

Arson Data Report

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MA 415 Final Project: Arson Data

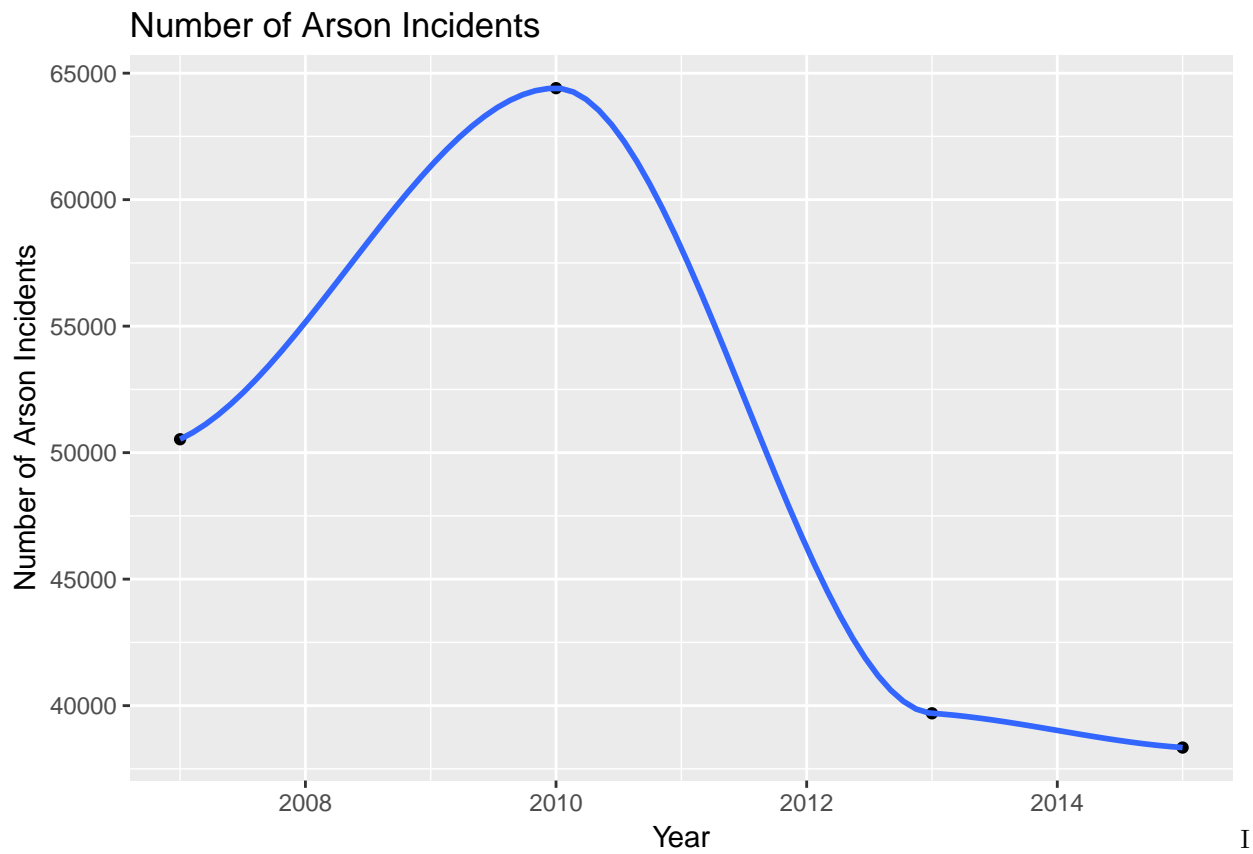
For my final project, I have chosen to focus on the arson data within the National Fire Incident Reporting System data that we were given by Diane. Diane mentioned that she had noticed a change in the data from the state of Massachusetts in the year 2011, and she asked that we look at the national data to see if we could find anything interesting. I have chosen to look at the national arson data from the years 2007, 2010, 2013, and 2015 (two years before 2011, two years after 2011).



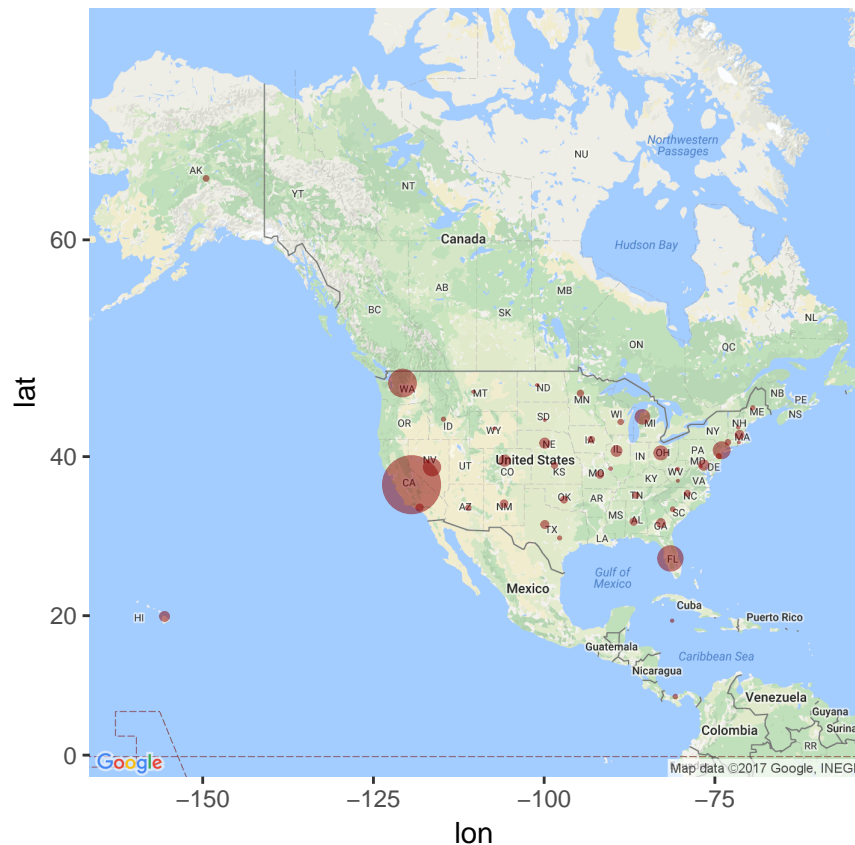
Figure 1: Arson Investigation

```
##      Year Number of Arson Incidents
## 1: 2007                      50530
## 2: 2010                      64408
## 3: 2013                      39697
## 4: 2015                      38343

## `geom_smooth()` using method = 'loess'
```



I am also interested in what it would look like to map this data set and figure out what states had the largest number of incidents of arson, so I am going to map the data from 2007.



Based on this map, in 2007, California, Florida, and Washington had the greatest number of incidents of arson.

After an initial exploration of the data, I narrowed my investigation to just a few specific variables that I found particularly interesting: civilian deaths, race and age of person arrested for committing arson, incendiary devices, and time of year of incidents. First I am going to look at civilian deaths.

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   NA's
##      1.00    1.00    1.00    1.52   2.00    9.00  47239

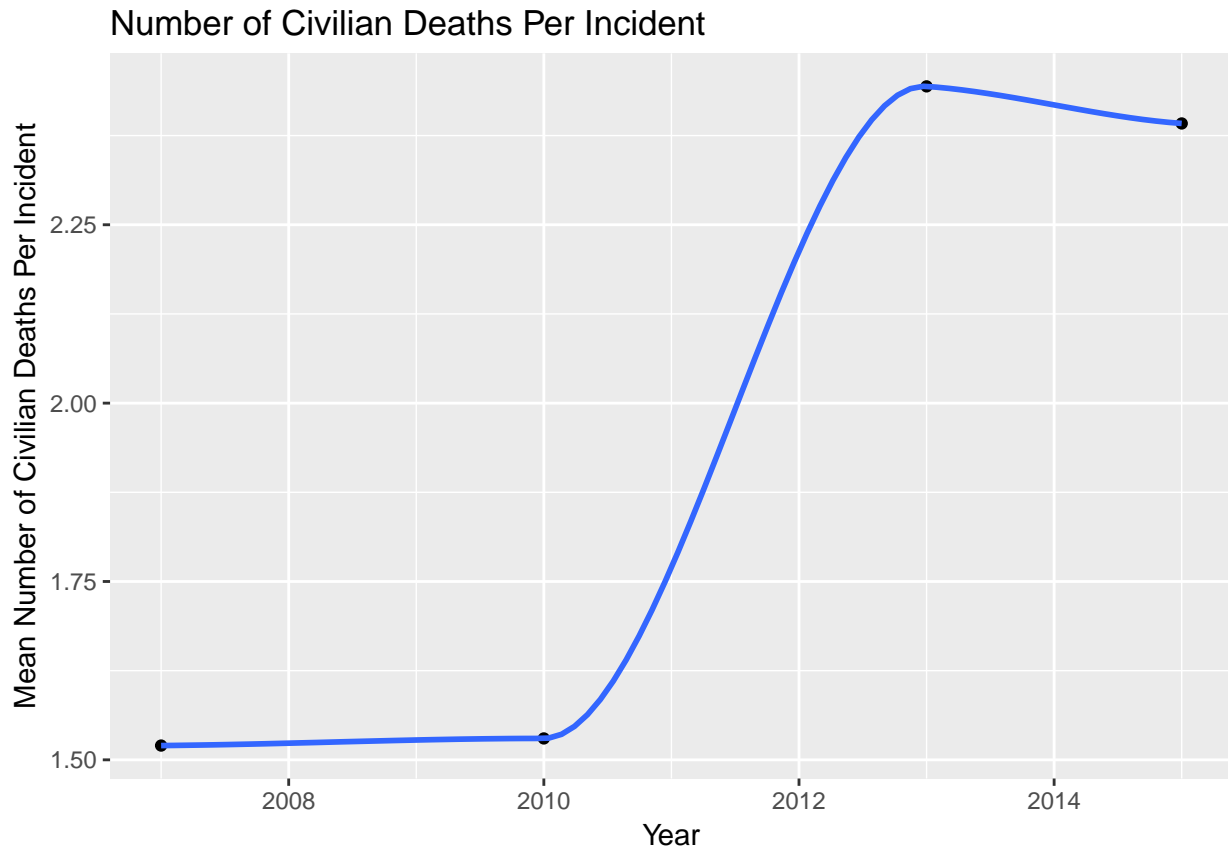
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   NA's
##      1.00    1.00    1.00    1.53   2.00   19.00  59439

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   NA's
##      1.000    1.000    2.000    2.444   3.000   24.000  30740

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   NA's
##      1.000    1.000    2.000    2.392   3.000  153.000  28616

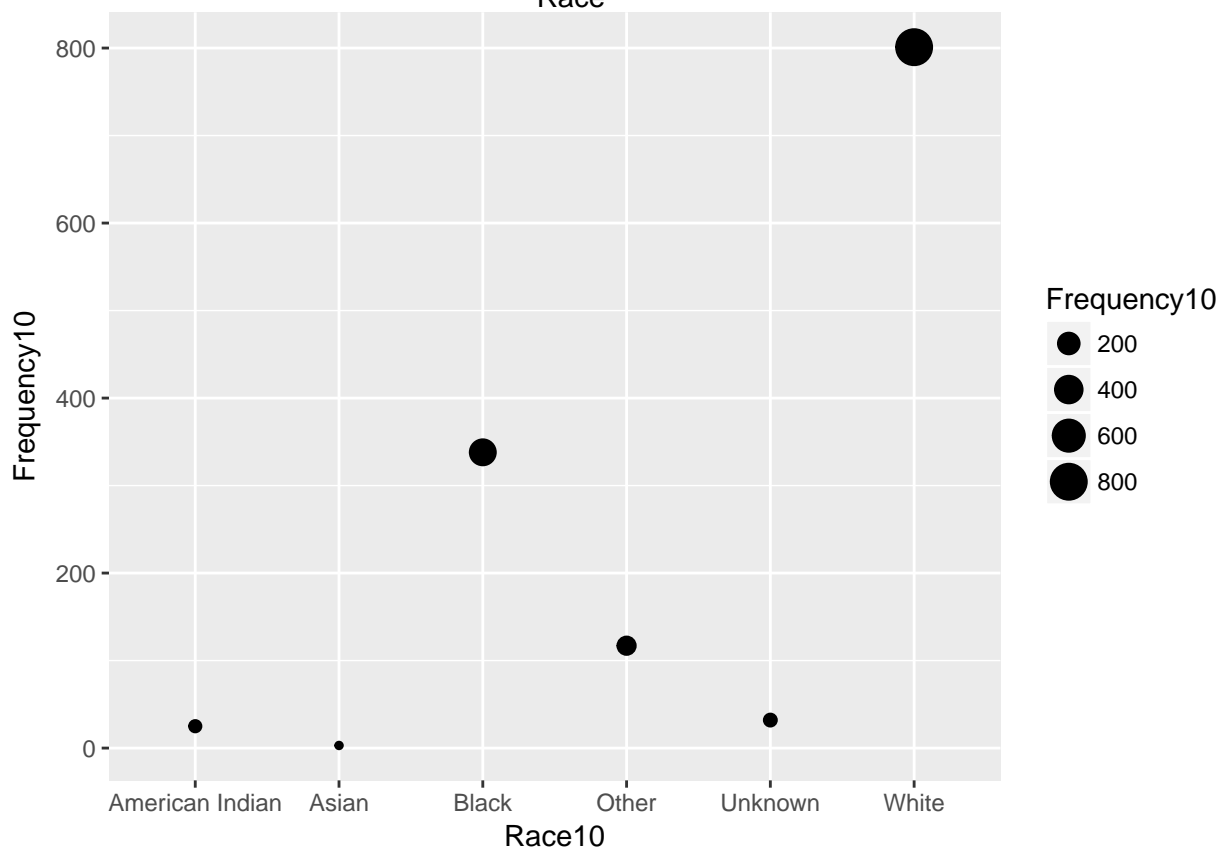
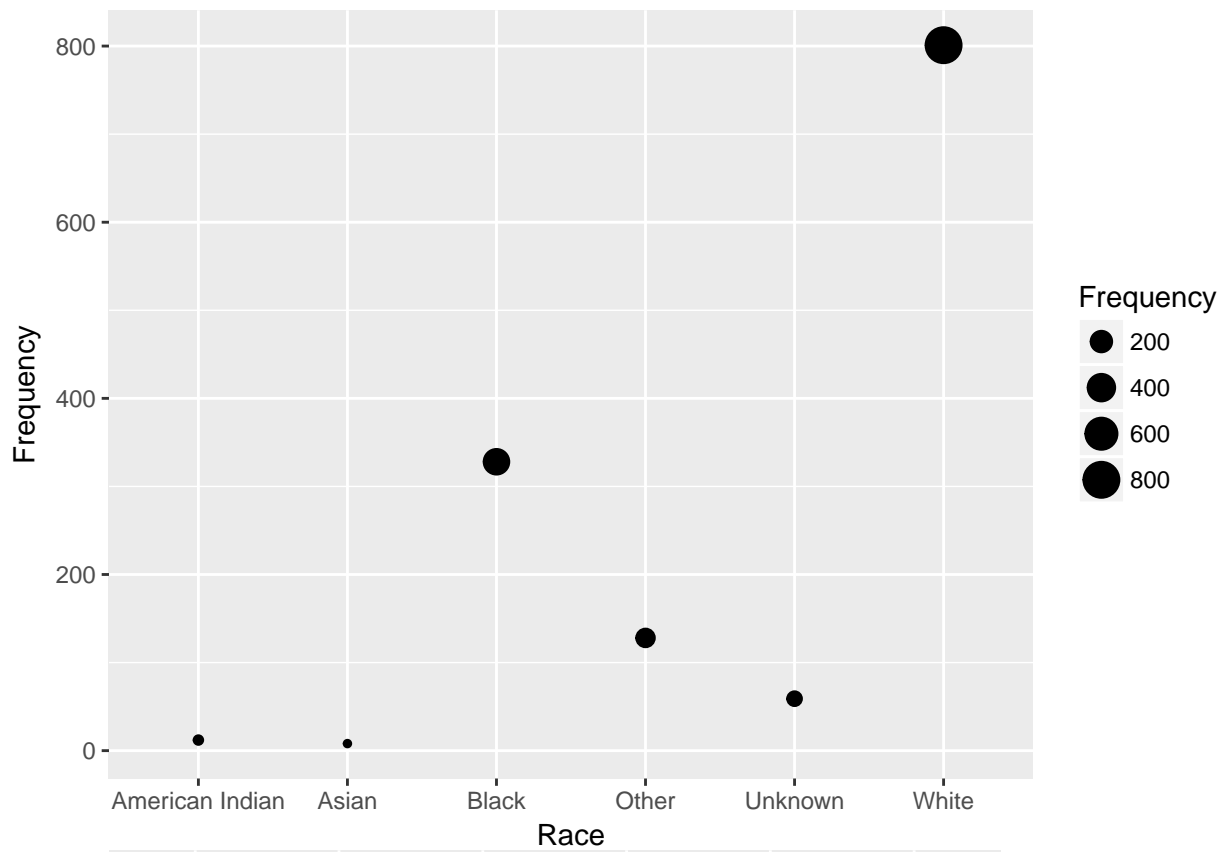
##      Year Mean Number of Civilian Deaths Per Incident
## 1: 2007                                     1.520
## 2: 2010                                     1.530
## 3: 2013                                     2.444
## 4: 2015                                     2.392

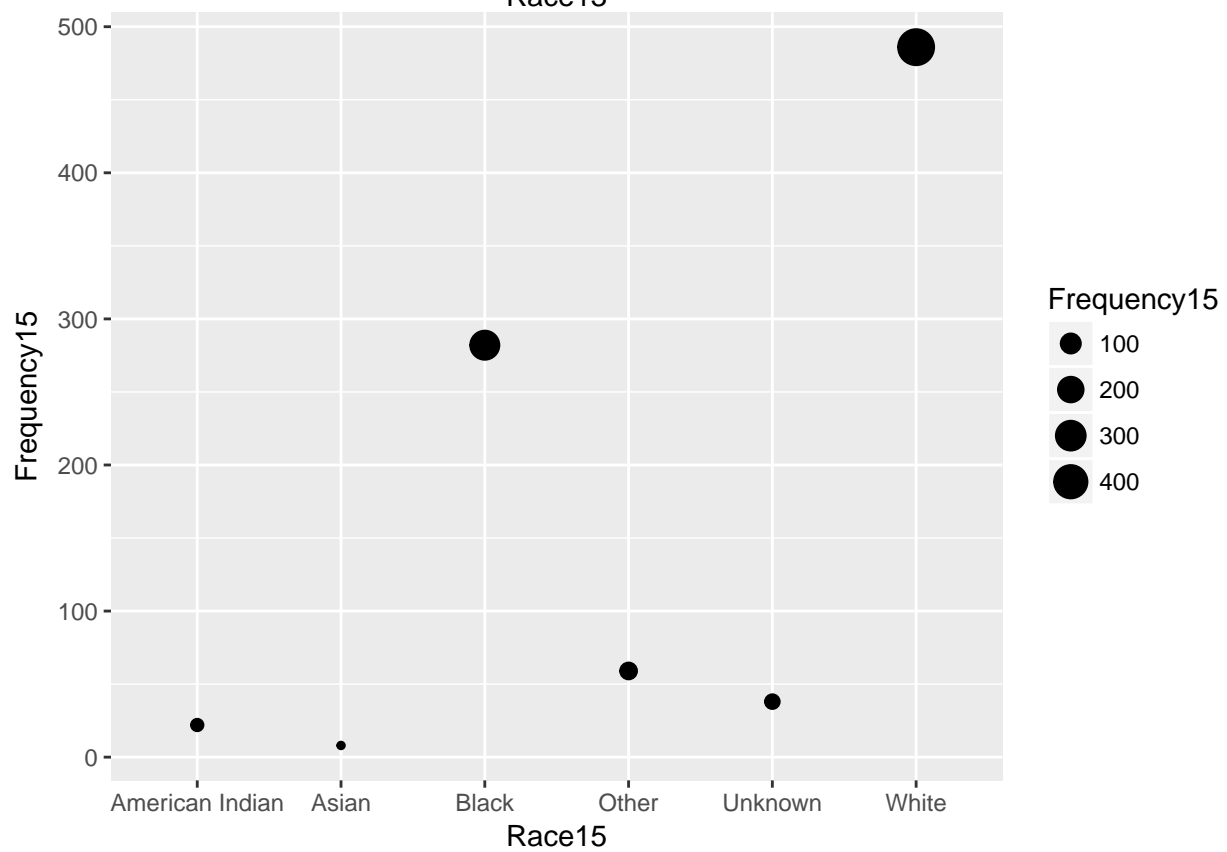
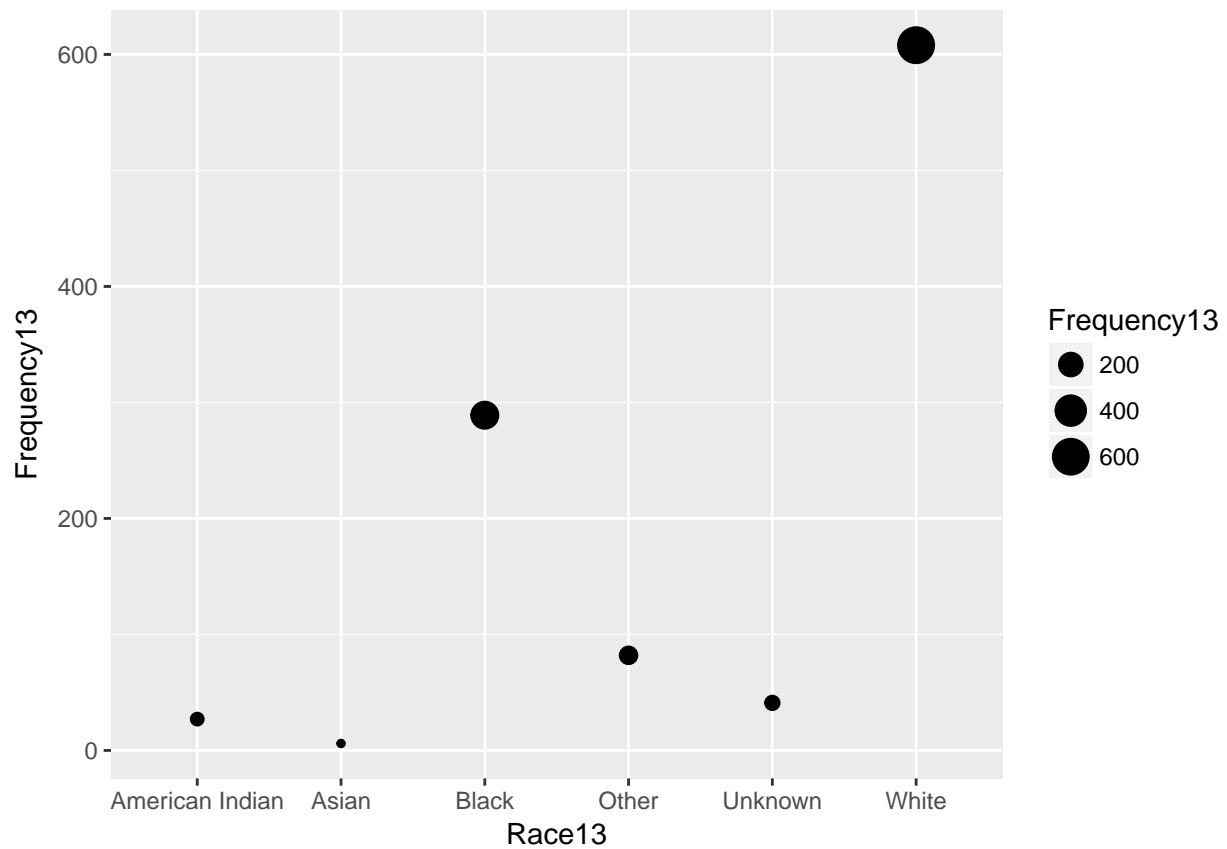
## `geom_smooth()`` using method = 'loess'
```



```
##
## Welch Two Sample t-test
##
## data: data_2007$`Civilian Casualties` and data_2015$`Civilian Casualties`
## t = -24.247, df = 13001, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -0.9441313 -0.8028994
## sample estimates:
## mean of x mean of y
## 1.518383 2.391899
```

Clearly, as seen in the “Number of Civilian Deaths” graph and as proven in the two-sample hypothesis test, the number of civilian deaths due to arson incidents has significantly increased from 2007 to 2015, from an average of 1.52 deaths to an average of 2.392 deaths per incident in which at least one person dies. Now I want to look more into the race and age of the person who committed arson. I am going to look at race in this PDF document, and age in the Shiny app.



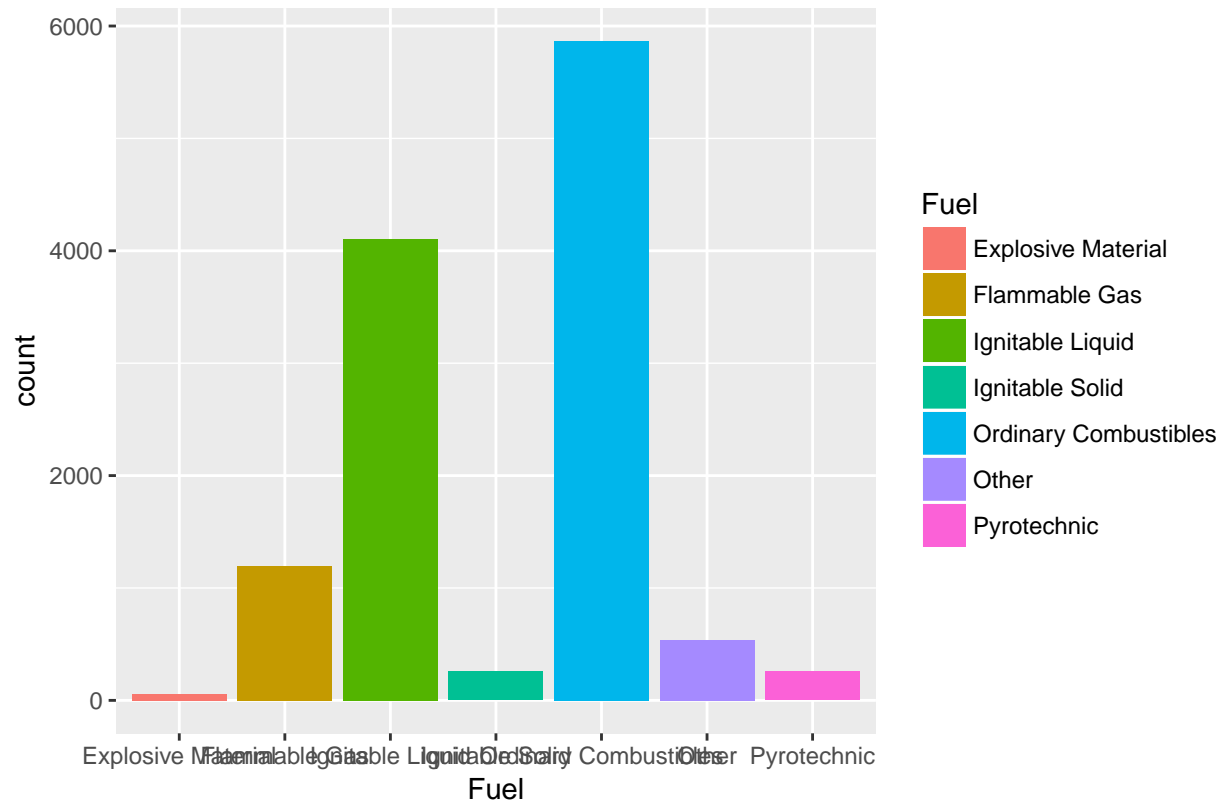


From all of this information, it is clear that white people were much more likely to commit arson. In all four

years that I investigated, many more white people committed arson than any other demographic, so this is likely a trend that continues today. Next I want to look at all of the incendiary devices that were used over the course of all four years.

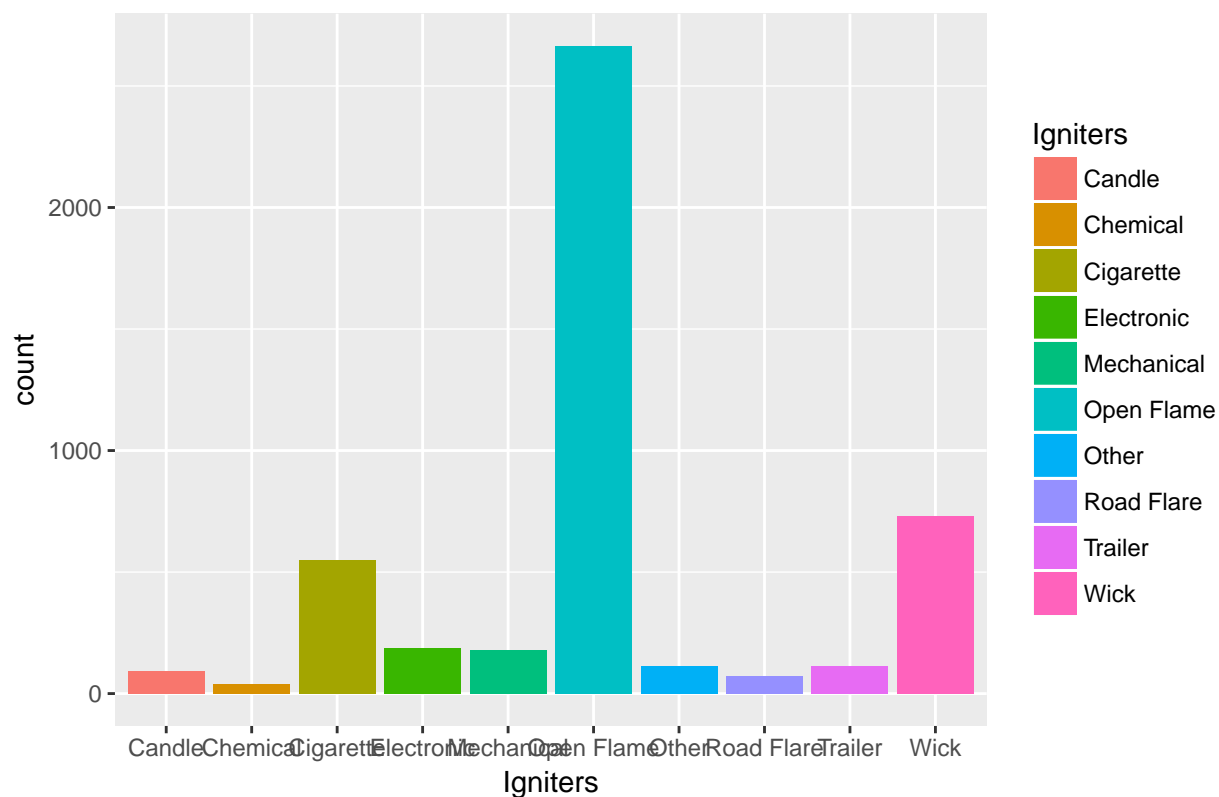
| ## | Fuel | NumberOfIncidents |
|-------|-----------------------|-------------------|
| ## 1: | Ordinary Combustibles | 5866 |
| ## 2: | Ignitable Liquid | 4108 |
| ## 3: | Flammable Gas | 1196 |
| ## 4: | Other | 540 |
| ## 5: | Pyrotechnic | 256 |
| ## 6: | Ignitable Solid | 257 |
| ## 7: | Explosive Material | 54 |

Cumulative Amounts of Fuel Devices for all Four Years

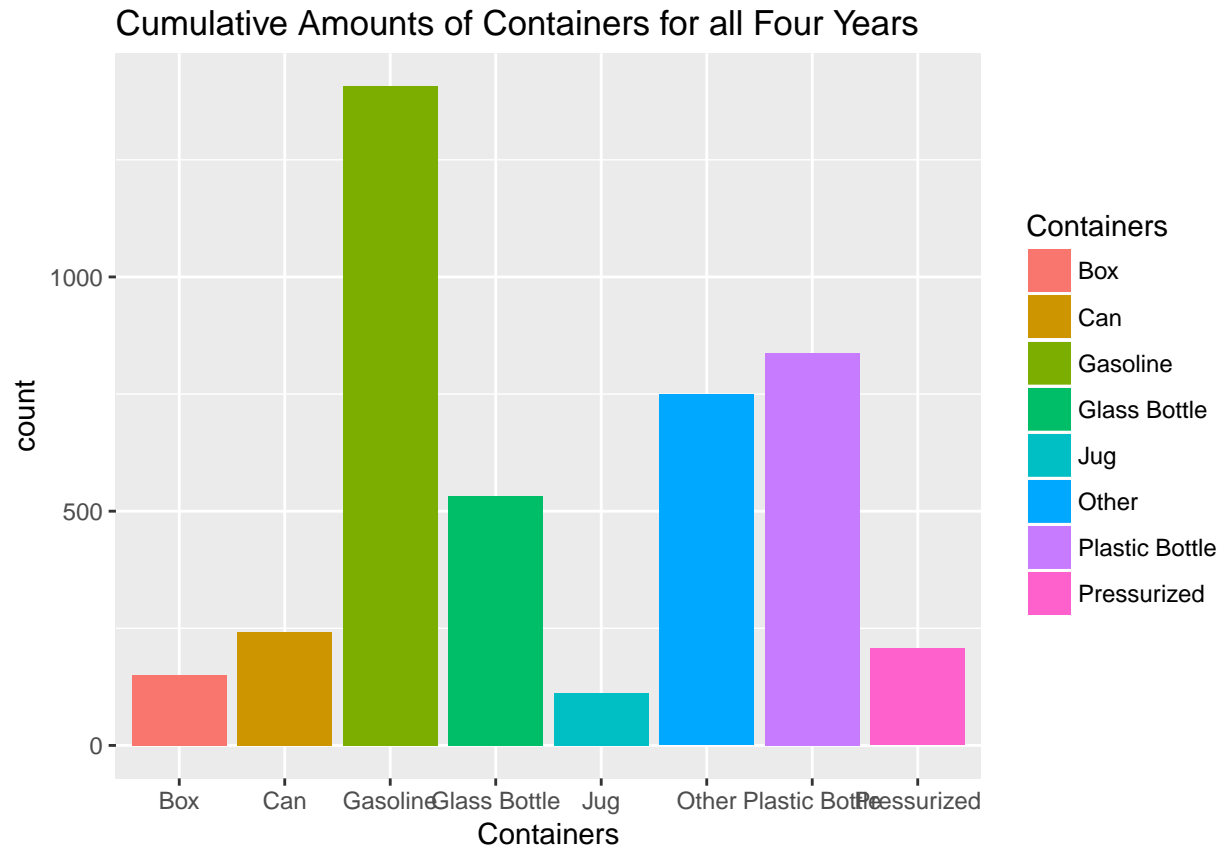


| ## | Igniters | NmbrofIncidents |
|--------|------------|-----------------|
| ## 1: | Open Flame | 2664 |
| ## 2: | Wick | 732 |
| ## 3: | Cigarette | 551 |
| ## 4: | Other | 115 |
| ## 5: | Trailer | 115 |
| ## 6: | Candle | 92 |
| ## 7: | Road Flare | 71 |
| ## 8: | Mechanical | 180 |
| ## 9: | Electronic | 186 |
| ## 10: | Chemical | 39 |

Cumulative Amounts of Ignition Devices for all Four Years



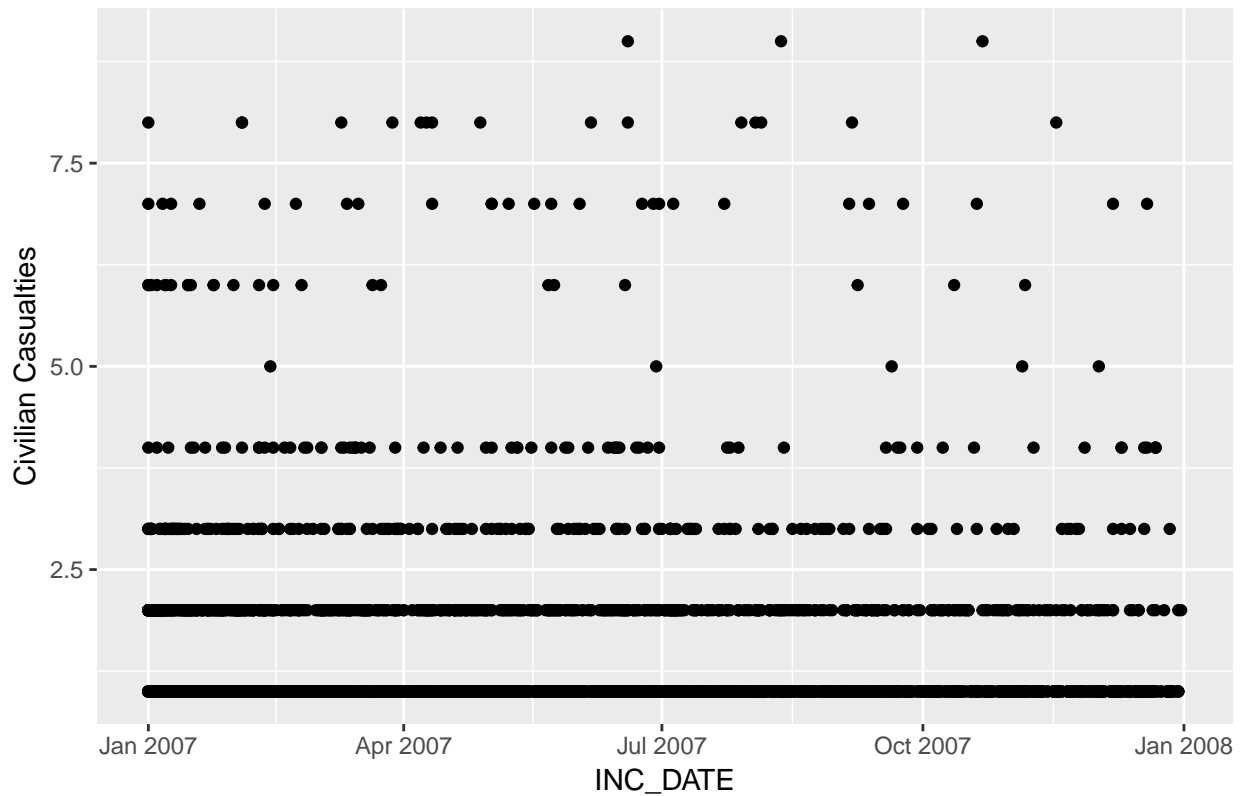
| ## | Containers | NumIncidents |
|-------|----------------|--------------|
| ## 1: | Gasoline | 1407 |
| ## 2: | Plastic Bottle | 838 |
| ## 3: | Other | 749 |
| ## 4: | Glass Bottle | 533 |
| ## 5: | Can | 242 |
| ## 6: | Pressurized | 207 |
| ## 7: | Box | 151 |
| ## 8: | Jug | 112 |



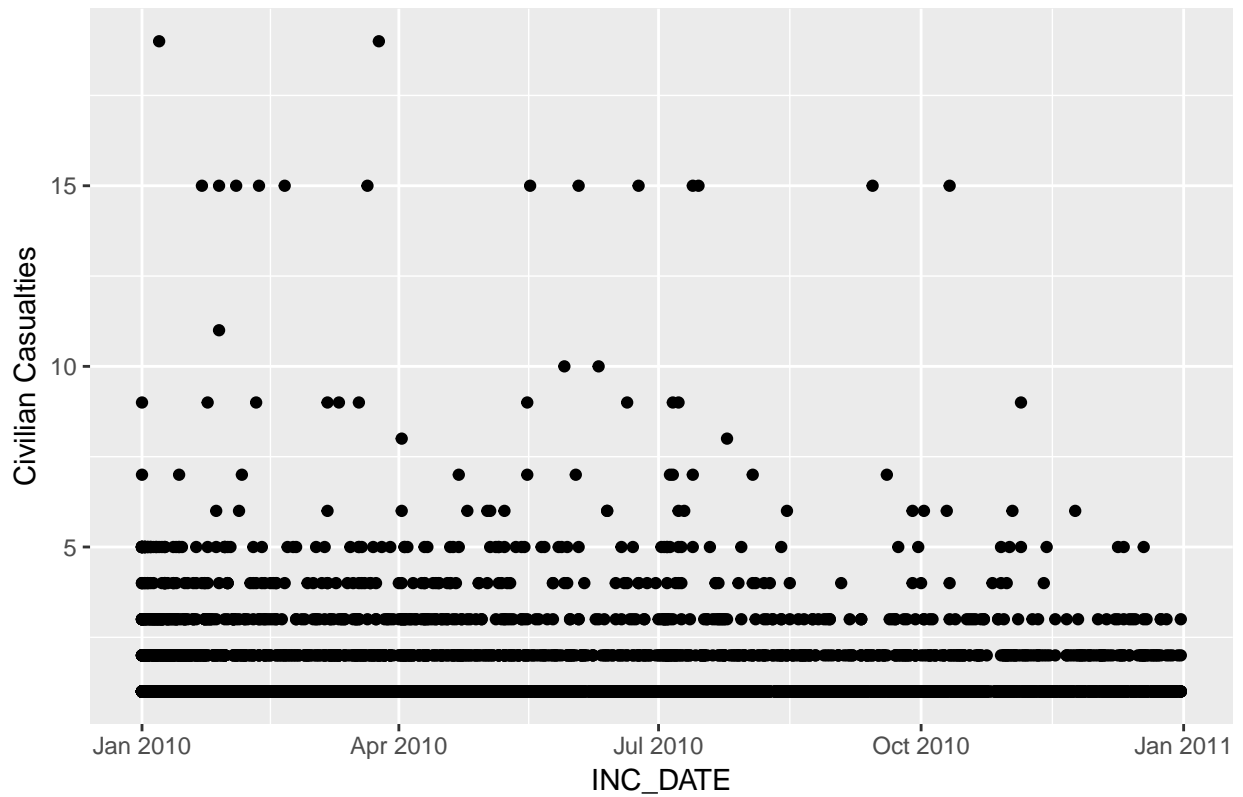
Clearly, the most popular forms of fuel are ordinary combustibles (which likely includes fuel that is meant to start controlled fires) and ignitable liquid. The most popular ignition devices are open flames, wicks and cigarettes and the most common containers that arsonists use are gasoline containers and plastic bottles. I had hoped that by further investigating this variable, I would be able to give suggestions for what products store owners could watch out for people buying in large quantities, because it could indicate that they were going to commit arson. Unfortunately, these are all pretty normal products, so they would be very difficult to regulate.

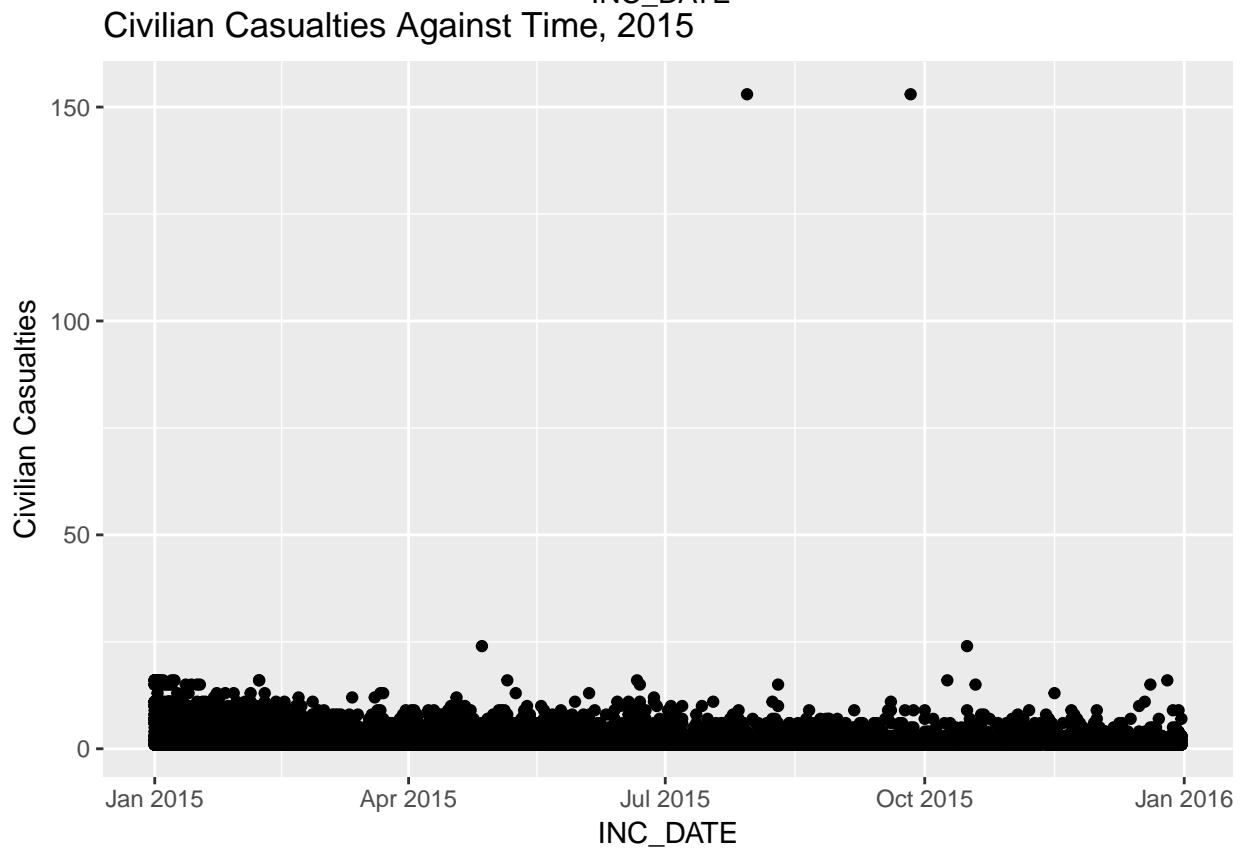
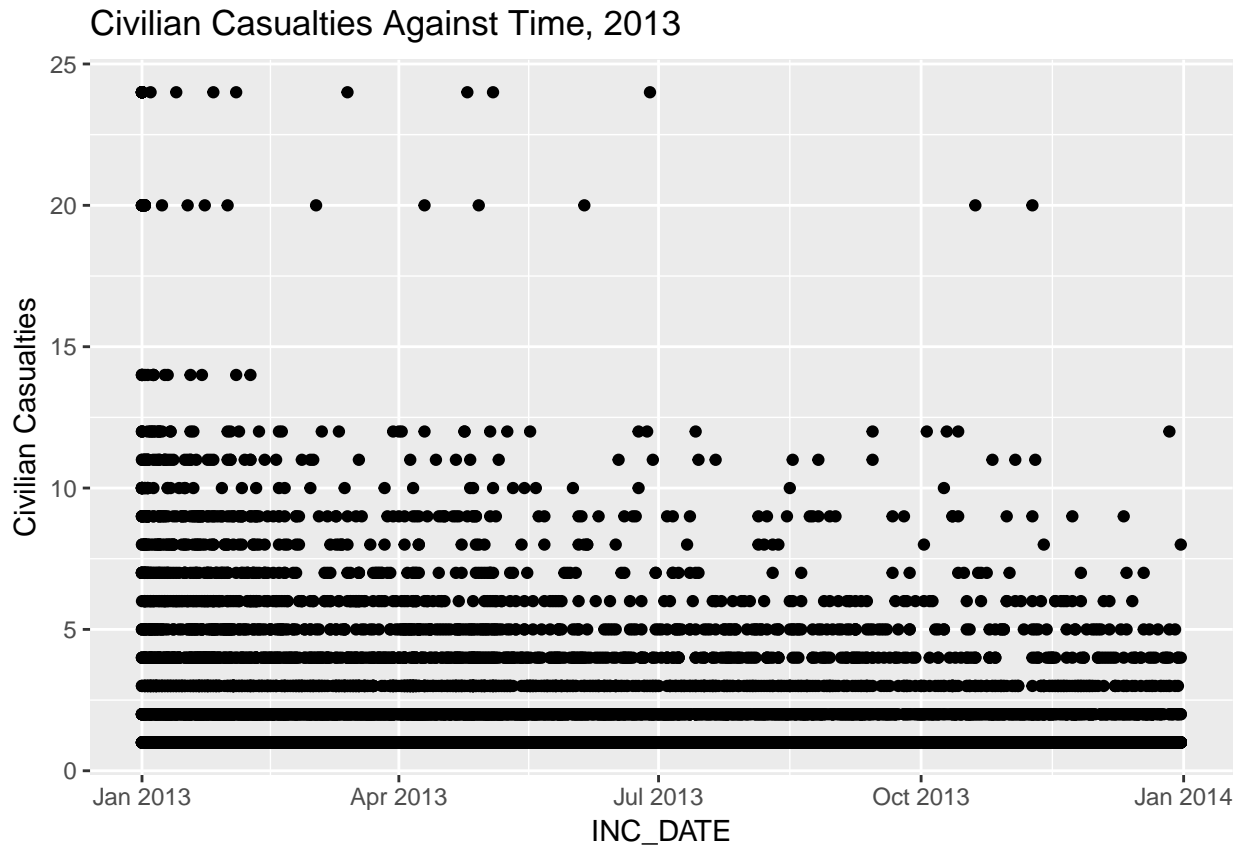
Now I am going to look into whether or not there are certain peak times of year that more civilians die due to incidents of arson.

Civilian Casualties Against Date, 2007



Civilian Casualties Against Time, 2010





The number of civilian casualties due to incidents of arson seem to remain mostly constant throughout the

year in all four years. There does not appear to be any obvious trends or peaks throughout the year, which surprises me. I would have expected that there be more incidents of arson in the warmer months because I would expect that it would be more difficult to burn down a structure during the winter in places where it snows. However, this does not seem to be the case. What I find really interesting about these plots is that in the 2015 plot, there are two outstanding observations in which over 150 civilians died. I want to look into this.

After further attempting to research these two incidents of arson, I could not find any news reporting of these on the internet. I find this very strange, because I could find other reports of incidents of arson that resulted in much fewer deaths at other times of the year. This leads me to believe that the number of civilian casualties has been misrecorded here, which is kind of concerning.