

# Housing Price and Population Density's Effects on Gun Violence

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## Hypothesis:

There is a statistical difference between gun violence rate (number of gun violence incidents per capita) between areas with expensive housing and areas with inexpensive housing. Specifically, we expect areas with expensive housing to have lower rates of gun violence and vice versa for areas with less expensive housing. We also hypothesize gun violence rate will increase with population density.

## Data:

We obtained our data from 3 sources:

1. 263,653 gun violence incidents data from 2014-2018 end of March from the GunViolenceArchive: <https://www.gunviolencearchive.org/>
2. 27,554 towns/cities with up to 260 price estimates, ranging from 1996 to 2013 Housing Prices by state from the Zillow housing data by regions in csv format from <https://www.zillow.com/research/data/>
3. 40,840 incidences of population data broken by countys and cities from the US census in csv format from <https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>

We found that the Gun Violence Database contained ~5% rows that do not provide location data. The other two sources of data were relatively clean and had little to no missing or duplicated data, except for some missing price estimates in the Zillow Database since it contains data all the way from 1996.

## Findings:

\*Note, we found that population has a lot to do with the rates of gun violence, specifically, areas with population less than 50,000 and greater than 500,000 have a large variability in gun violence rates, so we chose to focus our examination in the 50,000 - 500,000 population range. Additionally, housing prices tend to work better as a metric of socioeconomic status for cities with similar populations, since an equivalent standard of living often becomes more expensive for bigger cities.

**Claim 1:** There are higher rates of gun violence in areas with lower housing prices than areas with higher housing prices.

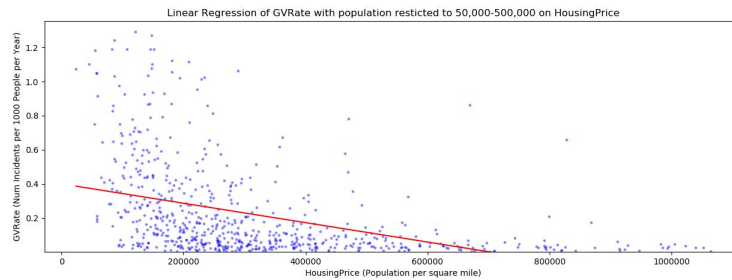
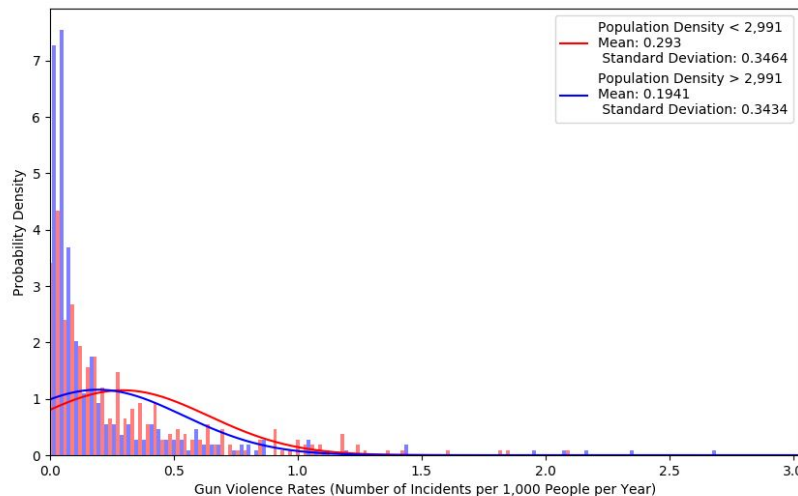


Fig 1: Linear Regression of Housing Price vs GVRate

When we ran linear regression on the data restricted to population segments of 50,000 - 500,000, there is a clear downward trendline of decreasing gun violence incidents with increases in housing price. The coefficient is  $-5.69 \times 10^{-4}$  Num Incidents per 1000 people per year per \$1000 house value.

**Claim 2:** Areas with lower population density does not have lower rates of gun violence than areas with higher population density, in fact the opposite might be true



We did a one tailed t-test on the data with populations between 50,000 and 500,000, and found that when splitting the data based on the median population density of 2991 people per square mile we got a test statistic of 3.97 and a p-value of 0.99996. This means we fail to reject the null hypothesis at a significance level of 0.05 that higher population density results in higher rates of gun violence. Furthermore, from plotting the distributions of gun violence rates based on population density, we can see that the red distribution where population density is less than 2,991 has, on average, higher rates of gun violence than places with higher population density.