

TEMPORAL, DEMOGRAPHIC AND SPATIAL ANALYSIS FOR RAPE CRIMES IN LOS ANGELES

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Motivations & Objectives

- **Motivations:** Sexual assaults against women have been a serious issue in many societies, which pose tremendous threats to public safety. Inspired by modern technology and data science techniques, we aim to apply analytical tasks on open-source data sets containing records from the police departments, and discover valuable information that can be used to increase the safety of our society and potentially lower the rape crime rate.
- **Research Objective:** Discover patterns of rape crimes in terms of time of crime occurrence, demographics of victims, and locations with high rape crime rates.

Methods

- We used crime data from 2010 to 2019 which is transcribed from original crime reports from online open data source. In particular, we focused on data with crime description RAPE - FORCIBLE and RAPE - ATTEMPTED targeting females, and extracted information regarding race as well as time periods and locations where rape crimes occurred. Also, the proportions of rape crime across races and time periods were calculated for each year.
- After preprocessing data and performing exploratory data analysis, we used ANOVA, post-hoc analysis with Tukey's HSD methods, and chi-square test to determine whether there is significant difference in rape crime proportion by time, race and location.

Data Analysis & Visualization

1 Temporal Analysis

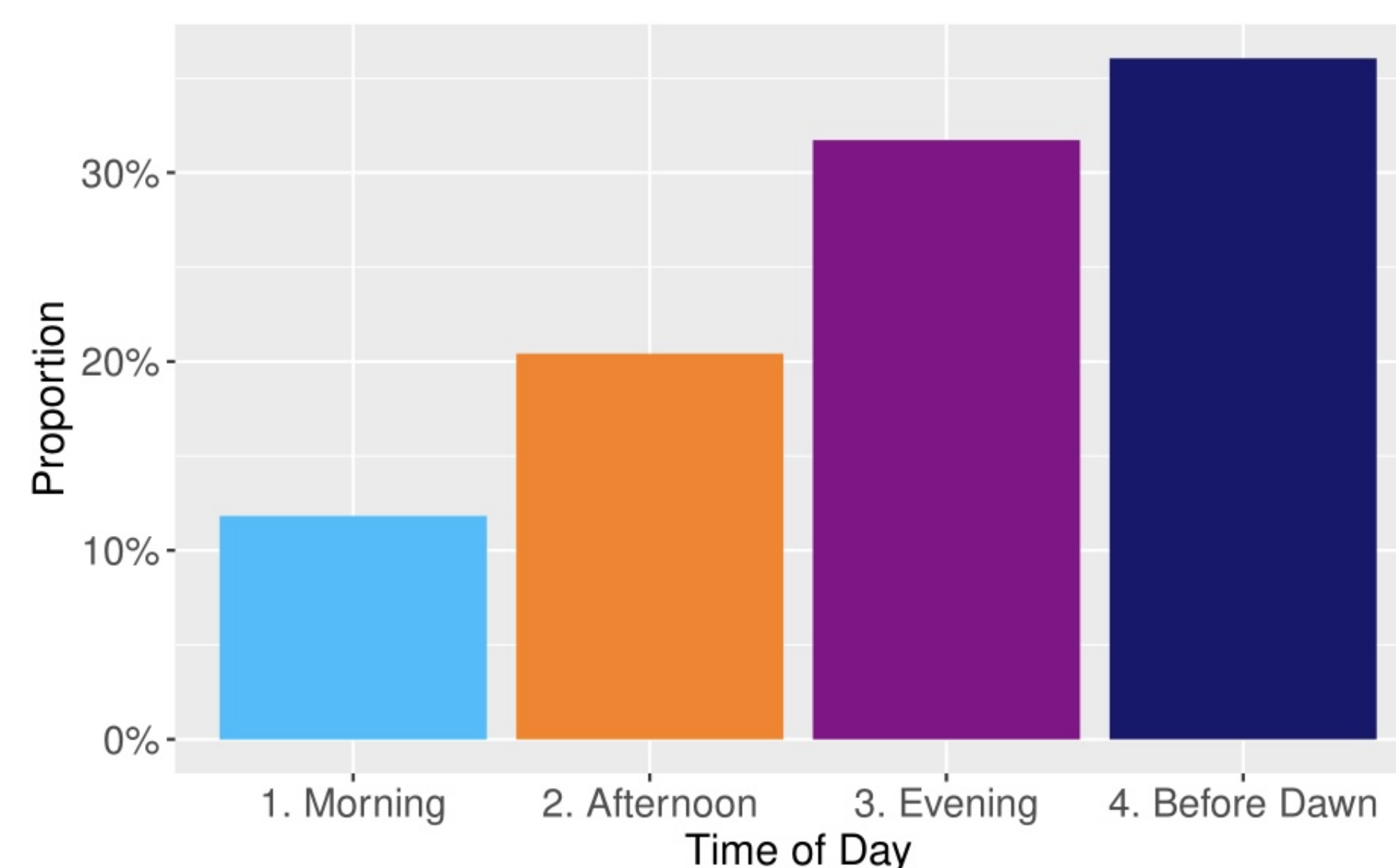


Fig. 1: Proportion of Rape Crime by Time

- We can observe that the proportion of rape crimes that happened before dawn (12:00am-5:59am) is significantly higher than all other three time periods, which matches to our test results. On the other hand, the morning time period, between 6:00am and 11:59am, has the least amount of reported rape crimes.
- The results from the ANOVA and post-hoc analysis agree with our graph. The Tukey's HSD tests show that all the pairwise p-values are significant, which indicates that the mean proportion of rape crimes committed at different times of a day are all different.

2 Demographic Analysis

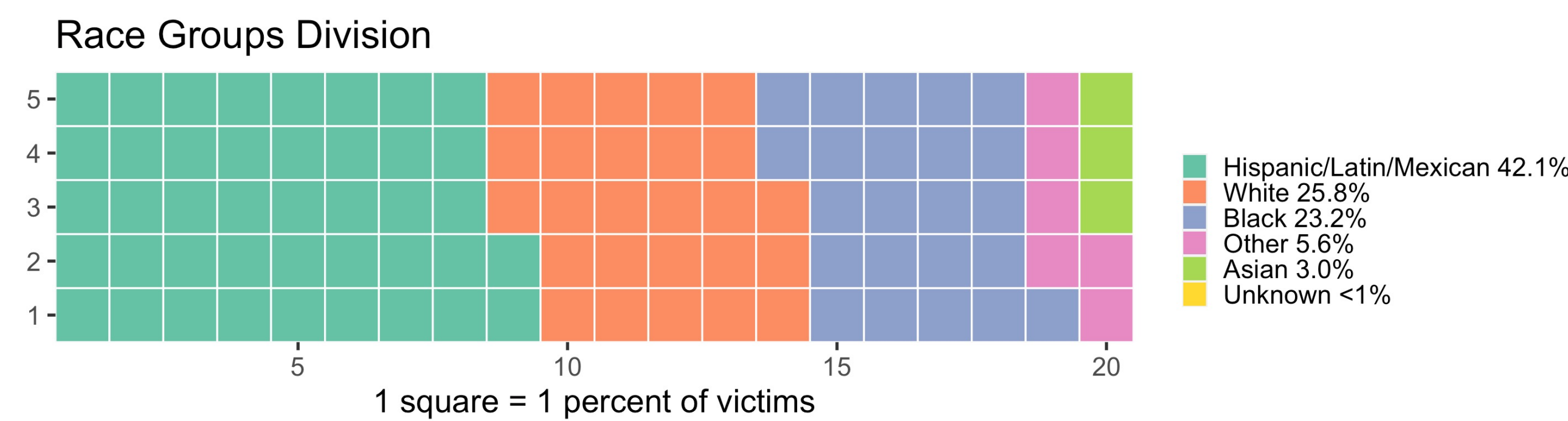


Fig. 2: Proportion of Rape Crime by Race

- We can observe that the proportion of rape crime happened on Hispanic/Latin/Mexican is significantly higher than all other races.
- ANOVA and post-hoc analysis verify this observation. The Tukey's HSD tests show that the mean proportion of rape crimes committed towards Hispanic/Latin/Mexican is significantly higher than every other race.

3 Spatial Analysis

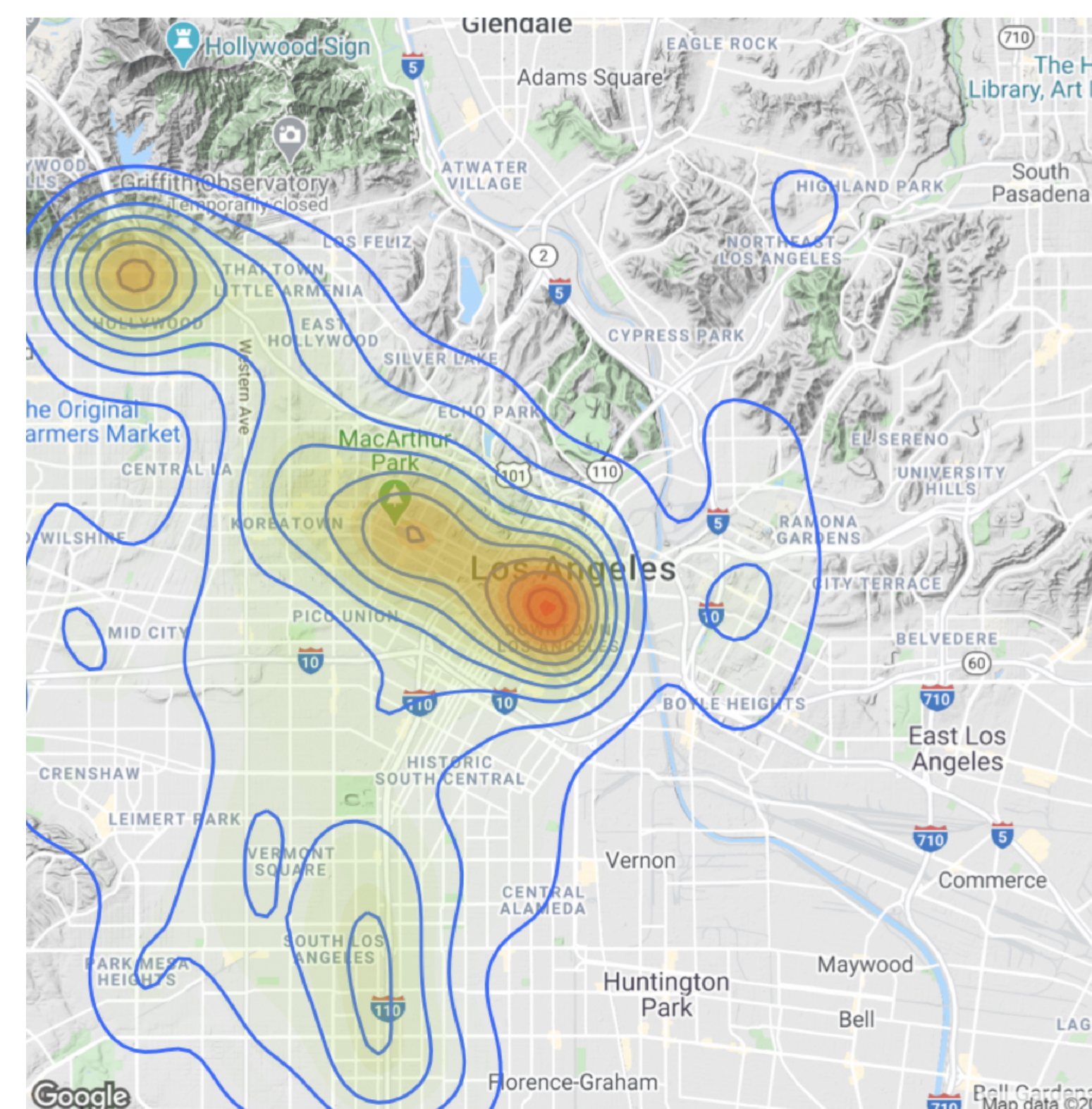


Fig. 3: Heatmap of Rape Crimes in LA

- The heat map shows that rape crimes are more likely to happen in Downtown Los Angeles, Hollywood, and South Los Angeles.
- We tested the uniformity of the data with chi-square test, and it gives a p-value of 2.2e-16. Therefore, we object the null hypothesis and conclude that rape crimes do not occur with equal probabilities in different areas of LA.

Conclusions & Interpretations

- Since the time period between evening and before dawn has the most frequent rape crime rate, women should be advised to not stay out alone at these times, or should be accompanied with trusted people. We can add more police patrol during evening and dawn to secure a safe environment.
- Hispanic/Latin/Mexican and white women are particularly vulnerable to rape crimes.
- Different regions of LA have non-uniform distributions of rape crimes. This analysis corroborates the graphical illustration where downtown LA, Hollywood, and South LA have more crimes.

Summary

- Rape crime is one of the most harmful and punished criminal activities in the US. From our analysis, such type of crimes do not occur uniformly across time of day, races, and geographical regions. By exploring these irregularities, we identified some crime patterns so that incidents can be foreseen and better prepared for. People can make informed decisions as to whether they should make trips to high crime locations during certain times, and if they decide to go, they would become more cautious and prepared for emergencies.
- In addition, our findings can be meaningful for redistribution of police power. For instance, areas such as Downtown LA probably need more police officers on patrol to provide a more safe environment for the local communities.

References

- <https://data.lacity.org/Public-Safety/Crime-Data-from-2010-to-2019/63jg-8b9z>