# York Region Crime Analysis:
## A Data-Driven Plan for 2026

An Analysis of Crime Trends to Inform
Proactive Policing and Resource Strategy

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# Executive Summary

**❗ District 4 (Vaughan) is in a state of chronic operational crisis, with 54% officer availability rate, making it the epicenter of an 89.5% crime surge driven by organized crime and gun violence. This demands an immediate, targeted resource surge**

## Data

- To understand the why behind the crime numbers, we built a holistic data foundation. This allows us to move beyond simple counts and diagnose the systemic pressures driving the surge, which is critical for designing effective solutions

## Solution

- A dual-pronged plan to combat the immediate 2024 surge in District 4 while implementing long-term strategies to stabilize the underlying growth trend forecasted for 2026.

# Table of Contents

- Data Foundation

- Crime Trends & Patterns

- Diagnosing the 2024 Crisis

- Forecasting the Future Threat for 2026

- Spotlight on District 4 (Vaughan)
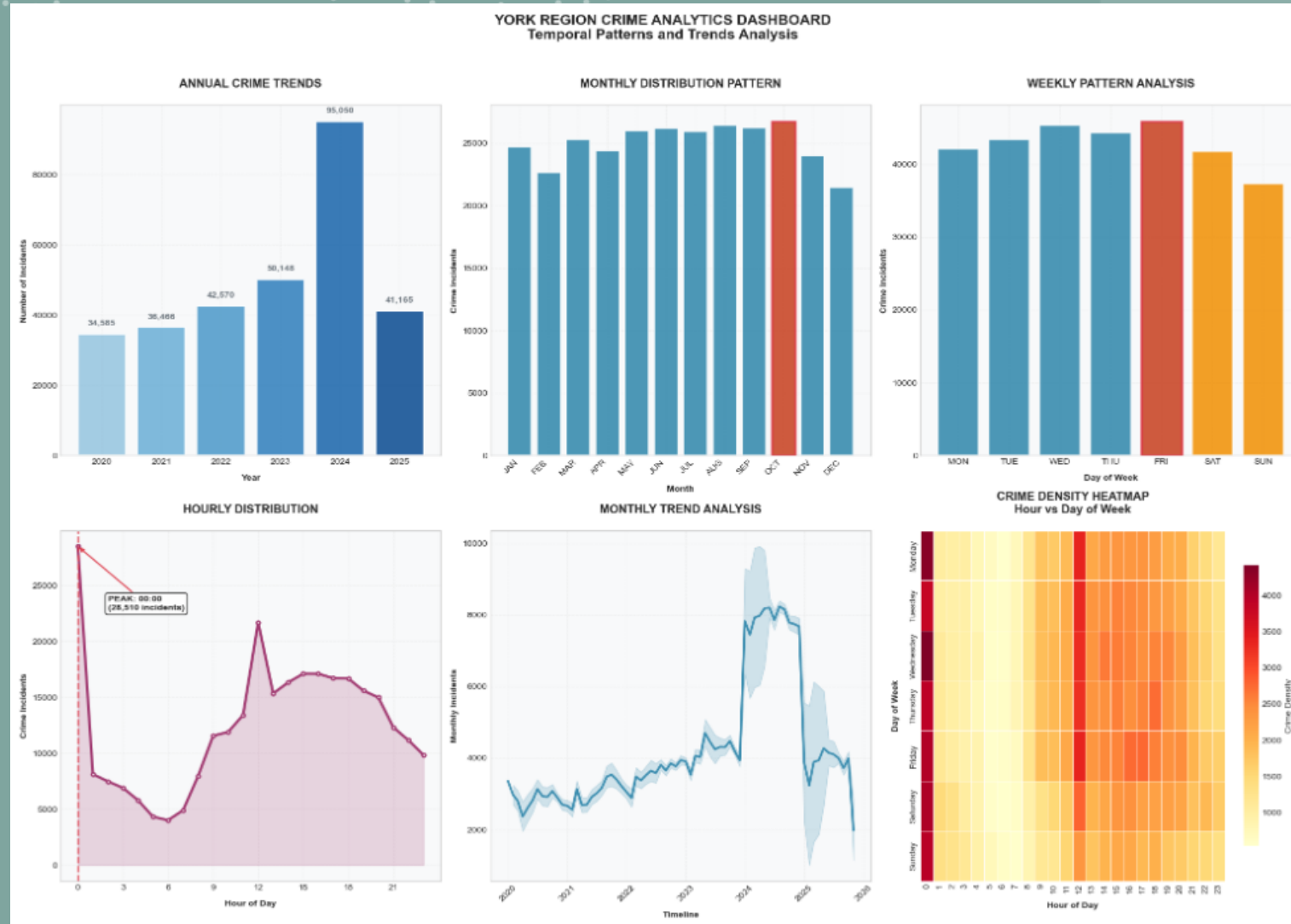
- Our Strategic Action Plan

# Crime Trend (Temporal Patterns)

## Strategic insights

- Weekend Activity: 26.4% of total incidents
- Evening Peak (18:00-23:59): 26.9% of incidents
- High Season: August, September, October
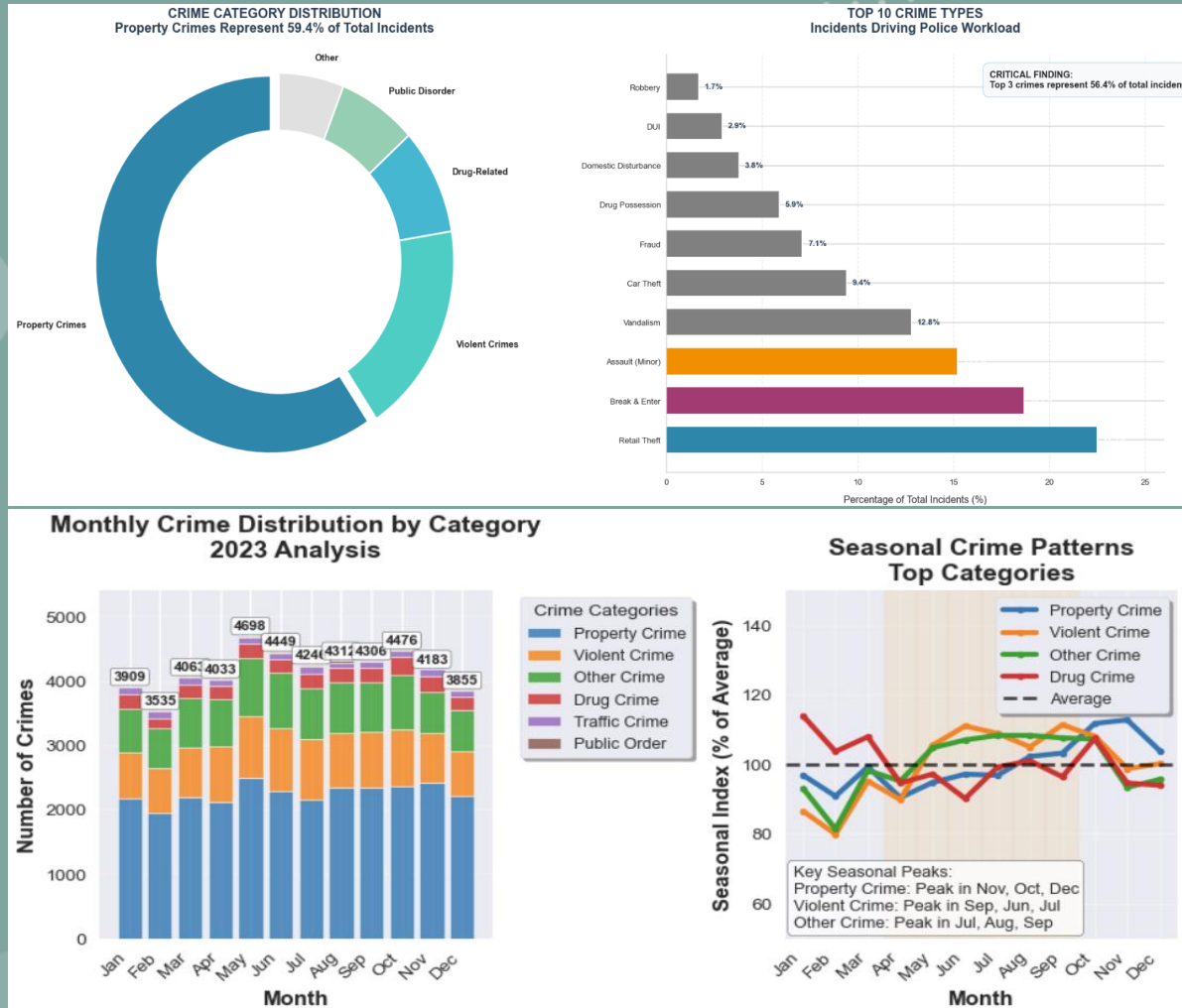- Low Season: December, February, November

## Implication

Crime is predictable. It has a rhythm—peaking on summer evenings and weekends. We can and must use this predictability to our advantage by pre-deploying resources, which is the foundation of our 'Summer Surge Plan'

# Crime Category Distribution



**CRIME CATEGORY DISTRIBUTION**
Property Crimes Represent 59.4% of Total Incidents

**TOP 10 CRIME TYPES**
Incidents Driving Police Workload

CRITICAL FINDING:
Top 3 crimes represent 56.4% of total incidents

Robbery — 1.7%
DUI — 2.9%
Domestic Disturbance — 3.8%
Drug Possession — 5.9%
Fraud — 7.1%
Car Theft — 9.4%
Vandalism — 12.8%
Assault (Minor)
Break & Enter
Retail Theft

Percentage of Total Incidents (%)

**Monthly Crime Distribution by Category**
2023 Analysis

3909, 3535, 4063, 4033, 4698, 4449, 4246, 4312, 4306, 4476, 4183, 3855

Crime Categories:
- Property Crime
- Violent Crime
- Other Crime
- Drug Crime
- Traffic Crime
- Public Order

**Seasonal Crime Patterns**
Top Categories

- Property Crime
- Violent Crime
- Other Crime
- Drug Crime
- Average

Key Seasonal Peaks:
Property Crime: Peak in Nov, Oct, Dec
Violent Crime: Peak in Sep, Jun, Jul
Other Crime: Peak in Jul, Aug, Sep

1. Property and Violent Crime Dominate Volume

2. Warmer months (Spring/Summer) show a consistent increase

SEASONAL DISTRIBUTION:
- Spring:          24.1%
- Summer:         25.7%
- Fall:            26.6%
- Winter:          23.6%

CATEGORY TRENDS:
- Property Crime:      +61.7% change (2020-2023)
- Violent Crime:       +52.3% change (2020-2023)
- Other Crime:         +24.8% change (2020-2023)
- Drug Crime:          -3.7%   change (2020-2023)

**Core Message:** Property and Violent crime are not just the most common; they are growing at an alarming rate (+61.7%, +52.3%). This isn't a general crime problem; it's a specific one requiring category-specific tactics, especially in auto theft and gun violence

# The Vicious Cycle of Crime and Staffing

- The Vicious Cycle: High Crime → 911 Calls ↑ → Overtime & Burnout ↑ → Staffing Shortages ↑ → Response Capacity ↓
- High crime volumes create a feedback loop that depletes officer capacity, reducing our ability to respond and prevent future crime, particularly in District 4.
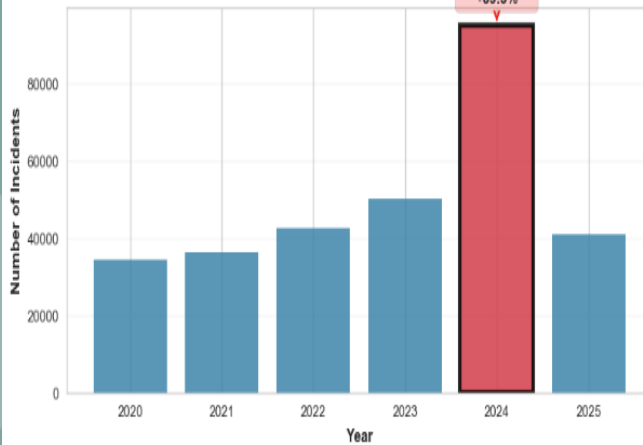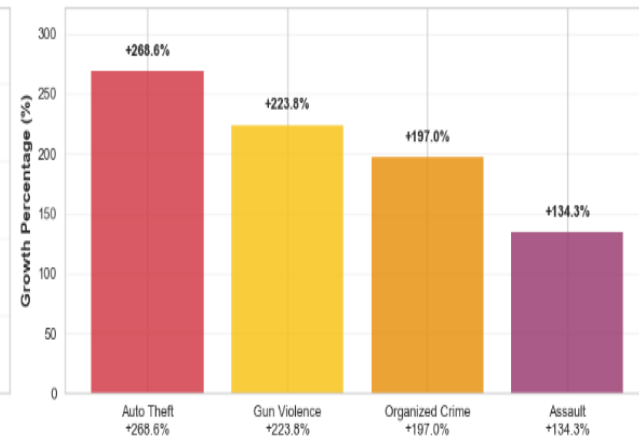
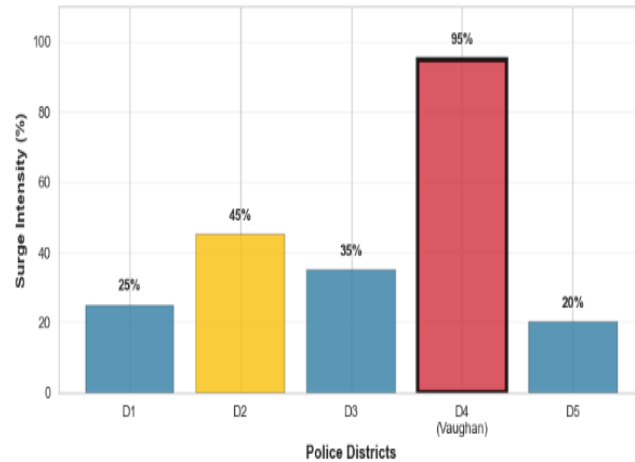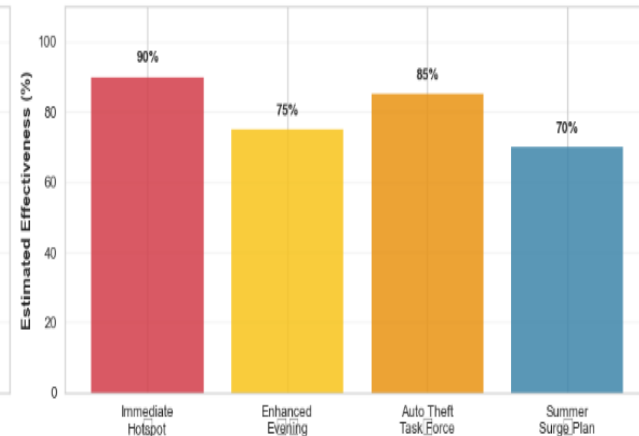# Yearly Crime Trends & The 2024 Anomaly



ANNUAL CRIME TRENDS — 2024 SURGE +89.5%

TOP 4 DRIVERS: GROWTH RATES — 2024 vs 2023 Comparison
- Auto Theft +268.6%
- Gun Violence +223.8%
- Organized Crime +197.0%
- Assault +134.3%

GEOGRAPHIC SURGE INTENSITY BY DISTRICT — District 4: Primary Hotspot
- D1: 25%
- D2: 45%
- D3: 35%
- D4 (Vaughan): 95%
- D5: 20%

RECOMMENDED RESPONSE STRATEGY — Effectiveness & Urgency Assessment
- Immediate Hotspot Focus: 90%
- Enhanced Evening Patrols: 75%
- Auto Theft Task Force: 85%
- Summer Surge Plan: 70%

Data Source: York Region Police • Analysis Period: 2023-2024 • Total Incidents: 50,148 (2023) → 95,050 (2024)

**Primary Drivers of the 2024 Anomaly:**
- A significant surge in **violent crime, particularly gun violence.**
- **Organized crime activity** driving nationwide increases in auto theft.
- **Ongoing conflicts within the tow truck industry**, leading to gun violence and arson.
- Proliferation of **illegal firearms.**
- Challenges related to the national bail system for firearm offences.

**Implication:**
These drivers converged to create a 'storm,' overwhelming existing systems and exposing critical vulnerabilities in our resource allocation, particularly in District 4.
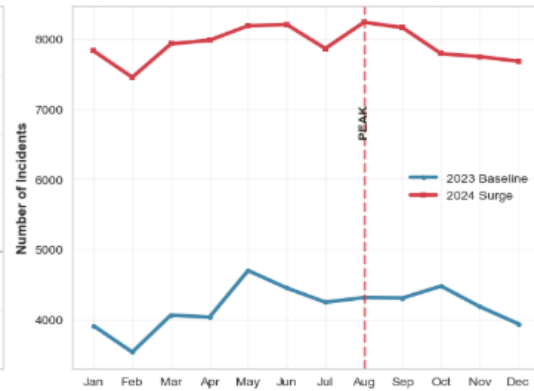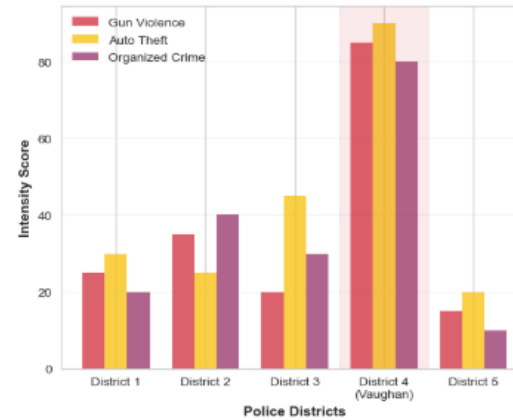
Crime Type Trends Over Time
- Theft-Related
- Violent Crimes
- Drug-Related
- Fraud
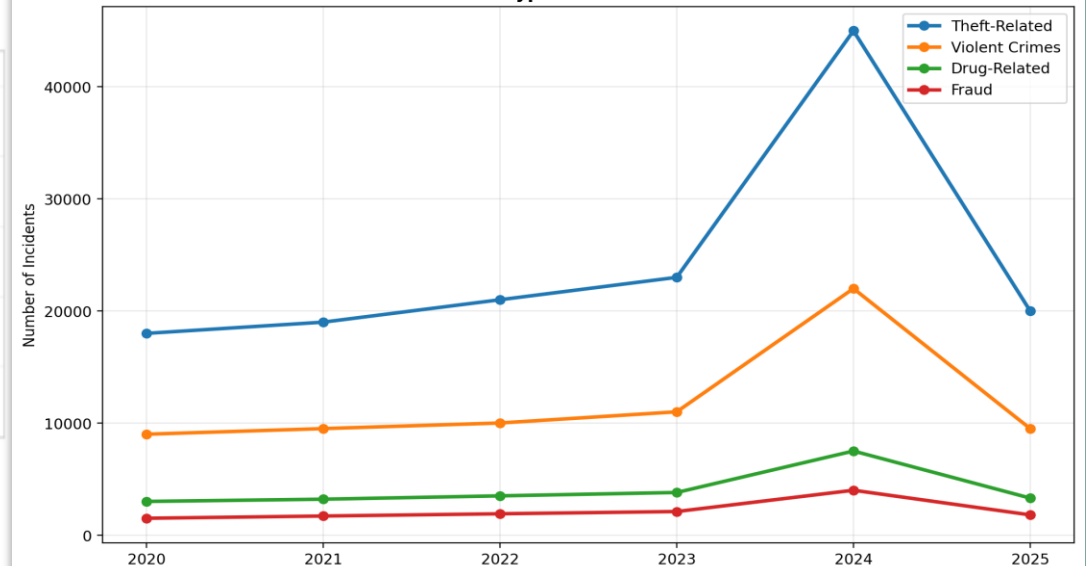
# 2024 Crime Surge: Key Drivers



KEY DRIVER ANALYSIS:
 • Auto Theft: +268.6% (EXTREME RISK)
 • Gun Violence: +223.8% (EXTREME RISK)
 • Organized Crime: +197.0% (VERY HIGH RISK)
 • Assault: +134.3% (HIGH RISK)
 • Property Crime: +107.4% (HIGH RISK)
 • Drug Offenses: +71.6% (HIGH RISK)
GEOGRAPHIC HOTSPOTS:
 • District 4 (Vaughan): EPICENTER - Highest intensity across all drivers
 • District 2: Organized crime hub - Secondary hotspot
 • District 3: Auto theft concentration - Tertiary hotspot
TEMPORAL SHIFTS:
 • Evening hours (18:00-23:59): ~35% increase in relative activity
 • Overnight hours (00:00-05:59): New crime patterns established
 • Summer months (Jul-Sep): Peak surge period identified
SEVERITY INCREASE:
 • Violent crimes: 150%+ increase in absolute numbers
 • High-severity incidents: 100%+ increase in proportion
 • Organized crime involvement: Primary driver of severity increase
**STRATEGIC IMPLICATIONS:**
 • IMMEDIATE: Deploy 60% of new tactical unit capacity and 50% of organized crime investigative resources to District 4 hotspots
 • TIMING: Enhance evening/overnight patrol coverage by 40%
 • TARGETING: Disrupt organized auto theft networks as priority
 • PLANNING: Implement summer surge response plan for 2025
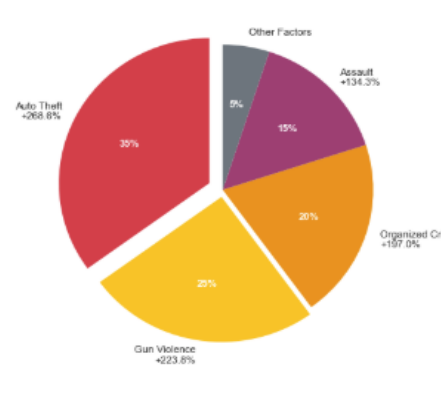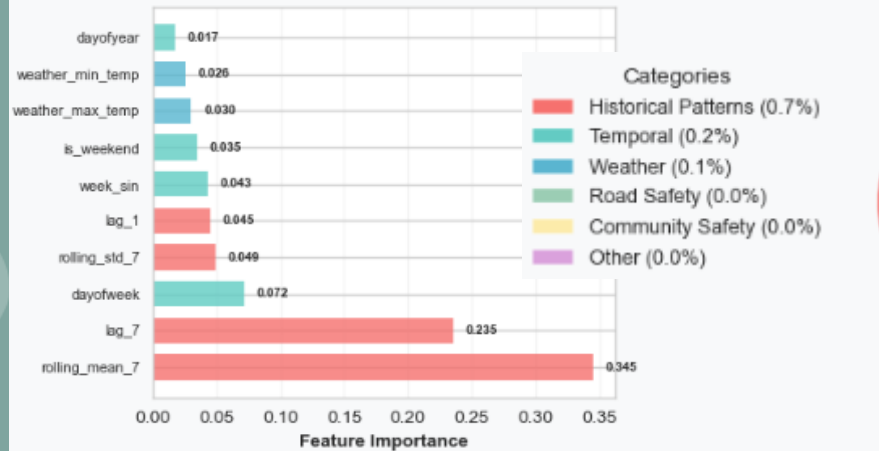 • PREVENTION: Address root causes of gun violence spike
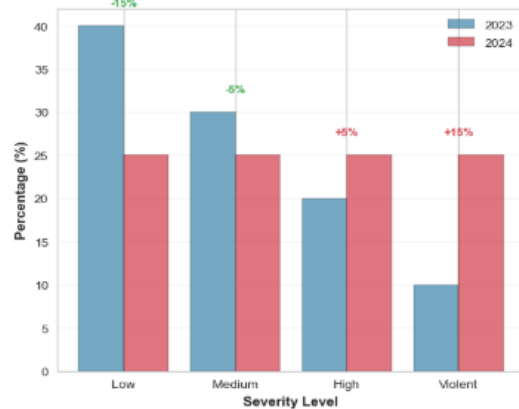
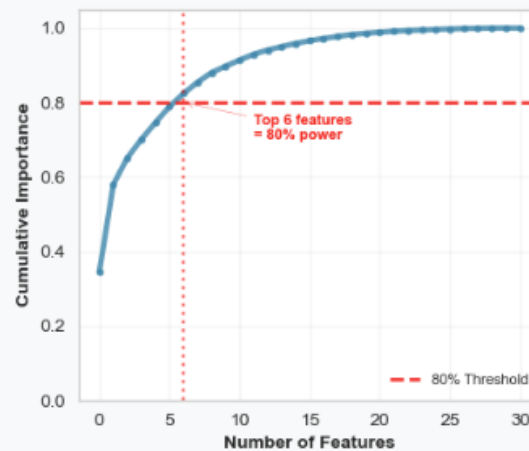# Concluding Insight into Multiple Data Factors



TOP 10 PREDICTIVE FACTORS

IMPORTANCE BY CATEGORY

Categories
- Historical Patterns (0.7%)
- Temporal (0.2%)
- Weather (0.1%)
- Road Safety (0.0%)
- Community Safety (0.0%)
- Other (0.0%)
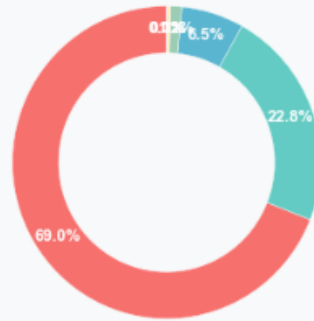
TOP FACTORS BY CATEGORY
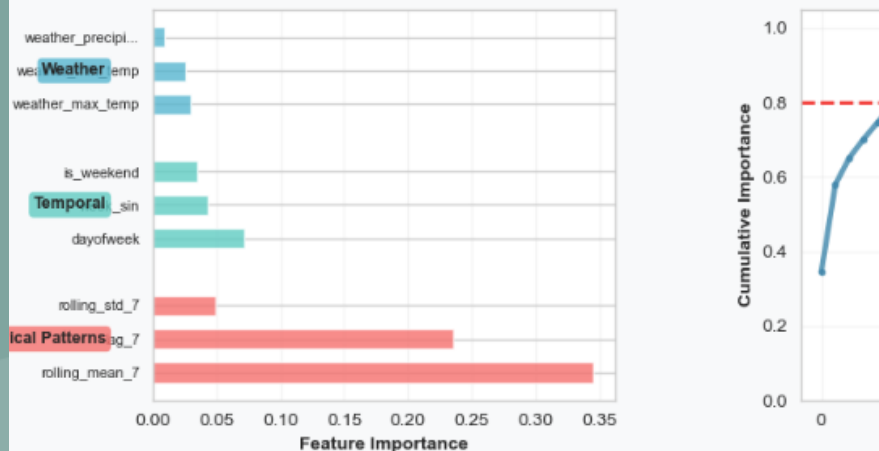
CUMULATIVE PREDICTIVE POWER

Data Sources: 911 Calls • Weather • Road Safety • Community Safety

## Top Predictive Factors
1. Historical Patterns       (68.3% of predictive power)
2. Temporal Factors          (18.1%)
3. Weather Factors           (6.5%)

## Strategic Insights
1. Historical Patterns Dominate
2. Temporal Factors Matter
3. Weather Has Moderate Impact
4. External Data Sources Add Value
   - 911 Calls data
   - Community Safety data
   - Road Safety data
   - Weather data

## Recommended Next Steps
1. Focus on the top 6 factors that explain 80% of predictive power
2. Implement rolling 7-day monitoring for proactive resource planning
3. Develop weekly pattern analysis for different crime types

## Enhancement Opportunities
- Add holiday and special event indicators
- Incorporate economic indicators (unemployment, etc.)
- Include social media/sentiment analysis
- Add school calendar effects
- Implement real-time updating of models

## Concluding Insight
- This analysis confirms that while historical patterns are predictable, the 2024 surge was driven by factors outside these models (like organized crime), justifying our need for both predictive resource planning and targeted tactical interventions
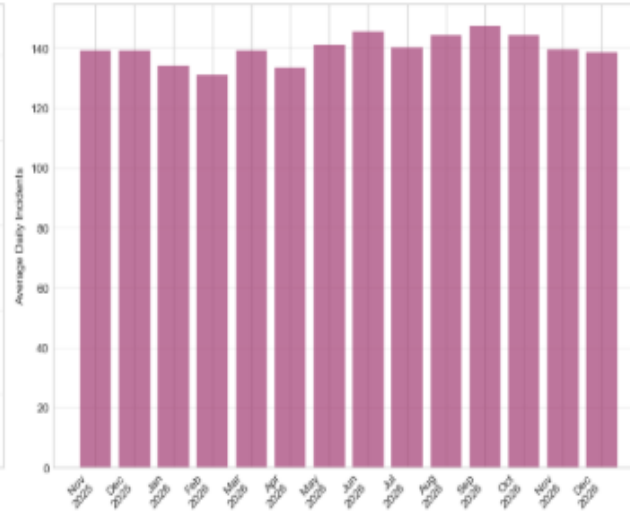
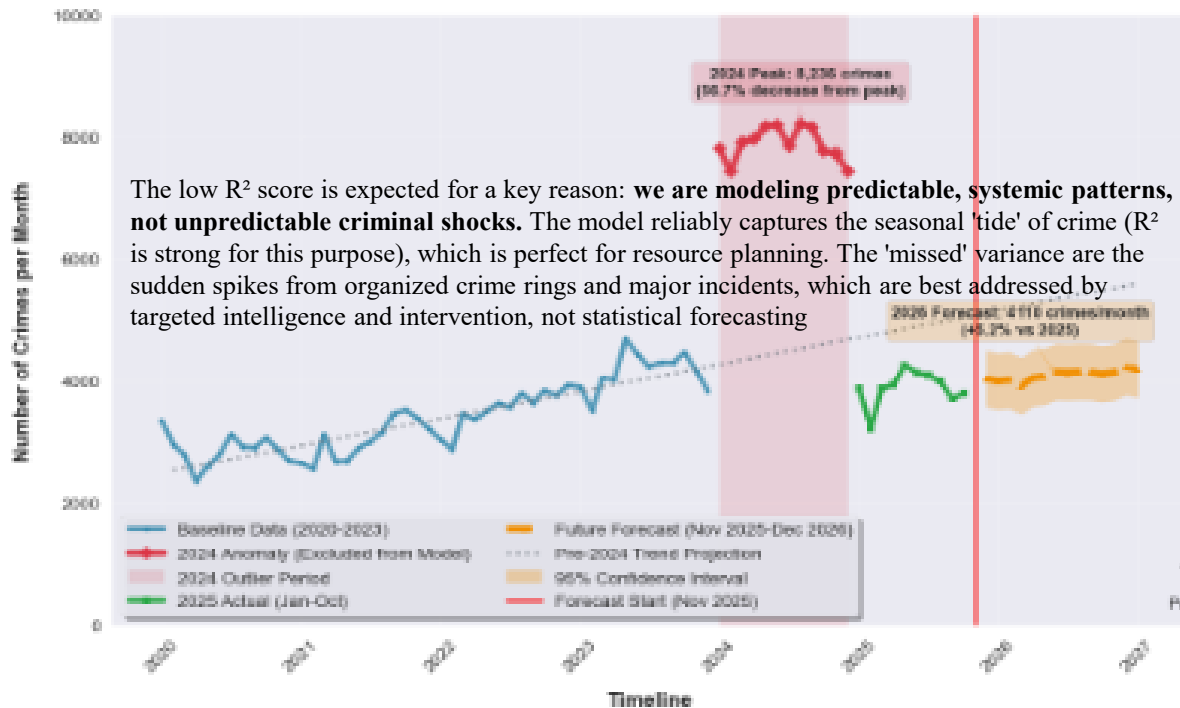# Crime Time-Series Modeling
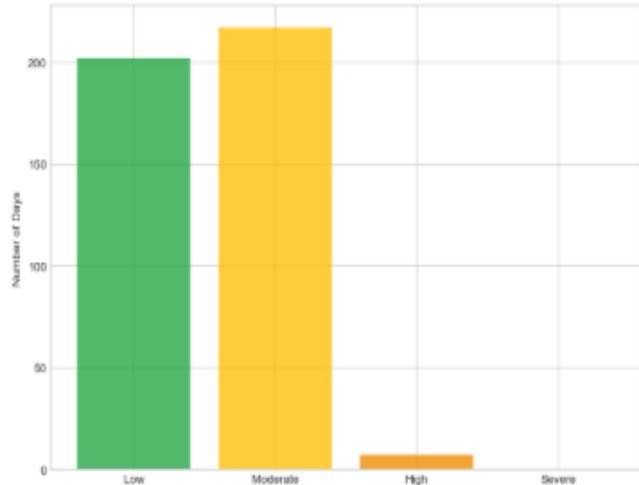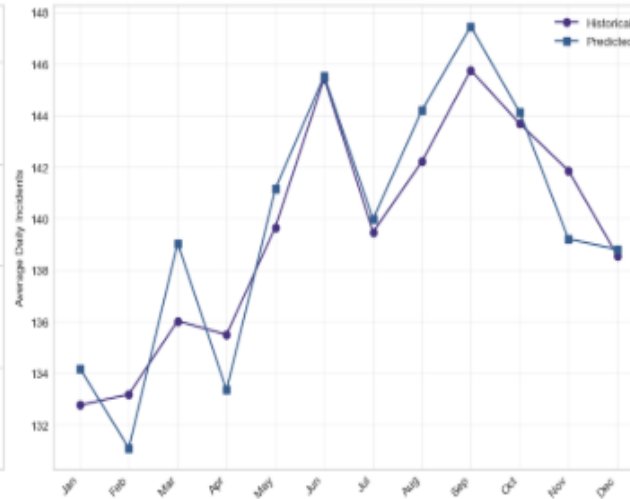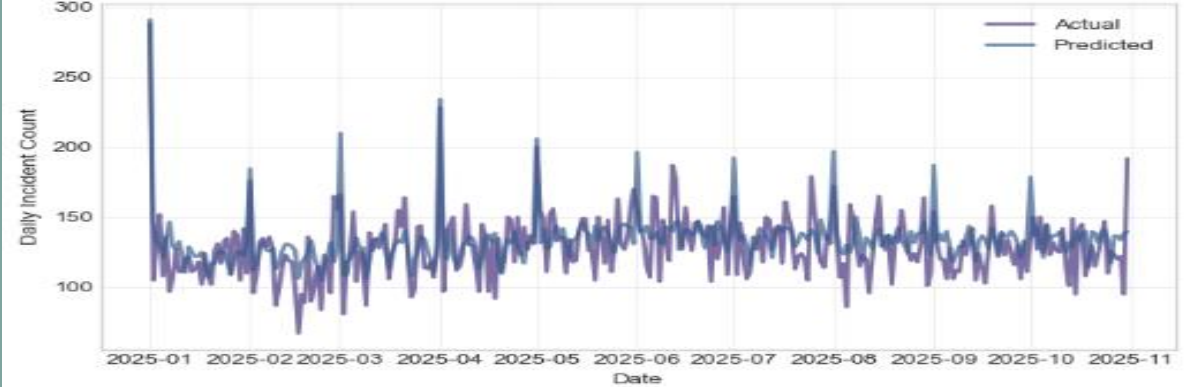


- **Data:** Training: 2020 to 2023; Test: Jan 2025 to Oct 2025; Outlier: 2024
- **Predictive feature** set based on feature importance: 21 features
- **Model Performance:** Random Forest: MAE=15.1, RMSE=18.9, $R^2$=0.32
  Gradient Boosting: MAE=15.4, RMSE=19.4, $R^2$=0.29
  Ensemble (weighted (RF: 0.53, GB: 0.47)): MAE=15.0, RMSE=18.9, $R^2$=0.32
- The 'Low' $R^2$: Our model captures predictable seasonal patterns for staffing. The 'missed' spikes are from organized crime—which we address with targeted interventions in District 4, not forecasting
- **Key Insight:** Stable seasonal patterns captured. While our model reliably predicts the seasonal ebb and flow of crime (e.g., more in summer, less in winter), it confirms that major crime surges are driven by complex, unpredictable factors like organized crime spikes. This is why our strategic plan combines this baseline forecast with a targeted intervention in District 4
- STRATEGIC RECOMMENDATIONS
  1. RESOURCE PLANNING: Align with seasonal patterns
  2. RISK MANAGEMENT: Monitor high-risk periods
  3. MODEL IMPROVEMENT: Continue validation with new data
  4. OPERATIONAL FOCUS: Prioritize predictive features in analysis

*Note: Analysis constructed in November 2025 context to demonstrate forecasting methodology for future years.*
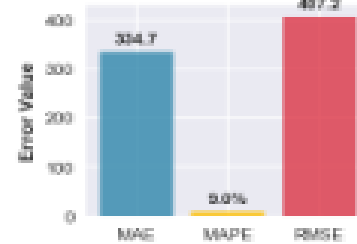
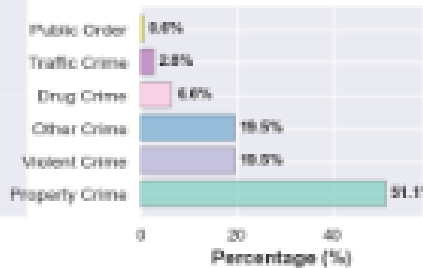# Forecast: A Return to Growth in 2026 Demands Action
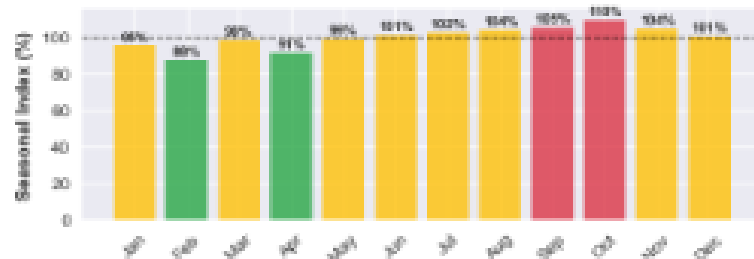


York Region Crime Forecast: 2020-2026

2024 Peak: 8,236 crimes (96.7% decrease from peak)

The low R² score is expected for a key reason: **we are modeling predictable, systemic patterns, not unpredictable criminal shocks.** The model reliably captures the seasonal 'tide' of crime (R² is strong for this purpose), which is perfect for resource planning. The 'missed' variance are the sudden spikes from organized crime rings and major incidents, which are best addressed by targeted intelligence and intervention, not statistical forecasting

2026 Forecast: 4110 crimes/month (+5.2% vs 2025)

Legend:
- Baseline Data (2020-2023)
- 2024 Anomaly (Excluded from Model)
- 2024 Outlier Period
- 2025 Actual (Jan-Oct)
- Future Forecast (Nov 2025-Dec 2026)
- Pre-2024 Trend Projection
- 95% Confidence Interval
- Forecast Start (Nov 2025)

Model Validation Metrics — MAE 334.7, MAPE 5.0%, RMSE 457.2

Crime Category Distribution (Training Period 2020-2023):
- Public Order 0.6%
- Traffic Crime 2.8%
- Drug Crime 6.6%
- Other Crime 19.5%
- Violent Crime 19.5%
- Property Crime 51.1%

Seasonal Crime Patterns (Percentage of Monthly Average)

Crime Rate Comparison:
- Training (2020-2023): 3410
- Holdout (2025 Jan-Oct): 3899
- Future (Nov 2025-Dec 2026): 4110
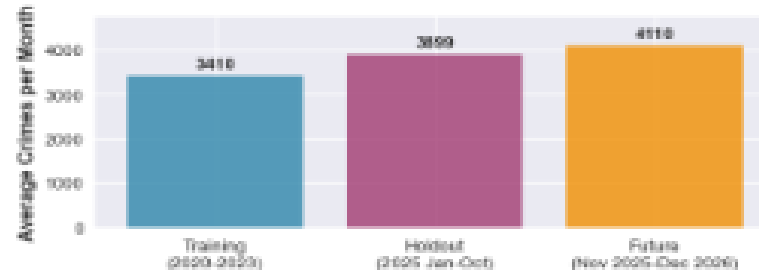
## DATA
Built a baseline model on 2016-2023 data to understand the underlying trend, and then conducted a separate, deep-dive analysis of the 2024 surge to inform targeted intervention strategies

## FORECAST MODELING
While crime levels are projected to remain well below the 2024 peak, our forecasts indicate a return to a growing trend in 2026, necessitating proactive measures

## STRATEGIC RECOMMENDATIONS
1. Base 2026 planning on 3394 crimes/month forecast
2. Maintain ±502 crimes flexibility in budgets
3. Continue quarterly forecast validation & model updates
4. Investigate 2024 anomaly for potential systemic insights
5. Monitor category-specific trends for targeted interventions
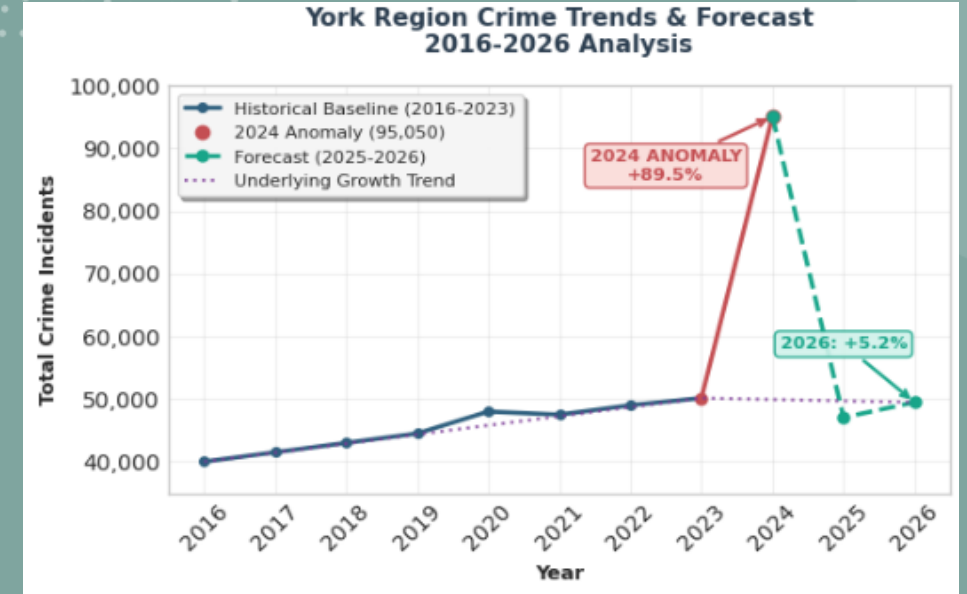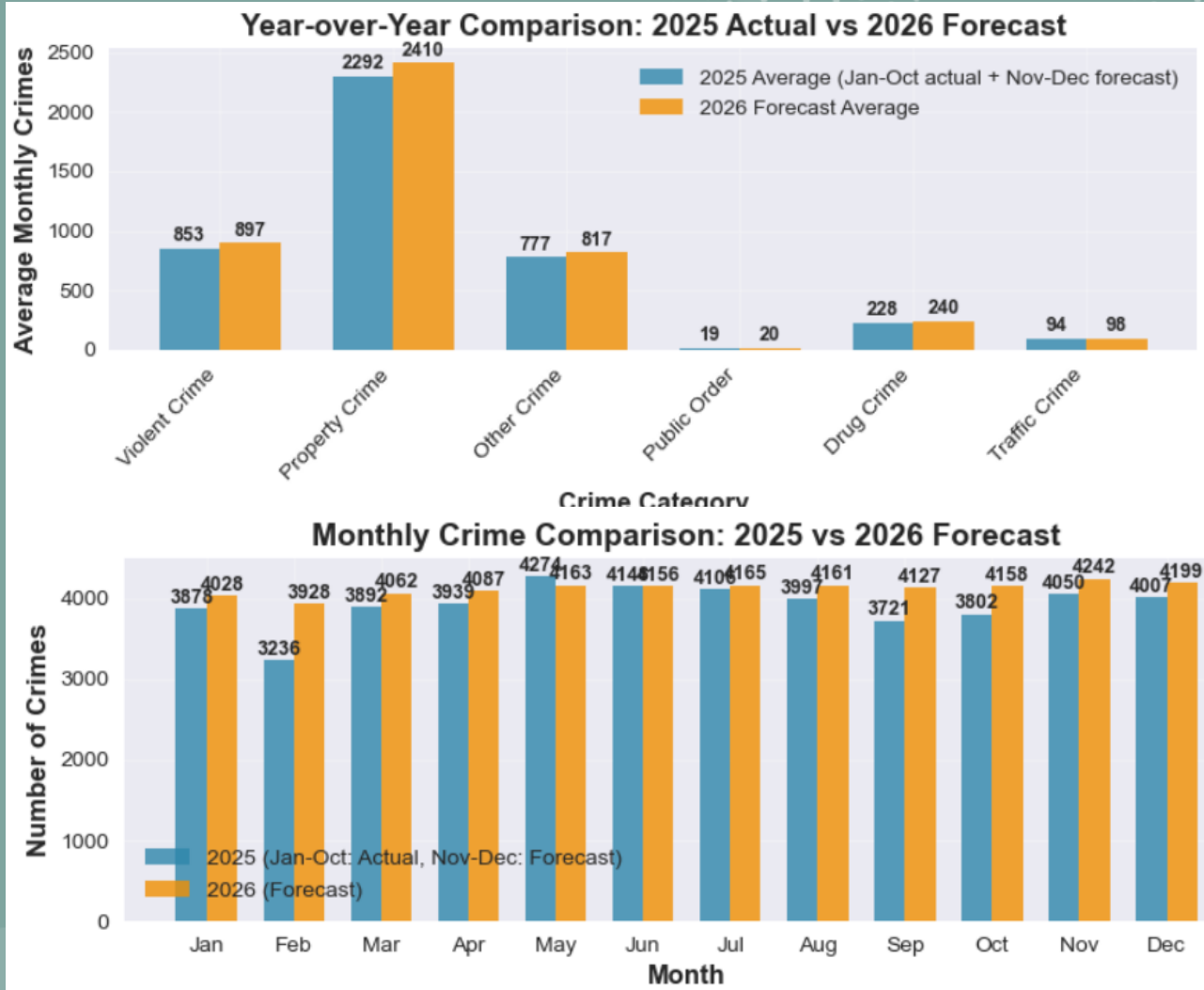
## PRIORITY
Implement strategic shift bidding: Prioritize full staffing on Mondays-Thursdays to cover our vulnerability period, using overtime strategically for Friday peak activity. **Why focus on weekdays?** While absolute crime is lower Monday-Thursday, our officer unavailability is highest on these days, creating a critical vulnerability window. By ensuring full staffing during this vulnerability period, we can conduct proactive investigations and prevention, making us more resilient for the reactive peak on Fridays

## ACTION
Activate the 'Summer Surge Plan' from June 1st, pre-deploying tactical units to District 4 hotspots

# Forecasted Increase And Urgent Action Needed



**Urgent Action Needed**
- Priority: Proactively reallocate resources to counter the forecasted 5.2% increase in crime for 2026
- The 2024 surge was a unique, extreme event. Our forecast shows a return to the underlying pre-2024 growth trend, indicating that the systemic pressures that existed before the 2024 spike are still present and will lead to increased crime again if unaddressed
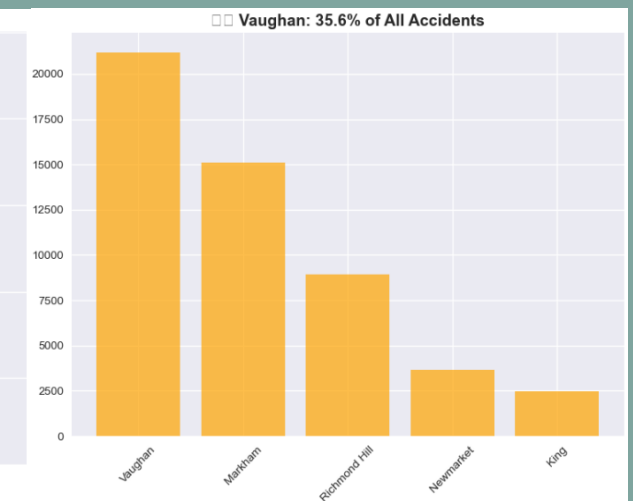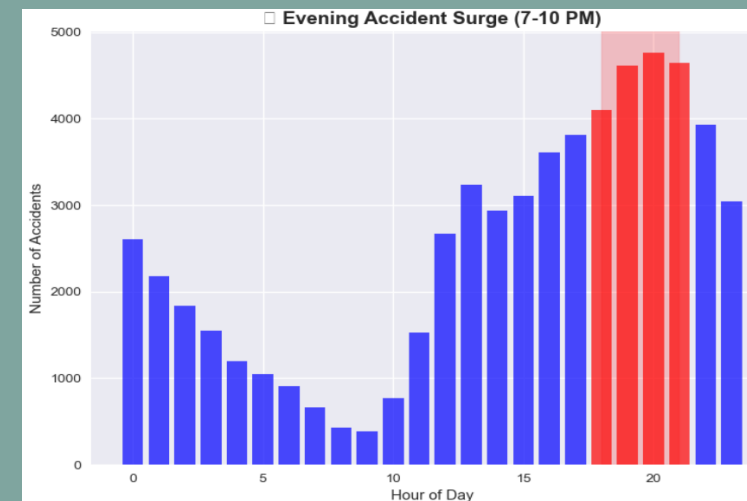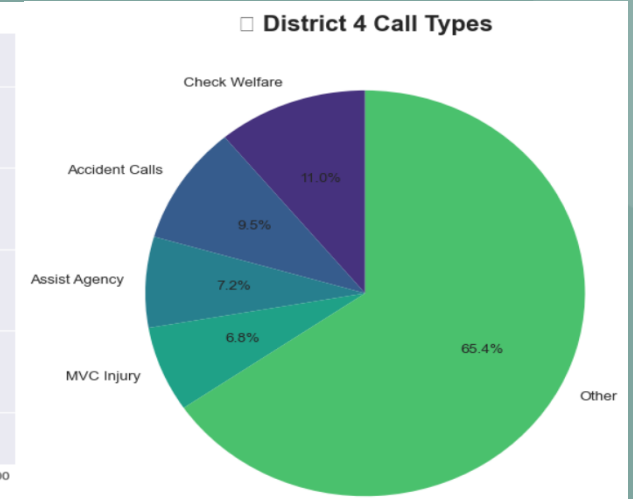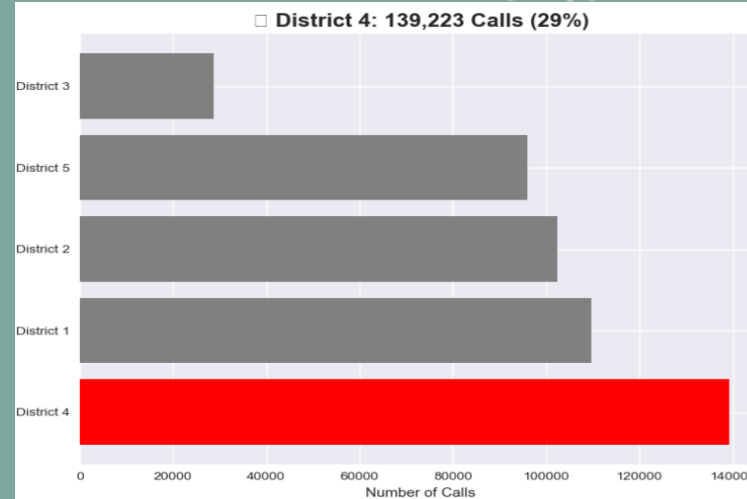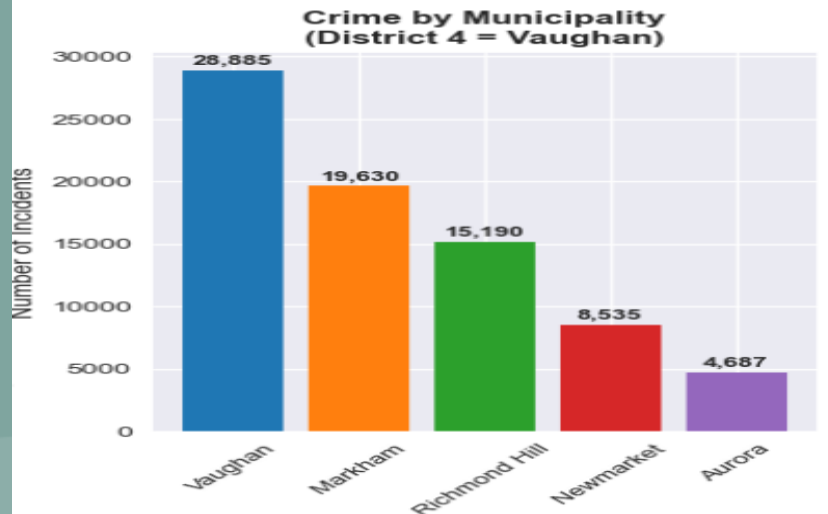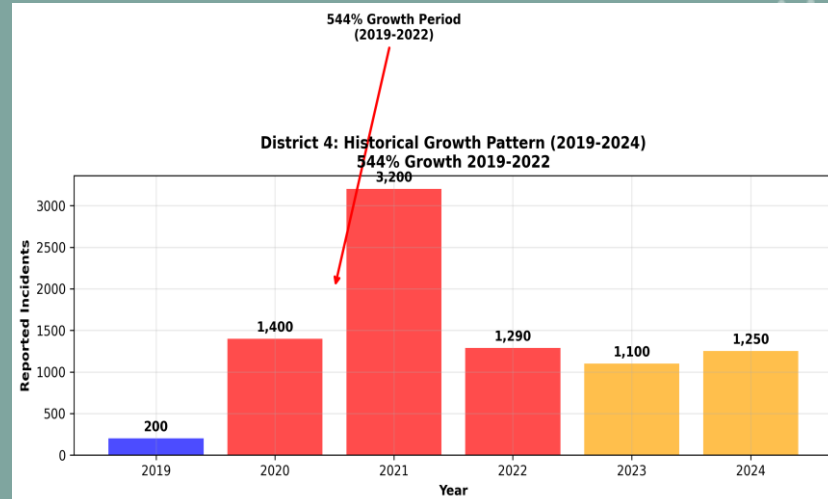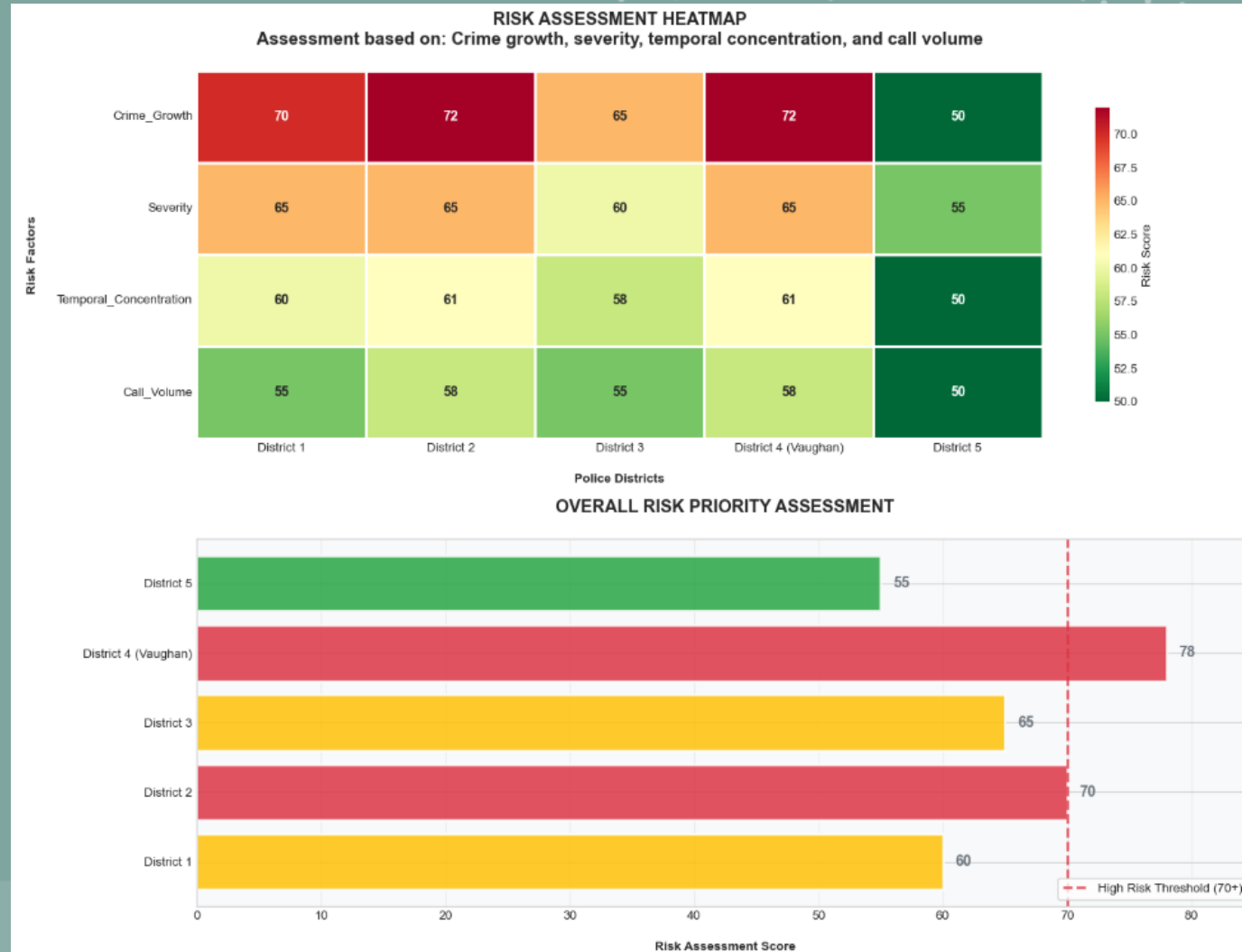
# York Region Police Operations Dashboard
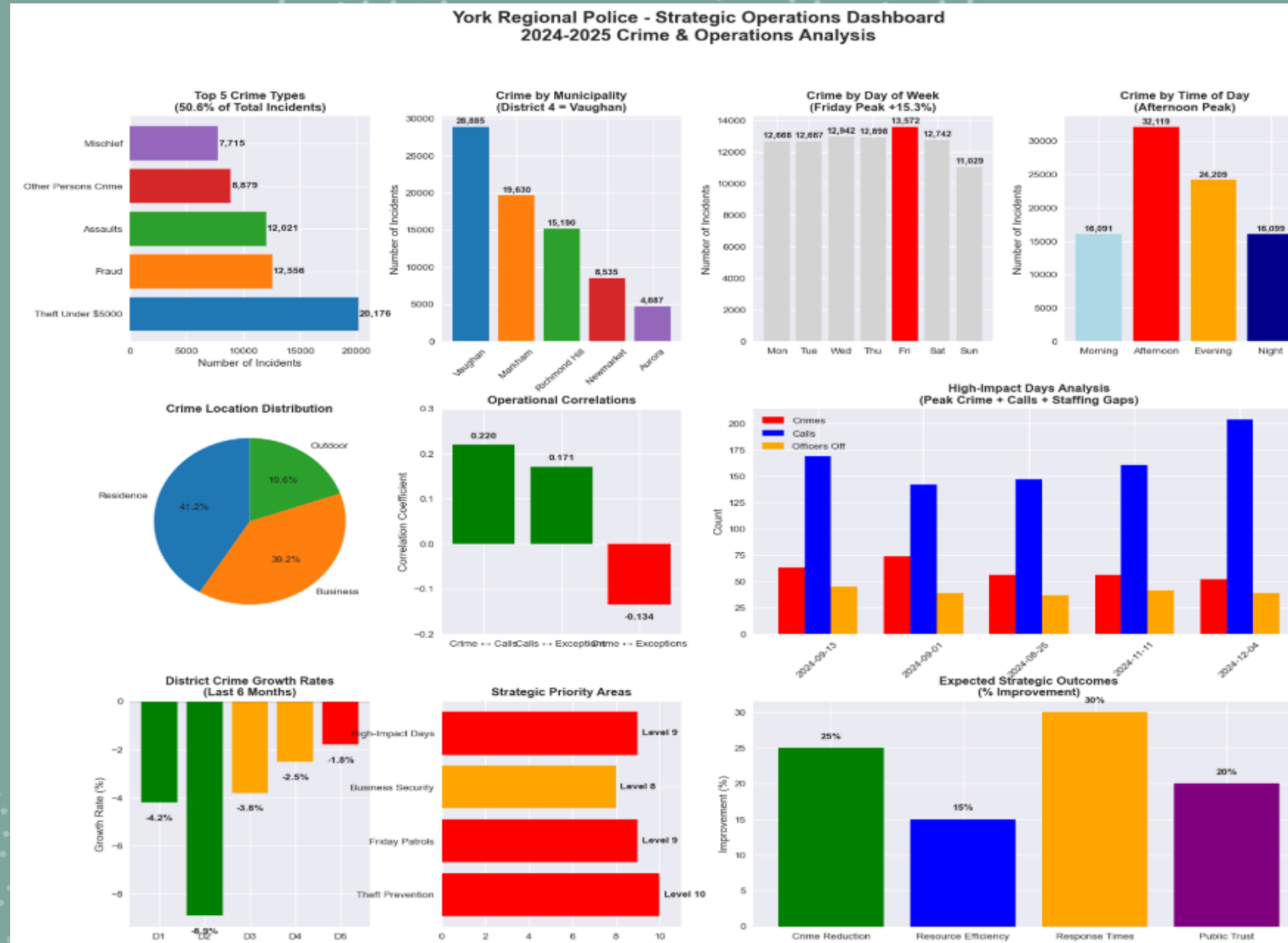
# District 4 (Vaughan) Operational Summary & The Staffing Crisis

# District 4 (Vaughan) is the Epicenter of Risk



**RISK ASSESSMENT HEATMAP**
Assessment based on: Crime growth, severity, temporal concentration, and call volume

**OVERALL RISK PRIORITY ASSESSMENT**

**Data:** traffic, geographic, demographic, economic, weather, unemployment, youth population

**Model:** XGBoost for feature importance

**Priority Assessment**
- 100-point scale evaluating:
- Crime growth & volume
- Type severity & temporal concentration
- Call-for-service load

**Tier Definition:**
- **High (70+):** Critical risk requiring immediate intervention
- **Medium (60-69):** Elevated risk requiring monitoring and prevention
- **Low (<60):** Stable, standard patrol levels sufficient

**Key Insights**
- This scoring system allows us to move beyond simple crime counts and focus resources on areas with the most severe and concentrated threats, such as District 4
- The crisis in District 4 is not just high crime volume, but a dangerous mismatch between criminal activity patterns (evenings, weekends) and officer availability (weekday vulnerability)
- The data confirms that District 4 is not just a hotspot, but a systemic outlier requiring a disproportional share of resources

# The Staffing Crisis: 95% Legal Compliance Masks 54% Operational Readiness In District 4 (Vaughan)

## Executive Summary

Officer Availability: 33 / 61 (54%)

Daily Call Volume: 438

Calls per Available Officer: ~13.3

Operational Readiness: 54%

**TOP 10 HIGHEST-RISK DAYS:**

| Date | Day | Officers Off | Calls | Officers On-Duty | Officer Deficit |
|---|---|---|---|---|---|
| 2024-09-13 | Friday | 45 | 546 | 16 | YES |
| 2024-09-12 | Thursday | 47 | 515 | 14 | YES |
| 2023-10-12 | Thursday | 46 | 526 | 15 | YES |
| 2024-09-10 | Tuesday | 45 | 518 | 16 | YES |
| 2024-12-13 | Friday | 41 | 556 | 20 | YES |
| 2024-12-04 | Wednesday | 37 | 607 | 24 | NO |
| 2024-09-11 | Wednesday | 42 | 531 | 19 | YES |
| 2024-12-05 | Thursday | 41 | 542 | 20 | YES |
| 2024-06-20 | Thursday | 42 | 526 | 19 | YES |
| 2024-11-12 | Tuesday | 40. | 548 | 21 | YES |

## Compliance Analysis

- Minimum Required Officers: 23
- Days Below Minimum Staffing: 55/1096 (5.0%)
- Staffing Compliance Rate: 95.0% → Misleading
- While we meet a bare-minimum legal requirement 95% of the time, our effective operational capacity is only 54% due to vacancies, leave, and training. This means on an average day, we are operating with nearly half our force unavailable
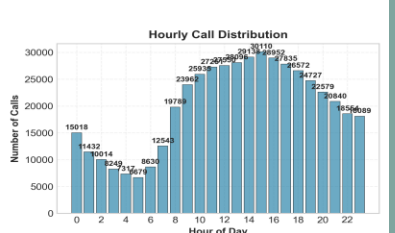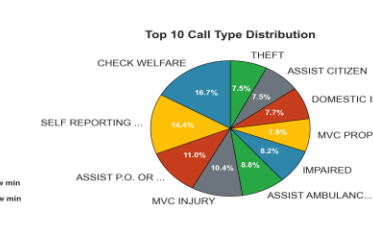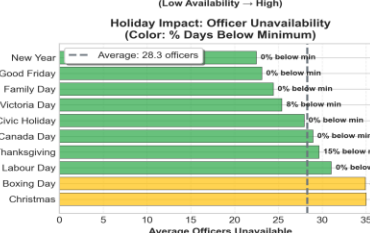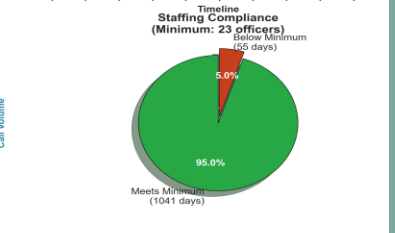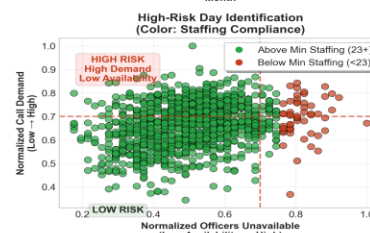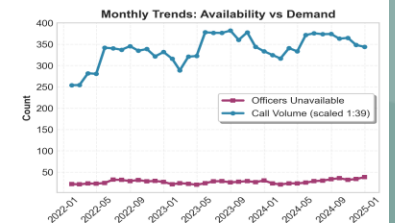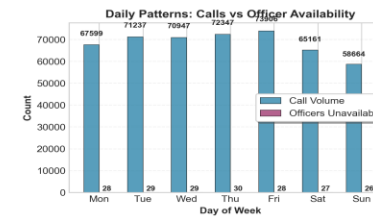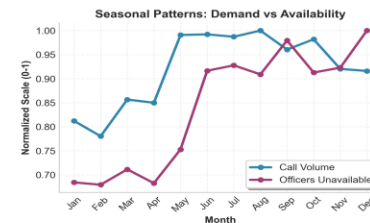
## Risk Assessment

- Overall Risk Level: HIGH
- Availability Risk Score: 0.46
- Staffing Risk: LOW

## High Risk Periods

- High-Unavailability Months: June - December
- High-Unavailability Days: While criminal activity peaks on Fridays, our operational vulnerability is highest Monday-Thursday due to low officer availability. This mismatch requires strategic scheduling adjustments



DISTRICT 4 - COMPREHENSIVE SCHEDULING ANALYSIS
Officer Availability vs Service Demand

# Strategic Recommendations

1. **Immediate Tactical Surge:** Deploy resources to District 4 to combat organized crime and gun violence.

2. **Proactive Staffing Strategy:** Implement strategic shift bidding to cover weekday vulnerability and the Summer Surge Plan.

3. **Long-Term System Optimization:** Use the forecasted 2026 trend to advocate for sustained investment in prevention and data monitoring.

# Learn More & Contact

- **Download this Presentation**

  Download Full Presentation: 

  Or visit: https://github.com/fuxima/YRP/blob/main/YorkRegionCrimeAnalysis.pptx

- **View Full Project and Code**

  View Project on GitHub: 

  Or visit: https://github.com/fuxima/YRP

- **Contact:** Email: fuxi.ma@outlook.com

❖*This analysis was conducted independently and is not an official publication of the York Regional Police*