GW Data Science

Los Angeles Crime Investigation: Data Driven Detectives

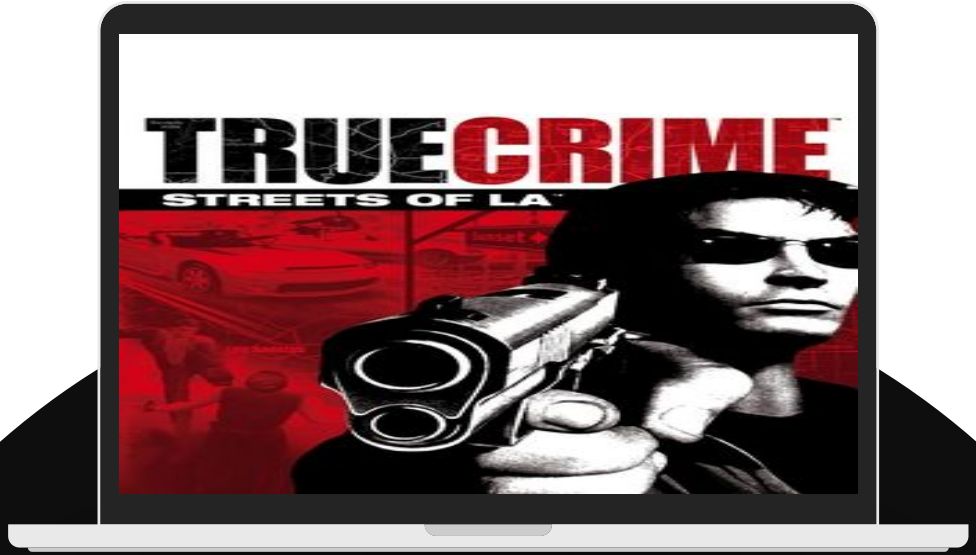
Abhinaysai Kamineni

Lasya Raghavendra

Neeraj Magadum

Aakash Hariharan

Amogh Ramagiri

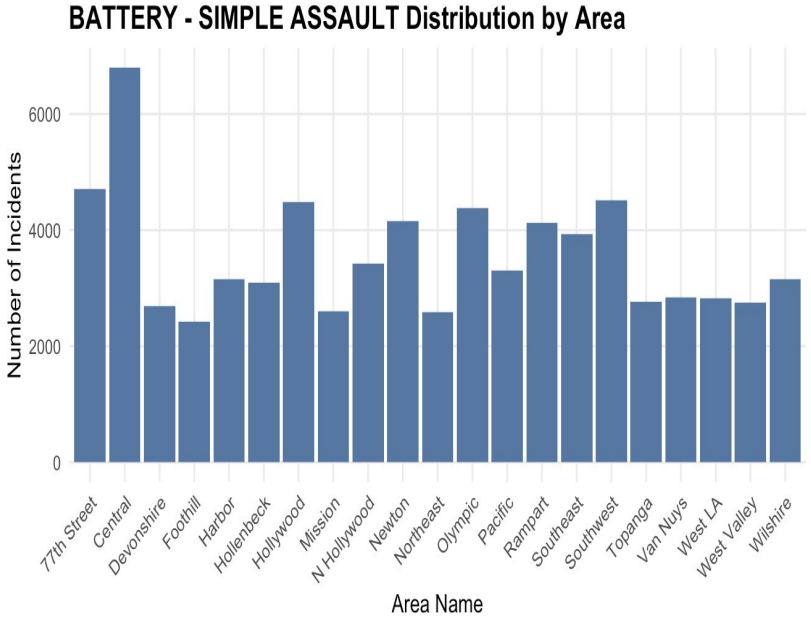


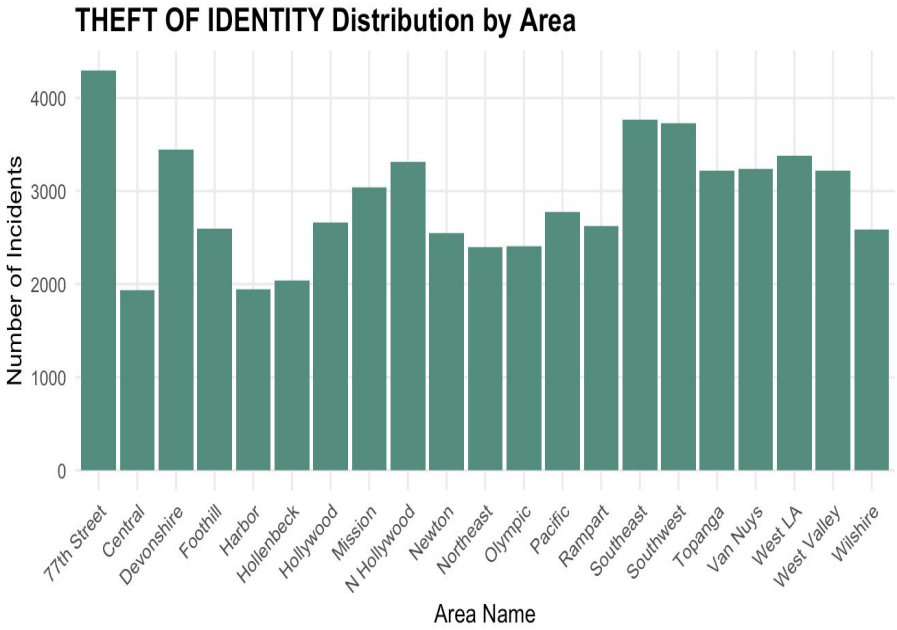
Synopsis of Data

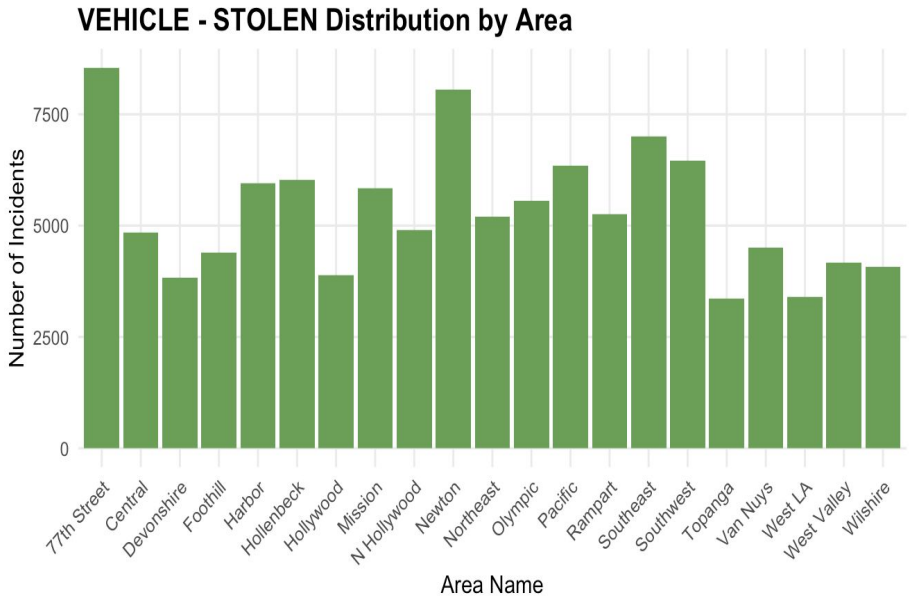
- The thousands of recorded incidents varying by crime type, victim demographics, location, law enforcement and city officials.
- Identifying meaningful trends and correlations such as how crime types vary by location.
- Victim demographics relate to specific crimes, and how different weapons are used in different crime remains a critical challenge.

SMART QUESTION 1

How have the top three most common crimes from 2020 to the present been distributed across the top five areas where they are most frequently committed in Los Angeles, and are these trends increasing or decreasing in each area from 2020 to 2024?


BATTERY - SIMPLE ASSAULT Distribution by Area
Number of Incidents
0
2000
4000
6000
77th Street
Central
Devonshire
Foothill
Harbor
Hollenbeck
Hollywood
Mission
N Hollywood
Newton
Northeast
Olympic
Pacific
Rampart
Southeast
Southwest
Topanga
Van Nuys
West LA
West Valley
Wilshire
Area Name


THEFT OF IDENTITY Distribution by Area
Number of Incidents
0
1000
2000
3000
4000
77th Street
Central
Devonshire
Foothill
Harbor
Hollenbeck
Hollywood
Mission
N Hollywood
Newton
Northeast
Olympic
Pacific
Rampart
Southeast
Southwest
Topanga
Van Nuys
West LA
West Valley
Wilshire
Area Name



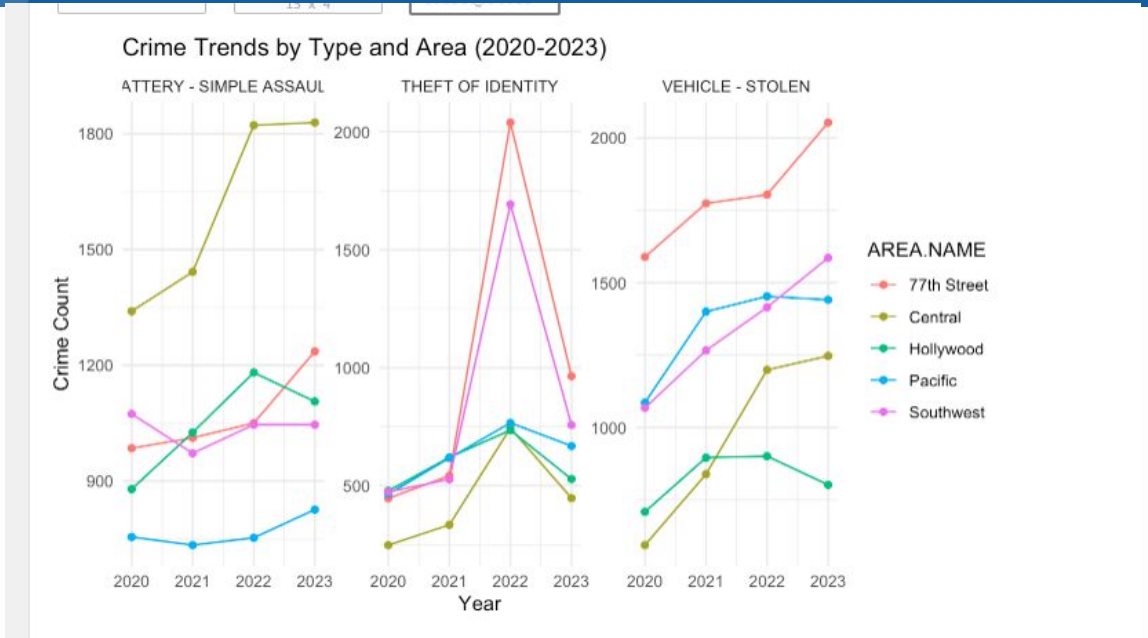
Top 3 Crimes:

1. BATTERY - SIMPLE ASSAULT
2. THEFT OF IDENTITY
3. VEHICLE - STOLEN

Top 5 Areas:

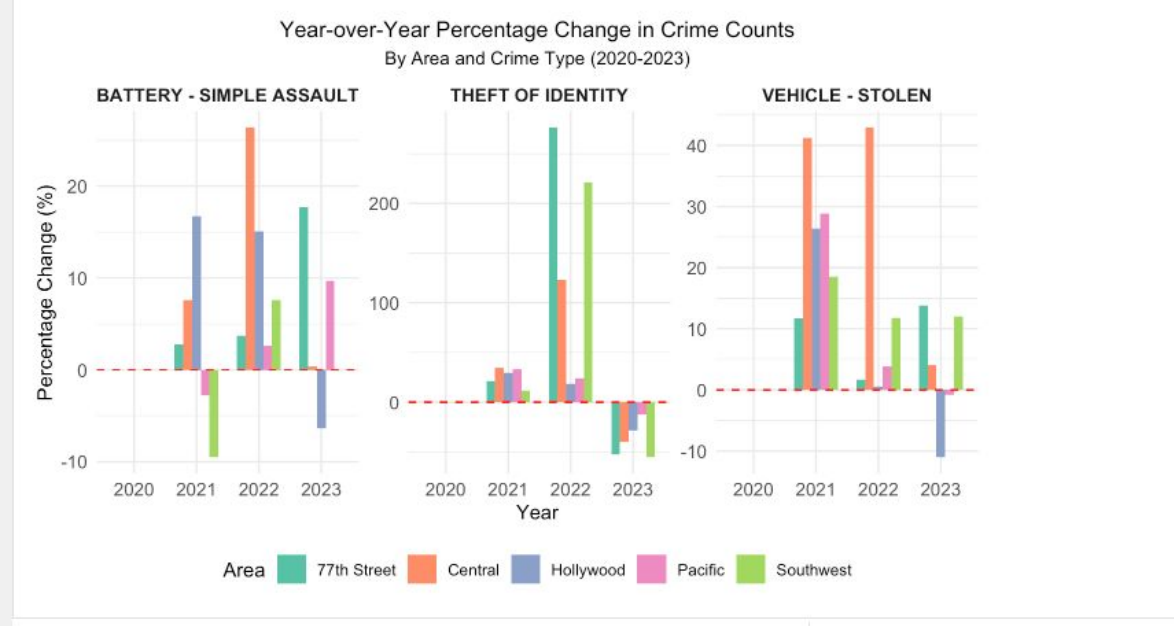
1. 77th Street
2. Central
3. Hollywood
4. Pacific
5. Southwest

Crime Trend by Type and Area

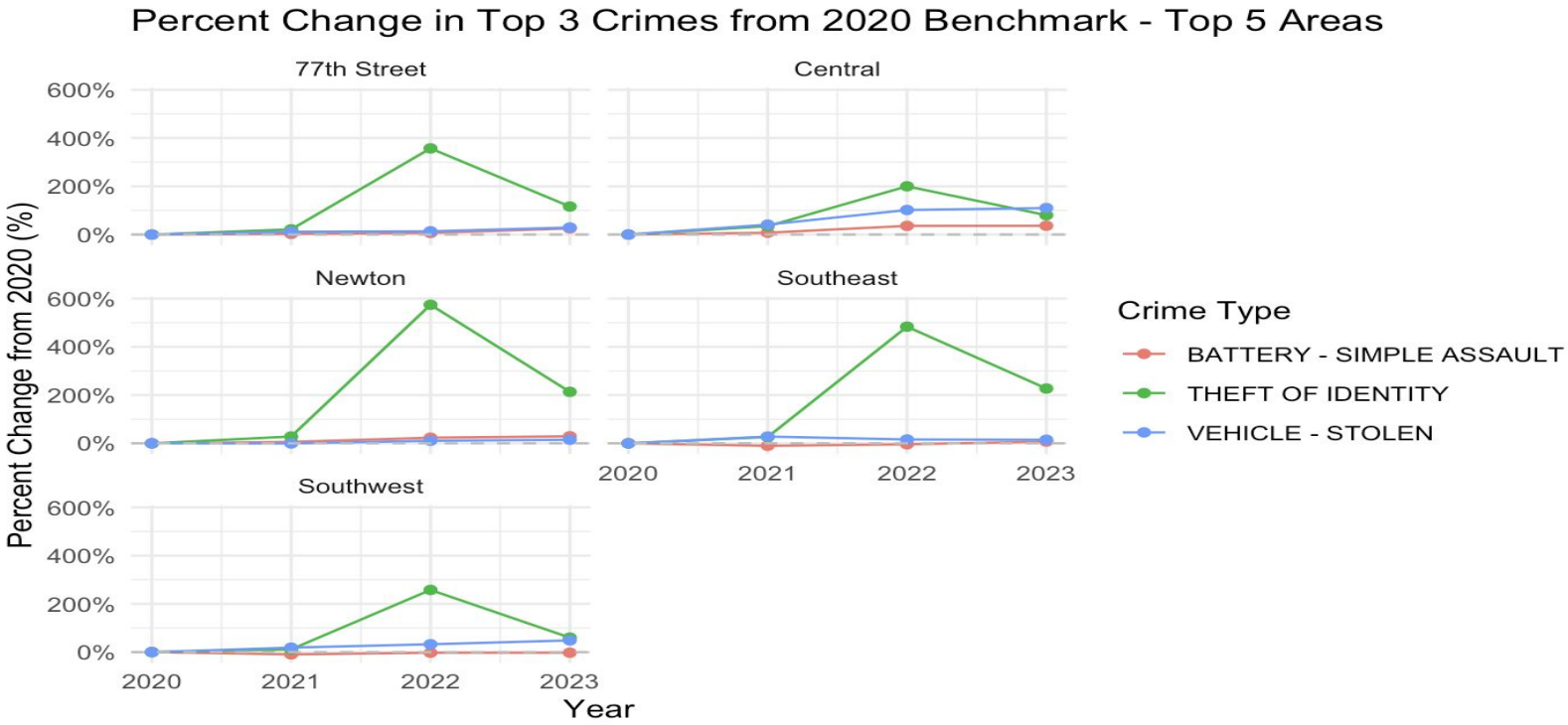


- Battery - Simple Assault: Central area peaks at 1,800 cases (2022)
- Theft of Identity: Dramatic spike in 2022 (2,000+ cases)
- Vehicle Theft: Steady increase, 77th Street reaching 2,000 cases by 2023

Year-over-Year Percentage Change in Crime Counts



- Central shows highest volatility
- Pacific shows most stable patterns
- 77th Street shows steady increases



This analysis highlights Theft of Identity as an emerging concern in multiple areas, suggesting a need for targeted intervention.

Peak Year: 2022

- Highest crime rates in most areas.
- Identity theft and battery assaults reached maximum levels.
- Vehicle thefts continued to rise.

Area-Specific Issues

- **Central Area**: Most affected by battery assaults.
- **77th Street**: High vehicle theft rates.

Conclusion for Q1

- The ANOVA analysis indicates that the crime counts vary by both the area and crime type.
- This suggests that some areas might experience higher incidences of certain crime types than others
- Some crime types occur more frequently regardless of location.
- Crime trends vary by area and type, indicating that crime prevention strategies may need to be tailored specifically to each area's challenges.
- The ANOVA test shows that both area and crime type significantly impact crime counts in Los Angeles

SMART QUESTION 2

Which neighborhoods in Los Angeles have experienced the most significant increases in crime rates from 2020 to 2023 with particular attention to demographic factors (race and sex of victims), and what insights can be drawn from Area's significant increase in crimes?

Calculating Year-Over-Year Percentage Change:-

1. **High Crime Growth**: Central, Rampart, Wilshire, and Olympic areas show the highest crime increases from 2020 to 2023, with Central leading at 46.18%.

2. **Consistent Crime Challenges**: Newton and North Hollywood have steady crime growth, indicating persistent issues that need continuous monitoring.

3. **Stable Crime Rates**: 77th Street and Southeast show minimal increases (4.5% and 4.07%, respectively), suggesting effective crime control in these areas.

AREA.NAME	2020	2023	percent_change_2020_2023
77th Street	13343	13944	4.50
Central	11600	16957	46.18
Devonshire	7982	9762	22.30
Foothill	7106	7155	0.69
Harbor	8874	9125	2.83
Hollenbeck	7805	8401	7.64
Hollywood	10171	11447	12.55
Mission	8480	8973	5.81
N Hollywood	10167	11548	13.58
Newton	9994	11926	19.33
Northeast	8452	9707	14.85
Olympic	9639	11739	21.79
Pacific	11575	13772	18.98
Rampart	9025	11527	27.72
Southeast	10847	11288	4.07
Southwest	11178	13109	17.28
Topanga	8106	9636	18.87
Van Nuys	8763	9936	13.39
West LA	9309	10578	13.63
West Valley	8091	9930	22.73
Wilshire	9291	11707	26.00

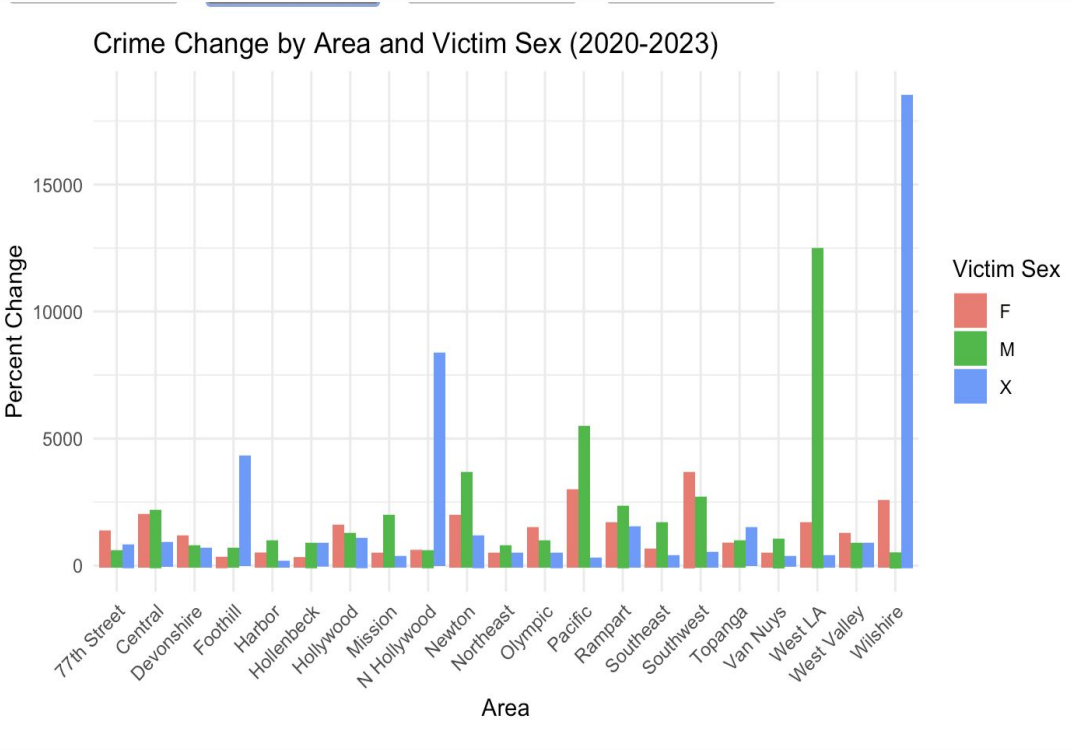
Top 3 Crimes in Areas with Highest Increases

AREA.NAME <chr>	Crm.Cd.Desc <chr>	2020 <int>	2023 <int>	count_2020 <int>	count_2023 <int>	percent_change <dbl>	absolute_change <int>
Central	VEHICLE, STOLEN - OTHER (MOTORIZED SCOOTERS, BIKES, ETC)	1	56	1	56	5500	55
Central	PICKPOCKET	15	280	15	280	1767	265
Central	SHOPLIFTING-GRAND THEFT ($950.01 & OVER)	15	71	15	71	373	56
Devonshire	VEHICLE, STOLEN - OTHER (MOTORIZED SCOOTERS, BIKES, ETC)	1	28	1	28	2700	27
Devonshire	PICKPOCKET	1	12	1	12	1100	11
Devonshire	SODOMY/SEXUAL CONTACT B/W PENIS OF ONE PERS TO ANUS OTH	1	9	1	9	800	8
Rampart	PICKPOCKET	2	50	2	50	2400	48
Rampart	VEHICLE, STOLEN - OTHER (MOTORIZED SCOOTERS, BIKES, ETC)	2	41	2	41	1950	39
Rampart	SHOPLIFTING-GRAND THEFT ($950.01 & OVER)	6	120	6	120	1900	114
West Valley	BOMB SCARE	1	11	1	11	1000	10
West Valley	STALKING	1	4	1	4	300	3
West Valley	BATTERY ON A FIREFIGHTER	2	7	2	7	250	5
Wilshire	VEHICLE, STOLEN - OTHER (MOTORIZED SCOOTERS, BIKES, ETC)	1	34	1	34	3300	33
Wilshire	PICKPOCKET	5	77	5	77	1440	72
Wilshire	SHOPLIFTING - PETTY THEFT ($950 & UNDER)	216	1381	216	1381	539	1165

1. **Rising Theft and Pickpocketing**: Central, Devonshire, Rampart, West Valley, and Wilshire show high increases in theft-related crimes, particularly vehicle theft and pickpocketing.
2. **Targeted Crime Types**: Specific crimes, like pickpocketing in Central and bomb scares in West Valley, highlight areas needing focused crime prevention.
3. **Overall Increase in Property Crimes**: The data shows a notable rise in property crimes across these top neighborhoods, pointing to changing crime patterns that may require specific responses.

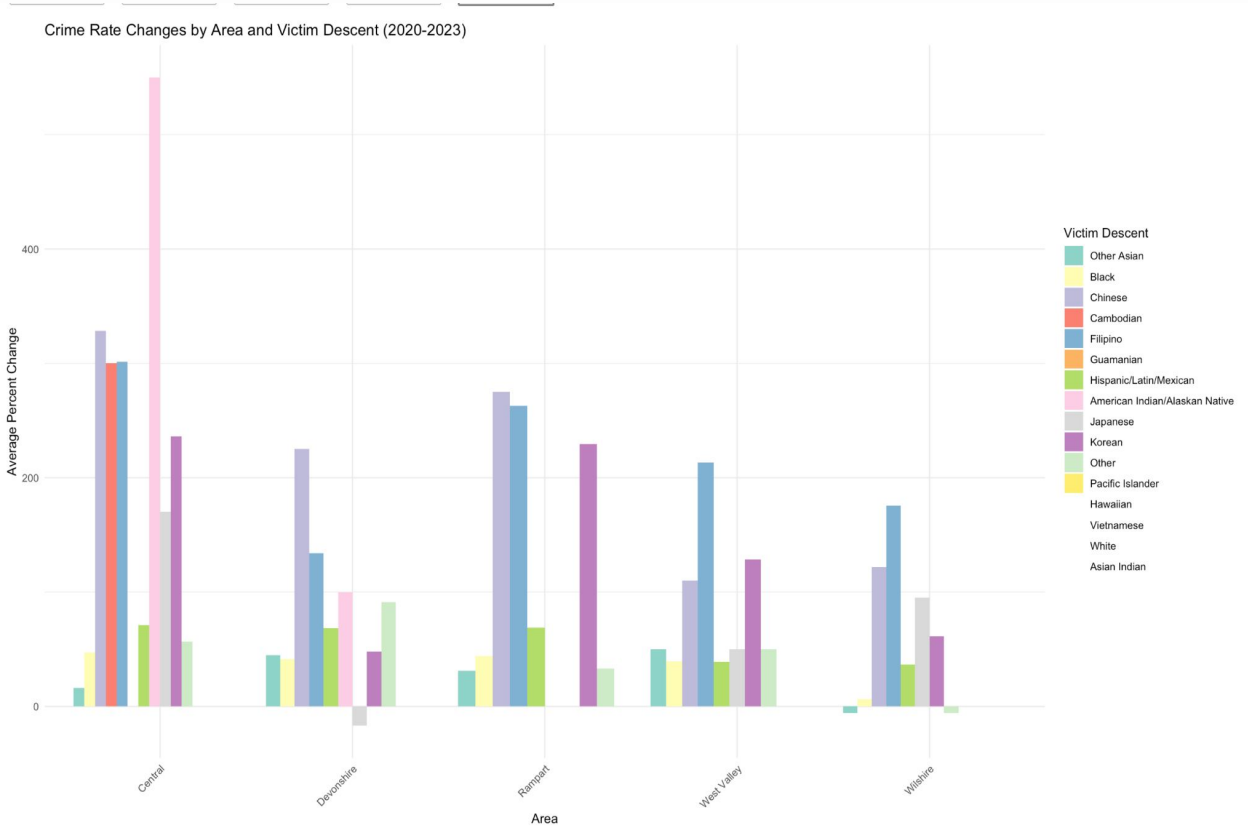
Crime Change Analysis by Sex and Race :-

1. **Rise in Unknown Gender Cases**: Newton, West LA, and Wilshire show high crime growth in unknown gender cases, hinting at data gaps or rising incidents.
2. **Gender-Specific Hotspots**: Wilshire and West LA see significant crime increases for both genders.
3. **Area-Specific Trends**: Pacific and Rampart show growth in male victim cases, while Foothill sees more growth among female victims, highlighting demographic-specific patterns.



Crime Change Analysis by Sex and Race

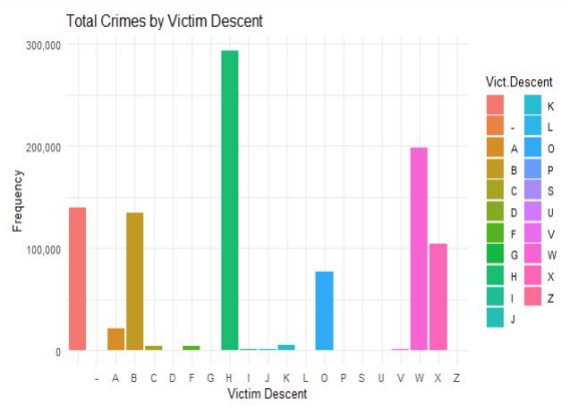
1. **High Growth in Unknown Descent**: Wilshire shows a major increase in crimes with unknown descent victims, suggesting data collection gaps.
2. **Targeted Descent Groups**: Central, Devonshire, and Rampart report high crime growth for Filipino, Indian, and Korean victims, indicating possible targeted impacts.
3. **Area-Specific Patterns**: Unique crime trends across areas highlight the need for tailored strategies based on neighborhood demographics.



SMART QUESTION 3

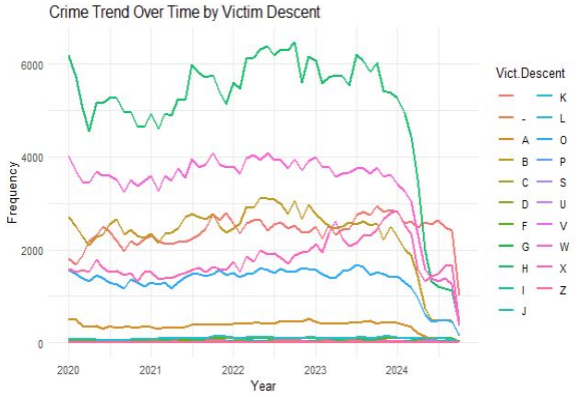
How does the frequency of crimes in Los Angeles vary by victim descent, and are there significant geographic patterns (based on latitude and longitude) associated with specific victim groups?

Total Crimes Distribution based on Victim Descent



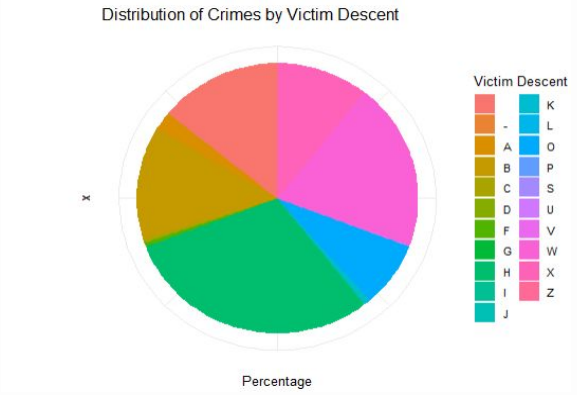
Bar Plot Representation

- Highest Crime Frequency: Victim descent groups "G" and "W" reflect the highest crime frequencies, with "G" reaching nearly 300,000 incidents and "W" exceeding 200,000.
- Smaller Group Representation: Certain groups like "C", "K", "O" display much lower frequencies, indicating smaller reported incidents of crime.



Line Plot Analysis

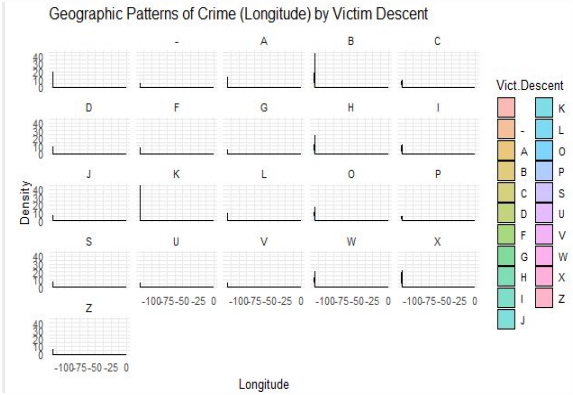
- Overall Trend: The crime frequency trends for various victim descent groups from 2020 to 2024. Descent group "G" consistently has the highest crime frequency.
- Steady vs. Fluctuating Trends: While groups like "G" and "W" exhibit some fluctuation, other groups, such as "C" and "I", remain relatively stable but at much lower frequencies.



Pie Chart Overview

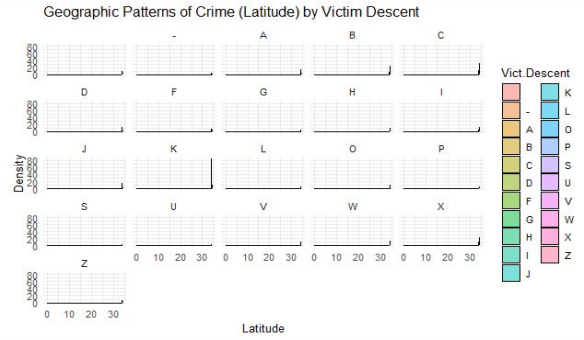
- Largest Victim Groups : Certain descent categories which include B,G,O have a higher proportion of crime victims.
- Smaller Victim Groups: Categories such as X, Y, Z show lower victim percentages, suggesting these groups experience fewer recorded crimes.

Crime activities with regards to Geopatterns



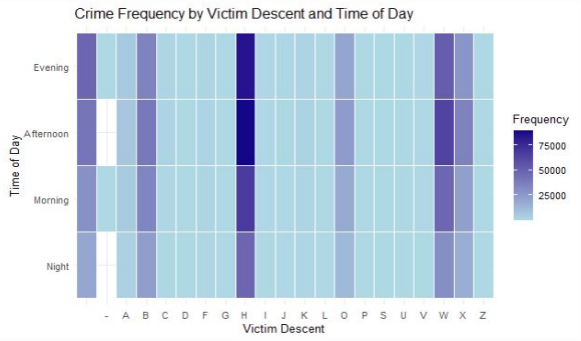
Multiple Density Plot for Longitude

- **Sparse Distribution for Most Groups:** The density curves are relatively flat, indicating a more dispersed or low-density crime pattern across geographic areas, without significant clustering.
- Low Density Across Most Longitudes: The majority of victim descent categories show minimal density across longitudes, with few or no peaks.



Multiple Density Plot for Latitude

- Most victim descents show minimal variation or activity across the latitude range (0-30), with generally low or flat density.
- A few categories, like "P" and "C," have small but density spikes..



Heat Map Quadrants

- **Notable Trends**: Certain descent categories, like **G** and **H**, experience significantly higher crime frequencies during **Evening** hours.
- **Consistent Crime Levels Across Groups**: Most descent categories experienced consistent level of crime frequency throughout the day, considering fews exceptions that show peak times, especially in the evening.

Statistical Inferences and Further Analysis

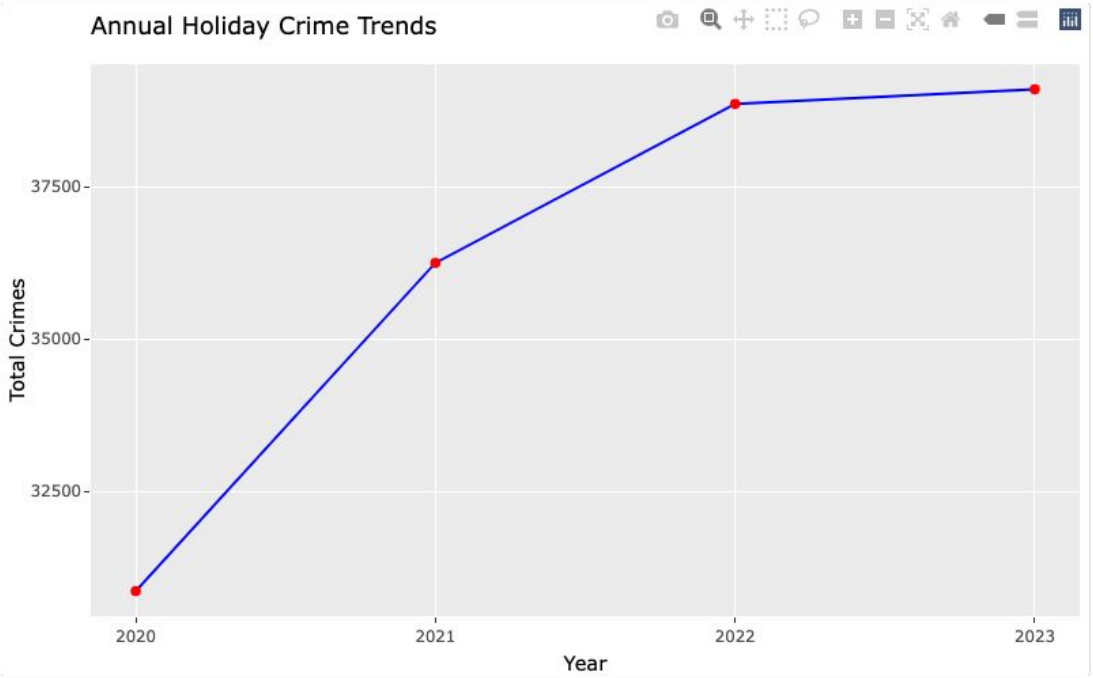
- The ANOVA tests for Longitude and Latitude suggest that crime distribution can be analysed and considered as spatial distribution.
- The ANOVA test including Coordinates and Victim Descent highlights the relationship between victim descent and latitude is more dispersed.
- T-Test Analysis shows moderate levels of significant variations along **latitude** than **longitude**.
- Correlation Matrix Analysis suggest that there has been reflecting regional hotspots in towards the boundaries of east-west location for Group B & H which fluctuating frequency.
- **Conclusion: - Victim Descent has significant correlation with geographical patterns, with specific descent groups Group-B, H & G.**

SMART Question 4

How do crime rates fluctuate during the holiday season, particularly in November and December, and what types of crimes occur during these months?

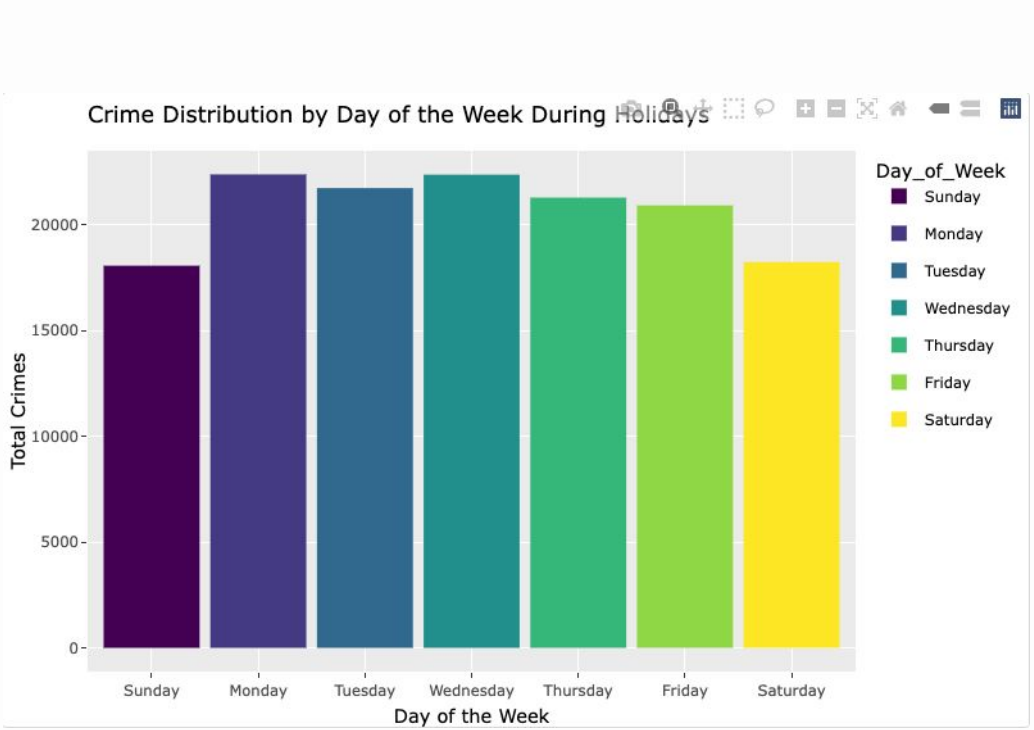
Annual Holiday Crime Trends Analysis

- From 2020 to 2023, there is a noticeable upward trend in total crimes during holiday periods, showing an increase each year.
- The largest increase occurs between 2021 and 2022, suggesting a potential impact of post-pandemic conditions or other socio-economic factors.
- The trend slightly stabilizes between 2022 and 2023, indicating that holiday crime rates might have reached a level off.



Crime Distribution by Day of the Week During Holidays

- **Higher crime rates on weekdays:** The graph shows a significant number of crimes occurring from Monday to Friday compared to weekends.
- **Peak on Wednesday:** Wednesday records the highest number of crimes during the holiday season, indicating a possible trend or specific trigger.
- **Lowest on Sunday:** Observably lower crime rates on Sundays may suggest effective weekend policing or fewer active targets.

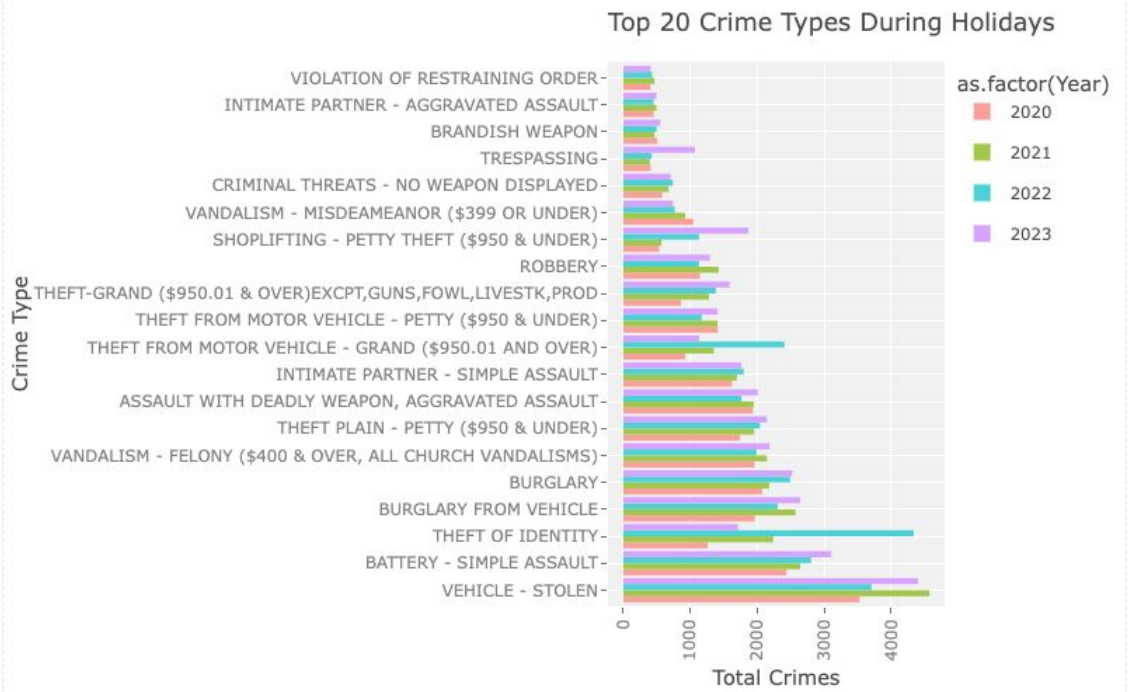


Top 20 Crime Types During Holidays

- **Vehicle-related crimes, especially "Vehicle - Stolen" and "Theft from Motor Vehicle", appear to be among the highest across all years, indicating that vehicle-related crimes are a consistent concern during holiday periods.**

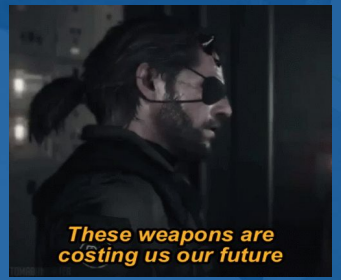
- **"Theft Plain - Petty ($950 & Under)" and "Theft Grand ($950.01 & Over)" have significant counts, suggesting that both petty and grand theft are common during the holidays. Notably, 2022 shows a higher number of theft-related crimes in both categories.**

- **"Theft of Identity" shows a notable increase, especially in 2022, indicating that identity theft may be on the rise during holiday seasons.**



SMART QUESTION 5

Which crimes in Los Angeles exhibited the highest weapon usage, and which ethnicities and genders showed the most significant weapon involvement over the last five years?



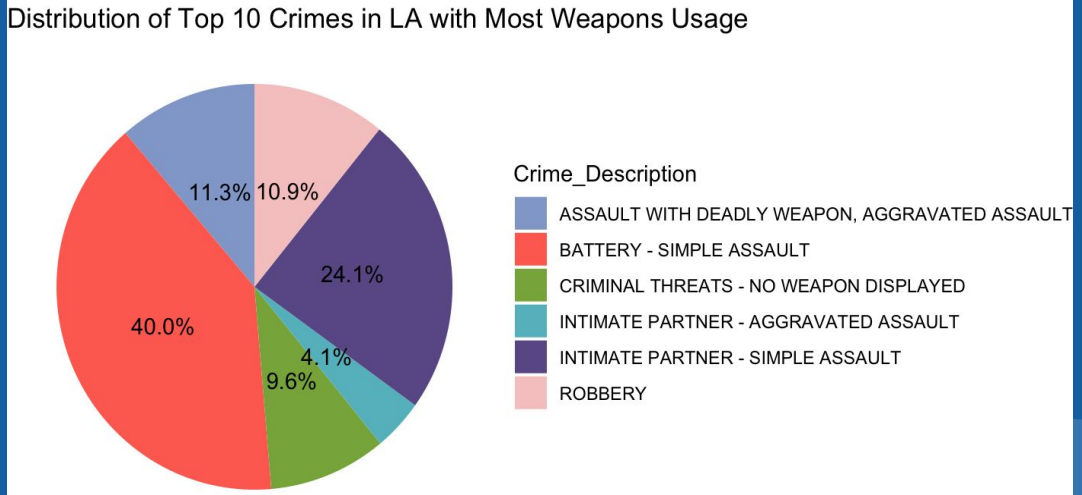
DISTRIBUTION OF CRIMES WITH MOST WEAPONS USAGE

- **Assaults** dominate the weapon-related crime landscape in LA, particularly **simple assaults**.
- **Intimate partner violence** (both simple and aggravated) is a prominent issue, reflecting recurring patterns of domestic conflict.
- **Robbery and aggravated assaults** occur but are less frequent, suggesting that high-severity weapon crimes are comparatively limited.

A tibble: 10 x 3

Crime_Description <chr>	Weapons_Description <chr>	count <int>
BATTERY - SIMPLE ASSAULT	STRONG-ARM (HANDS, FIST, FEET OR BODILY FORCE)	67439
INTIMATE PARTNER - SIMPLE ASSAULT	STRONG-ARM (HANDS, FIST, FEET OR BODILY FORCE)	43968
CRIMINAL THREATS - NO WEAPON DISPLAYED	VERBAL THREAT	17559
ROBBERY	STRONG-ARM (HANDS, FIST, FEET OR BODILY FORCE)	14010
ASSAULT WITH DEADLY WEAPON, AGGRAVATED ASSAULT	HAND GUN	7658
INTIMATE PARTNER - AGGRAVATED ASSAULT	STRONG-ARM (HANDS, FIST, FEET OR BODILY FORCE)	7511
ASSAULT WITH DEADLY WEAPON, AGGRAVATED ASSAULT	STRONG-ARM (HANDS, FIST, FEET OR BODILY FORCE)	7122
ASSAULT WITH DEADLY WEAPON, AGGRAVATED ASSAULT	UNKNOWN WEAPON/OTHER WEAPON	5888
ROBBERY	HAND GUN	5830
BATTERY - SIMPLE ASSAULT	UNKNOWN WEAPON/OTHER WEAPON	5725

1-10 of 10 rows



Statistical Insights: Chi-Square Test Outcomes

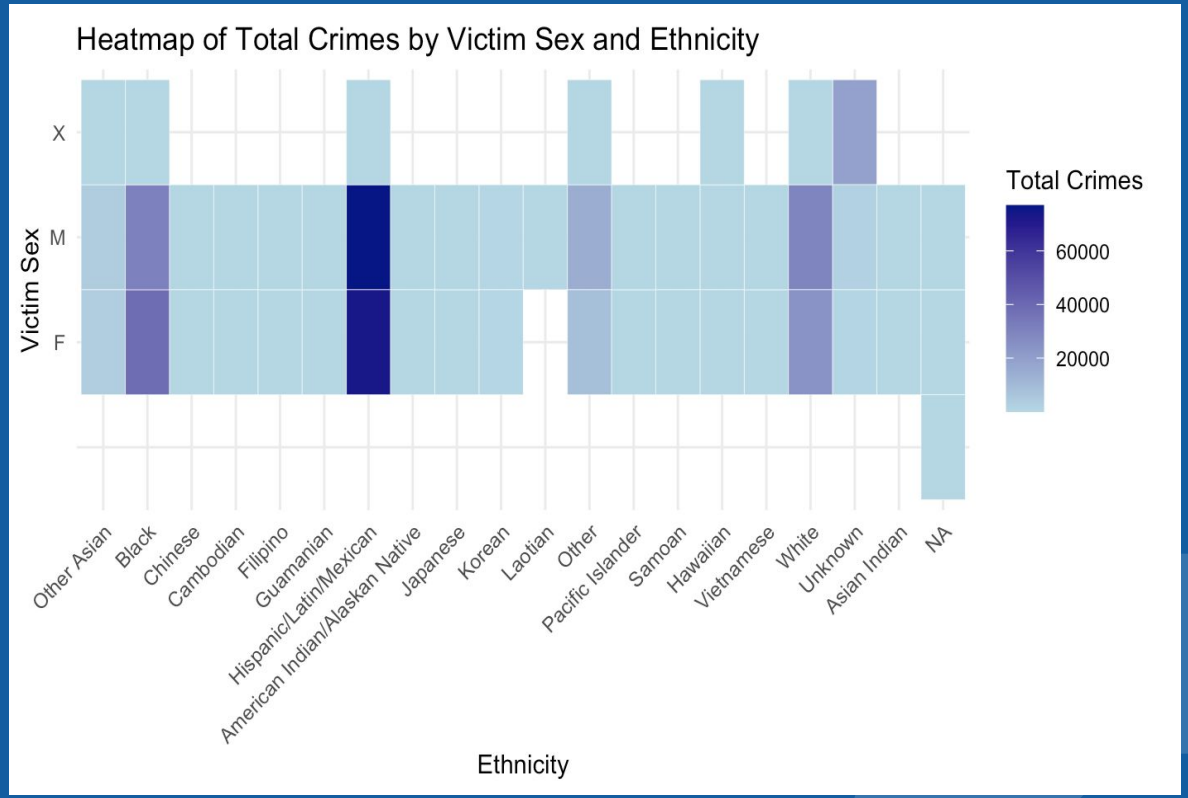
- Statistically significant association found between the two categorical variables.
- Chi-Square Tests conducted on Victim Sex and Crime as well as Victim Descent, and Crime.
- High X-Squared values indicating difference in distribution of the features.
- Accept the alternative hypothesis.(p -value < 0.05)
- Conclude that the variables are dependent on each other.

```
        Pearson's Chi-squared test

data:  contingency_Sex
X-squared = 1e+05, df = 363, p-value <2e-16
```

```
        Pearson's Chi-squared test

data:  contingency_descent
X-squared = 95725, df = 2299, p-value <2e-16
```

Crime Patterns Across Victim Demographics

- **Black and Hispanic/Latino/Mexican** groups exhibit the highest crime counts, indicated by darker shades.
- Crimes against **females** appear less frequent overall, with relatively lighter shades in general.
- The Unknown Sex category also has significant counts across several ethnicities, particularly **Black, Hispanic/Latino/Mexican, and White** groups.

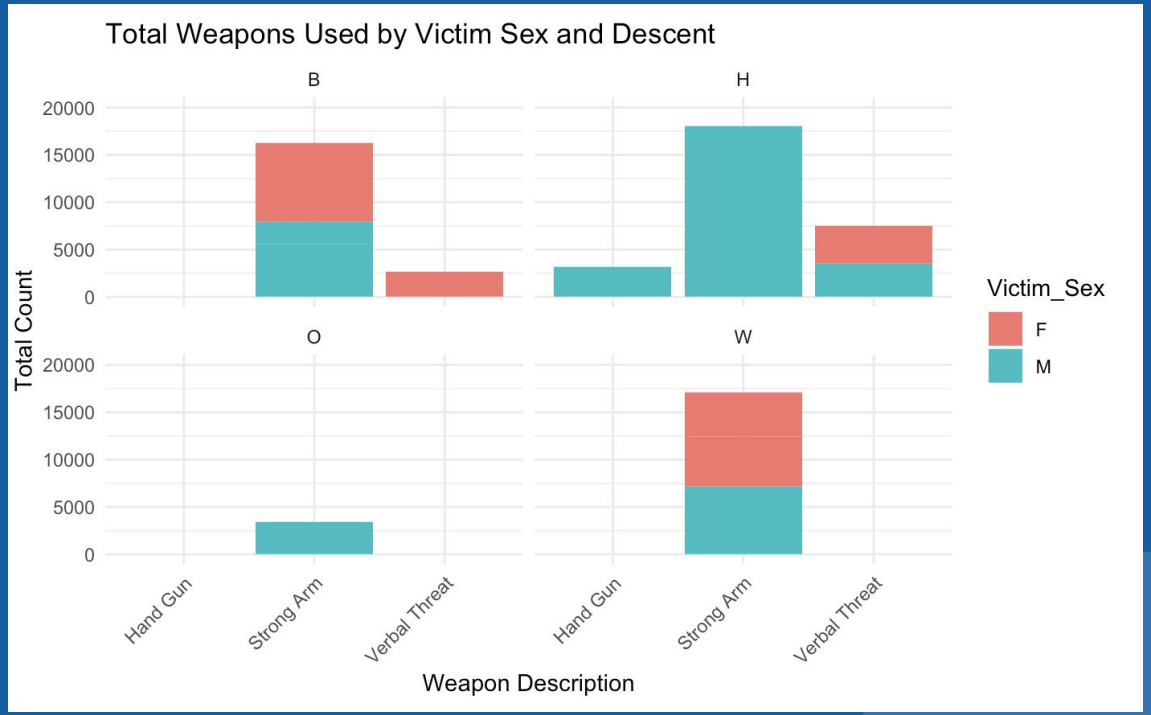


Analyzing Weapon Usage: Victim Sex and Descent

Across all categories, males (teal) are more frequently victims, especially in cases involving firearms.

Female victims (red) appear more frequently in non-weapon-based incidents

Handgun usage is notably higher for Black (B) and Hispanic (H) victims, with males being disproportionately represented.



Conclusion

01

Area can indeed be considered a significant factor in understanding and predicting which types of crimes are more likely to occur.

02

Crime trends in Los Angeles neighborhoods reveal significant increases in property crimes and distinct patterns across demographics, highlighting the need for targeted, area-specific strategies to effectively address and prevent crime growth.

03

There are notable geographical patterns for victim descent in North-South section of LA & less patterns were noticed in East-West sections.

04

The data suggests a need for better security and public awareness from November to December to reduce crime.

05

Battery is the crime most commonly associated with weapon usage in LA, with Hispanic individuals and male population showing significant involvement in these offenses as victims.