model</b>	<b>188</b>	<b>1.21</b>	<b>1.17-1.26</b>	<b>10.47</b>	<b>&lt; 0.001</b>
Robbery	47	1.37	1.23-1.52	5.81	< 0.001
Felonious Assault	47	1.22	1.15-1.29	6.80	< 0.001
Assault	47	1.19	1.14-1.25	7.63	< 0.001
Burglary	47	1.25	1.18-1.33	7.15	< 0.001

Table 2. Poisson regression results. IRR is the post-Flock incidence rate ratio for the closure rate.

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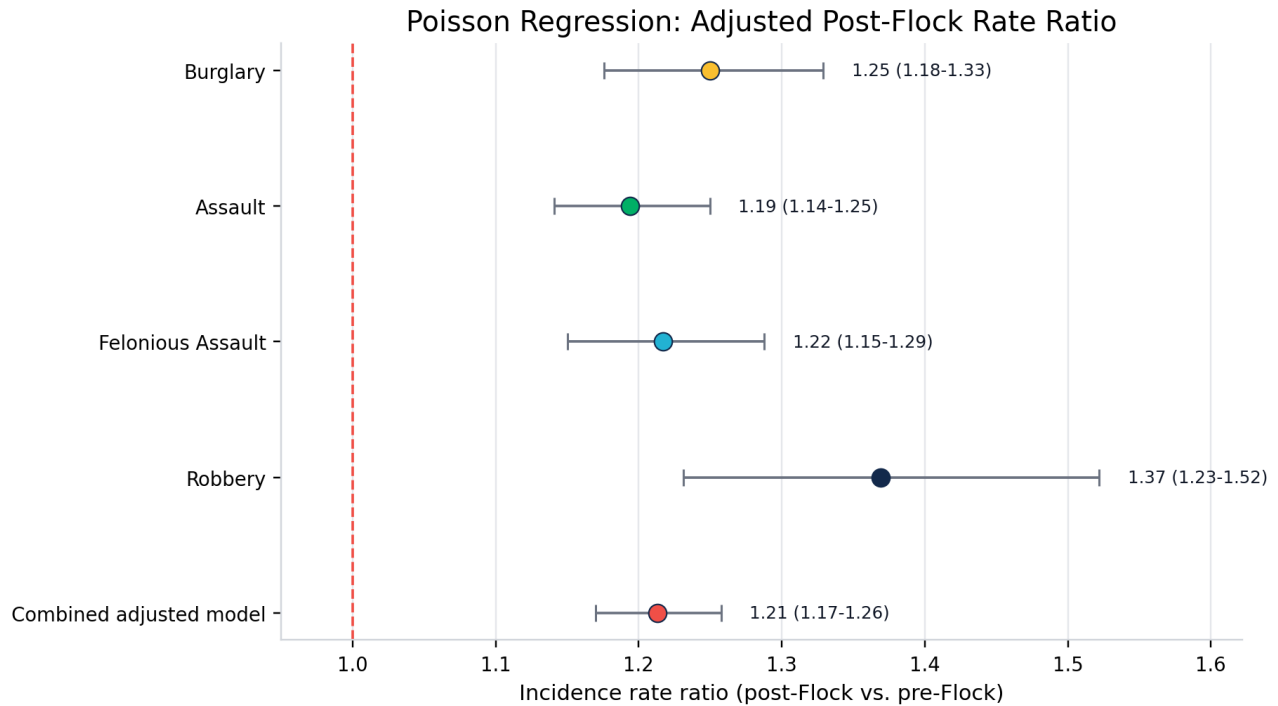


Figure 3. Poisson regression incidence rate ratios with 95% confidence intervals.

## V. Findings

- Robbery closure rate increased from 11.9% to 16.2%, a +4.3 pp<sup>2</sup> increase; z-test  $p < 0.001$ ; Poisson IRR 1.37 (95% CI 1.23-1.52).
- Felonious closure rate assault increased from 21.2% to 25.8%, a +4.6 pp increase; z-test  $p < 0.001$ ; Poisson IRR 1.22 (95% CI 1.15-1.29).
- Assault closure rate increased from 15.9% to 18.9%, a +3.0 pp increase; z-test  $p < 0.001$ ; Poisson IRR 1.19 (95% CI 1.14-1.25).
- Burglary closure rate increased from 10.7% to 13.3%, a +2.6 pp increase; z-test  $p < 0.001$ ; Poisson IRR 1.25 (95% CI 1.18-1.33).
- Combined, the reviewed categories' closure rates increased from 15.5% to 18.7%, a +3.2 pp increase; z-test  $p < 0.001$ ; adjusted Poisson IRR 1.21 (95% CI 1.17-1.26).

## VI. Discussion

Both statistical approaches support the same conclusion that the post-Flock period had a significantly higher closure rate for the selected categories. The results are particularly relevant because the reviewed categories are offense types in which timely vehicle or license plate information can assist investigators in identifying suspects, locating vehicles, corroborating leads, and narrowing investigative timelines. The two-proportion z-test confirms that the raw pre/post

<sup>2</sup> “pp” means percentage point



percentage difference is statistically significant, while the Poisson regression confirms that the increase remains statistically significant when the raw monthly counts are modeled as rates and adjusted for offense category and seasonality.

Statistical significance means the observed post-Flock increase is unlikely to be explained by random variation in the reviewed data. This data should be viewed as one measurable indicator of improved investigative outcomes following Flock ALPR implementation and should be considered alongside the firsthand experience of officers, detectives, analysts, and prosecutors in cases where Flock information helped identify suspects, locate stolen or suspect vehicles, or advance time-sensitive investigations.

This analysis most likely undercounts case resolutions because arrestees may not always be added to LERMS consistently or at the same point in an investigation. The percentages should therefore be treated as a conservative operational proxy for closure or solve rate.

## VII. Conclusion

The Division of Police raw case number data shows a statistically significant increase in the closure rate after Flock ALPR implementation for each reviewed offense category and for the four reviewed categories combined; Burglary, Assault, Felonious Assault, Robbery. The conclusion is supported by both a two-proportion z-test and a confirmatory Poisson regression using the raw monthly case counts. Although the analysis should not be characterized as a full causal evaluation or formal closure rate study, it provides a reasonable, data supported basis to state that case outcomes significantly improved after Flock ALPRs were implemented in 2023.

