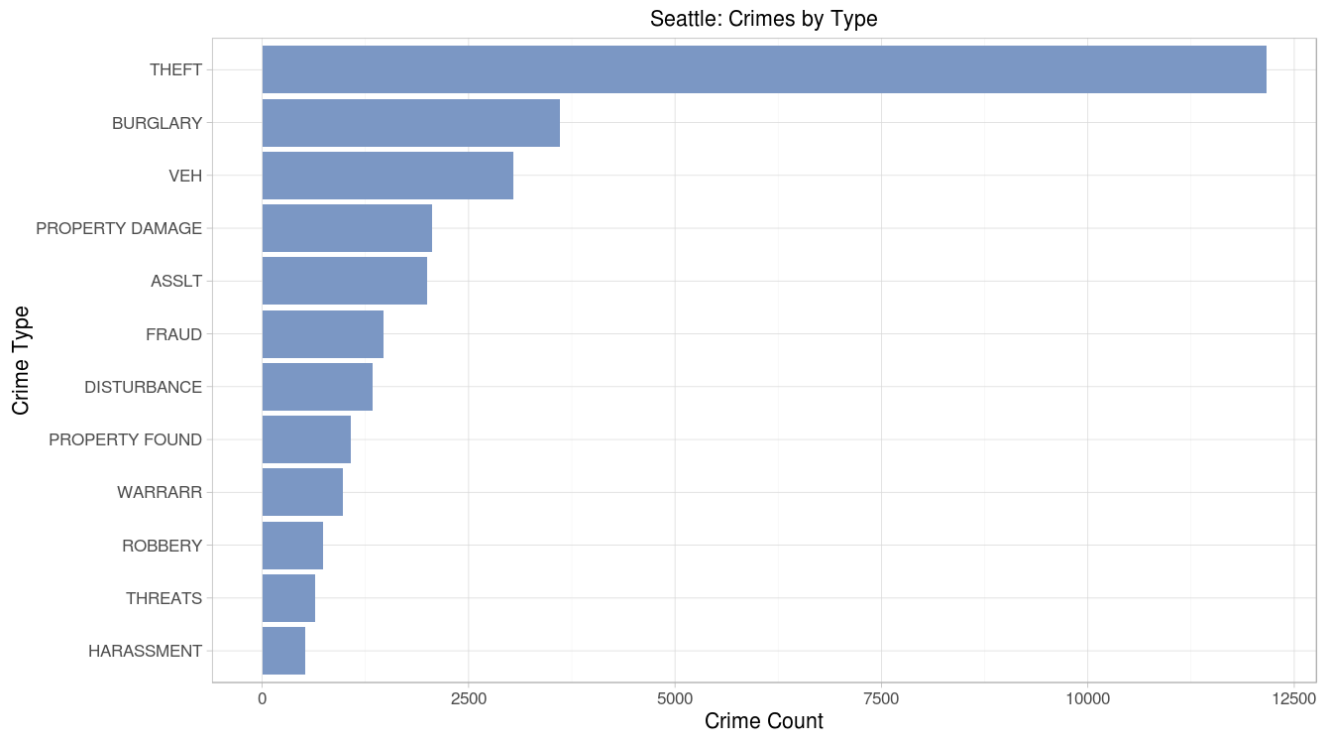**Main Findings**

1. **Most criminal Precincts of Seattle are North and West. (West is where Downtown is located). The safest is South West Precinct.**
2. **North is #1 in Theft and Burglary, while West is #1 in Robbery and Assaults (more violent crimes).**
3. **The densest criminal area is in the Downtown. Next comes University District, then Ballard.**
4. **University District has approx. 6 times less incident density than Downtown, and is even much lower on violent crimes.**

We will reach these conclusions step by step, beginning at simple incident types analysis.
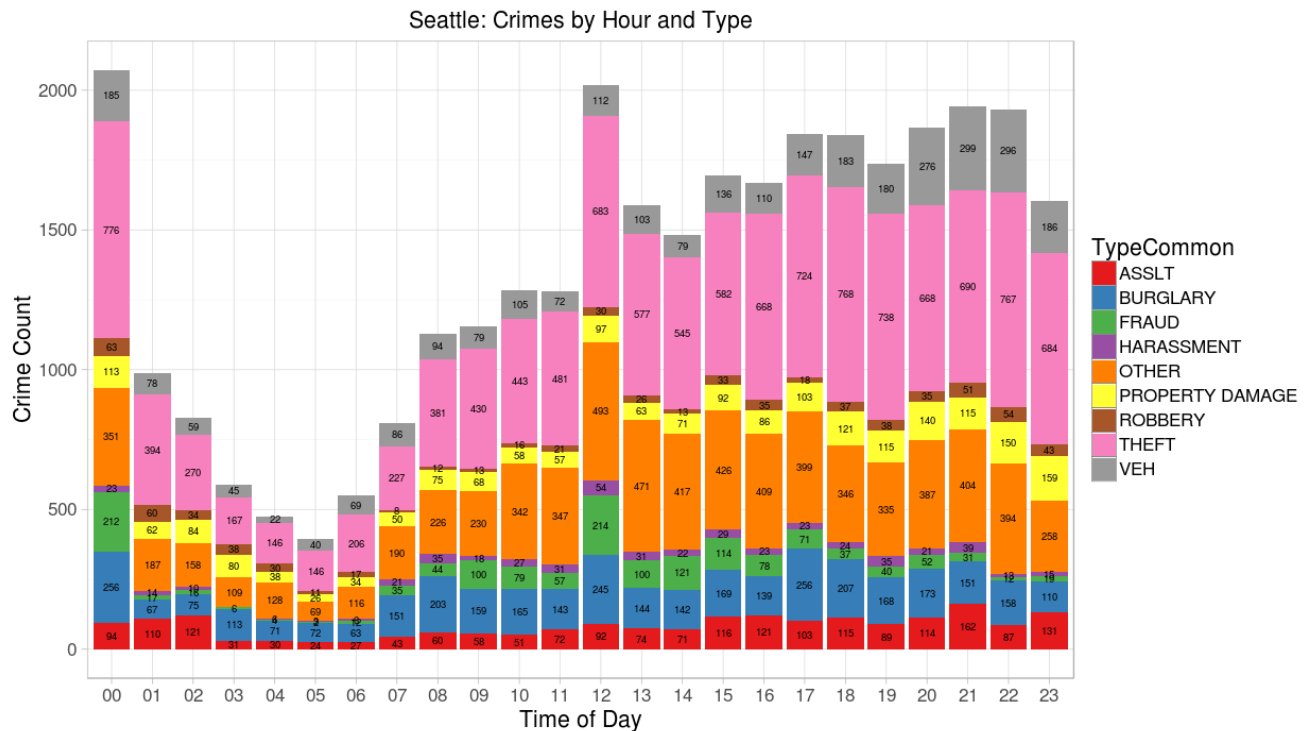
Incident Types

Incident types were first analyzed to determine most common types. Groups of initial types were first grouped by prefix to get to 45 types, e.g. THEFT-CARPROWL and THEFT-OTH were all grouped by type THEFT. These were then sorted by count:

The 8 most common and interesting types were then considered – 'ASSLT', 'BURGLARY', 'FRAUD', 'HARASSMENT', 'PROPERTY DAMAGE', 'ROBBERY', 'THEFT', 'VEH', while all others were considered of type 'OTHER'.

Hours of Day

Then counts of incidents per hour of day was plotted, additionally sliced by incident types.

Observations:

- The total number of incidents has two peaks – at noon and at midnight. The lowest is at 5 am, and the period from 3 to 6 am is when incidents are low.
- Second half of the day, the period between noon and midnight hours (inclusive) is when number of incidents are almost equally high every hour.
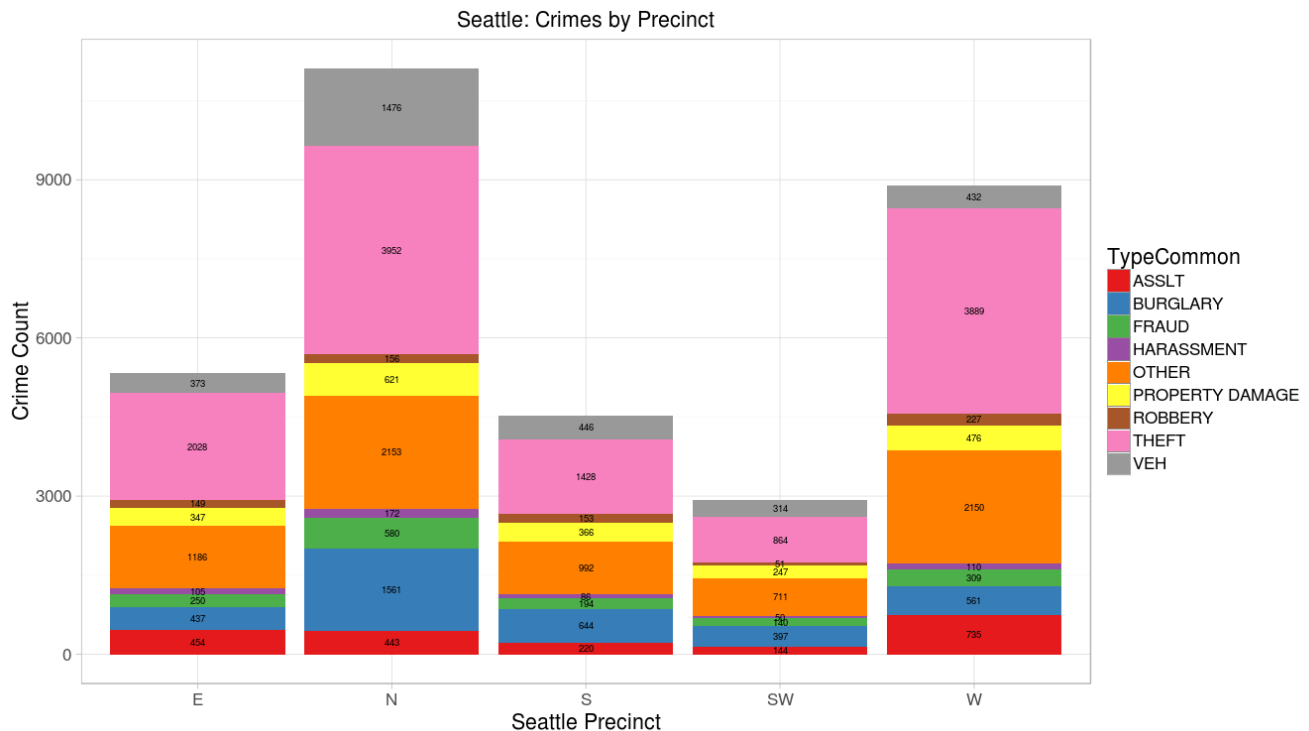
Observation on incident types:

- Though overall evening peak is at midnight hour, assaults' peak is earlier – at 9 pm. Robberies' evening peak is 9-10 pm, and then again even higher at midnight.

These observations were not our main findings, but still worth mentioning. Also, I find that combining several bar plots into one stacked bar plot with numbers makes it more informative and allows for making observations without having to look at several plots.

Precincts

It seemed worthwhile making geographical analysis based on Seattle precincts, as the city is divided by 6 of them – North, West, East, SouthWest and South, see
http://www.seattle.gov/police/maps/precinct_map.htm

The incidents were then analyzed again with a stacked bar plot by Precinct and Incident Types.
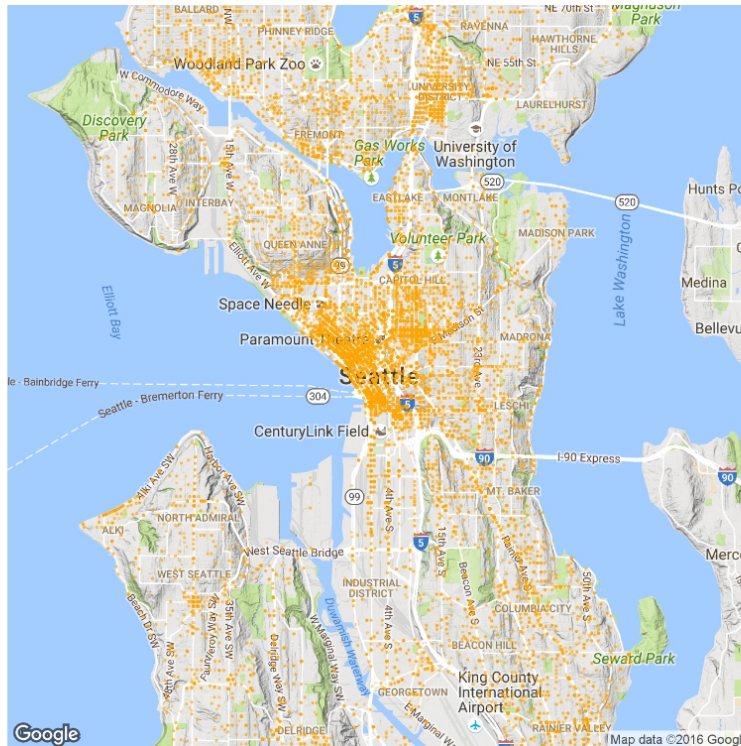

Since we have several bar plots and additional information in terms of incident counts combined into one, we can begin to make our observations:

1. South West Precinct is by far the most safe
2. The most dangerous (by overall count) is North, followed by West
3. From the numbers we can see that West is still #1 on Assault and Robbery (probably because this is where Downtown is located)
4. North is #1 overall, but also #1 on Theft and Burglary (less violent then Assault and Robbery, probably because North has larger area and is more residential than West).
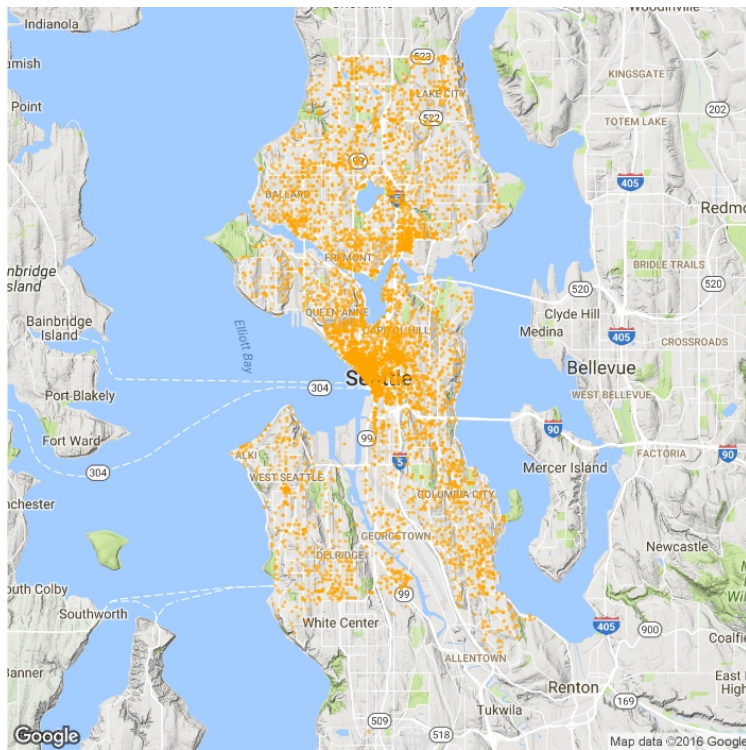
Geographical Map

We then proceed to some geographical maps that will presumably support findings above and provide more finding on the 'criminally dense' geographical areas of the city.
We first plot all incidents on the city map to have the overall picture:
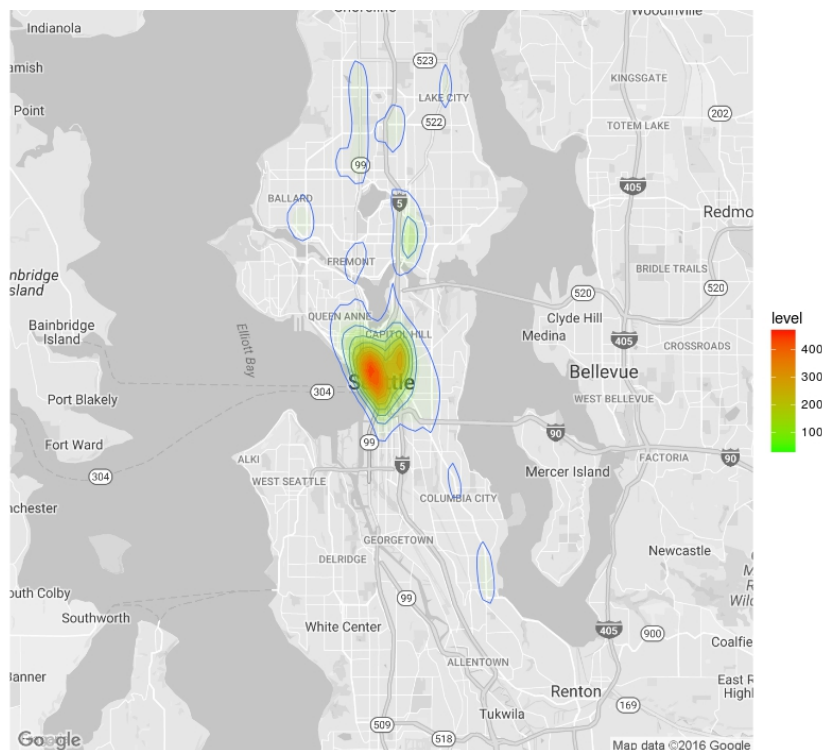

First of all, we see that our conclusions on the safety of South West and South are supported.
Next, we can say the same thing about North and West being 'less safe'.

Though it may look like West, not North, is overall #1, we need to take into account that North is quite large and if we zoom out we can see North indeed should be #1, even though certain areas of Downtown have more incident density:
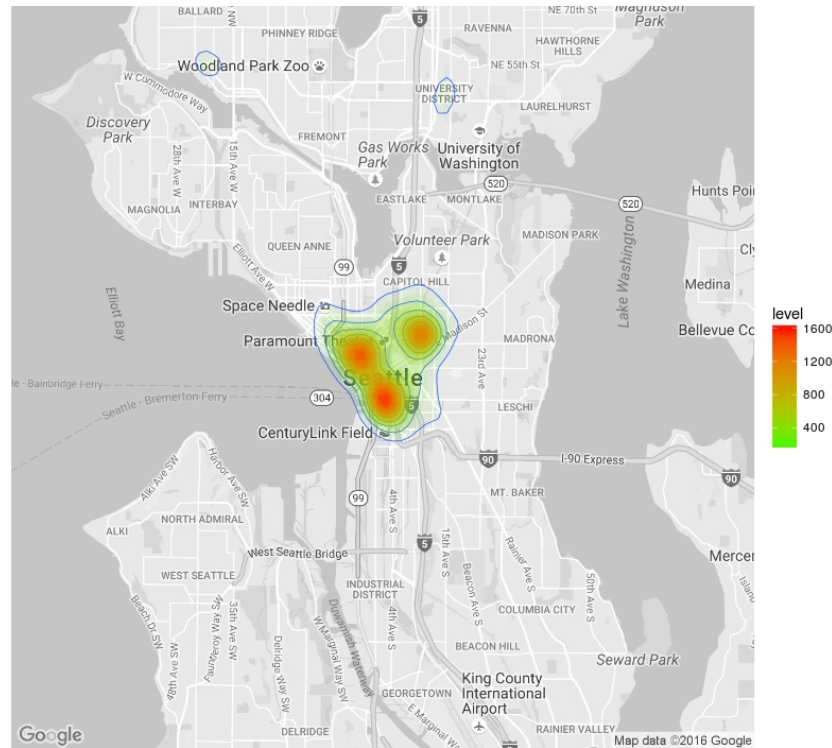
It is also clear from these maps that the most dense area on incidents is downtown – by far. The rest of the incidents are spread more scarcely around the city, but a few more dense areas are in the north: University District, then South of Ballard (and possibly also Fremont). The density 'heat' (or density level) map really makes the point of how much more dense Downtown is:
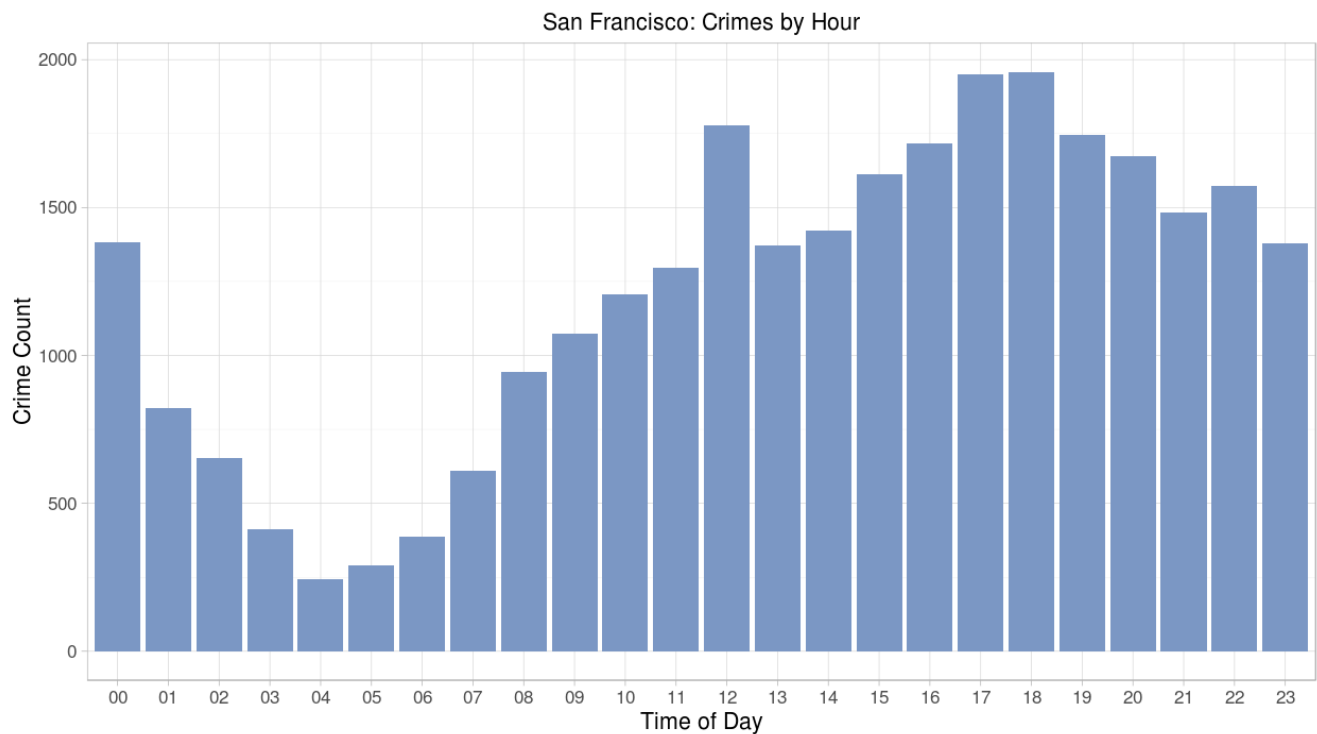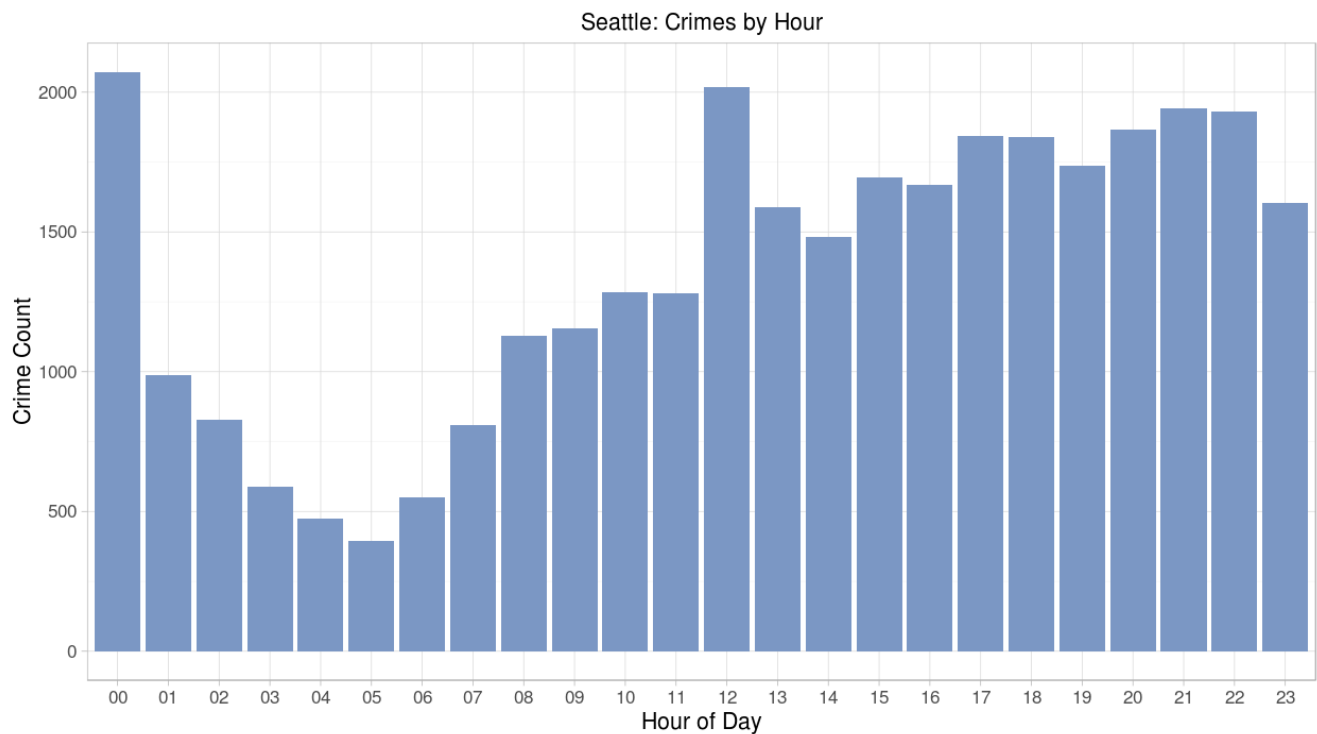

What could be useful about the map above is that it also shows all the 'potentially unsafe' areas in the North (including University District), East and South.

Finally, let us zoom in, and look at density of more violent incidents, i.e. Assaults and Robberies.

Indeed, these more violent incidents occur mostly in the center. Therefore, we conclude that even though University District is second after Downtown, first of all, the density there is much less (6-7 times less), and secondly, most incidents there are non-violent.

Seattle vs San Francisco: Simple Comparison by Time of Day patterns

Seattle: Crimes by Hour

San Francisco: Crimes by Hour

The similarity is that both cities have incident peak at noon, and lowest incident period from 3 to 5 am. The main differences are that evening peak is much earlier in San Francisco: 6 to 7 pm, as opposed to midnight in Seattle. The late evening period (from 9pm to midnight) is comparatively lower (by approx. 20%) on incidents in San Francisco than Seattle.

Reproducibility

All of the plots and maps above are easily reproducible with an R scripts located here:
https://github.com/glungu/coursera-uow/blob/master/crime_seattle.r
https://github.com/glungu/coursera-uow/blob/master/crime_sanfrancisco.r

This document can be found here:
https://github.com/glungu/coursera-uow/blob/master/Incident%20Data%20Analysis.pdf