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Reducing Drug, Alcohol, and Traffic Crimes in the Denver Metro Area

A Presentation to the Denver Police Department
on Recommendations for Crime Prevention

Data Quality

Columns	Nulls
INCIDENT_ID	0
OFFENSE_ID	0
OFFENSE_CODE	0
OFFENSE_CODE_EXTENSION	0
OFFENSE_TYPE_ID	0
OFFENSE_CATEGORY_ID	0
FIRST_OCCURRENCE_DATE	0
LAST_OCCURRENCE_DATE	223662
REPORTED_DATE	0
INCIDENT_ADDRESS	35036
GEO_X	0
GEO_Y	0
GEO_LON	2508
GEO_LAT	2508
DISTRICT_ID	0
PRECINCT_ID	0
NEIGHBORHOOD_ID	0
IS_CRIME	0
IS_TRAFFIC	0

Columns	Distinct Values
INCIDENT_ID	372507
OFFENSE_ID	396346
OFFENSE_CODE	150
OFFENSE_CODE_EXTENSION	6
OFFENSE_TYPE_ID	194
OFFENSE_CATEGORY_ID	15
DISTRICT_ID	7
PRECINCT_ID	32
NEIGHBORHOOD_ID	78

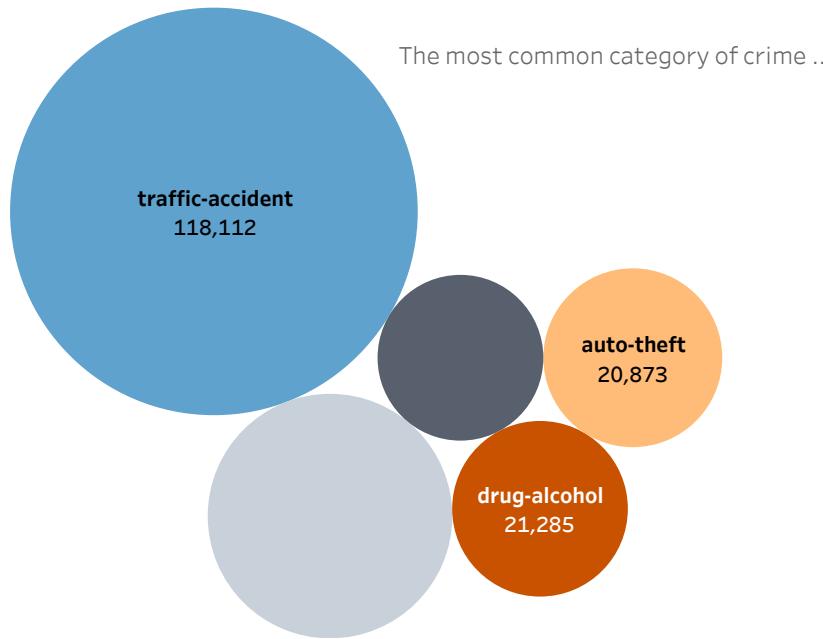
Range of Time for the Dataset	
Earliest Time (Dataset)	1/2/2010 0:00
Latest Time (Dataset)	11/6/2015 4:59

Data Quality

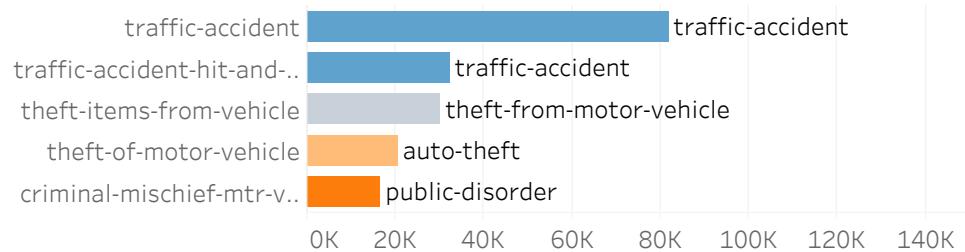
- Positive:
 - “OFFENSE_CATEGORY_ID” column standardized
 - Detailed date & time data
 - useful for trends and pattern analysis
- Needed improvement:
 - Split “FIRST_OCCURRENCE_DATE” data
 - Created categorical variables for time of day
 - Created categorical variables for time between first occurrence and reported date

Overview

Top 5 Crime Categories



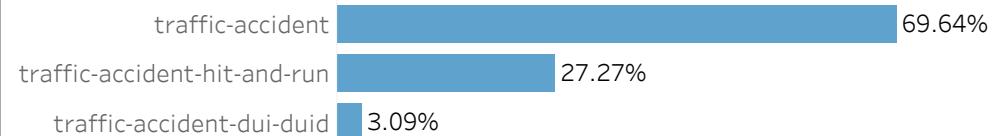
Top 5 Crimes



Breakdown of Traffic-Related Crimes

Category of Crime	Type of Crime	Count
traffic-accident	traffic-accident	81,615
	traffic-accident-dui-duid	3,621
	traffic-accident-hit-and-run	31,961
murder	traf-vehicular-homicide	25

Top 3 Traffic-Related Crimes

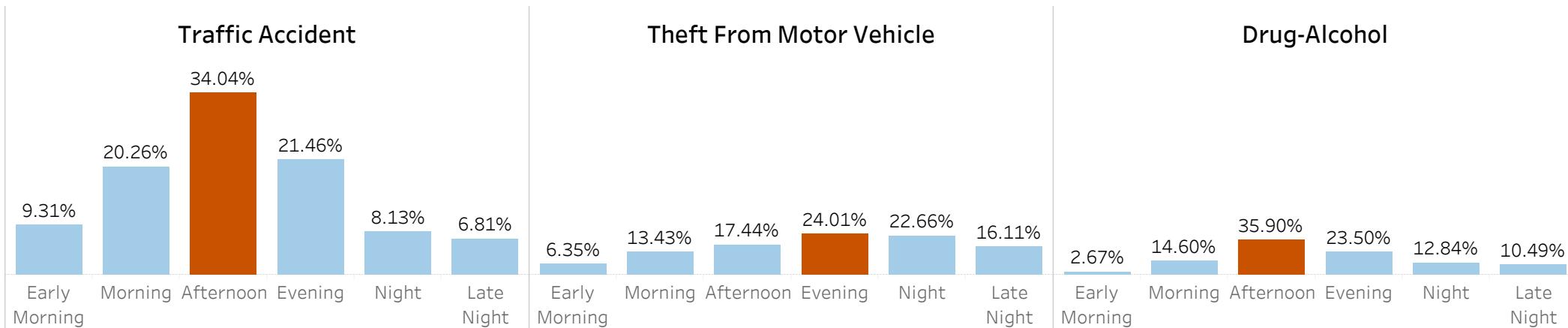


Top 3 Alcohol-Related Crimes



Times of Crimes and Reporting

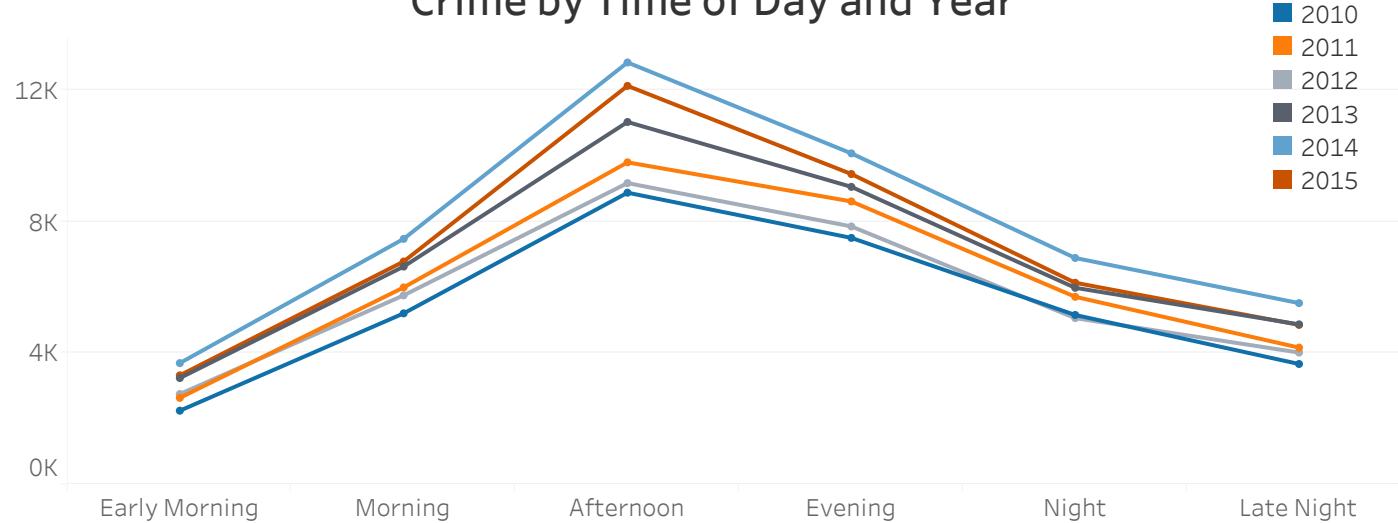
Time of Day Top 3 Crime Categories Occur



Time Between First Occurrence & R..

89.23%	4.14%
Same Day	Next Day
4.55%	1.39%
Within 1 Week	Within 1 Month
0.62%	0.09%
Within 1 Year	Over 1 Year

Crime by Time of Day and Year



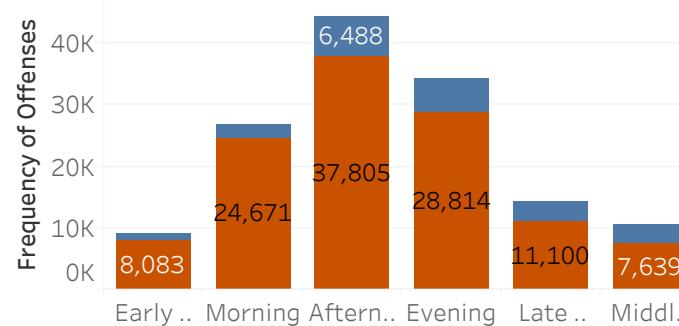
Correlation between Traffic Accidents and Drug-Alcohol Crimes

Offense Category Id
drug-alcohol traffic-accid...

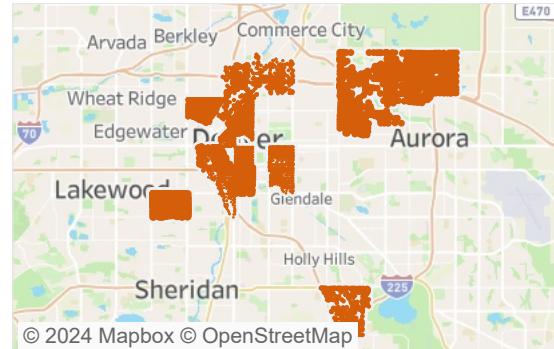
Frequency of Crimes by District



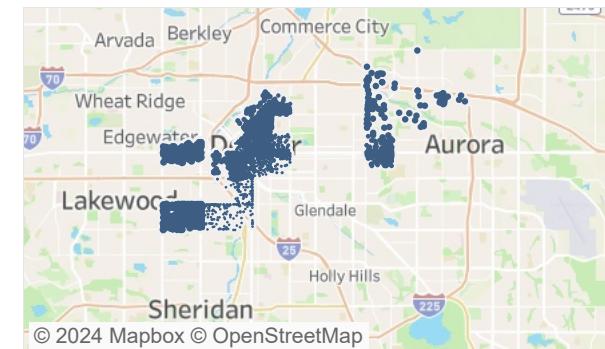
Frequency of Crimes by Time of Day



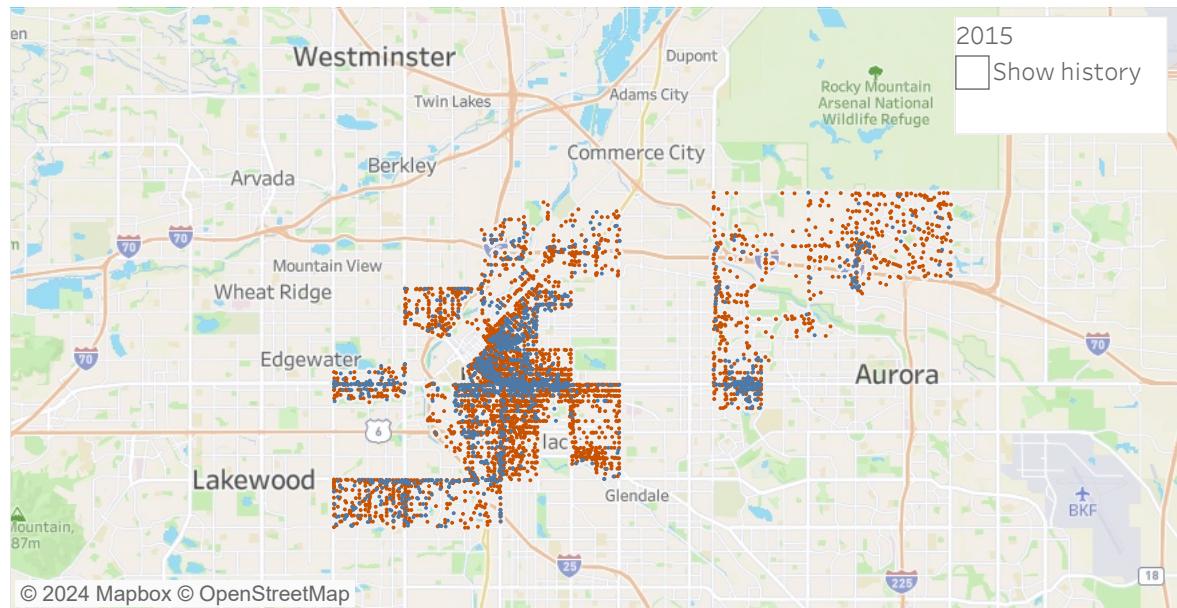
Top 15 Neighborhoods - Traffic



Top 15 Neighborhoods - Drug-Alcohol

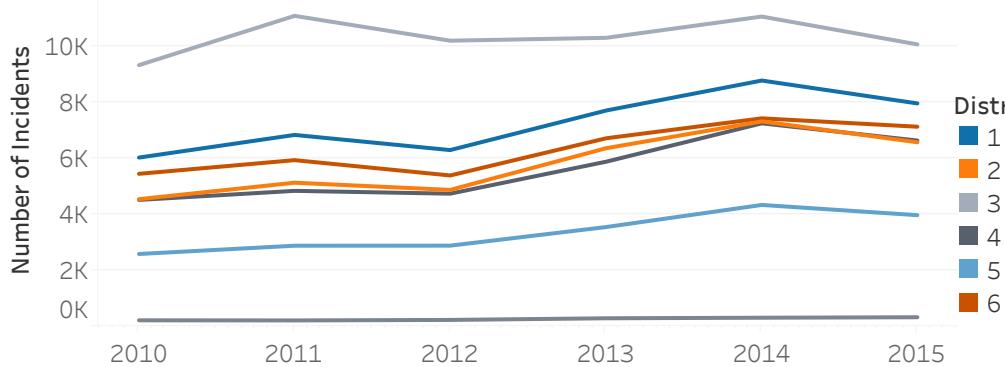


Comparison of Drug-Alcohol & Traffic Related Crimes

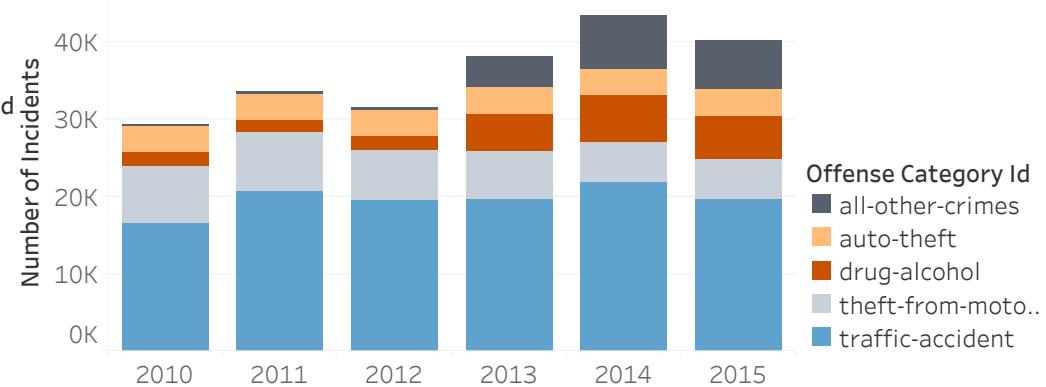


Progress Over Time

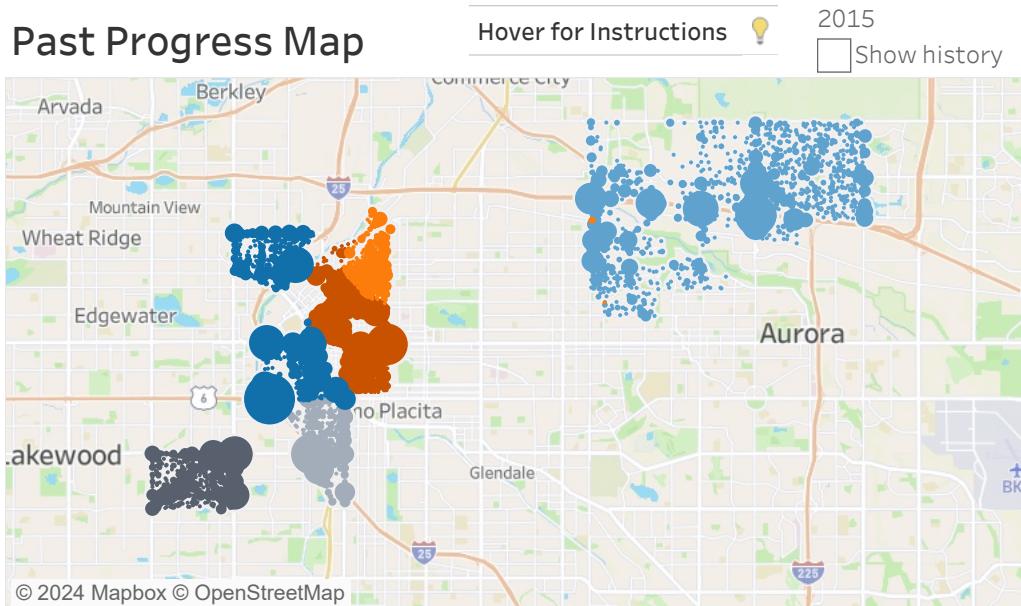
Past Progress by District



Trends of Top 5 Crime Categories



Past Progress Map



Neighborhoods with Highest number of Crime

A table titled "Neighborhoods with Highest number of Crime" for the year 2015. The table lists neighborhoods and their corresponding incident counts. The data is presented in two columns: one for the highest counts and one for the remaining neighborhoods.

five-points	baker	cbd
2,150	1,373	1,195
stapleton	westwood	hampden-south
1,795	1,372	869
capitol-hill	montbello	highland
1,424	1,317	824

Data Investment Recommendations

- Demographics
- Economic and Social Conditions
- Age of individuals involved in traffic accidents and drug-alcohol
- Investment:
 - 2 data engineers: \$120,000/engineer
 - 2 business analysts: \$80,000/analyst
 - 2 data scientists: \$125,000/scientist
 - Total of \$650,000/year in salaries
- Return:
 - We expect budget to decrease by 5%

Overall Recommendations

- **Recommendation #1: School-Based Program for Substance Abuse Prevention**
 - **Rationale:**
 - Goal: A growing and significant body of knowledge that addiction is a preventable, treatable, and manageable disease
 - State government spending on substance abuse and addiction= **15.7% State budget (\$135.8 bn)**
 - **Investment and Savings:**
 - Materials & Teacher Training Average Cost: **\$400/pupil= \$400*45,000 students= \$18.2 M in costs**
 - Estimates state government savings (ROI): **\$30 per \$1 invested=\$546 M in savings**
 - Reduced social costs of substance-abuse-related medical care, resources, and lost productivity over a lifetime by an estimated **\$56.5 billion**
 - Saved **\$2.2 billion** of State and local government budget

Overall Recommendations

- **Recommendation #2: Public Awareness Campaigns addressed to Underage Drinking**
 - **Rationale:**
 - 99% of the cases related to alcohol involve Underage Liquor Possession.
 - Goal: Raise awareness among underage individuals about the risks and consequences of underage drinking.
 - State govt spending = **43.4 M** (2020) on substance abuse prevention and treatment
 - **Investment:**
 - Social Media Advertising: **\$1,500/month** in each app
 - Instagram and Tik Tok are the most used apps by teenagers
 - Investment per year = **\$3,000 x 12 months = \$36,000**
 - In-person marketing and public information campaigns
 - Marketing plan and preparations= **\$240,000**
 - Public information campaigns= **\$100,000**

Overall Recommendations

- **Recommendation #3: Traffic Accident Prevention Measures**

- **Rationale:**

- Traffic accidents account for 69.64% of all traffic related offenses
 - Average Annual cost of all motor vehicle crashes is \$10,600,000
 - Goal: Reduce traffic accidents by 5%

- **Investment & Savings:**

- Improved road visibility
 - Ensuring 80% of busy streets are well-light translate to a 2.5% reduction in accidents
 - **\$3500/light + \$1000/installation * 100 lights = \$450,000 total investment cost**
 - **2.5% reduction in accidents = \$265,000 savings**
- Police force redistribution
 - Higher presence in Afternoon
 - Higher presence along main highways and intersections
 - **2.5% reduction in accidents = \$265,000 savings**

Total Savings = \$530,000

Overall ROI

- **Total Costs for our recommendations:**
 - Recommendation #1: 18.2 M
 - Recommendation #2: \$376,000
 - Recommendation #3: \$450,000
- **Estimated Savings from the implementation:**
 - Recommendation #1: \$546 M
 - Recommendation #2: \$1.5M
 - Recommendation #3: \$530,000
- **Overall ROI:**
 - Total Returns/Total Investments = 548.03 M/19.026 M
 - **28.8% ROI**

Citations

- [https://www.nutshell.com/blog/cost-of-social-advertising#:~:text=Average%20social%20media%20advertising%20pricing,\(paid%20to%20ad%20networks\).](https://www.nutshell.com/blog/cost-of-social-advertising#:~:text=Average%20social%20media%20advertising%20pricing,(paid%20to%20ad%20networks).)
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- <https://www.samhsa.gov/sites/default/files/cost-benefits-prevention.pdf>
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- <https://www.waldenu.edu/online-bachelors-programs/bs-in-criminal-justice/resource/why-national-crime-statistics-are-important#:~:text=Crime%20statistics%20can%20be%20a,the%20predicted%20crimes%20from%20occurring.>