Methods

Data Cleaning

```
hate_df =
  read_csv("./data/HateCrimes.csv") %>%
  mutate(
    state = as.factor(state),
    unemployment = as.factor(unemployment),
    urbanization = as.factor(urbanization),
    hate_crimes_per_100k_splc = as.numeric(hate_crimes_per_100k_splc)
  )
```

Descriptive Statistics

```
# Table labels
my_labels =
  list(
    unemployment = "Antibody IgM",
    urbanization = "Urbanization",
    median_household_income = "Median Household Income",
    perc_population_with_high_school_degree = "Percent with HS Degree",
    perc_non_citizen = "Percent Non-Citizen",
    gini_index = "Gini Index",
    perc_non_white = "Percent Non-White",
    hate_crimes_per_100k_splc = "Hate Crimes per 100k"
)

# Table controls
my_controls = tableby.control(
  total = F,
  test = F,
  numeric.stats = c("N", "meansd", "medianq1q3", "range", "Nmiss2"),
  cat.stats = c("N", "countpct"),
  stats.labels = list(
    meansd = "Mean (SD)",
    medianq1q3 = "Median (Q1, Q3)",
    range = "Min - Max",
    Nmiss2 = "Missing",
    countpct = "N (%)",
    N = "N"
    )
  )
```

```r
# Generate table
descriptive_tab =
  tableby( ~ unemployment +
           urbanization +
           median_household_income +
           perc_population_with_high_school_degree +
           perc_non_citizen +
           gini_index +
           perc_non_white +
           hate_crimes_per_100k_splc,
           data = hate_df,
           control = my_controls)

summary(
  descriptive_tab,
  title = "Descriptive Statistics: Hate Crimes Data",
  labelTranslations = my_labels,
  text = T)
```

```
##
## Table: Descriptive Statistics: Hate Crimes Data
##
## |                         |          Overall (N=51)          |
## |:------------------------|:--------------------------------:|
## |Antibody IgM             |                                  |
## |-  N                     |               51                 |
## |-  high                  |            24 (47.1%)            |
## |-  low                   |            27 (52.9%)            |
## |Urbanization             |                                  |
## |-  N                     |               51                 |
## |-  high                  |            24 (47.1%)            |
## |-  low                   |            27 (52.9%)            |
## |Median Household Income  |                                  |
## |-  N                     |               51                 |
## |-  Mean (SD)             |       55223.608 (9208.478)       |
## |-  Median (Q1, Q3)       | 54916.000 (48657.000, 60719.000) |
## |-  Min - Max             |      35521.000 - 76165.000       |
## |-  Missing               |               0                  |
## |Percent with HS Degree   |                                  |
## |-  N                     |               51                 |
## |-  Mean (SD)             |          0.869 (0.034)           |
## |-  Median (Q1, Q3)       |       0.874 (0.841, 0.898)       |
## |-  Min - Max             |          0.799 - 0.918           |
## |-  Missing               |               0                  |
## |Percent Non-Citizen      |                                  |
## |-  N                     |               48                 |
## |-  Mean (SD)             |          0.055 (0.031)           |
## |-  Median (Q1, Q3)       |       0.045 (0.030, 0.080)       |
## |-  Min - Max             |          0.010 - 0.130           |
## |-  Missing               |               3                  |
## |Gini Index               |                                  |
## |-  N                     |               51                 |
## |-  Mean (SD)             |          0.454 (0.021)           |
```

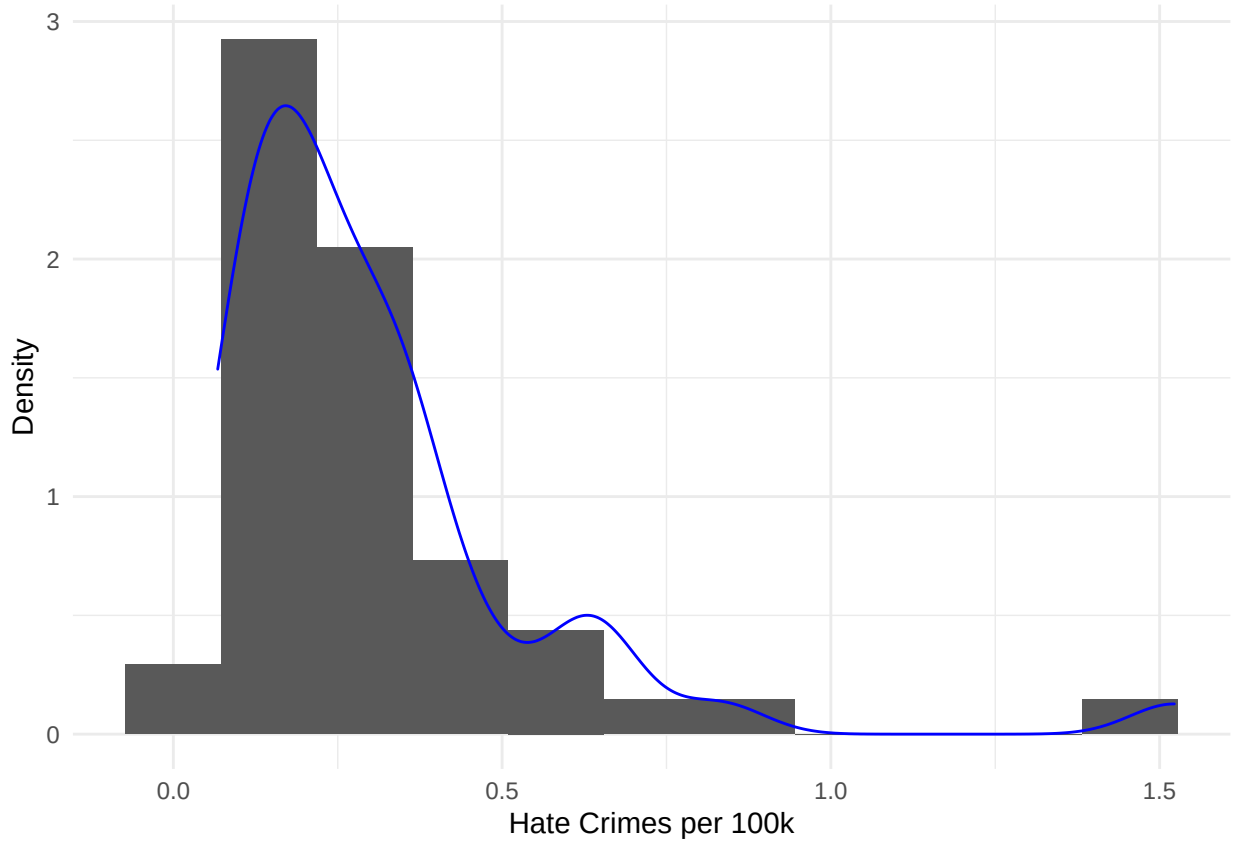
```
## |-  Median (Q1, Q3)      |       0.454 (0.440, 0.467)       |
## |-  Min - Max            |          0.419 - 0.532           |
## |-  Missing              |                0                 |
## |Percent Non-White       |                                  |
## |-  N                    |                51                |
## |-  Mean (SD)            |          0.316 (0.165)           |
## |-  Median (Q1, Q3)      |       0.280 (0.195, 0.420)       |
## |-  Min - Max            |          0.060 - 0.810           |
## |-  Missing              |                0                 |
## |Hate Crimes per 100k    |                                  |
## |-  N                    |                47                |
## |-  Mean (SD)            |          0.304 (0.253)           |
## |-  Median (Q1, Q3)      |       0.226 (0.143, 0.357)       |
## |-  Min - Max            |          0.067 - 1.522           |
## |-  Missing              |                4                 |
```

As a note, I didn't include the "states" variable as the output was huge and not that helpful. Suggest we include a note somewhere that data from 50 states + Washington, DC.

Distribution of Outcome Data

Histogram of raw outcome data (hate crimes per 100k).

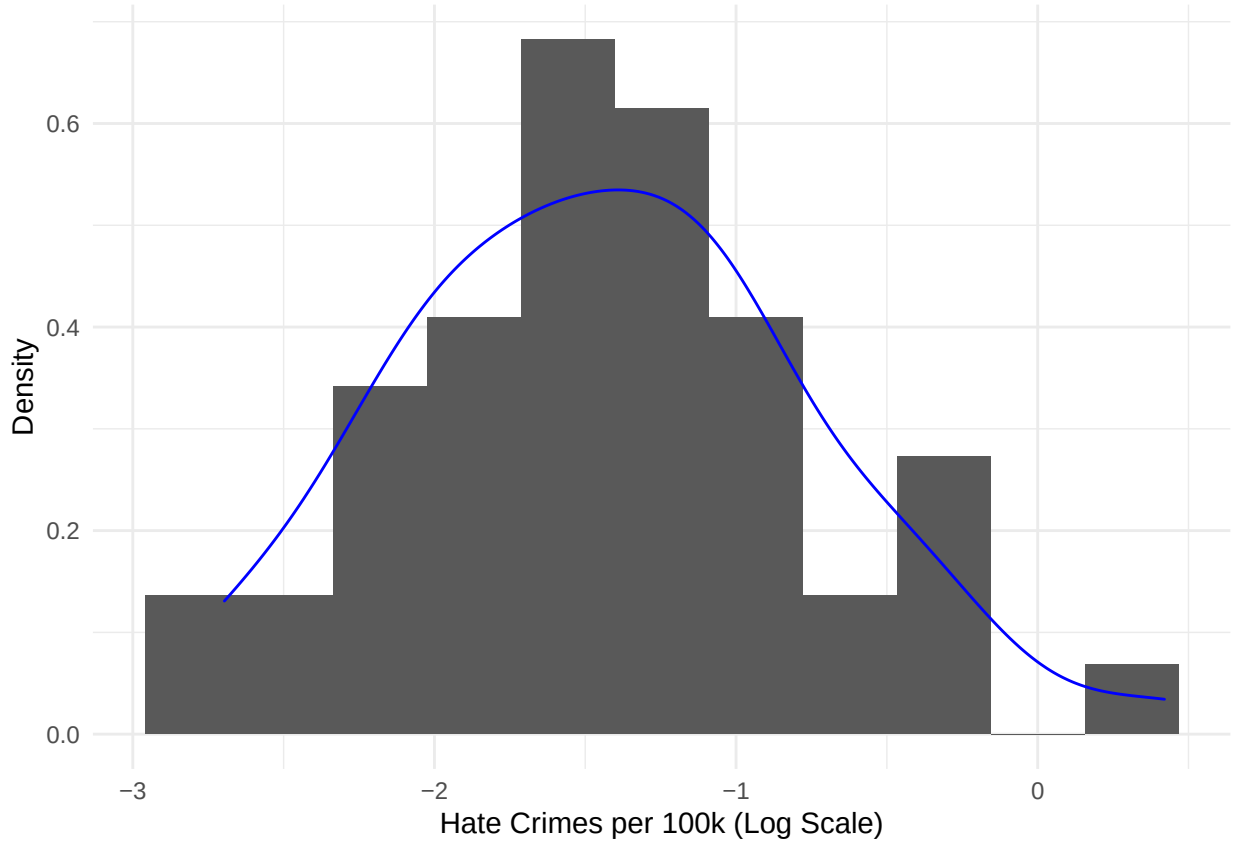
```
hate_df %>%
  ggplot(aes(x = hate_crimes_per_100k_splc, y = ..density..)) +
  geom_histogram(bins = 11) +
  geom_density(alpha = 0.2, color = "blue") +
  labs(
    x = "Hate Crimes per 100k",
    y = "Density"
  )
```



These data look skewed :(

Histogram of log-transformed outcome data (hate crimes per 100k).

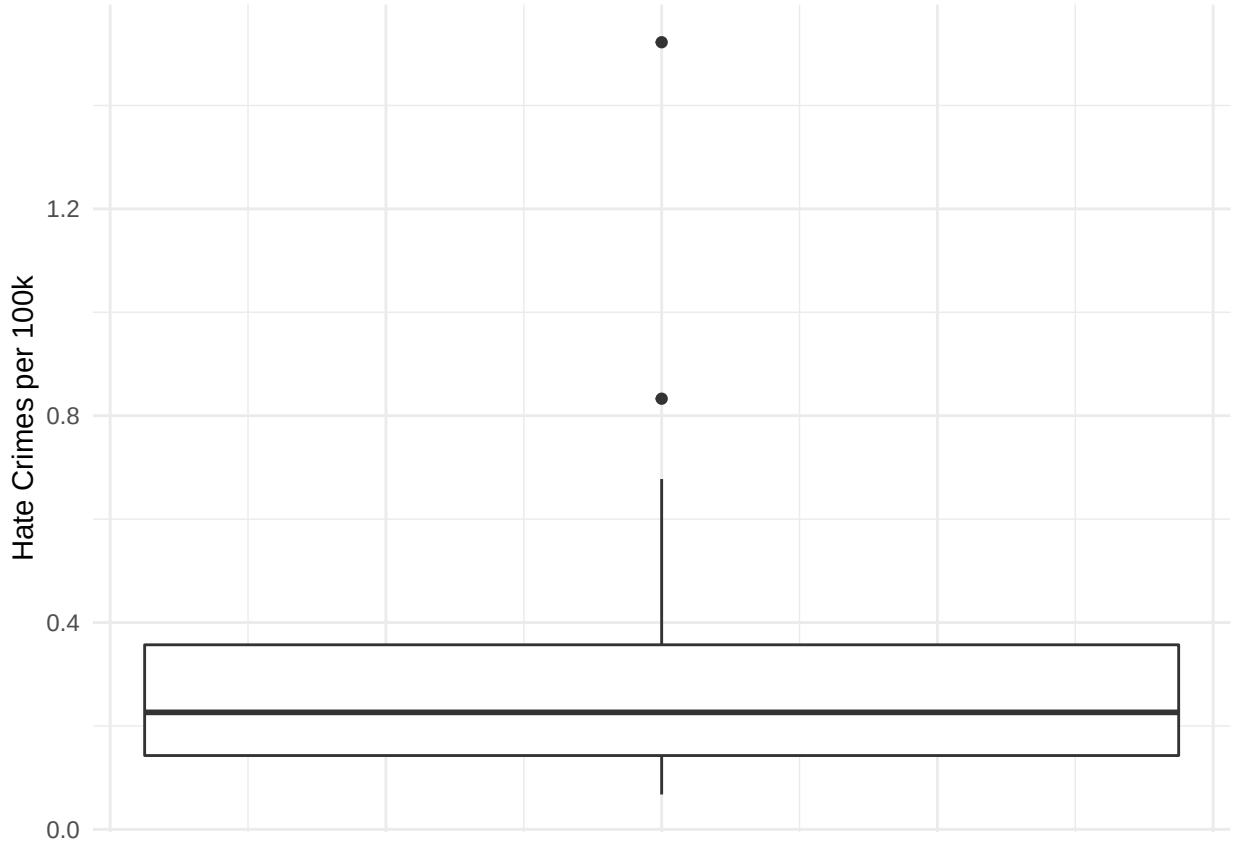
```
hate_df %>%
  ggplot(aes(x = log(hate_crimes_per_100k_splc), y = ..density..)) +
  geom_histogram(bins = 11) +
  geom_density(alpha = 0.2, color = "blue") +
  labs(
    x = "Hate Crimes per 100k (Log Scale)",
    y = "Density"
  )
```



Looks better!

Box plot of the (raw) outcome data.

```
hate_df %>%
  ggplot(aes(y = hate_crimes_per_100k_splc)) +
  geom_boxplot() +
  labs(
    y = "Hate Crimes per 100k"
  ) +
  theme(
    axis.text.x = element_blank(),
    axis.ticks.x = element_blank()
    )
```



Just based on the boxplot, it ks like there are two states with potential usually high rates (Washington, DC and Oregon).

Examining Potential Multicollinearity

```
hate_df %>%
  select(
    hate_crimes_per_100k_splc,
    median_household_income,
    perc_population_with_high_school_degree,
    perc_non_citizen,
    gini_index,
    perc_non_white
    ) %>%
  cor(use = "complete.obs") %>% # Ignoring NA values
  round(., 2)
```

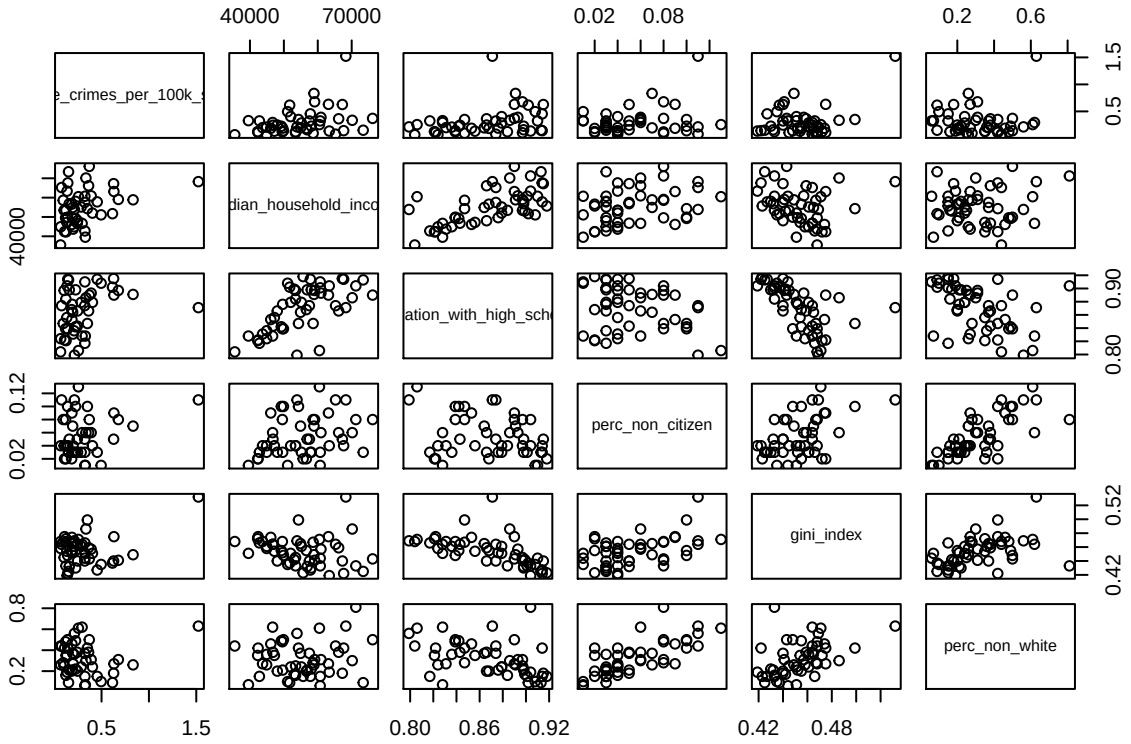
```
##                                        hate_crimes_per_100k_splc
## hate_crimes_per_100k_splc                                   1.00
## median_household_income                                     0.34
## perc_population_with_high_school_degree                     0.26
## perc_non_citizen                                            0.24
## gini_index                                                  0.38
```

```
## perc_non_white                                        0.11
##                                       median_household_income
## hate_crimes_per_100k_splc                                0.34
## median_household_income                                  1.00
## perc_population_with_high_school_degree                  0.65
## perc_non_citizen                                         0.30
## gini_index                                              -0.13
## perc_non_white                                           0.04
##                                       perc_population_with_high_school_degree
## hate_crimes_per_100k_splc                                                0.26
## median_household_income                                                  0.65
## perc_population_with_high_school_degree                                  1.00
## perc_non_citizen                                                        -0.26
## gini_index                                                              -0.54
## perc_non_white                                                          -0.50
##                                       perc_non_citizen gini_index
## hate_crimes_per_100k_splc                         0.24       0.38
## median_household_income                           0.30      -0.13
## perc_population_with_high_school_degree          -0.26      -0.54
## perc_non_citizen                                  1.00       0.48
## gini_index                                        0.48       1.00
## perc_non_white                                    0.75       0.55
##                                       perc_non_white
## hate_crimes_per_100k_splc                       0.11
## median_household_income                         0.04
## perc_population_with_high_school_degree        -0.50
## perc_non_citizen                                0.75
## gini_index                                      0.55
## perc_non_white                                  1.00
```

Based on this output, the following pairs of variables have a correlation of 60% or higher:

- Percentage non-citizens & percentage non-white (0.75)
- Median household income & percentage of population with a high school degree (0.65)

```
hate_df %>%
  select(
    hate_crimes_per_100k_splc,
    median_household_income,
    perc_population_with_high_school_degree,
    perc_non_citizen,
    gini_index,
    perc_non_white
    ) %>%
  pairs()
```



Simple Linear Regression Using Income Inequality (Per FiveThirtyEight)

Fitting SLR using income inequality (measured by Gini index) per FiveThirtyEight findings.

```
slr_income_lm = lm(hate_crimes_per_100k_splc ~ gini_index, data = hate_df)
slr_income_log_lm = lm(log(hate_crimes_per_100k_splc) ~ gini_index, data = hate_df)

summary(slr_income_lm)
```

```
##
## Call:
## lm(formula = hate_crimes_per_100k_splc ~ gini_index, data = hate_df)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.28669 -0.14565 -0.04991  0.07356  0.91085
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.5275     0.7833  -1.950   0.0574 .
## gini_index    4.0205     1.7177   2.341   0.0237 *
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2412 on 45 degrees of freedom
##   (4 observations deleted due to missingness)
## Multiple R-squared:  0.1085, Adjusted R-squared:  0.08872
## F-statistic: 5.478 on 1 and 45 DF,  p-value: 0.02374
```

```
summary(slr_income_log_lm)
```

```
##
## Call:
## lm(formula = log(hate_crimes_per_100k_splc) ~ gini_index, data = hate_df)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.32883 -0.36358 -0.02325  0.38705  1.47219
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -3.676      2.195  -1.674    0.101
## gini_index     4.932      4.814   1.024    0.311
##
## Residual standard error: 0.6761 on 45 degrees of freedom
##   (4 observations deleted due to missingness)
## Multiple R-squared:  0.02279,    Adjusted R-squared:  0.001073
## F-statistic: 1.049 on 1 and 45 DF,  p-value: 0.3111
```

Gini index appears to be a significant predictor only when using the raw outcome data (not the log-transformed outcome data).

Jacy's Ideas

```
##Project ideas
hate = read.csv("/Users/jacysparks/Downloads/HateCrimes.csv")
head(hate)
dim(hate)
hate$hate_crimes_per_100k_splc = as.character(hate$hate_crimes_per_100k_splc)
hate$hate_crimes_per_100k_splc = as.numeric(hate$hate_crimes_per_100k_splc)
summary(hate)
##Four NA's for outcome
##NA for Wyoming, South Dakota, North Dakota, and Idaho
hate[,c(1,9)]
##Could remove
hate = na.omit(hate)

##3 NA's for non citizen


##Create indicators
names(hate)[names(hate)=="unemployment"] = "High.Unemployment"
```

```r
names(hate)[names(hate)=="urbanization"] = "High.Urban"
names(hate)[names(hate)=="median_household_income"] = "Med.Income"
names(hate)[names(hate)=="perc_population_with_high_school_degree"] = "HS.Degree"
names(hate)[names(hate)=="perc_non_citizen"] = "Non.Citizen"
names(hate)[names(hate)=="perc_non_white"] = "Non.White"
names(hate)[names(hate)=="hate_crimes_per_100k_splc"] = "Hate.Crime"
hate$High.Unemployment = ifelse(hate$High.Unemployment=="high",1,0)
hate$High.Urban = ifelse(hate$High.Urban=="high",1,0)

##Outcome var is skewed
hate$Hate.Crime = log(hate$Hate.Crime)
hist(hate$Hate.Crime)
##Much better

reg = lm(Hate.Crime~.-state,data=hate)
summary(reg)

pairs(hate[,4:9],lower.panel=NULL)
cor(hate[,4:9])
#Percent white and percent non-white highly correlated


##Check linearity
for(i in 4:8){
  plot(hate[,i],hate$Hate.Crime,main=colnames(hate)[i])
}
plot(reg)
```