Crimes, Neighborhoods, and Schools in Chicago: Geospatial Analysis Project

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Introduction and Methods

Chicago's reputation for high crime has long been a focus of media and policy discussions. Schools, serving as both educational spaces and community hubs, require a safe environment for students and staff. This project aims to analyze crime distribution across Chicago, with a focus on identifying high-risk areas near schools through geospatial analysis.

Using data from the City of Chicago, I examined crime incidents, school locations, zip codes, and community areas. The data was transformed into a shapefile for mapping, and crime rates were categorized by zip code and community area using R Studio. Zip codes with crime incidences above the city's median (2,767 crimes) were marked in red, while those below were in green. A similar approach was applied to community areas using the mean crime rate (2,841 crimes).

To assess crime near schools, buffer zones of 0.5 and 1 mile were created, with a focus on incidents classified as criminal damage to property. Two maps were generated: one displaying school locations and another incorporating buffer zones with crime incidents. Bar charts were used to highlight the ten schools with the highest and lowest property crime within a 1-mile radius.

Findings

The first visualization[1] outlined the Chicago zip codes with the highest and lowest risk levels, based on crime incidences above or below the city's median. The pattern that emerged showed that high-risk zip codes tend to be concentrated toward the center of the city, while low-risk areas are located on the outskirts. When crime was categorized by community instead of zip code, a new pattern emerged.

The second visualization[2] mapped communities by their risk level, based on whether the amount of crime in the community was higher or lower than the mean rate for all communities. It illustrated two pockets of high-risk communities surrounded by low-risk communities, with one pocket in the north-central area and another in the south-central area, separated by a strip of low-risk communities. Interestingly, the third visualization[3], which highlighted only the community with the most incidents of crime

and the one with the fewest, found that both communities were located in the northern section of Chicago.

The fourth visualization[4] mapped where each school in Chicago is located, without any other data. The fifth visualization[5] built on the fourth by layering the 0.5 mile buffer zone and property crime incidents, showing a concentration of property crime in the northwest sector, which also has a high density of schools.

Additionally, two bar charts provided further insights into crime near schools. The first[6] presented the top ten schools with the highest number of property crimes within a one-mile buffer zone, with Bouchet School ranking first. The second[7] showed the ten schools with the least property crime within the same distance, with Ombudsman-Northwest High School having the lowest number of incidents.

The summary statistics of each shape file revealed that crime distribution in Chicago is highly uneven across communities and zip codes. [8]The maximum crime count in a community (8,522) is over 46 times higher than the minimum (182), suggesting that some communities experience dramatically higher crime rates than others. Similarly, the highest crime count in a zip code (7,586) is 151 times higher than the lowest (50), indicating that crime is highly concentrated in certain areas rather than evenly spread across the city.

Crime distribution at the community level[9] appears more skewed than at the zip code level. The mean crime count by community (2,250) is significantly higher than the median (1,666), suggesting a right-skewed distribution where a few high-crime communities pull the average upward. In contrast, for zip codes, the mean (2,841) and median (2,767) are closer, indicating a slightly more even spread of crime. However, some zip codes still experience exceptionally high crime rates.

School-related property crime[10] is also unevenly distributed. The fact that some schools have nearly 100 times more property crime than others (maximum: 383, minimum: 4) suggests that school location and surrounding neighborhood characteristics play a significant role in the amount of property crimes near a school.

Conclusions

After creating the maps and bar charts, the analysis revealed several key patterns in crime distribution. Communities in the northwest of Chicago should be most concerned about crime near their schools, as they not only have a higher risk level than average but also experience more incidents of property crime within 0.5 miles of their schools. Additionally, there is a band of communities in the middle of Chicago with a low crime risk at the community level, but when grouped by zip code, the same area appears high-risk. Therefore the categorization of an area as high-risk or low-risk should be taken into account but not relied on to be completely accurate due to the disparity depending on how it is measured. Finally the maps showed that the south of Chicago has more incidents of property crime than any other area, but the most concentrated area of property crime is in the northwest.

The large difference between the minimum and maximum crime values across all categories highlights that Chicago has distinct pockets of both very low-crime and extremely high-crime areas. Understanding what differentiates these areas could be key to designing targeted crime prevention strategies. By recognizing the disparities in crime distribution and the specific risks around schools, policymakers, and community leaders can take more informed steps toward reducing crime and improving safety in Chicago's neighborhoods. For example, if your school is located in a high-risk area with a large amount of property crimes within a 0.5 or 1 mile radius then it would be best to invest in more security measures.

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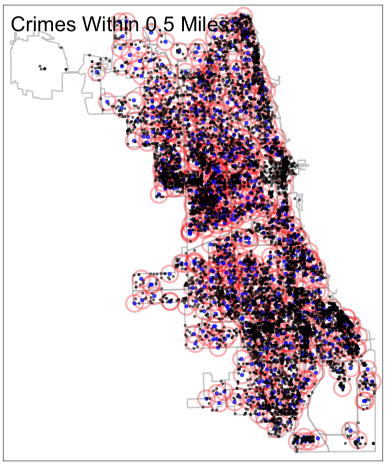

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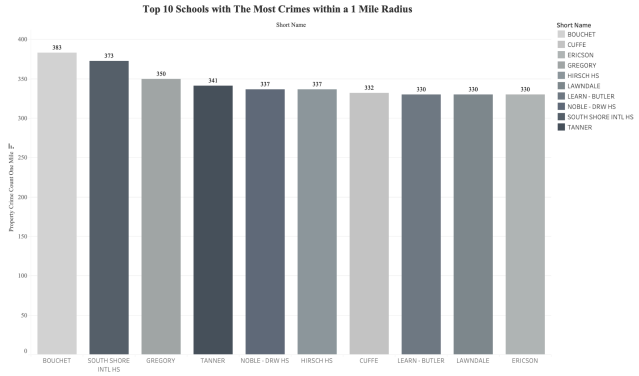
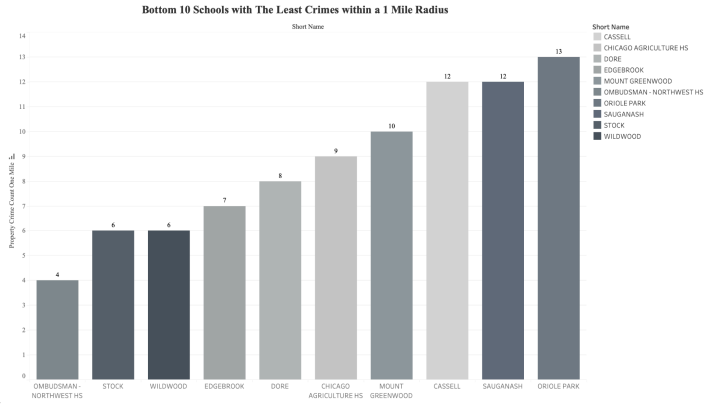


6 Sum of Property Crime Count One Mile for each Short Name. Color shows details about Short Name. The marks are labeled by sum of Property Crime Count One Mile.



7 Sum of Property Crime Count One Mile for each Short Name. Color shows details about Short Name. The marks are labeled by sum of Property Crime Count One Mile.

Summary Statistics

```
crime_count_by_zip
Min.   :  50
1st Qu.:1328
Median :2767
Mean   :2841
3rd Qu.:4113
Max.   :7586
```

```
crime_count_by_community
Min.   : 182
1st Qu.: 817
Median :1666
Mean   :2250
3rd Qu.:3072
Max.   :8522
```

```
property_crime_count_one_mile
Min.   :  4.00
1st Qu.: 84.25
Median :125.00
Mean   :138.30
3rd Qu.:184.00
Max.   :383.00
```