Analysis Of Police Shootings

Vaibhav Vennam

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1.Introduction

One of the prevalent news recently among social media is the rise of police shootings and general discrimation leading to deaths focused towards black/African citizens of the USA The rise in "#BlackLivesMatter" trend led to a counter movement by the white supremacists as "#WhiteLivesMatter". While the more illogically fearing white supremacists were open about the racism and felt like black people didn't deserve the same rights or felt like that black people were getting more rights than deserved. This led to a much cruder hatred and racism calling the shootings of black Americans as "lawful" and that supporting black people would lead to "acts of violence rising upon our (white) race" [1]. And the more logical white supremacists stand on the statistical argument that white people are often shot than black people by the police, justifying that their lives matter as well. The interest in this small visual analysis project is to see different relations between police shootings in the USA, races, weapon the victim was carrying at the time of shooting, stats per state and see if :

1) Is one race dominantly being shot amongst the others?
2) Is there a correlation between that race and the lethality of the weapon they are carrying?
3) Which state has the highest shootings per race?

2. Data Methodology

The major source for this data can be found on Kaggle [2]. However, the census data for the US population per year per race has been scraped from Statista [3]. And state data has been downloaded from Government Census estimates [4].

The data for police shootings has been thoroughly cleaned. Further cleaning involved removing the ID of each victim shot from the shootings dataset, and classifying each weapon into lethal and non-lethal attributes as to answer the question if shooting the victim was necessary or not. Year 2020 was removed from classification when compared against the state and population data considering the year census hasn't been collected and also considering the unfortunate losses

faced during the pandemic. For comparisons against population with the shootings, the shooting data was reduced down to included only three races as “Blacks”, “Whites” and “Others”, since the major focus of the article is to see any bias towards the black population. Government census for both statewide and nationwide populations has been reduced down to the same level of detail as well. The data relevant from each of the populations data would be the population per race and hence that was collected. One flaw of the cleaning data however was that both the population data consisted of citizens of the US belonging to every race group whereas the major shooting victims ranged from 6 to 91 years, while most of the victims ranged from 20 to 50 years old.

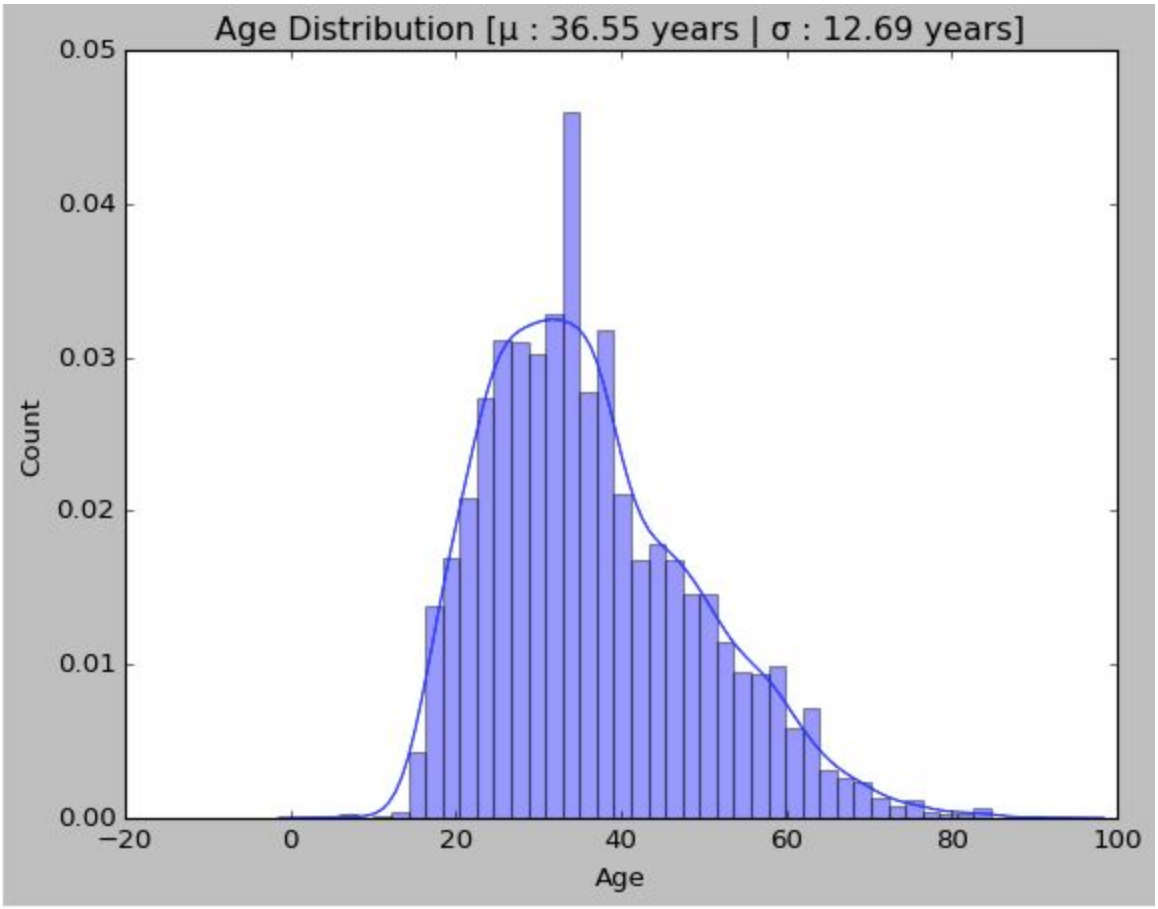

Fig1. Age Distribution of Police Shooting Victims

The data will be used to get relevant per-state racial bias factors, per nation racial bias and to sort what are the reasons a police shoots a person:

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df.head()
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	name	date	manner_of_death	armed	age	gender	race	city	state	signs_of_mental_illness	threat_level	flee	body_camera	arms_cate
0	Tim Elliot	2015-01-02	shot	gun	53.0	M	Asian	Shelton	WA	True	attack	Not fleeing	False	
1	Lewis Lee Lembke	2015-01-02	shot	gun	47.0	M	White	Aloha	OR	False	attack	Not fleeing	False	
2	John Paul Quintero	2015-01-03	shot and Tasered	unarmed	23.0	M	Hispanic	Wichita	KS	False	other	Not fleeing	False	Una
3	Matthew Hoffman	2015-01-04	shot	toy weapon	32.0	M	White	San Francisco	CA	True	attack	Not fleeing	False	Other uni ob
4	Michael Rodriguez	2015-01-04	shot	nail gun	39.0	M	Hispanic	Evans	CO	False	attack	Not fleeing	False	Pie ob

Fig2: Data of police shootings

	Year	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Two or more races
0	2019.0	250.52	44.08	4.19	19.50	0.81	9.14
1	2018.0	249.96	43.73	4.15	19.13	0.79	8.92
2	2017.0	249.27	43.37	4.10	18.76	0.78	8.69
3	2016.0	248.41	42.97	4.05	18.28	0.77	8.46
4	2015.0	247.38	42.53	4.00	17.75	0.75	8.21

Fig3: Data of US population for Years 2015-2019

	NAME	White	Black	Others
2015	Alabama	13766968	5339656	631672
2015	Alaska	2150332	152448	877972
2015	Arizona	23460028	1600644	3060044
2015	Arkansas	9696432	1959628	503924
2015	California	118758852	11856936	31497024
...	...	...	...	...

Fig4: Data of US population per State per Race for Years 2015-2019

The mentioned data has gone through multiple filtering and summation to come through to be divided into 3 races as earlier mentioned : 'Black', 'White' and 'Others'. Furthermore, the shape file for the US states has been extracted from the US Government Census [5] as well. The geocodes for each state to combine with the shootings data was extracted from Google [6].

Final data used for geo-mapping:

year	code	race	lat	lng	name	count	norm_count	score
2015	AK	Others	63.588753	-154.493062	Alaska	2	2.277977	71.007798
2015	AK	White	63.588753	-154.493062	Alaska	2	0.930089	28.992202
2015	AL	Black	32.318231	-86.902298	Alabama	6	1.123668	58.442736
2015	AL	White	32.318231	-86.902298	Alabama	11	0.799014	41.557264
2015	AR	Black	35.201050	-91.831833	Arkansas	1	0.510301	62.255122

Fig5: Number and % of shootings of citizens shot per race per state.

Formulas Used:

1) $$norm\_count(race) = \frac{count(race)}{statepop(race)} \times 1000000$$

2) $$score(race) = \frac{norm\_count(race)}{total(norm\_count(all\ races\ of\ state\ of\ year)} \times 100$$

	name	race	lat	lng	count	norm_count	score
0	Alabama	Black	161.591155	-434.511490	28	5.200911	52.867717
1	Alabama	Others	32.318231	-86.902298	1	1.513968	8.313094
2	Alabama	White	161.591155	-434.511490	55	3.985798	38.819189
3	Alaska	Black	190.766259	-463.479186	3	19.076695	38.007267
4	Alaska	Others	317.943765	-772.465310	10	11.176708	38.954355

Fig6: Average score per race per state over a period of 5 years (2015-2019)

Also, the population % of each race per state was geo-mapped from the state dataset extracted from the US Government Census to check the density of each race per state.

3. Exploratory Analysis

3.1 Shootings per year:

Number of people shot over each year shows if there has been any noticeable decline over years on the restraints placed over police and that would give us an idea to check for laws introduced to curb shootings or to check for reduction in crime rate or if any other external factor is affecting the decline.

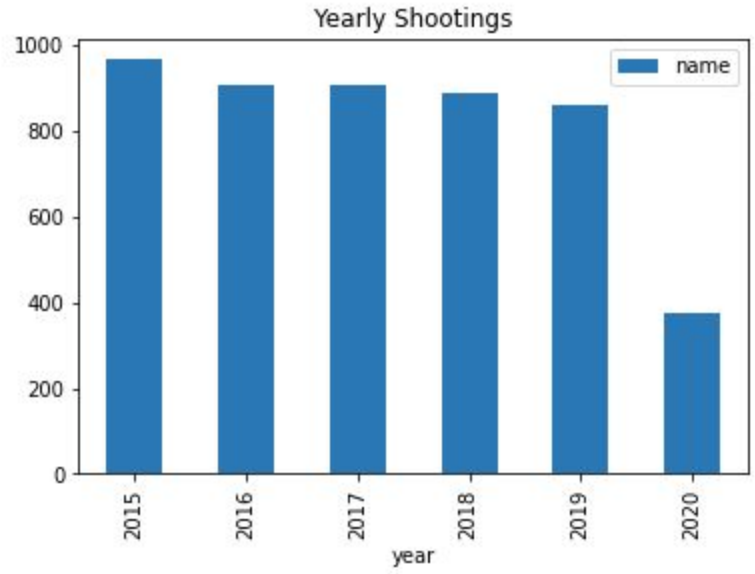

Fig7: Yearly Police Shootings

We can observe that there hasn't been any decline over years 2015 to 2019 and 2020's shooting data is understandably less because only half the year's passed so far. But we can still observe that the shooting count hasn't reached half the average number of deaths per year. This can be because of two factors:

1) COVID-19 and early 2020 protests over police brutality.
2) Majority of shootings happening over the second half of the year.

3.2 Shootings per month:

In that case, we need to see if the number of shootings are more prevalent during the second half of the year.

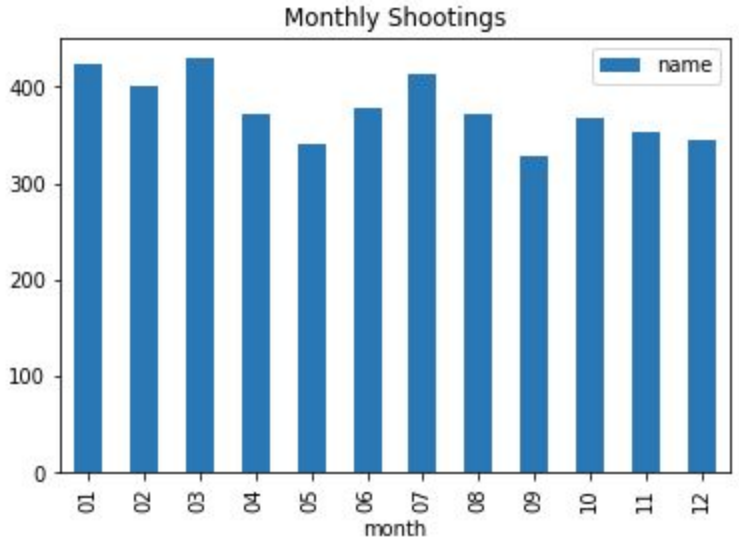

Fig8: Monthly Police Shootings from 2015-2019

The second half of the year is relatively less compared to the first half of the year. We can see that the first half of the year is slightly higher than the second half of the year. The monthly analysis helps us to understand that the current decline of shootings in 2020 account to the pandemic and riots of early 2020.

3.3 Ratio of fleeing vs non-fleeing victims:

One of the factors to factor talking about police brutality is to consider how many non-fleeing, non-attacking victims were shot instead of being arrested. The lack of necessity of shooting a non-attacking individual can be factored as an unnecessary shot. Fleeing victims, who aren't attacking as well, aren't supposed to be shot but accounting to the lack of data over which shots were missed while trying to incapacitate, this data will not be scored against brutality.

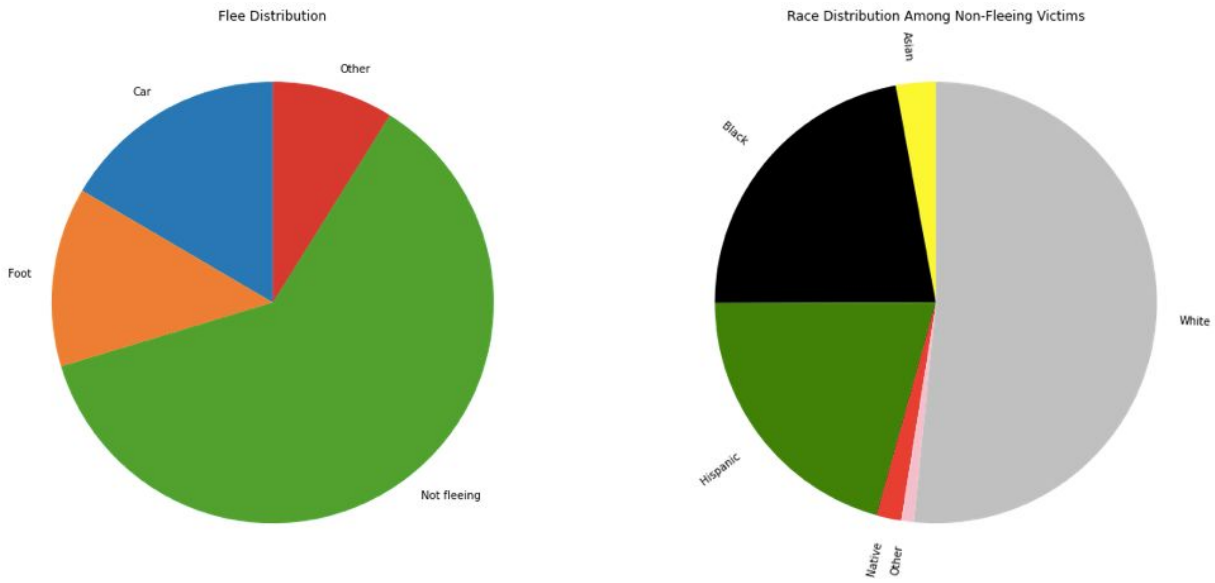

Fig9: Pie Chart of fleeing vs non-fleeing (non-attacking) victims (left),
Chart of racial distribution of non-fleeing non-attacking victims (right).

The number of white victims shot while not fleeing on the right chart is more than 50%. This doesn't account for the majority of white people over black people. But we can still notice on the left chart that the number of non-fleeing, non-attacking individuals is much higher regardless of the race. This acts as our first point - *Usage of firearms by police when not required*

However, understandably there are 3160 shootings where there was a threat of attack over 1735 shootings of non-attack threat levels. And yet that's 35% of people shot without a threat of harm.

3.4 Lethal vs Non Lethal Race Distribution:

The category of the weapon (if exists) carried by the victim is divided into 89 categories containing both lethal and non-lethal weapons. So the data has been manually sorted into lethal/non-lethal weapons. It is to keep in mind that while the lethality of each weapon in itself was determined out of personal judgment, there was no data other than the name of the weapon influencing the decision over the lethality of the weapon. After categorising the arms into lethal/non-lethal weapons, 77% of the victims shot were carrying a lethal weapon understandably.

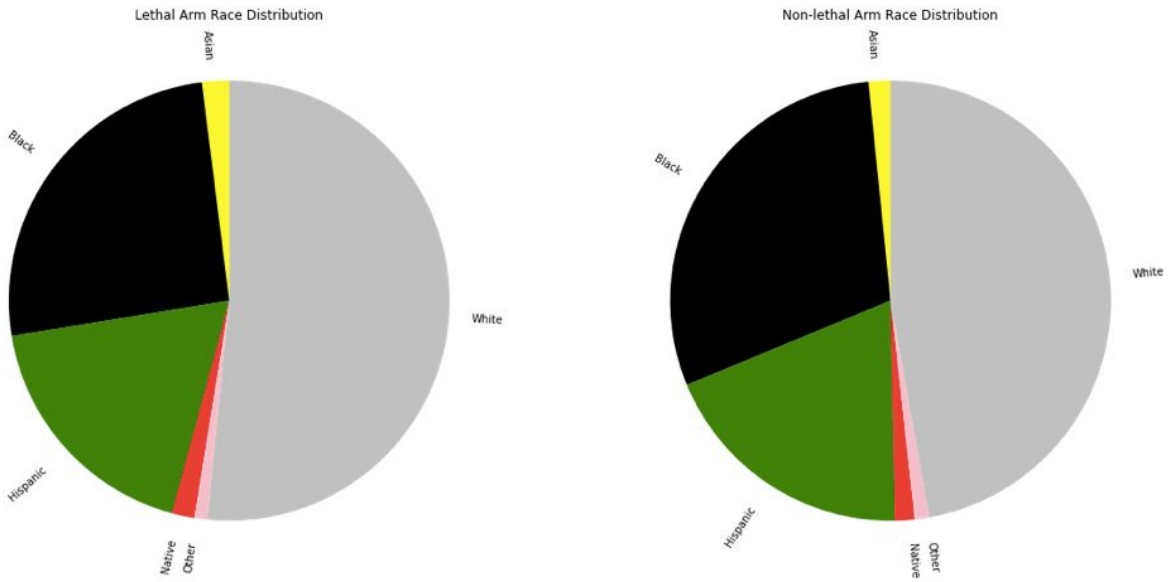

Fig10: Lethal vs Non-Lethal Race Distribution

The number of white people shot over years 2015-2020 is understandably high in number considering the majority of the total white population in the US. But the reduction in the ratio of white citizens being shot and the consequent increase in the black citizen ratio can speak about:

1) Black citizens are shot higher in ratio for not having a non-lethal weapon vs having a lethal weapon.
2) White citizens are shot less in ratio for not having a non-lethal weapon vs having a lethal weapon.

It's already observed that 77% of victims were shot carrying a lethal weapon and so it makes more sense statistically to say that white citizens are shot less in ratio over not having a non-lethal weapon, and understandable so, but not the case with black citizens. We can further solidify this hypothesis by comparing the ratios of white and black citizens each shot while carrying lethal weapon vs non lethal weapon.

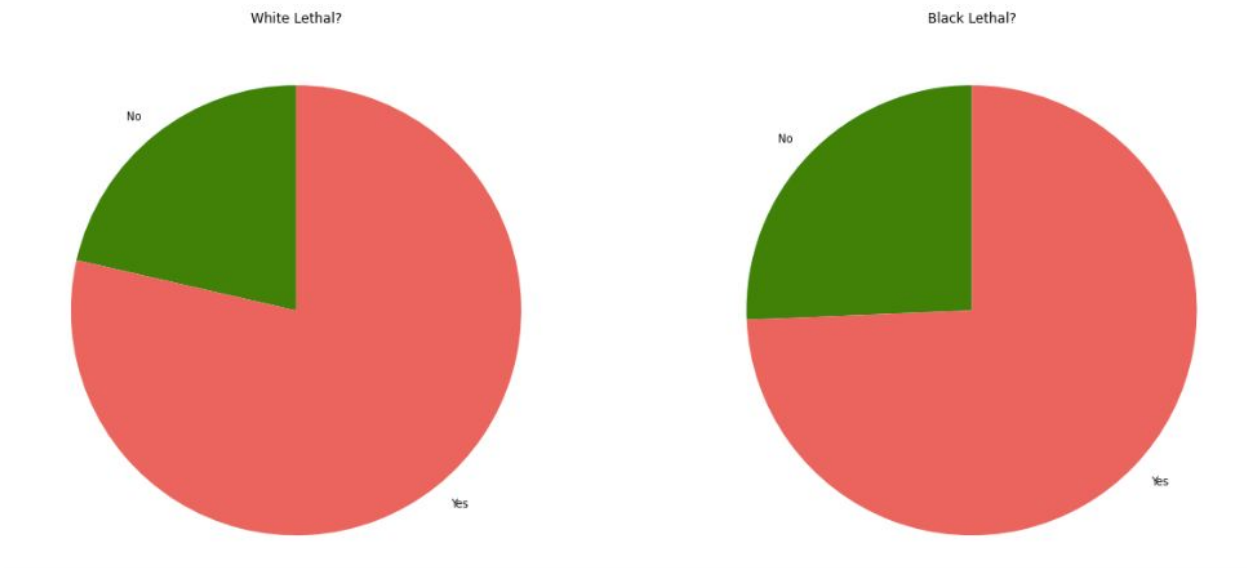

Fig11: Victims shot while carrying lethal vs non-lethal weapons.

Pie-left: White Victims

Pie-left: Black Victims

While logically more citizens are shot for carrying a weapon in both the charts, there's a higher ratio of black citizens being shot by police while carrying a non-lethal weapon and this can be attributed to the preconceived baseless notion that points to black citizens being more criminal, considering that the ratio of lethal weapon carrying white individuals is higher and that's even without normalising the counts to their normal population densities, that is, despite the white individuals being higher ratio and number-wise, the killings for black men in terms of ratio is higher when compared to the white counterpart for carrying a non-lethal weapon*.

* includes being unarmed as well.

3.5 Normalised Population Shootings - Racial Distribution:

While keeping that analysis aside, the distribution of black and white lethal victims are similar. However the number of white and black non-lethal shootings prove that the number of white men shot by police unarmed is higher than the black population. This is the buoy that stands against the police racial bias accusations. Until now, the pie charts of the shootings showed that white citizens were often more shot compared to their black counterparts, but to see true bias, lets see how many people black citizens per million were shot vs white citizens per million. For this analysis, we are going to accumulate the rest of the races into a single category as "Others".

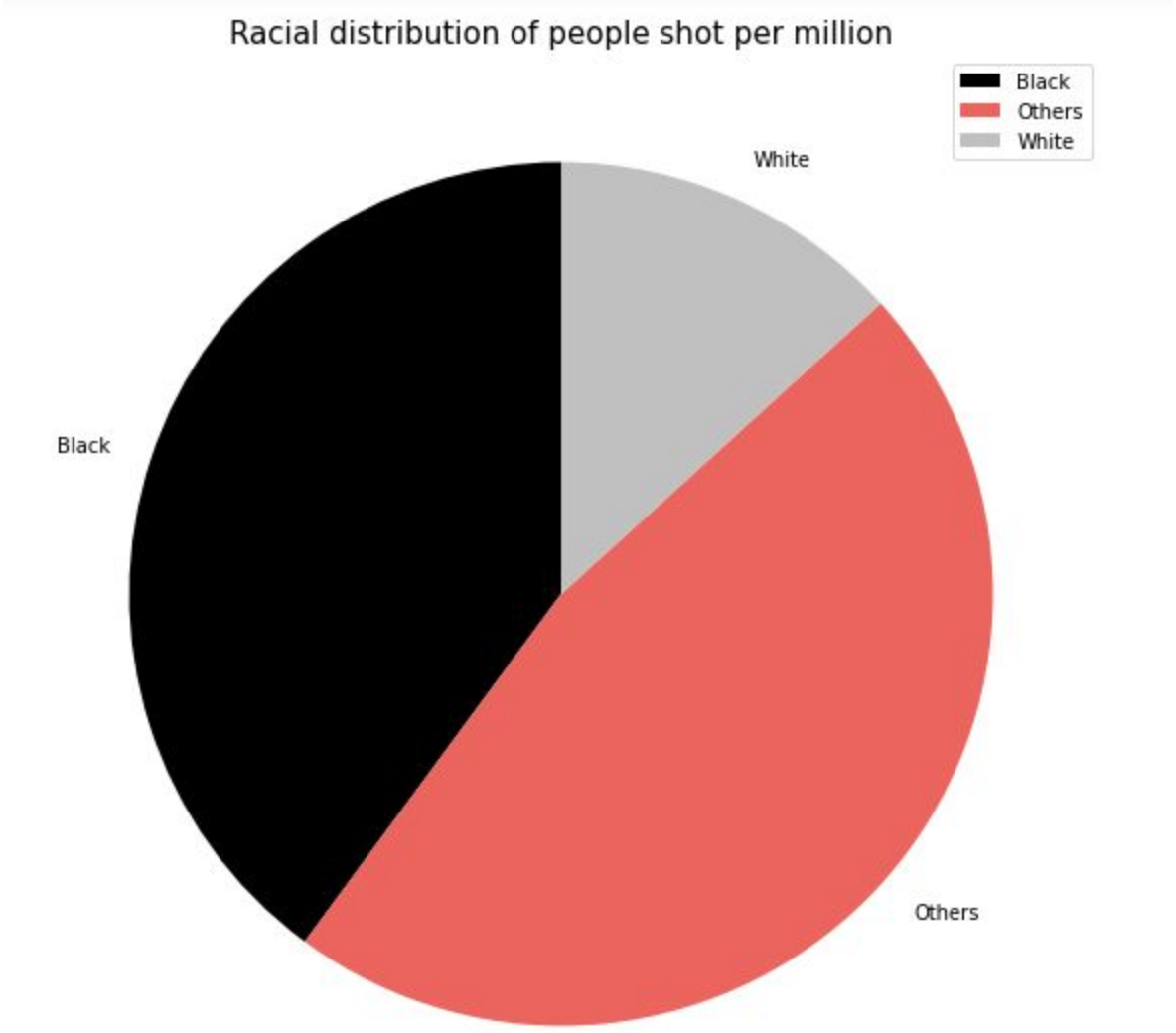

Fig12: Racial Distribution of People Shot by Police (per million)

After dividing the number of victims shot per USA population for each respective race, you can see that 16-20 people per 1 crore white Americans are shot every year by police, whereas 50-60 people per 1 crore black Americans are shot every year by police. If the black Americans were in equal numbers as the white Americans in the USA, people belonging to black or African race comprise 33% of the shootings per year.

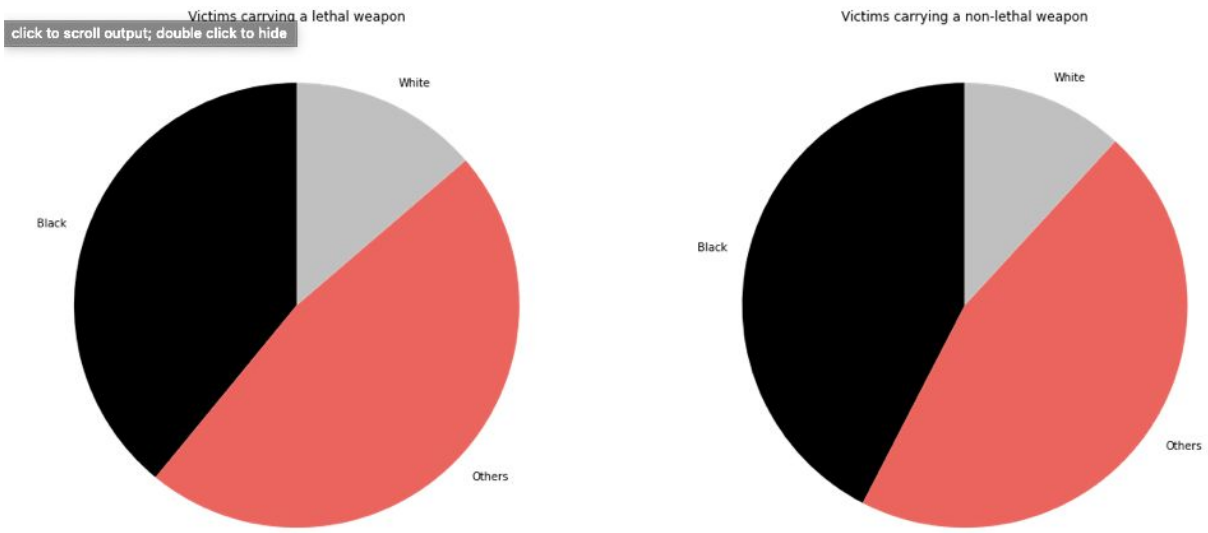

Fig13: Racial Distribution of Victims Shot by Police (per million) as per weapon carried.
Pie-left:Victims carrying a lethal weapon
Pie-right:Victims carrying a non-lethal weapon

Earlier, the idea of this bias was that because black citizens were considered criminal than their white counterparts. And it's only fair to plot to show that there is some truth to every notion and indeed, the number of black people carrying a lethal weapon is higher compared to the white citizens (as seen in Fig13 left). But this notion cannot be the bias for why more non lethal weapon black citizens are shot as well, which is not the case (as seen in Fig13 right).

3.6 Geo-mapping population ratios:

After normalising populations, the number of people shot per race per million by police showed a noticeable bias towards the black population in the US, by associating with the notion that a high ratio (not number) of black population are considered criminals. However, the curiosity lies in finding which states show higher bias.

Separate Images: https://imgur.com/a/LDF5CAM

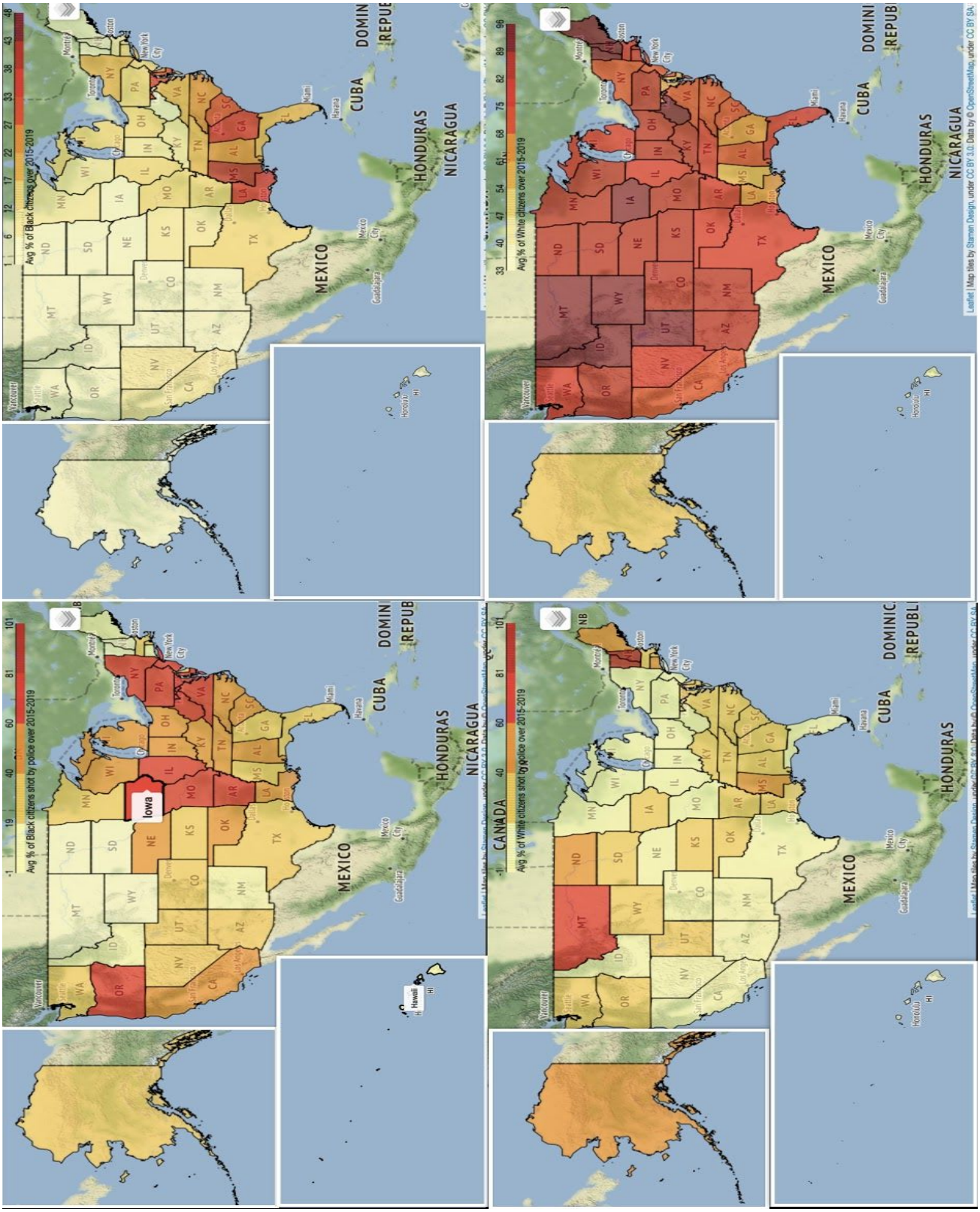

Fig14: US States - % of whites vs blacks shot vs % race population (inverted -90degrees)

4. Discussion

In dominantly whites states like Montana, Wyoming and Vermont, predictably there was a greater percent of white men being shot. Similarly, in dominantly black states (not as dominant as white states were, the max% of blacks in a state was at 47.4% in DC) like District of Columbia, Mississippi and Louisiana, there was a good number of black men being shot. The score % determines how many people of that race are killed if there existed an equal number of whites and blacks and other races (combined). This brings us to states like Oregon, Arkansas, Iowa, Illinois, Missouri, New York, Pennsylvania, New Jersey, Virginia and West Virginia states with higher percentages of white population and yet higher percentages of black people being shot. However, the same percentages don't hold with the white population. The US has understandably a high percentage of white population in most of the states whereas the percentage of black people being shot in these states except Montana, North Dakota, Vermont and New Hampshire show less than 10% of white population being shot. Most of the states that don't follow the pattern as the earlier mentioned 4 white states have higher percentages of blacks or other races being shot by the police.

5. Conclusion

The goal of this paper is to prove wrong how white supremacists try to show that there is no bias against black people or that there is bias against white people as well. And more importantly, show that there is racism prevalent according to the data from police shootings. And that this is just a minor area where racism is being seen. The recent deaths of Breonna Taylor and George Floyd have been echoing all through 2020 to show that the racism is prevalent, the riots in 2019, 2018 and 2016 all prove that racism is prevalent and yet the percentages of black population dying hasn't reduced over the years and in fact, Oregon has seen one of the highest black victims in 2019. This paper sheds lights on:

1) Police brutality is prevalent over people regardless of race, nearly 35% of non-attacking, non-fleeing members are shot to death by the police where no such action was needed.
2) The criminal activity among the black community has led to the bias among people and police that black communities are by default assumed to be criminal and black people with non-lethal weapons or a lack of weapon are shot in higher ratios than white people are.
3) Cities like OR, AR, IA, IL, NY, VA, PA, NJ and WV have higher racism factors, that is, a major population % of black people were shot compared to those of white people despite the state being dominantly white.

6. Future Goals

The data contains shootings of people from 2015 to 2019. However, the future additions to the same dataset would be to see how often a black person gets shot and to compare these stats to education, employment gaps, further explaining why the states with higher racism factors could be because of external reasons other than racism.

7. References

[1] https://www.splcenter.org/fighting-hate/extremist-files/group/white-lives-matter

[2] https://www.kaggle.com/ahsen1330/us-police-shootings

[3] https://www.statista.com/statistics/183489/population-of-the-us-by-ethnicity-since-2000/

[4] https://www.census.gov/data/tables/time-series/demo/popest/2010s-state-detail.html

[5] https://www.census.gov/geographies/mapping-files/time-series/geo/carto-boundary-file.html

[6] https://developers.google.com/public-data/docs/canonical/states_csv