CPDBP: Injury Trends
Checkpoint 3: Interactive Visualization

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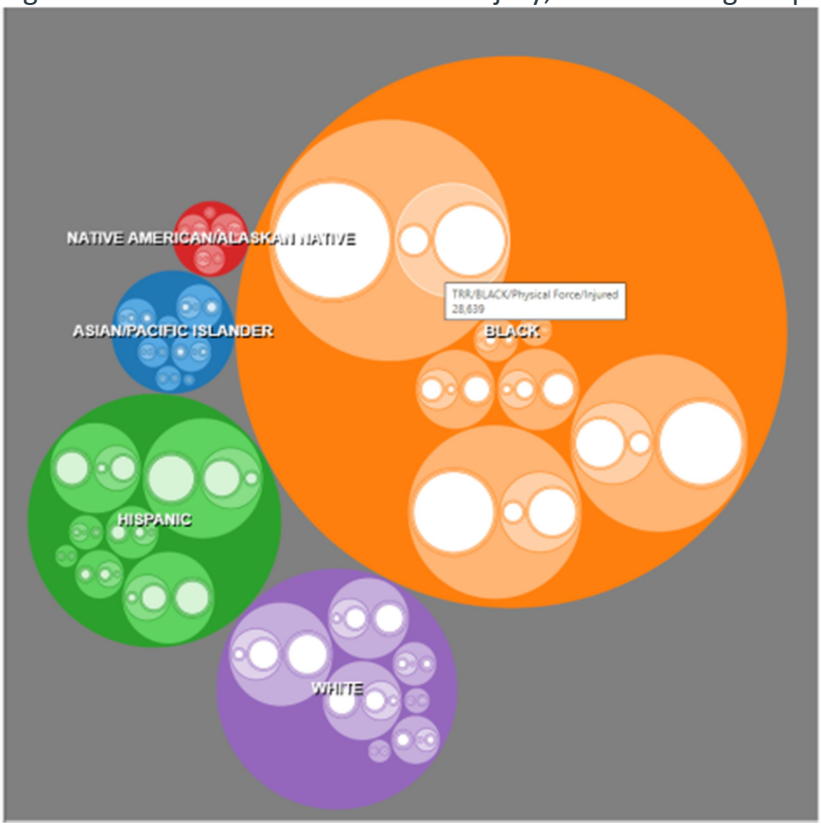
Question 1: Starburst, Treemap, circle packing graph showing nested racial groups, use of force encounters, type of use of force, injuries sustained versus alleged.

The goal of this visualization is to represent all cases of use of force with the hypothesis that the motivations or trends in the use of force may be different split along these variables. First the uses of force are divided by race from trr_trr. Next they are split by the force type from trr_actionresponse grouped into similar bins to remove some of the granularity. One of the bins, for instance, is a combination of Tasers and "impact weapon" as they represent non-lethal weapons and an escalation from fists and holding. Now that these divisions are made this visualization allows you to analyze the crux of the matter, was an injury caused (or alleged to have been caused), or was no injury reported by either party. Given its capability to zoom it allows you to perceive smaller categories that are easier to overlook in the data if you just click on their circle. Initially we had proposed to represent this data as an interactive bar graph but given the dimensionality of this data the additional dimension that this representation provided was favorable. Even firearm use (an area of interest to many) pales in comparison to the total use of force reports and requires a focusing tool to begin to perceive trends.

We represented the same information in each of these graph types. While there was strength in the ability for the Starburst and Treemap to help identify what percent of the total events each group contributed, some groups are nigh invisible in these representations. While that in itself does provide some information, without knowing that Native American/Alaskan Natives existed on the graph, it would be impossible to see or click on their data. Similarly it is hard to find firearm use in these graphs, something we would expect to be linked to injury. The circle map makes sure you can access the data for these groups if you had a query.

The circle graph (a partially represented still in figure 1) has a lot to unpack as it splits the use of force reports into over 70 bins. Some of what can be seen through its exploration is that there are generally similar top 3 causes of force amongst all races. These are member presence, physical force, and verbal commands. One surprising realization is that TRR's documented as "Verbal Commands" result in the same amount of injury and injury profile (alleged versus sustained) as physical force (pushing/holding/striking). The same can be said of "Member Presence". This is likely a case of under-documentation or even incorrect/malicious documentation. We can explore the graphic to see that Taser/Impact weapons have a higher rate of reported injuries in Whites and Hispanics than in Blacks. Finally we can see that Firearms are most likely to result in reported injury, almost twice as often as physical force.

Figure 1 Use of Force and Resultant Injury, Circle Packing Graph



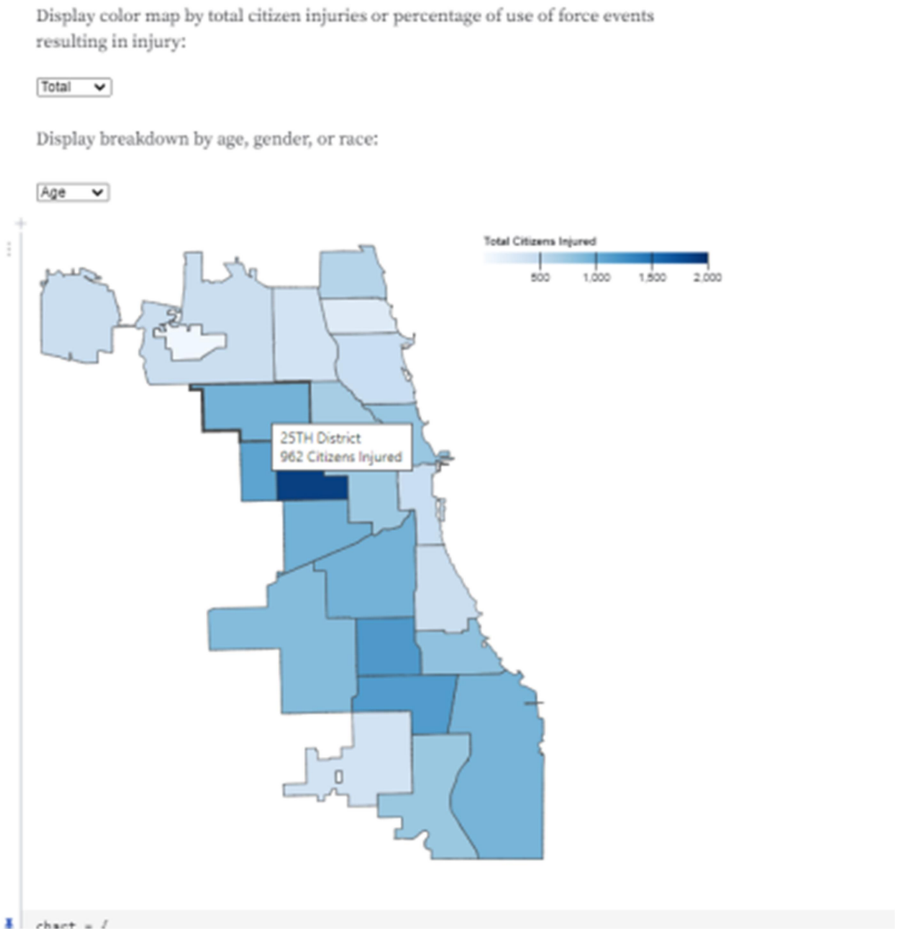
Question 2: Chloropleth map of Chicago that displays the use of force and attributes of the demographics in the force reports of the district as well as hospitals in that district.

The goal of this visualization is to evaluate if individual districts have use of force trends that target a particular demographic. We also wanted to see if nearness to a hospital had any effect on the use of force or injury. This was achieved by binning the beats into districts of trr_trr and then aggregating groups within those districts by age, race, and the amount of hospital facilities in that district. Chicago's 42 hospital locations were obtained from addresses supplied in the city of Chicago dataset and translated into police districts through the police departments Find My District application. This will allow us to perceive the data about the demographics and the districts as well as potentially revealing trends about the police commanders in charge of this district, and the officers that report to them.

This d3 notebook (a partially representative still in figure 2) when accessed, allows the user to click on each district and compare to other districts as well as the overall data provided in our previous checkpoints. Drop downs are available to toggle between total injuries and percent of events resulting in injury as well as to toggle between race, age and gender. When we compare the districts we highlighted in checkpoint 2 on boundaries of these demographics, percent injuries by age do differ. 18-40 yrs was the age group with the highest number of injuries and the district with the highest percentage of injury in this age group was the 9th (which is also one of the districts with highest percent of injuries overall), but percent injuries in the 40-65 yrs age group fell in other districts: 19th, 17th and 2nd. It is unclear why members of this age group are getting injured at higher rates in these districts. There appears to be high

rates of use of force events resulting in injury in the Hispanic and Asian race/ethnicities, and the districts that this is occurring in are different, possibly related to the overarching demographic of that neighborhood. Black individuals have higher numbers of injuries within many districts though the percentage of events resulting in injury appears to be lower on average within the districts. There is no apparent connection between injuries and nearness to hospitals. There were an equal number of hospitals in districts with lower injury percentages as compared to the higher injury districts. The district with the highest percent of injury has only one acute care hospital and the district with the second highest percent of injury has no hospitals.

Figure 2



While hospital locations likely do not factor into this data so far, we hypothesize that in our future analysis in the details of the complaint reports that seeking medical attention after a use of force may be more likely if more proximal to hospitals.

Conclusion:

These splits of the data allow for evaluating more specific cases of officer use of force and the injury that results from these force uses. Interestingly non-violent force can be seen to have a similar impact in terms of injury, alleged and sustained, as physical force without a weapon does. These observations may represent a way for police departments to further monitor the development of incongruences in their data and the trends of the officers behind them to hopefully make reform. It is possible that if officers were observed while making

reports those documented in these two categories would also qualify under another category, more expected to result in subject injury. As previously stated, the hospital locations may play a key role in identifying how officers behave after injurious force has been applied and we plan to further analyze this, though there doesn't appear to be a connection to hospital location and number or percent of injuries. Age and race do appear to play a role in the data. Different age groups are being injured at different rates in different districts and the etiology of this trend is unclear. This is certainly a finding that could be investigated further in the future. Also, the high rates of Asian and Hispanic injuries in certain neighborhoods may be related to the racial and ethnic demographics of those neighborhoods.

References:

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