Fatal Police Shootings in the U.S.

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DSC 530

Introduction

- The 2014 killing of Michael Brown in Ferguson, MO began a movement that culminated in Black Lives Matter.
- Due to the lack of complete data, The Washington Post began collecting details surrounding fatal shootings by police officers in the line of duty.

Questions & Hypotheses

- **Are fatal police shooting victims typically young, black men?**
- Are fatal police shootings more likely to occur in diverse areas?
- Are fatal police shootings correlated to age?
- Are fatal police shootings more likely to occur in areas of high poverty/low income?
- Are fatal police shootings more likely to occur in areas of lower levels of education?

Data Sources

SOURCE	LINK	DATASET NAME	DESCRIPTION
Washington Post	https://github.com/washingtonpost/data-police-shootings	fatal-police-shootings-data.csv	Starting from 2015, this data includes instances of shootings in which a police officer shot and killed a civilian in the line of duty. It does **not** include deaths of people in police custody, fatal shootings by off-duty officers or non-shooting deaths.
US Census Bureau	https://www.kaggle.com/kwullum/fatal-police-shootings-in-the-us/data	MedianHouseHoldIncome2015.csv	US Census data containing the median household income in all US cities.
		PercentOver25CompletedHighSchool.csv	US Census data containing the high school graduation rate for people over 25 in all US cities.
		PercentagePeopleBelowPovertyLevel.csv	US census data containing the percentage of population living below the poverty level in all US cities.
		ShareRaceByCity.csv	US Census data regarding racial demographic in all US cities.

Variables

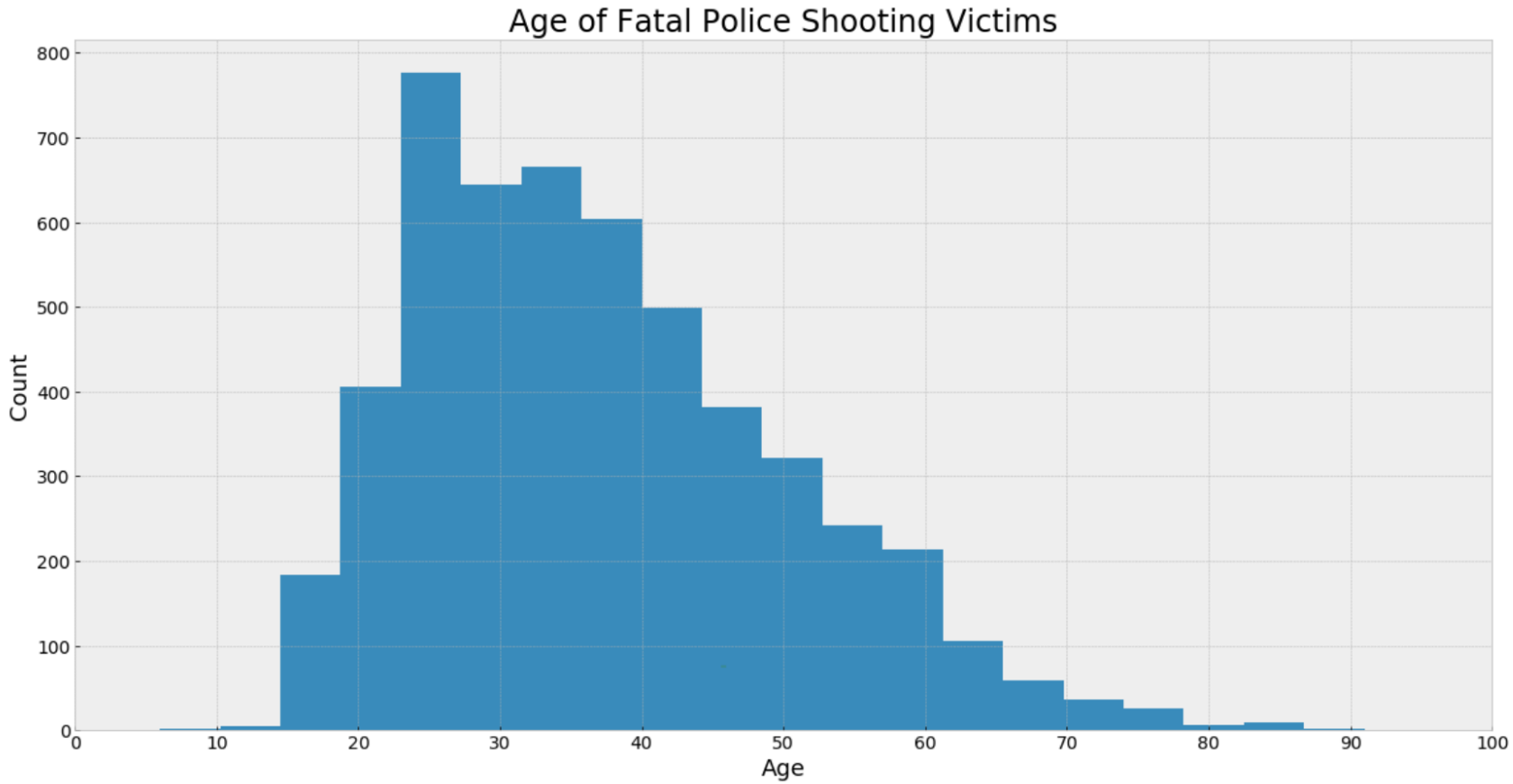
VARIABLE	DESCRIPTION	SOURCE DATASET
age	Age of the shooting victim	fatal-police-shootings-data.csv
gender	Gender of the shooting victim. M = Male F = Female	fatal-police-shootings-data.csv
race	Race of the shooting victim. W = White (Non-Hispanic) B = Black (Non-Hispanic) A = Asian H = Hispanic N = Native American O = Other	fatal-police-shootings-data.csv
city	City where the police shooting incident took place	fatal-police-shootings-data.csv
state	State where the police shooting incident took place	fatal-police-shootings-data.csv

Variables (cont.)

VARIABLE	DESCRIPTION	SOURCE DATASET
median_income	Median income of each city	MedianHouseholdIncome2015.csv
poverty_rate	Poverty rate of each city	PercentagePeopleBelowPovertyLevel.csv
percent_completed	High school graduation rate for adults over 25 for each city	PercentOver25CompletedHighSchool.csv
share_white share_black share_hispanic share_asian share_native_american	Percentage of the city's population that is white, black, etc.	ShareRaceByCity.csv

Exploratory Data Analysis

Age

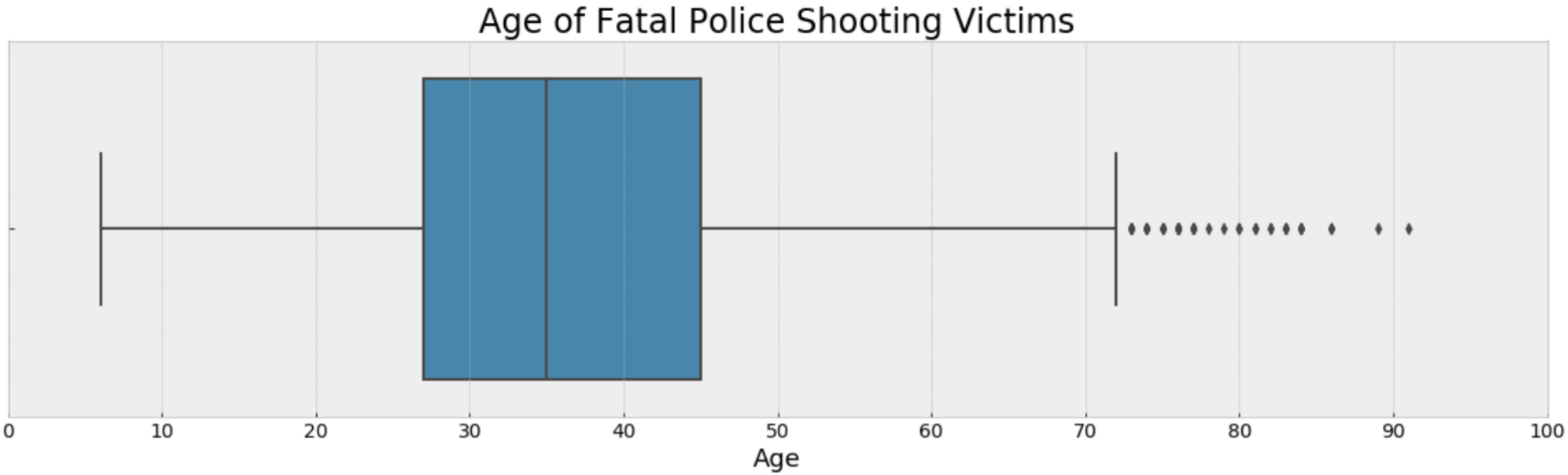


Measures of Central Tendency

- Mean: 37
- Mode: 36
- Median: 35

Measures of Spread

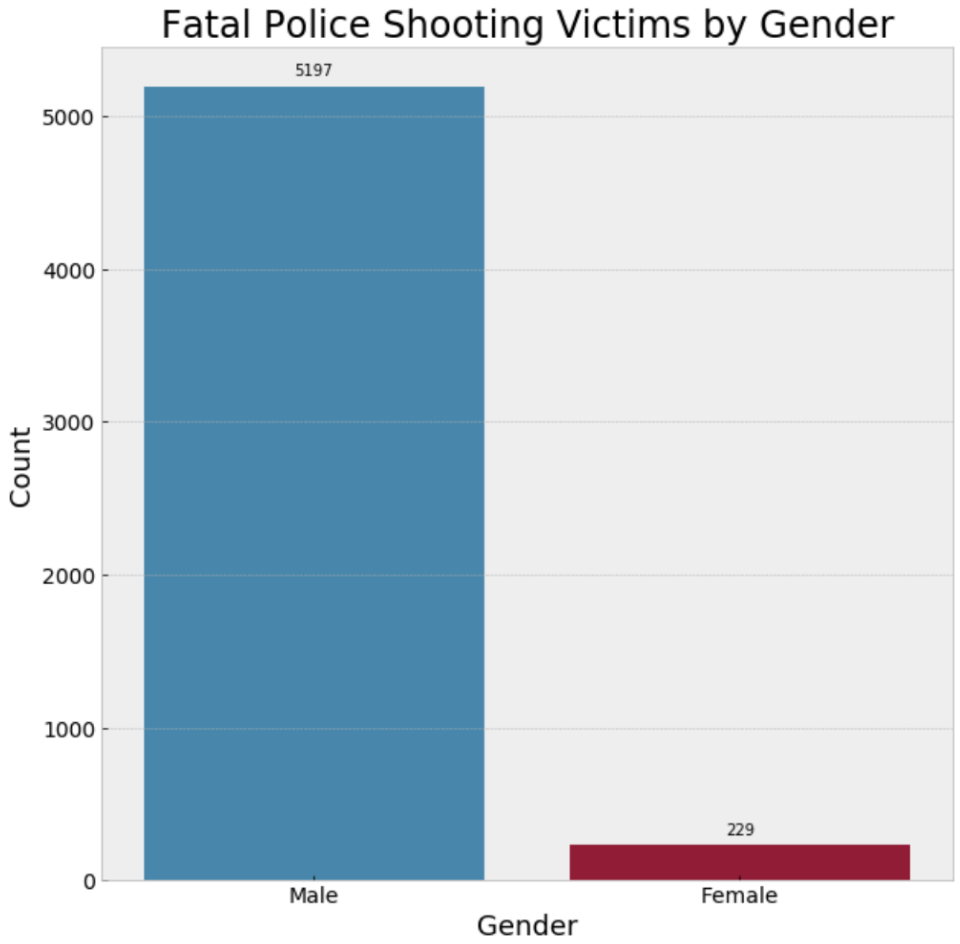
- Minimum: 6
- Maximum: 91
- IQR: 27 to 45
- Standard Deviation: 12.98
- Variance: 168.48



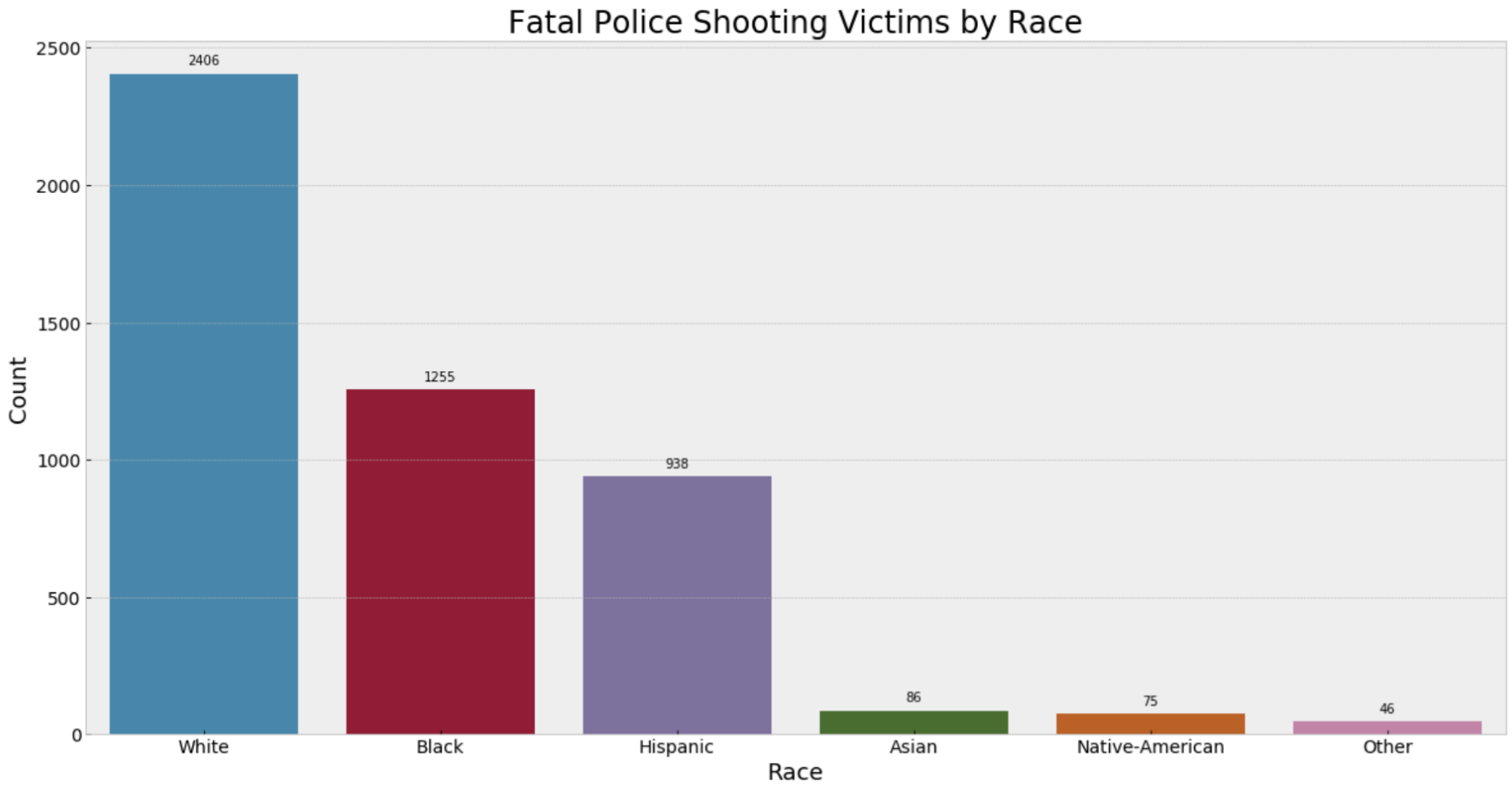
Outliers	
Age Range	**Count**
72 - 80	35
80 - 90	14
90 - 91	1

The cutoff for outliers is <0 and >72.

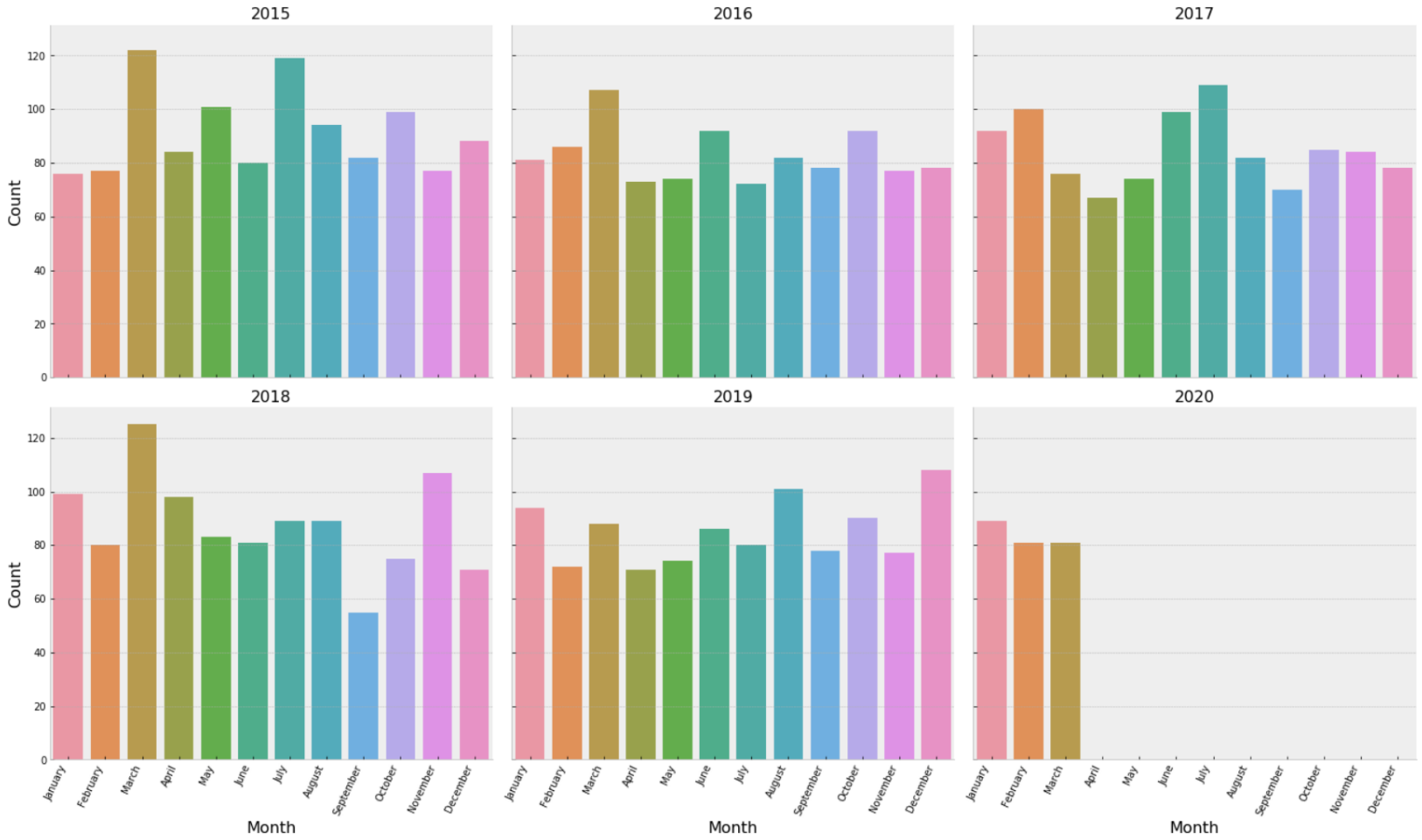
Gender


Fatal Police Shooting Victims by Gender
5197
229
5000
4000
3000
2000
1000
0
Count
Male
Female
Gender

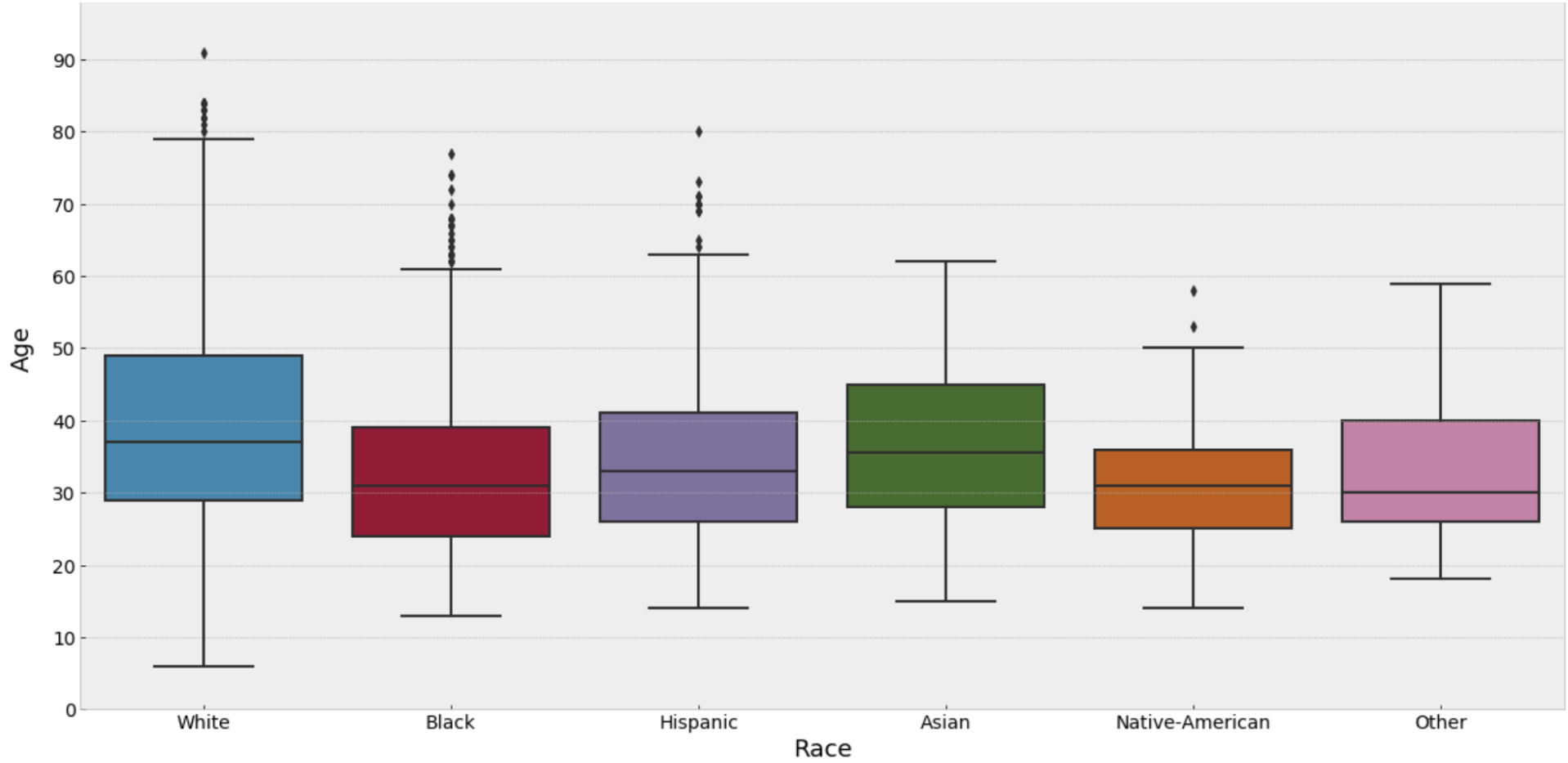
Race


Fatal Police Shooting Victims by Race
Count
2500
2000
1500
1000
500
0
2406
1255
938
86
75
46
White
Black
Hispanic
Asian
Native-American
Other
Race

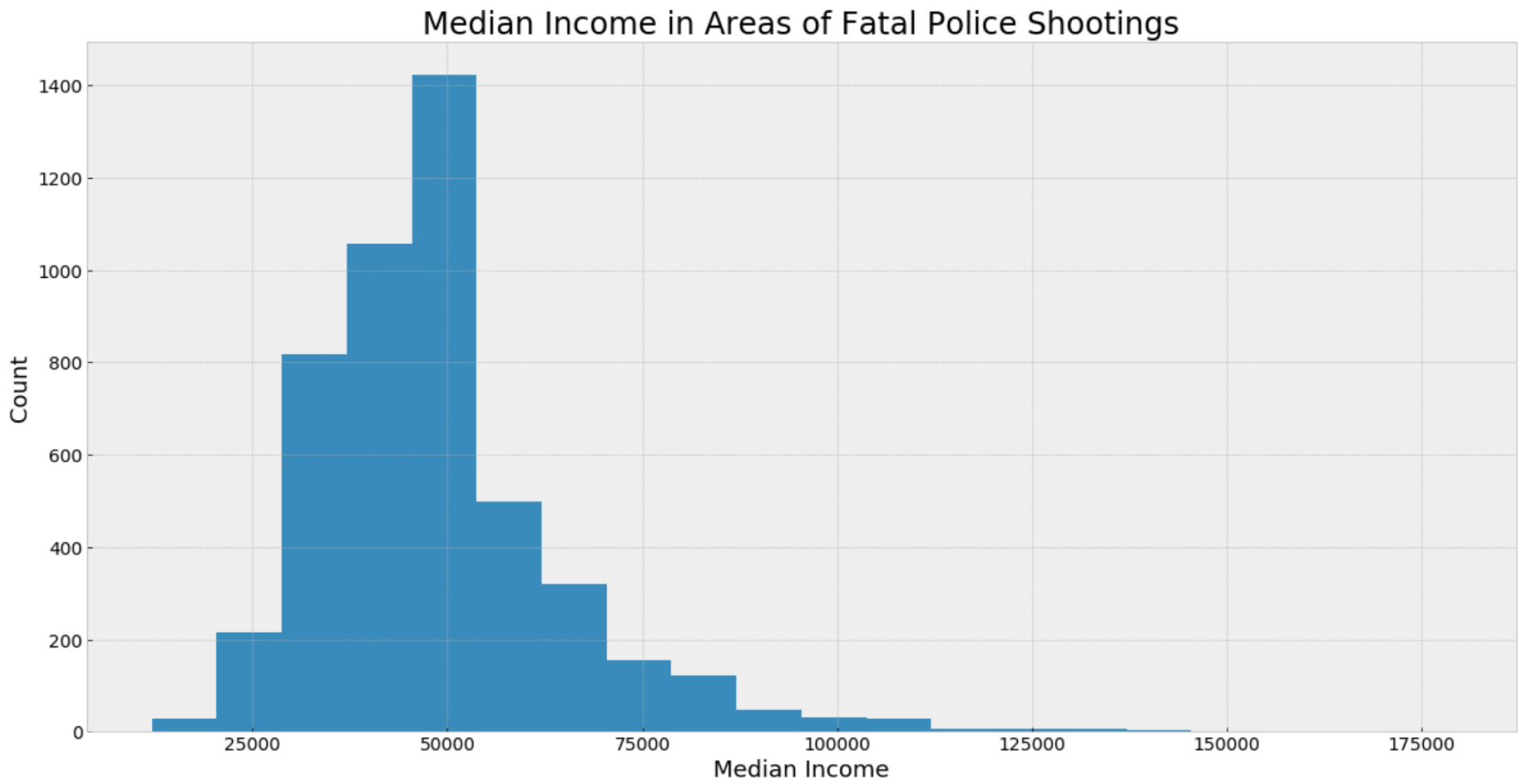
Fatal Police Shootings by Year & Month



Age of Fatal Police Shooting Victims by Race



Median Income

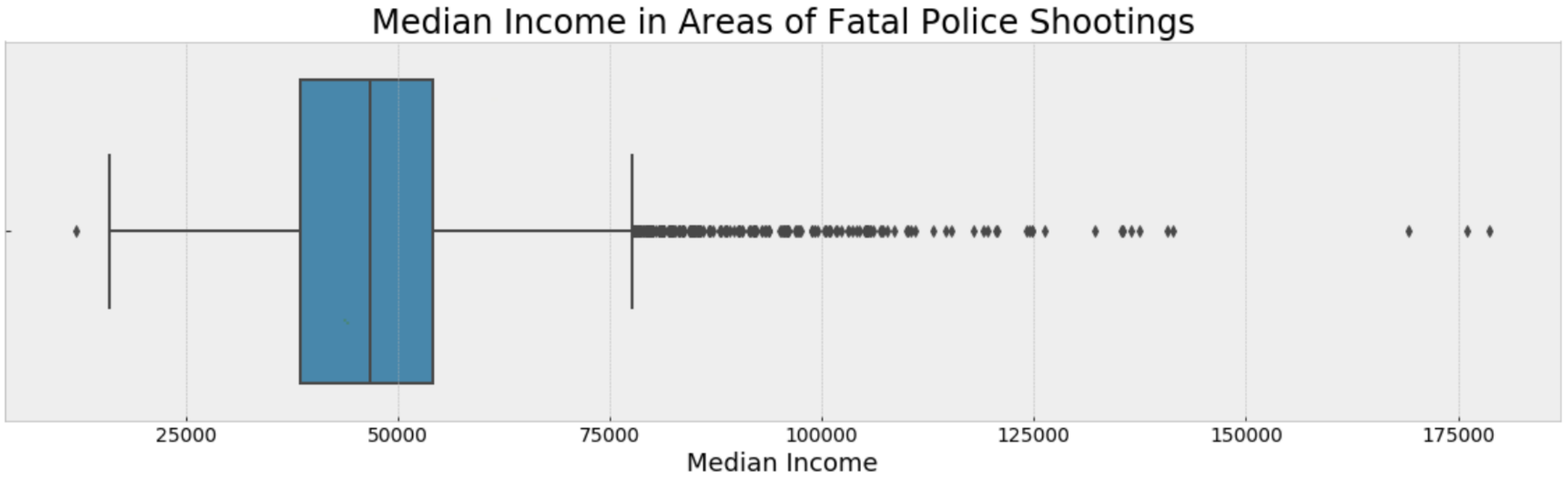


Measures of Central Tendency

- Mean: $48,682.18
- Mode: $50,205.00
- Median: $46,764.00

Measures of Spread

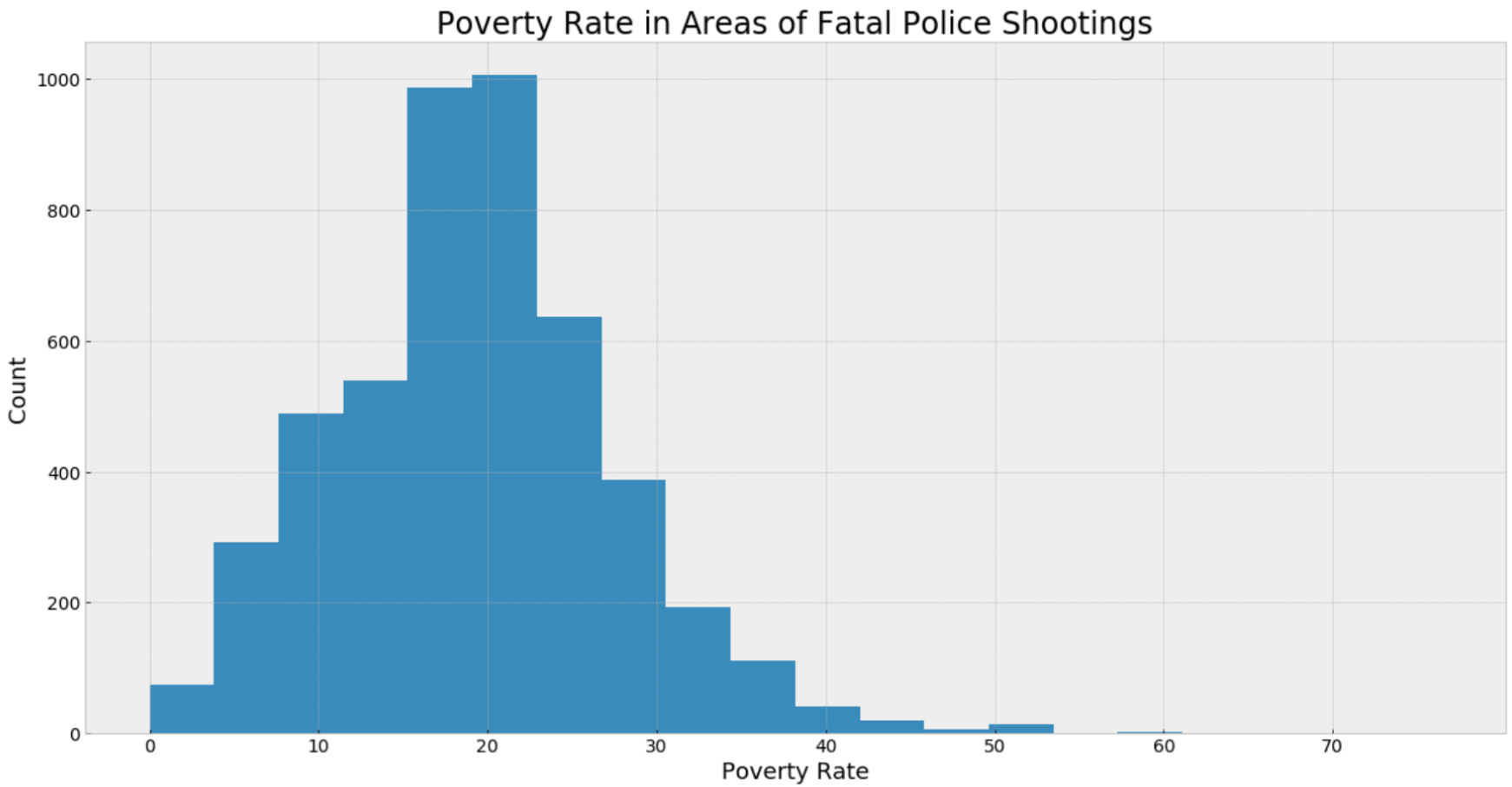
- Minimum: $12,083.00
- Maximum: $178,765.00
- IQR: $38,554.50 - $54,222.50
- Standard Deviation: 15983.06
- Variance: 255458207.96



Outliers	
Median Income Range	**Count**
<= $15,052.50	1
$77,724.50 - $100,000	219
$100,000 - $150,000	61
$150,000 - $178,765	3

The cutoff for outliers is <$15,052.50 and >77.724.50

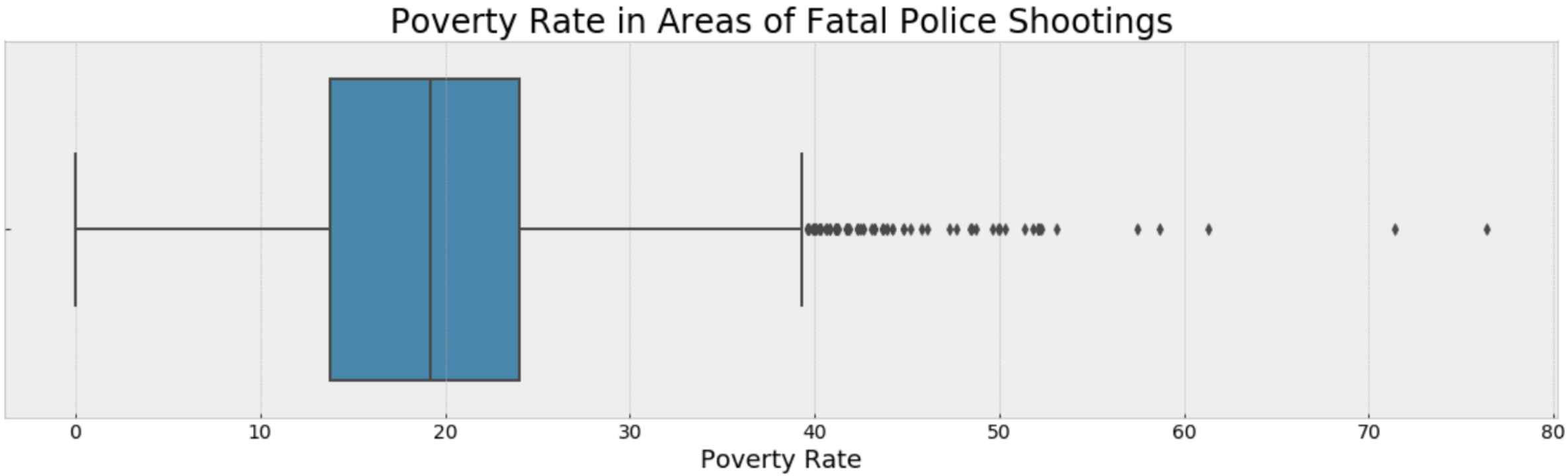
Poverty Rate



Measures of Central Tendency

- Mean: 19.34%
- Mode: 22.1%
- Median: 19.2%

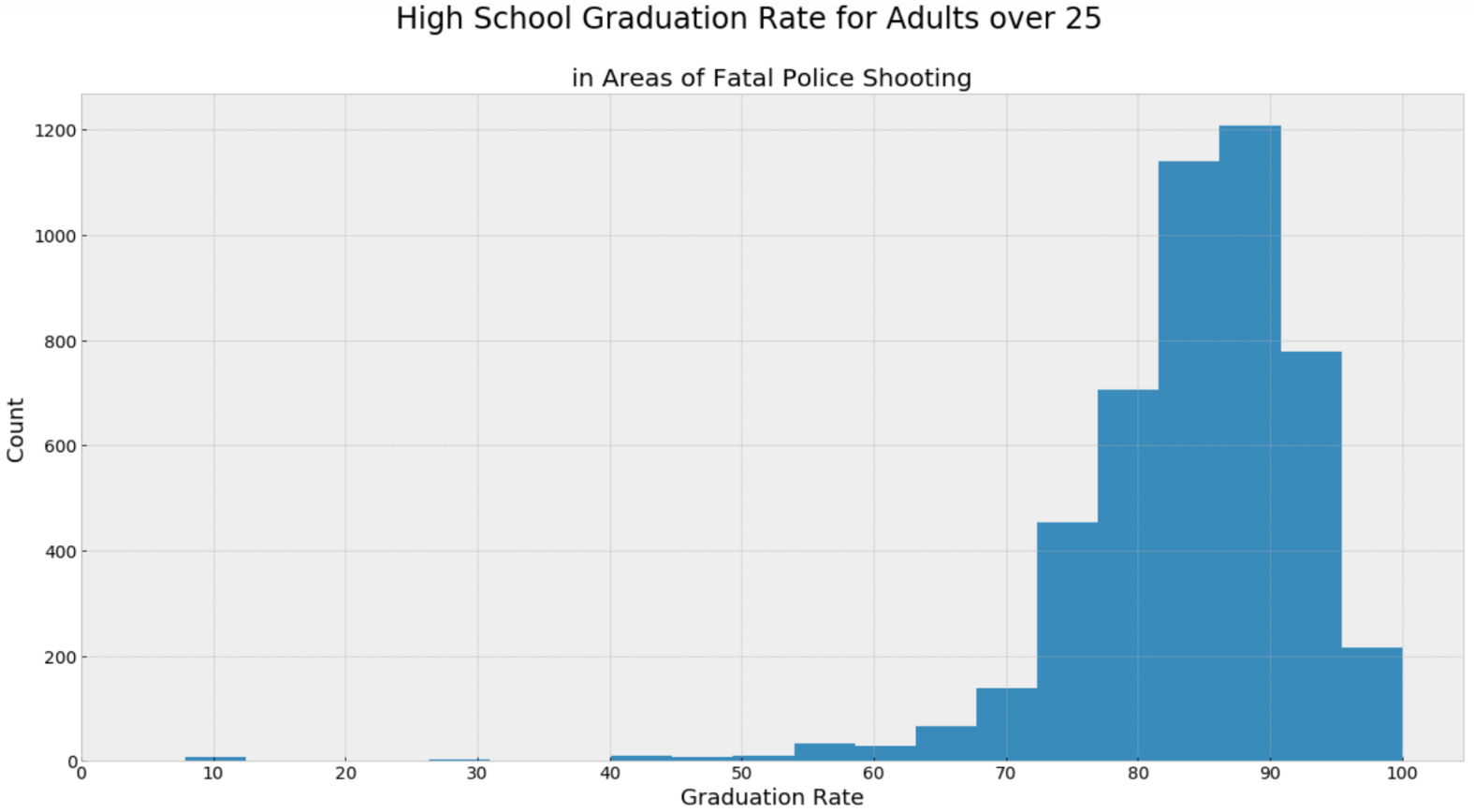
- Measures of Spread
- Minimum: 0%
- Maximum: 76.4%
- IQR: 13.8% - 24%
- Standard Deviation: 8.24
- Variance: 67.9



Outliers	
Poverty Rate Range	**Count**
39.3% - 50%	65
50% - 60%	15
60% - 70%	1
70% - 76.4%	2

The cutoff for outliers is <-1.5% and >39.3%

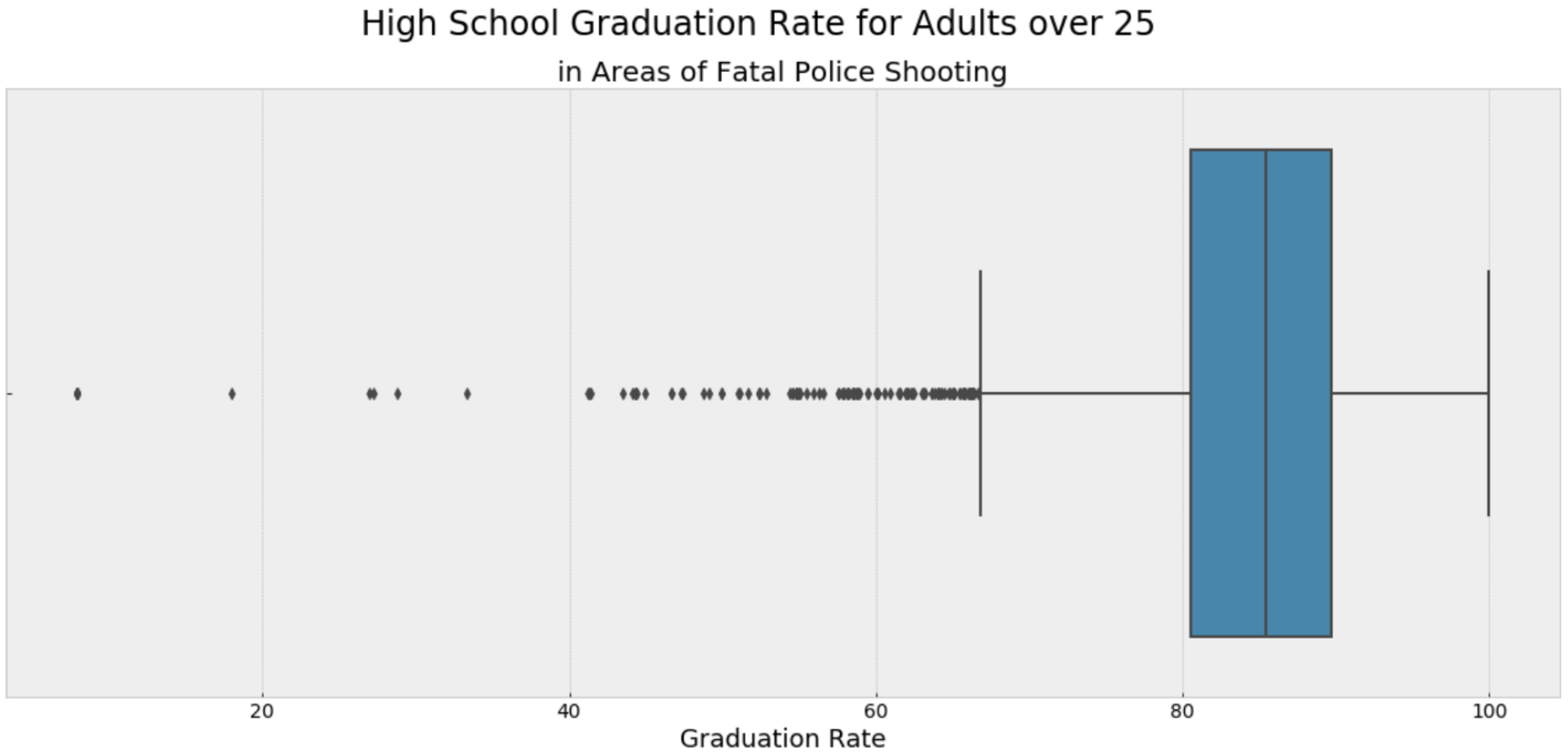
Graduation Rate



Measures of Central Tendency

- Mean: 84.28%
- Mode: 75.5%, 80.7%
- Median: 85.4%

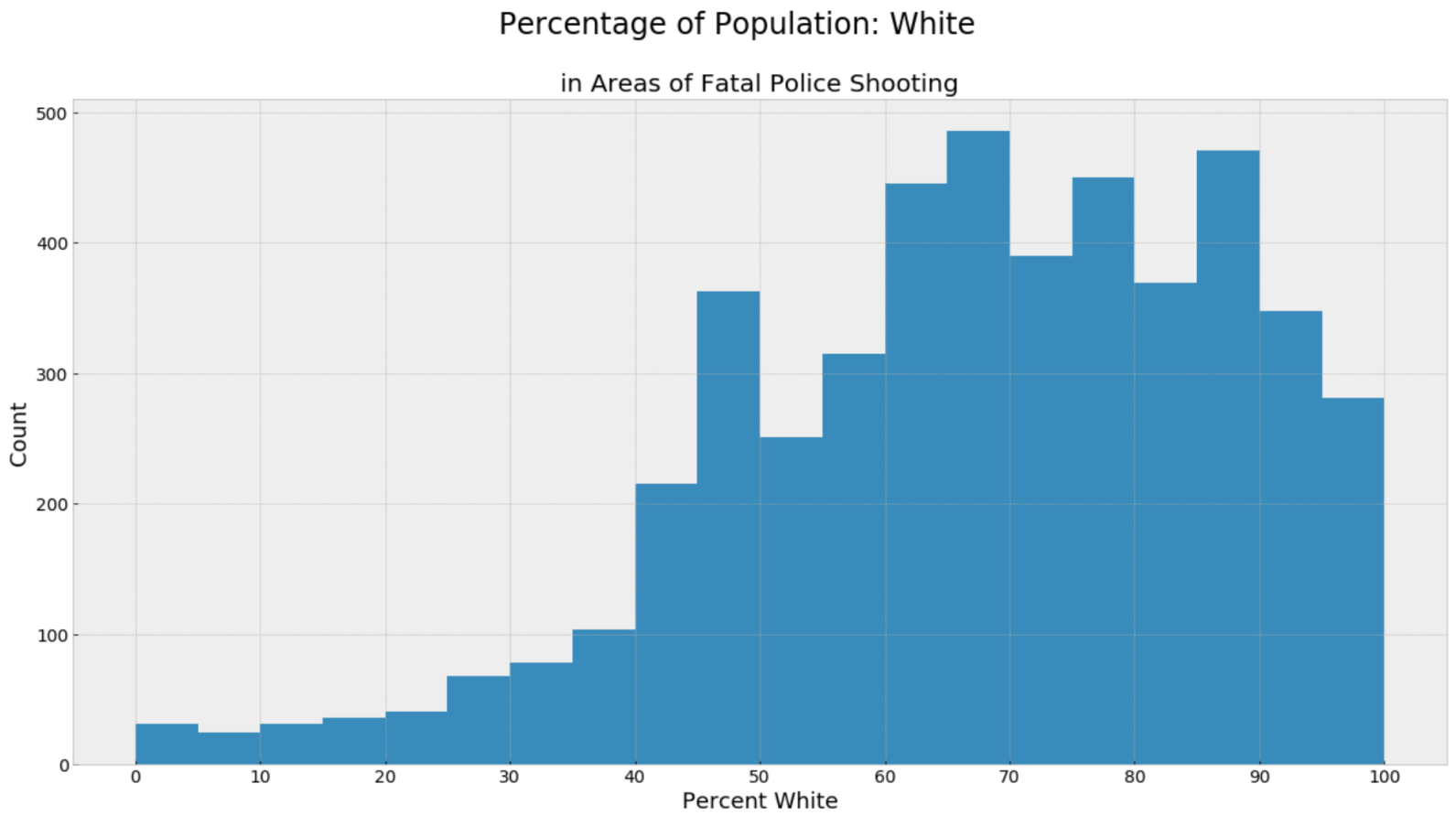
- **Measures of Spread**
- Minimum: 7.9%
- Maximum: 100%
- IQR: 80.5% - 89.7%
- Standard Deviation: 8.67
- Variance: 75.17



Outliers	
Graduation Rate Range	**Count**
0% - 20%	9
20% - 40%	4
40% - 60%	71
60% - 66.7%	60

The cutoff for outliers is <66.7% and >103.5%

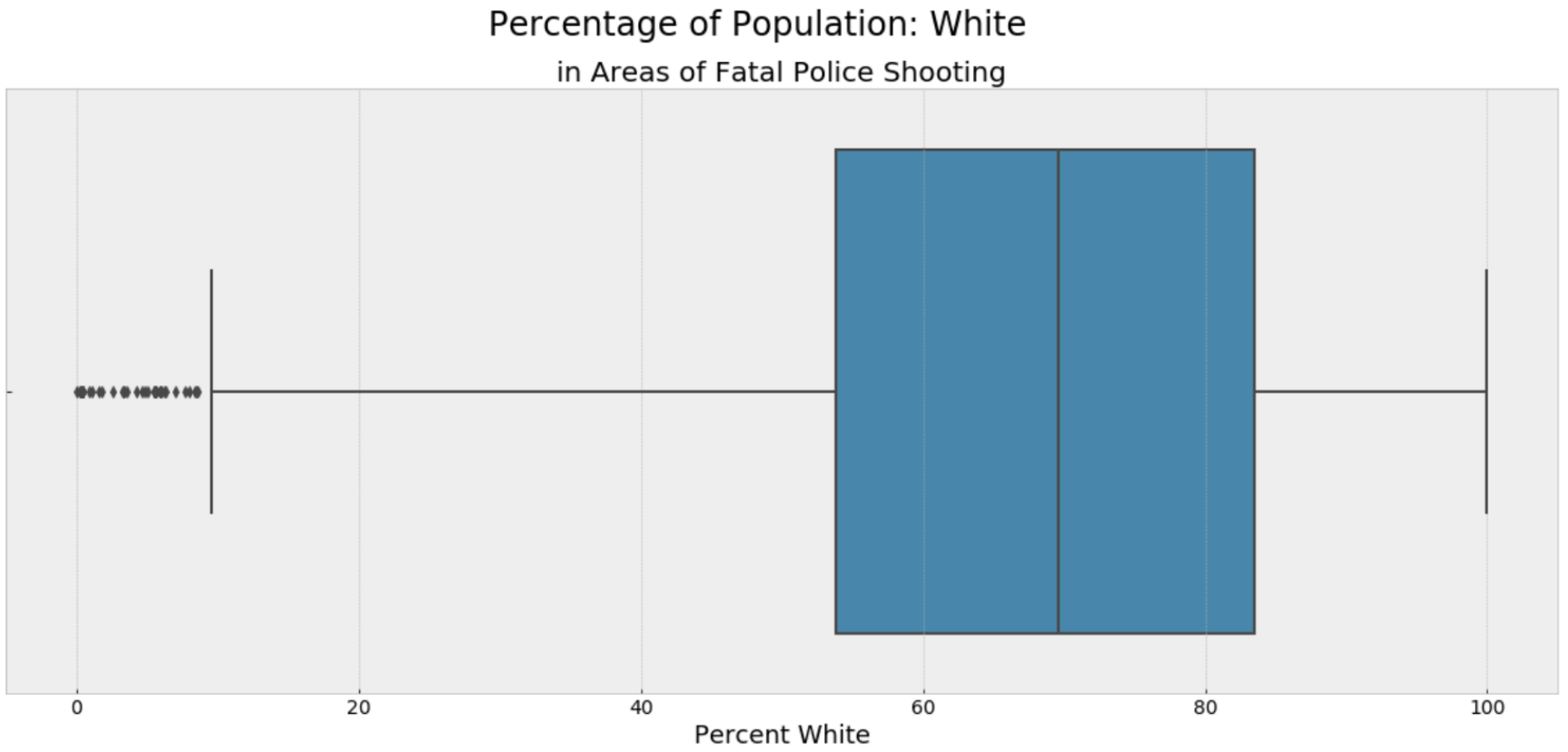
Racial Demographics: White



Measures of Central Tendency

- Mean: 67.36%
- Mode: 49.8%, 72.6%
- Median: 69.55%

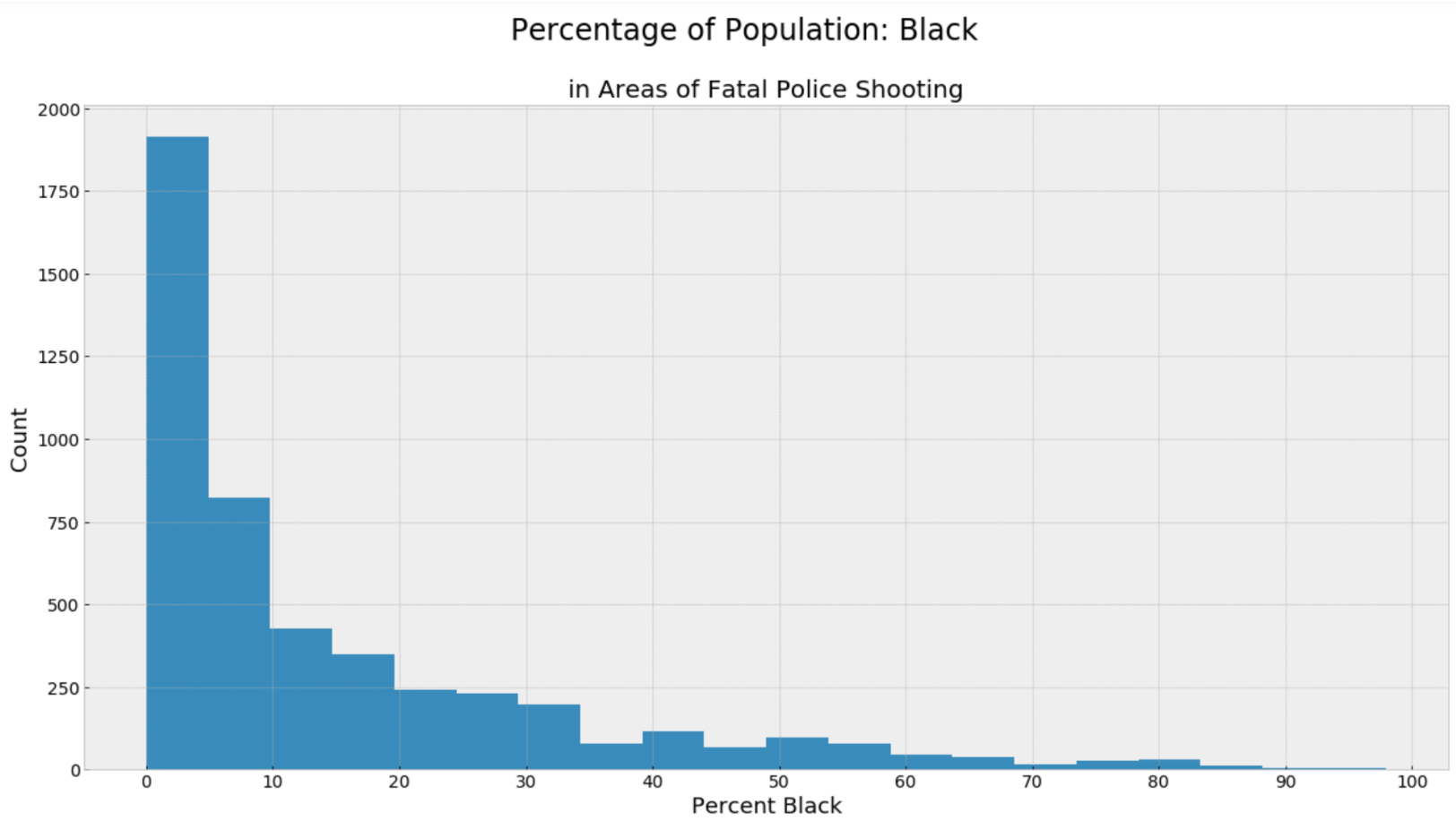
- **Measures of Spread**
- Minimum: 0%
- Maximum: 100%
- IQR: 53.8% - 83.5%
- Standard Deviation: 20.22
- Variance: 408.85



Outliers	
Percentage White Range	**Count**
0% - 5%	31
5% - 9.25%	22

The cutoff for outliers is <9.25% and >128.05%

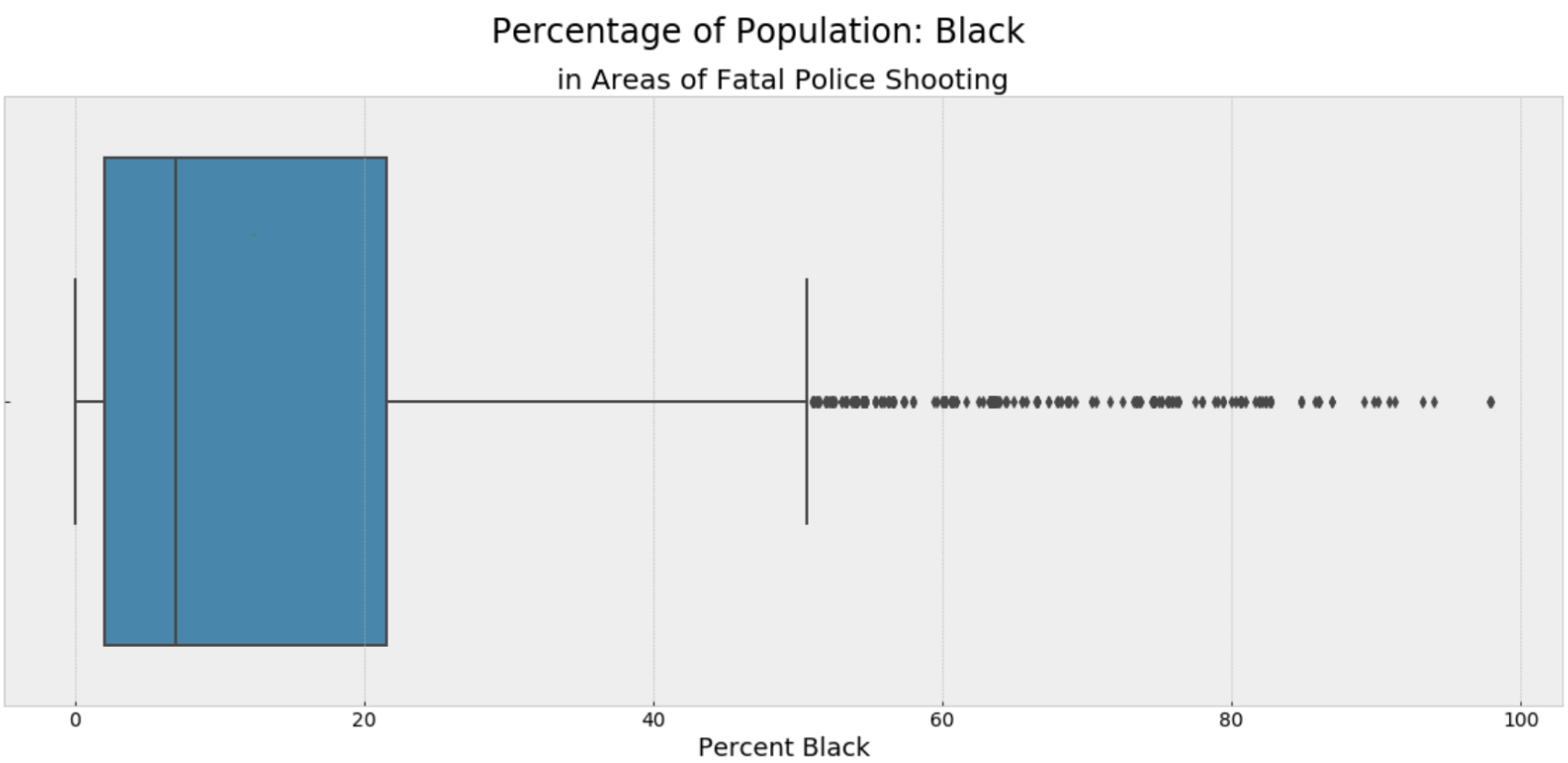
Racial Demographics: Black



Measures of Central Tendency

- Mean: 14.76%
- Mode: 0%
- Median: 7%

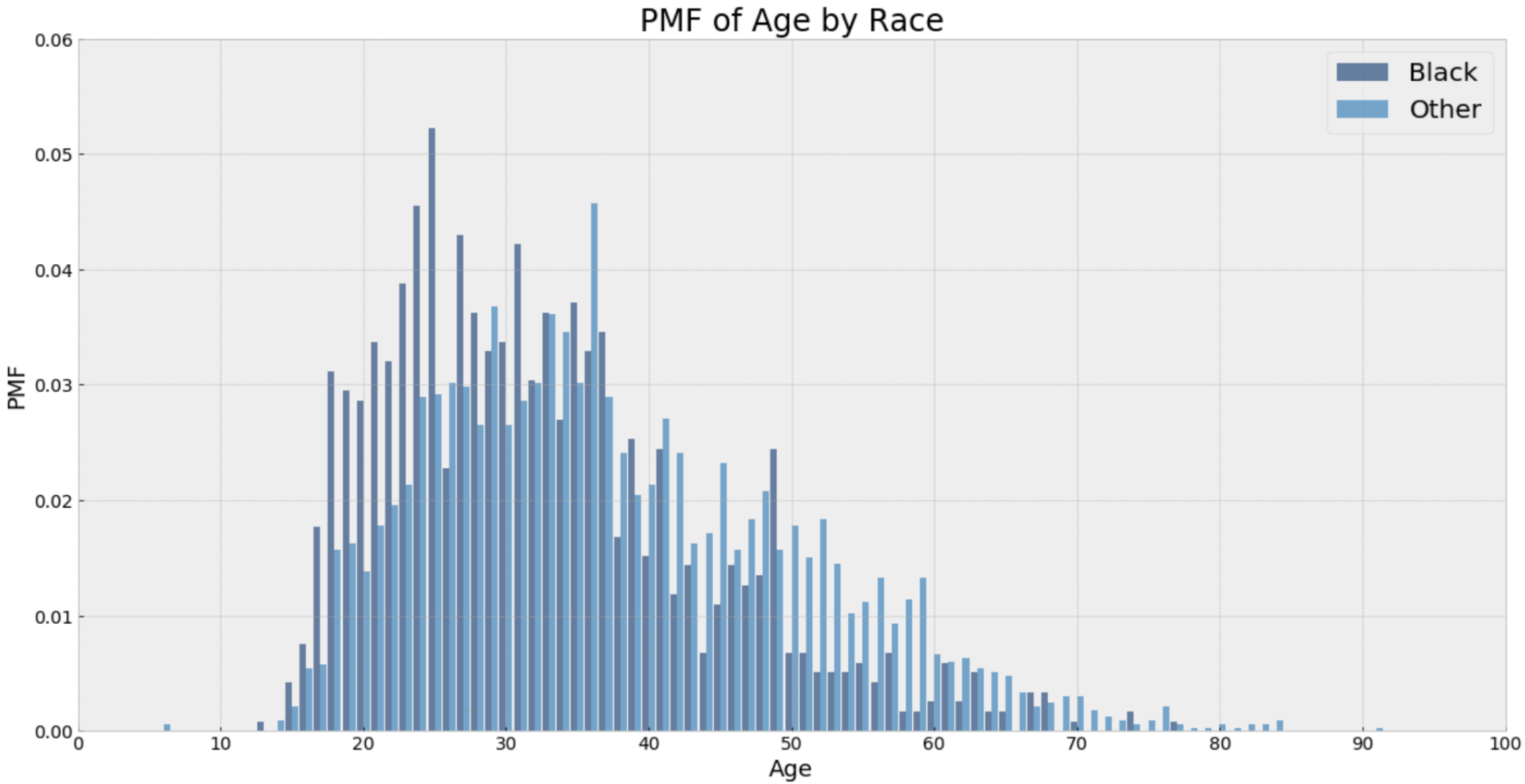
- Measures of Spread
- Minimum: 0%
- Maximum: 98%
- IQR: 2% - 21.5%
- Standard Deviation: 17.83
- Variance: 317.9



Outliers	
Percentage Black Range	**Count**
50.75% - 60%	127
60% - 70%	79
70% - 80%	49
80% - 90%	35
90% - 98%	7

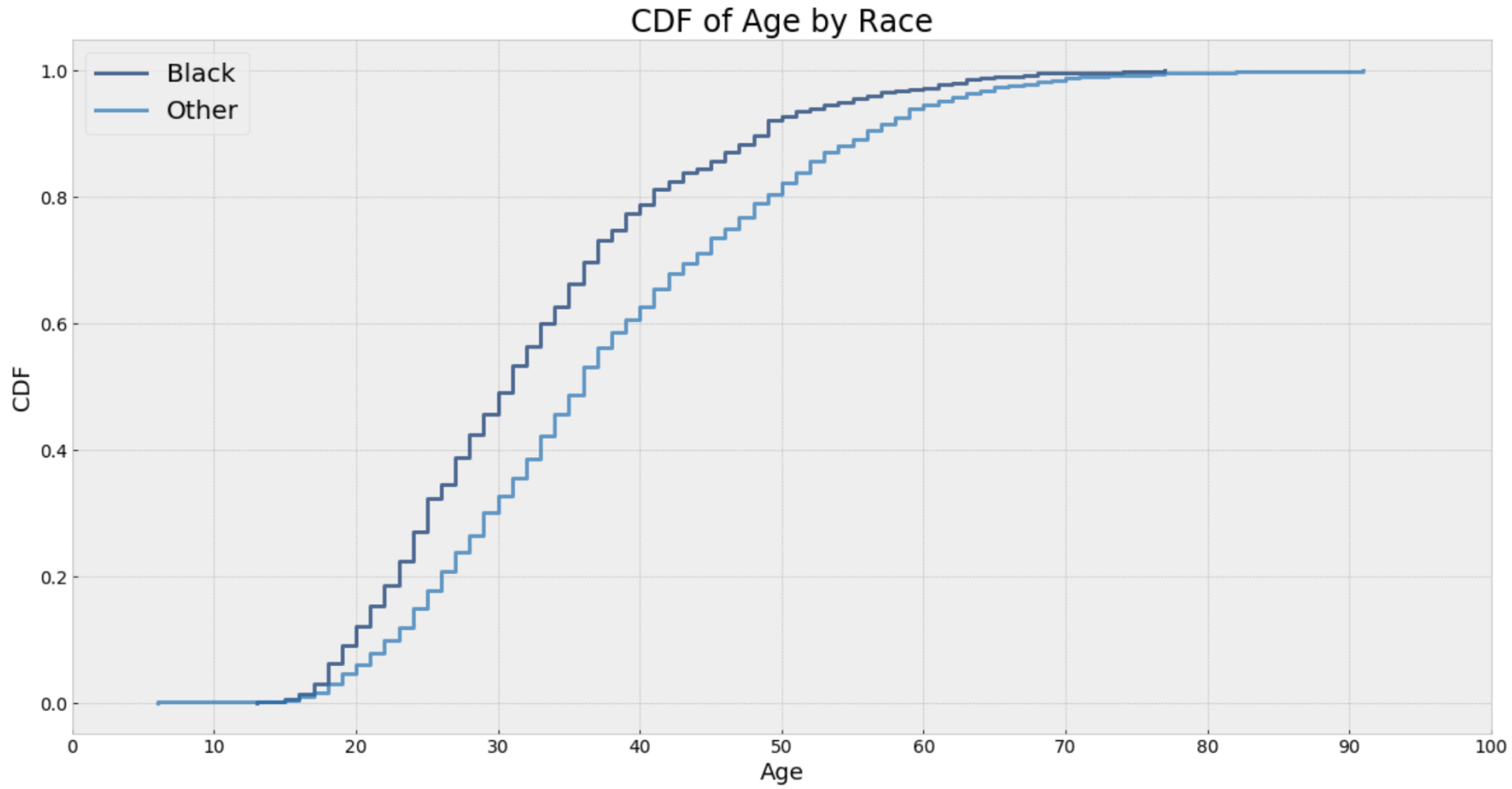
The cutoff for outliers is <-27.25% and >50.75%

Probability Mass Function

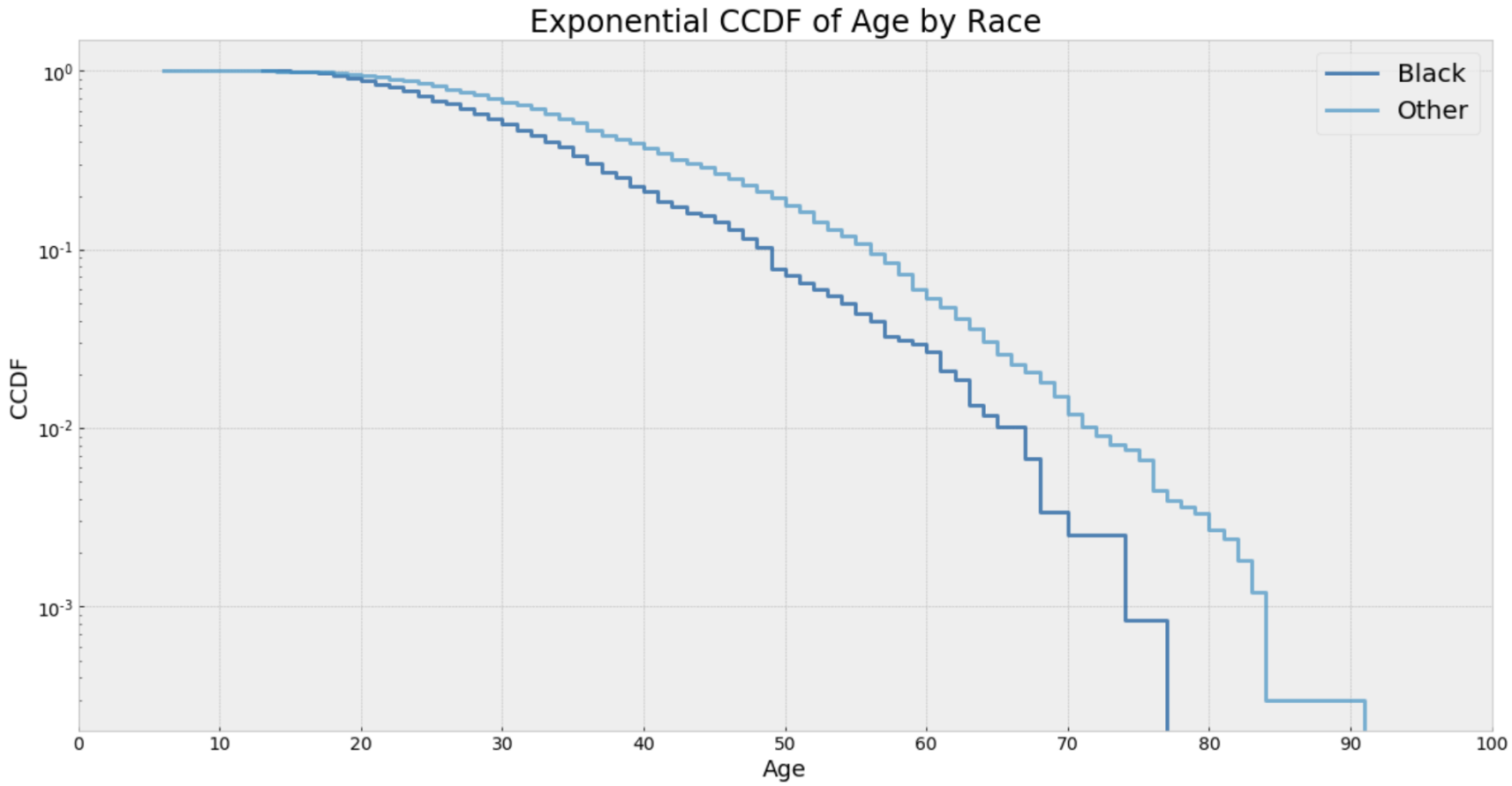

PMF of Age by Race
Black
Other
PMF
Age
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0
10
20
30
40
50
60
70
80
90
100

Cumulative Distribution Function

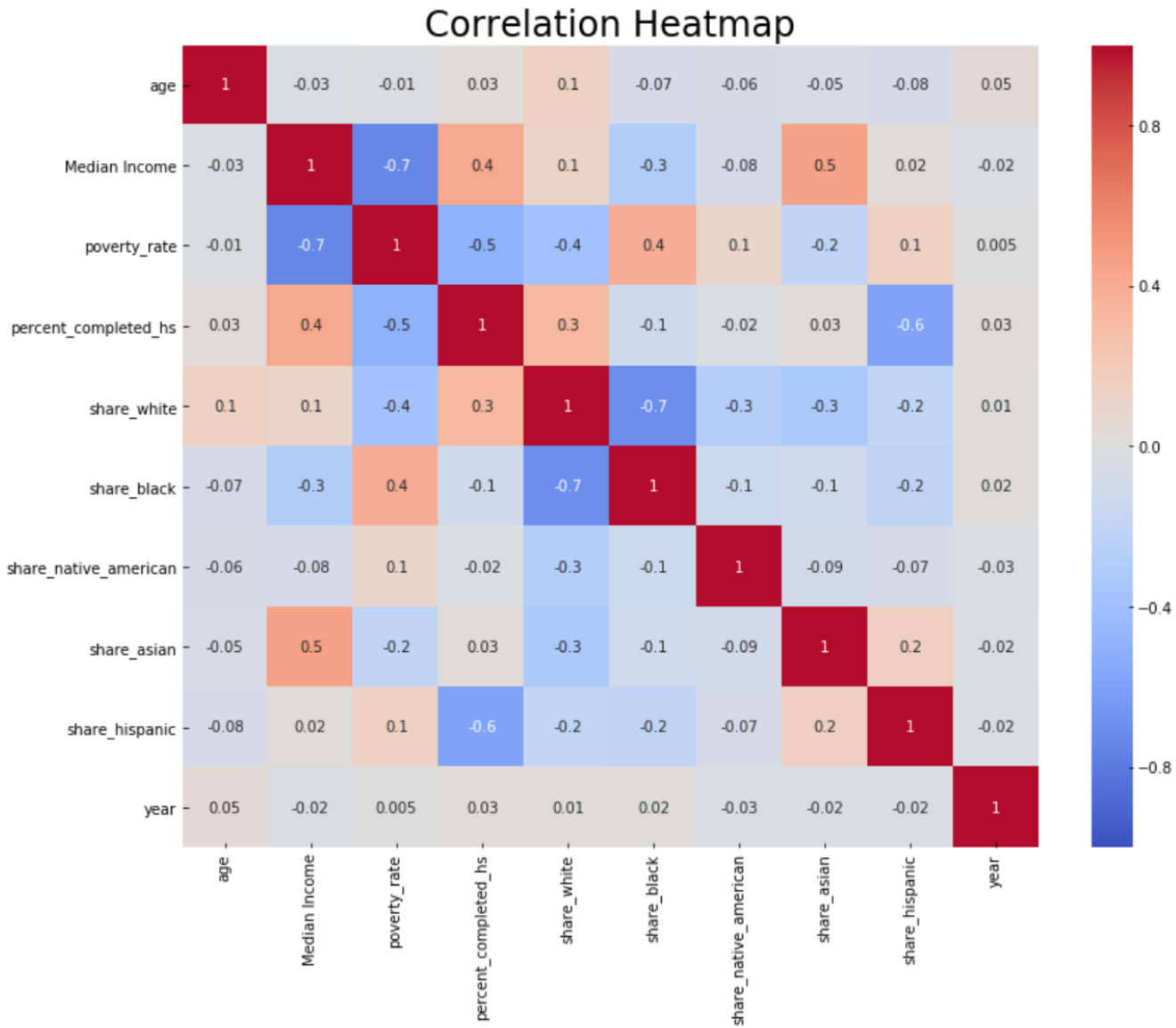
CDF


CDF of Age by Race
Black
Other
CDF
Age
0.0
0.2
0.4
0.6
0.8
1.0
0
10
20
30
40
50
60
70
80
90
100

CCDF: Exponential Distribution

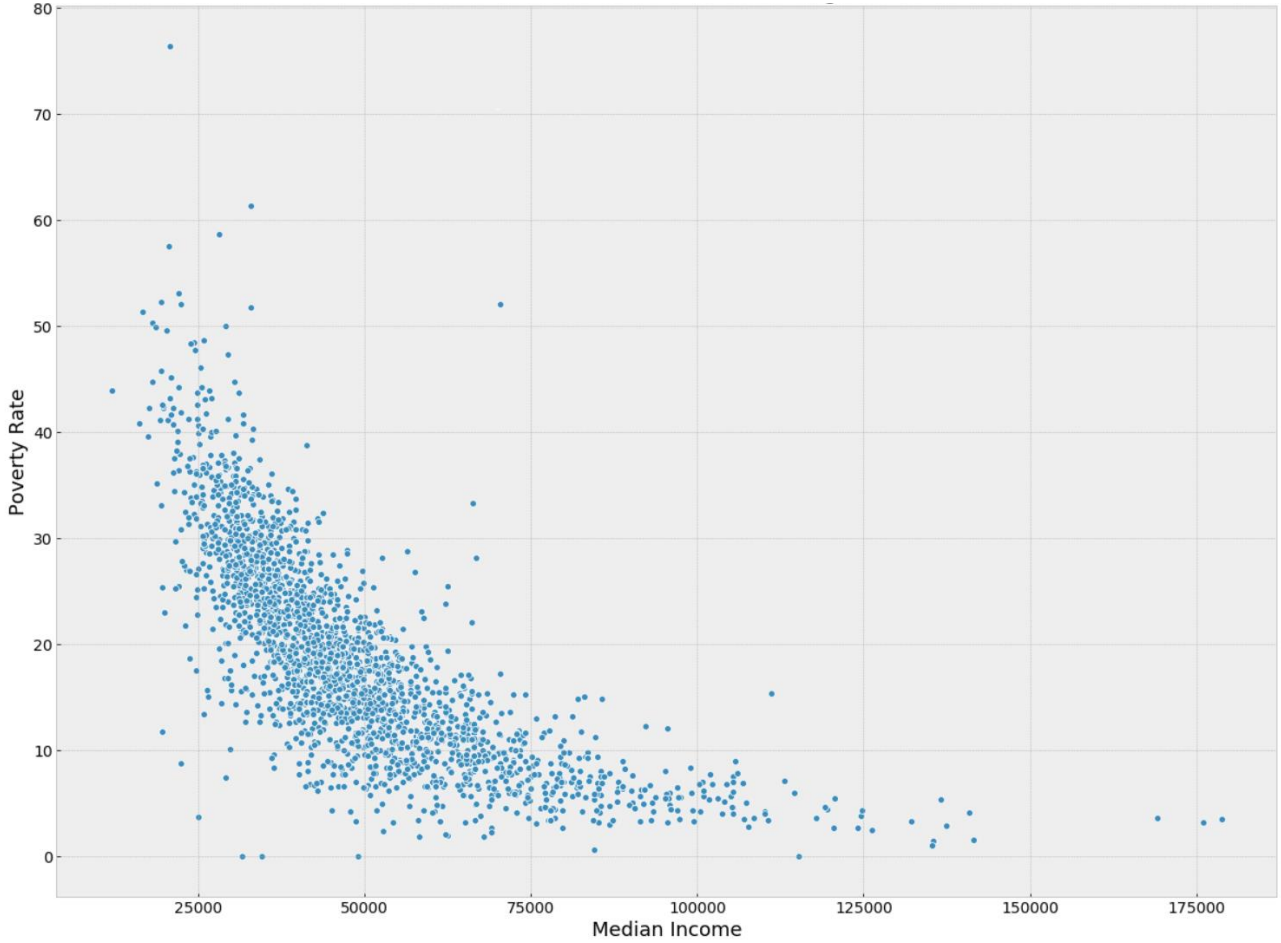


Scatterplots & Correlation Analysis


Correlation Heatmap
age
Median Income
poverty_rate
percent_completed_hs
share_white
share_black
share_native_american
share_asian
share_hispanic
year
1 -0.03 -0.01 0.03 0.1 -0.07 -0.06 -0.05 -0.08 0.05
-0.03 1 -0.7 0.4 0.1 -0.3 -0.08 0.5 0.02 -0.02
-0.01 -0.7 1 -0.5 -0.4 0.4 0.1 -0.2 0.1 0.005
0.03 0.4 -0.5 1 0.3 -0.1 -0.02 0.03 -0.6 0.03
0.1 0.1 -0.4 0.3 1 -0.7 -0.3 -0.3 -0.2 0.01
-0.07 -0.3 0.4 -0.1 -0.7 1 -0.1 -0.1 -0.2 0.02
-0.06 -0.08 0.1 -0.02 -0.3 -0.1 1 -0.09 -0.07 -0.03
-0.05 0.5 -0.2 0.03 -0.3 -0.1 -0.09 1 0.2 -0.02
-0.08 0.02 0.1 -0.6 -0.2 -0.2 -0.07 0.2 1 -0.02
0.05 -0.02 0.005 0.03 0.01 0.02 -0.03 -0.02 -0.02 1
0.8
0.4
0.0
−0.4
−0.8

Poverty Rate vs. Median Income

in areas of fatal police shootings



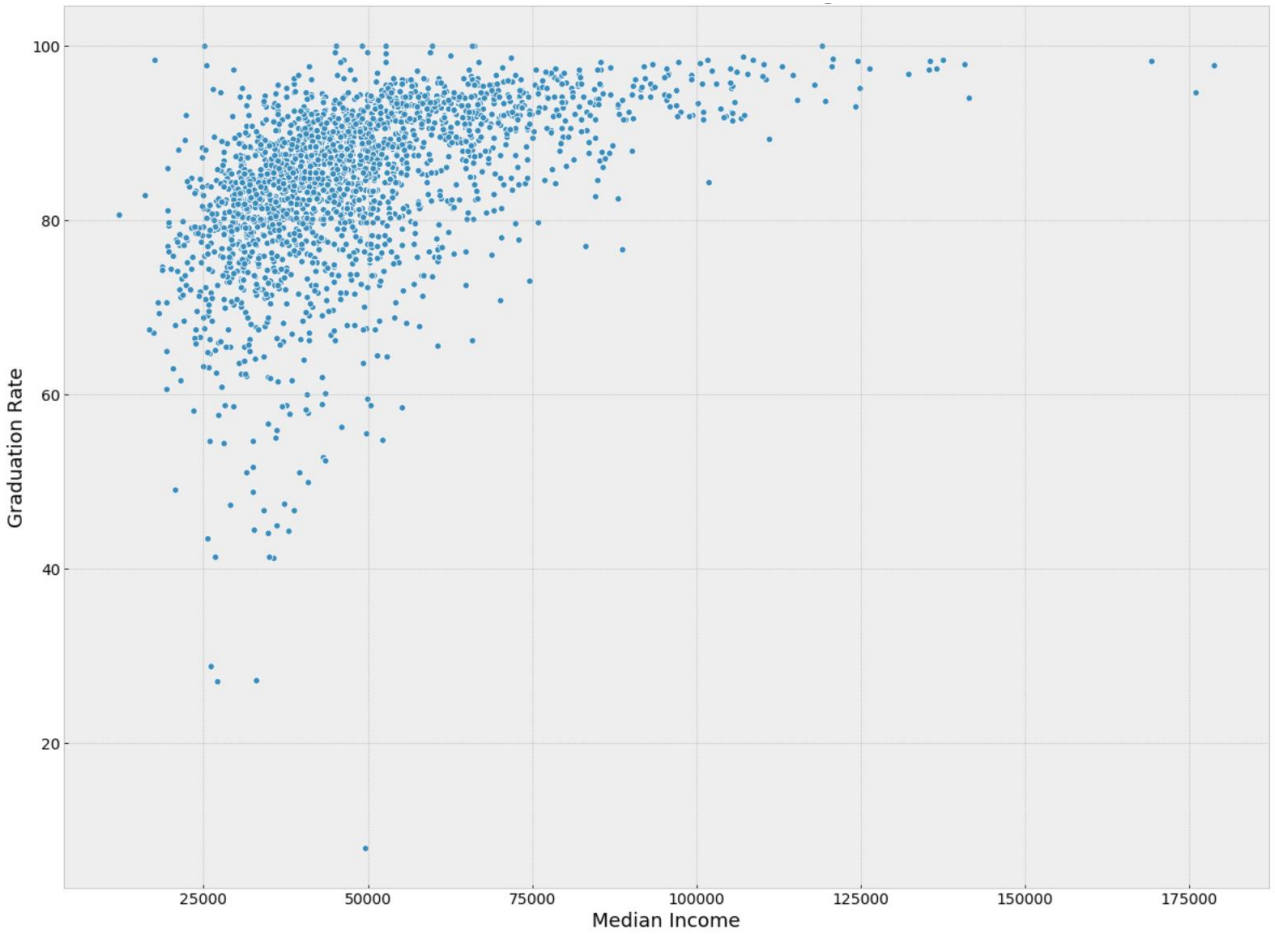
Covariance: -96555.63

Pearson's Correlation: -0.74

Spearman's Correlation: -0.78

Graduation Rate vs. Median Income

in areas of fatal police shootings



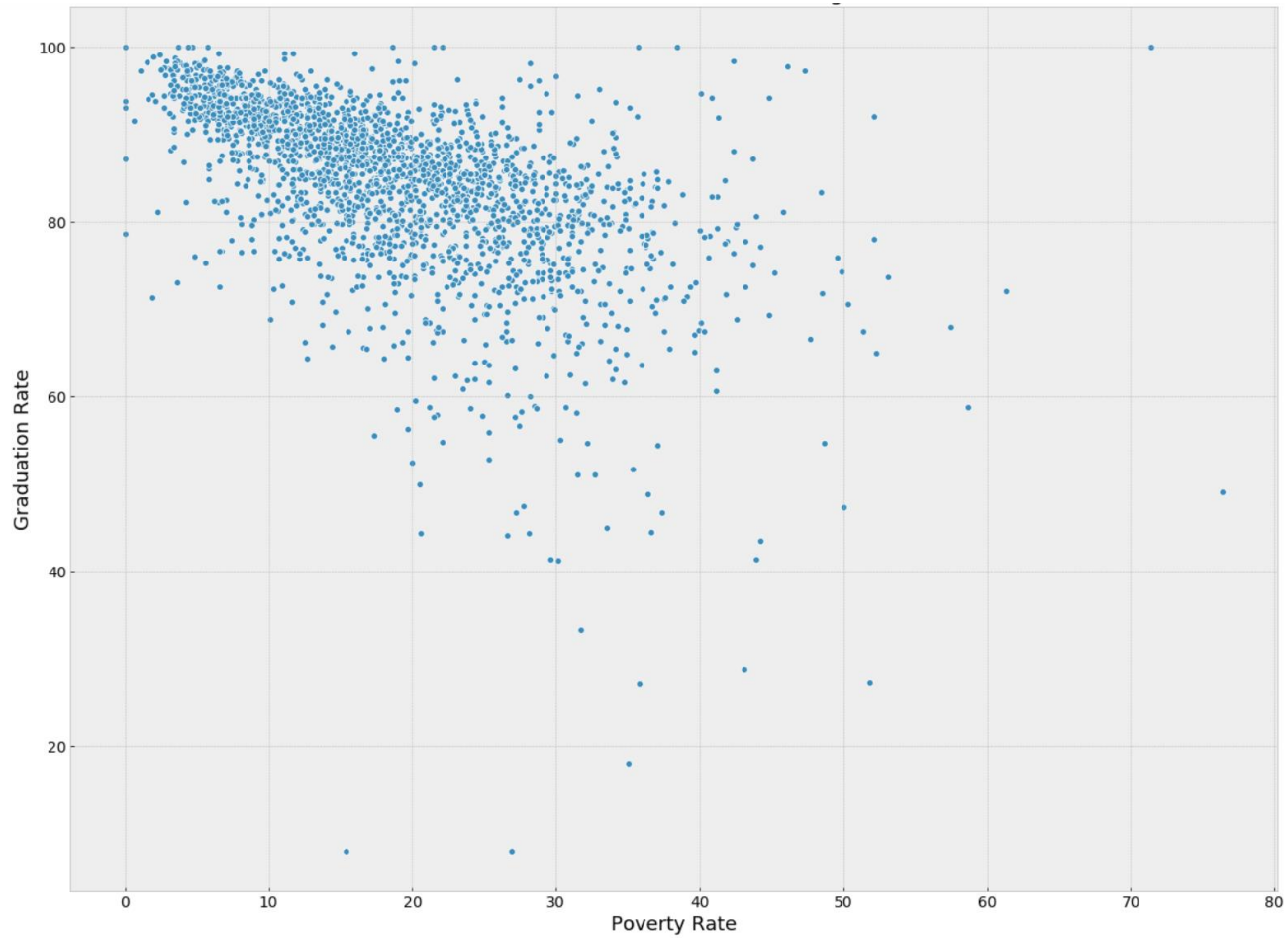
Covariance: -55161.2

Pearson's Correlation: 0.42

Spearman's Correlation: 0.45

Graduation Rate vs. Poverty Rate

in areas of fatal police shootings

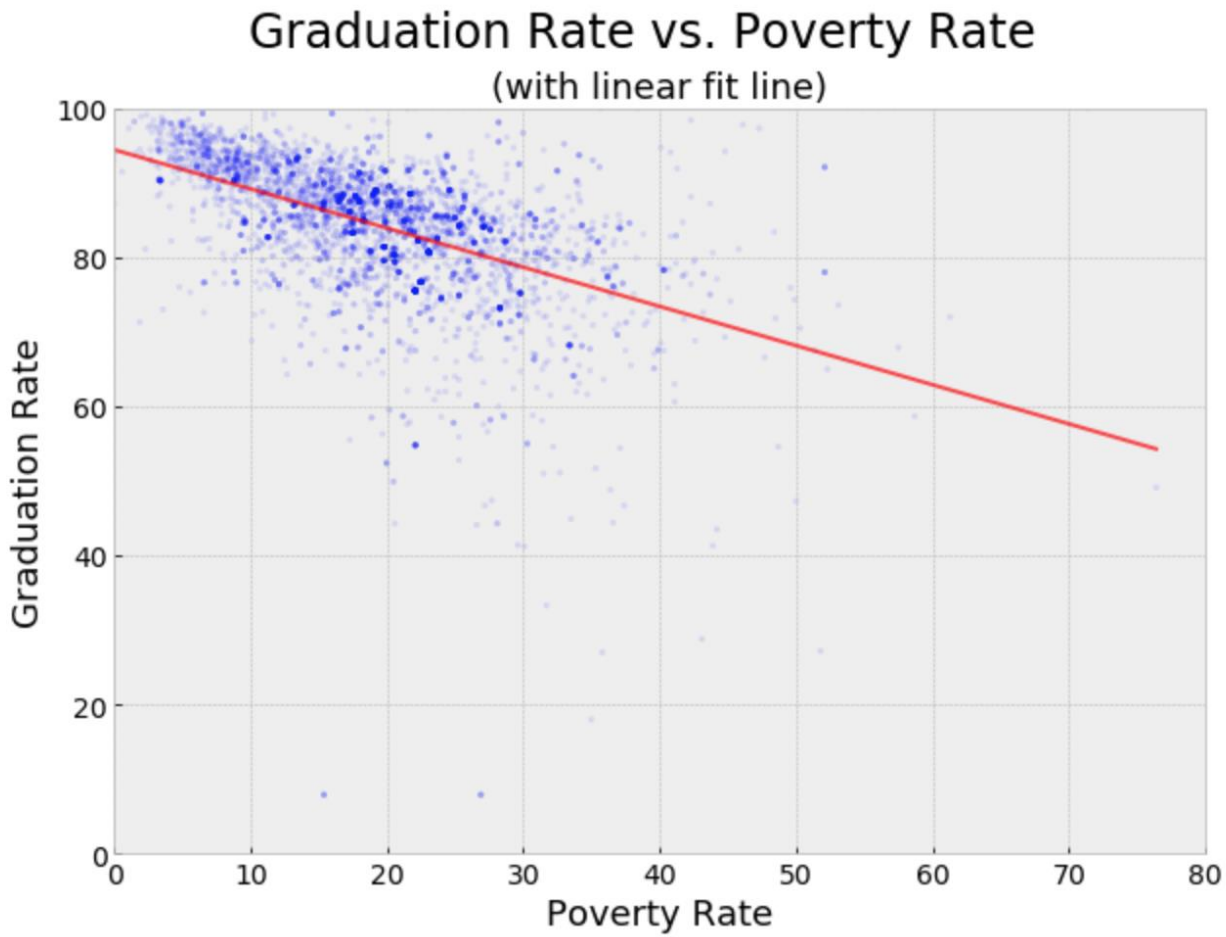


Covariance: -35.72

Pearson's Correlation: -0.5

Spearman's Correlation: -0.58

Regression Analysis

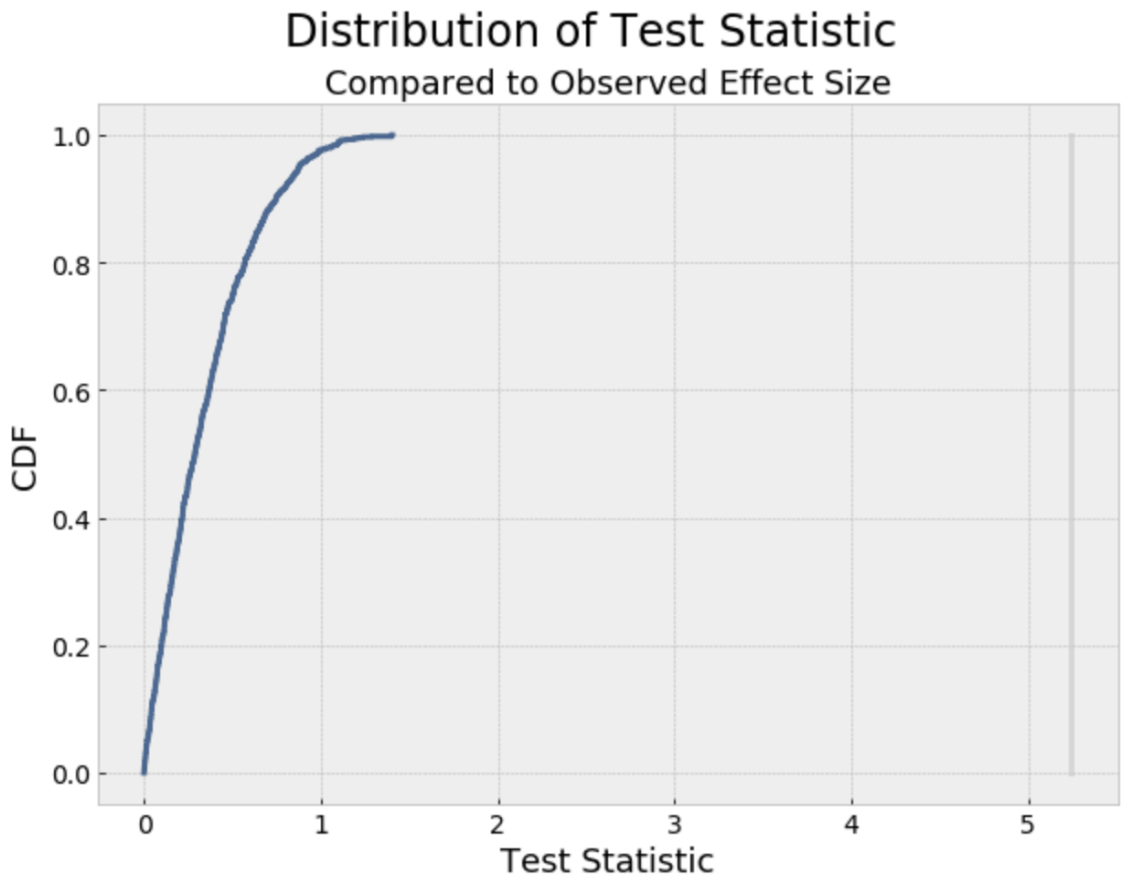


Intercept: 94.44

Slope: -0.53

Coefficient of Determination: 0.25

Hypothesis Testing



Test statistic: Difference of Means

Null Hypothesis: There is no difference in mean age between black fatal police shooting victims and other races; the ages for both groups have the same distribution.

P-value: 0

Conclusion: The difference in mean age is statistically significant; it is unlikely to have occurred by chance.

Conclusions

- The distribution of age appears to be significantly different between racial groups. Victims are Black at a disproportionate rate when compared to national census data.
- Fatal police shootings do not appear to be associated with high poverty rates or lower graduation rates.
- Fatal police shootings may be associated with lower median income.