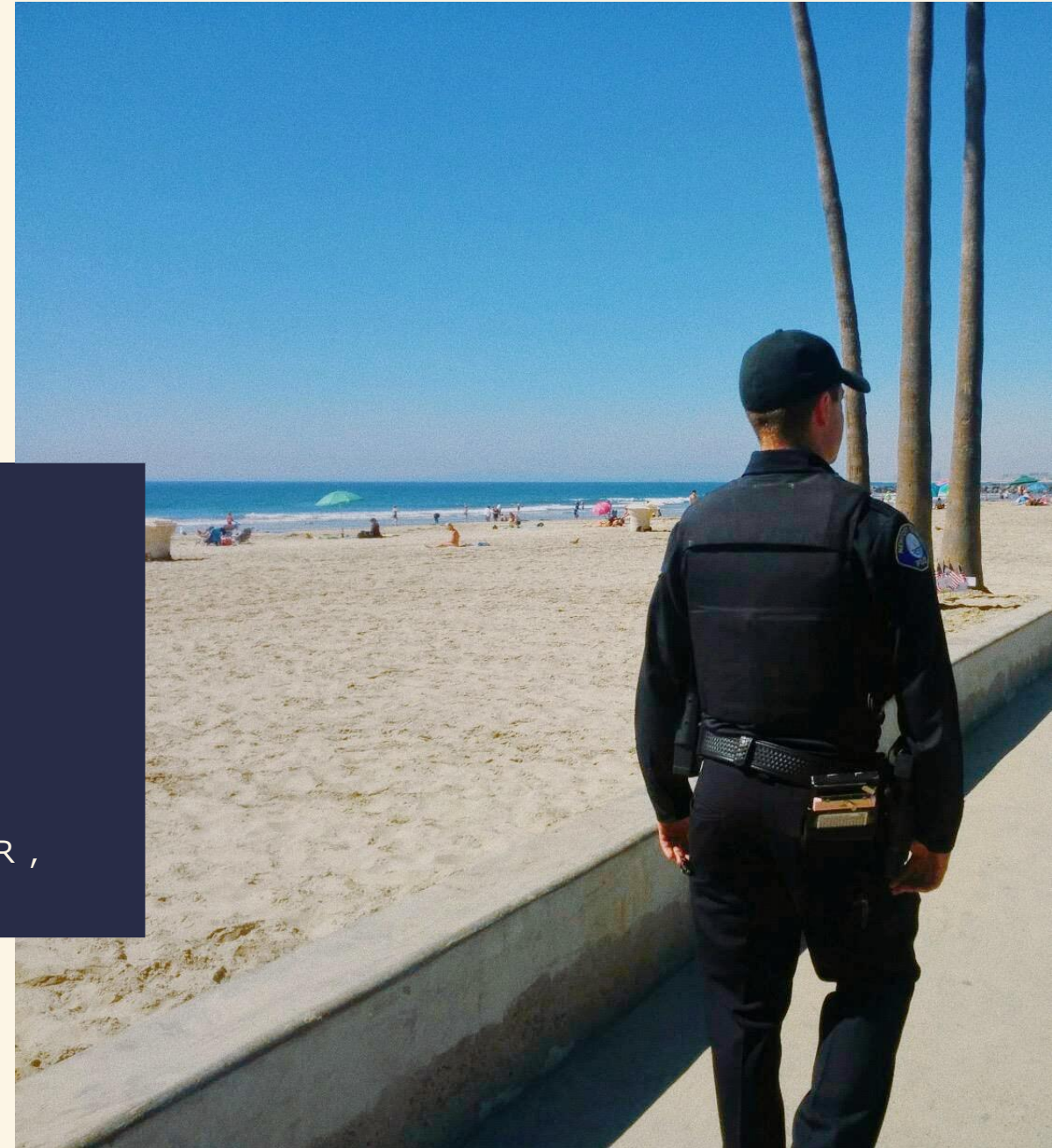


Crime & Weather

KIMBERLY JEFFRIES, SAMYUKTHA IYER,
IAN MCGUIRE, DILDAR SINGH



Our Motivation

The Effect of Weather on Crime: An Investigation of Weather and Annual Crime Rates

High temperatures can lead to more violent crime, study finds

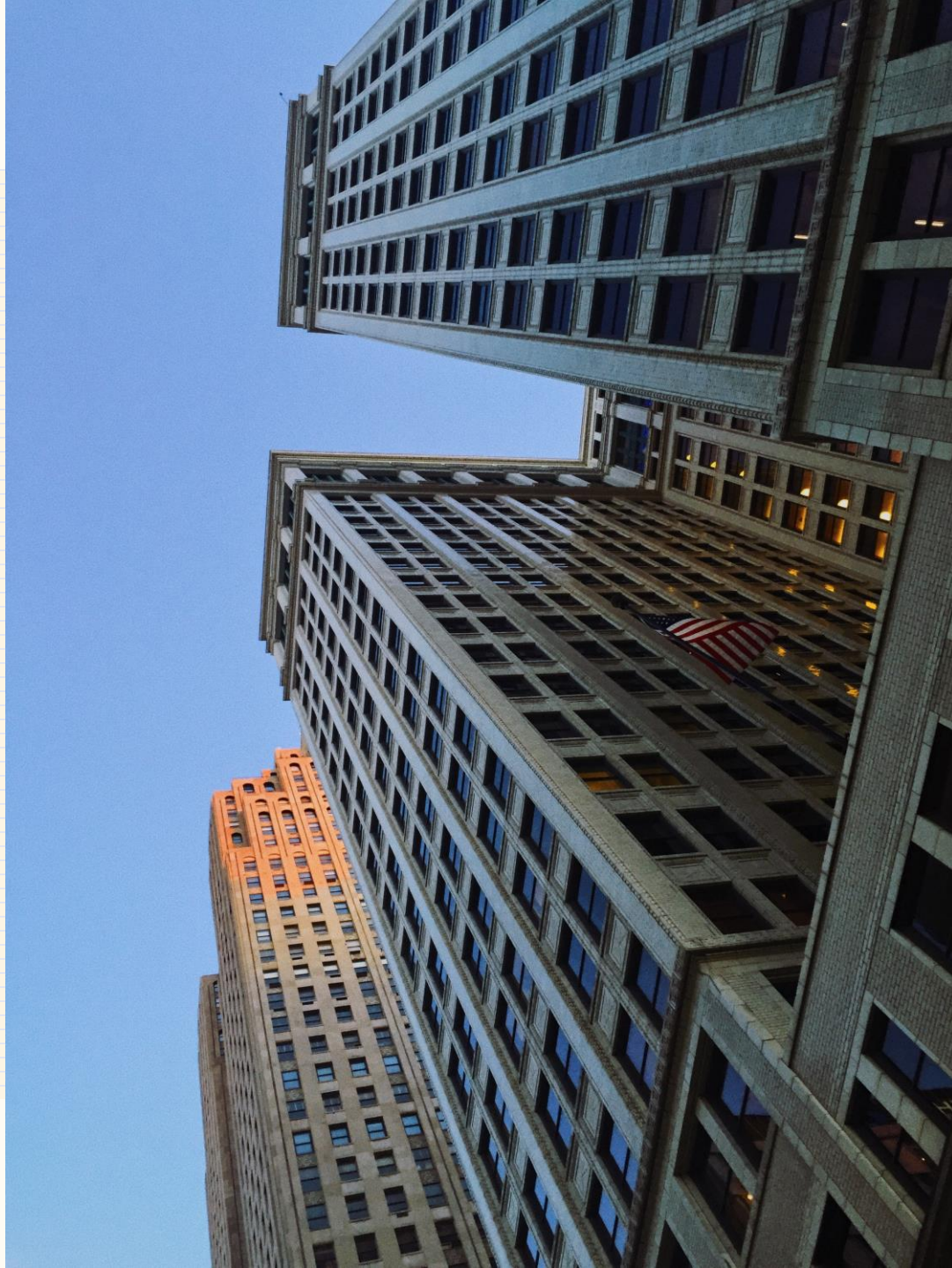
8, 2019 | 11:39am

A Rise in Murder? Let's Talk About the Weather

The relationship between tree canopy and crime rates across an urban–rural gradient in the greater Baltimore region

Can Trees Actually Deter Crime?

ERIC JAFFE MAY 25, 2012

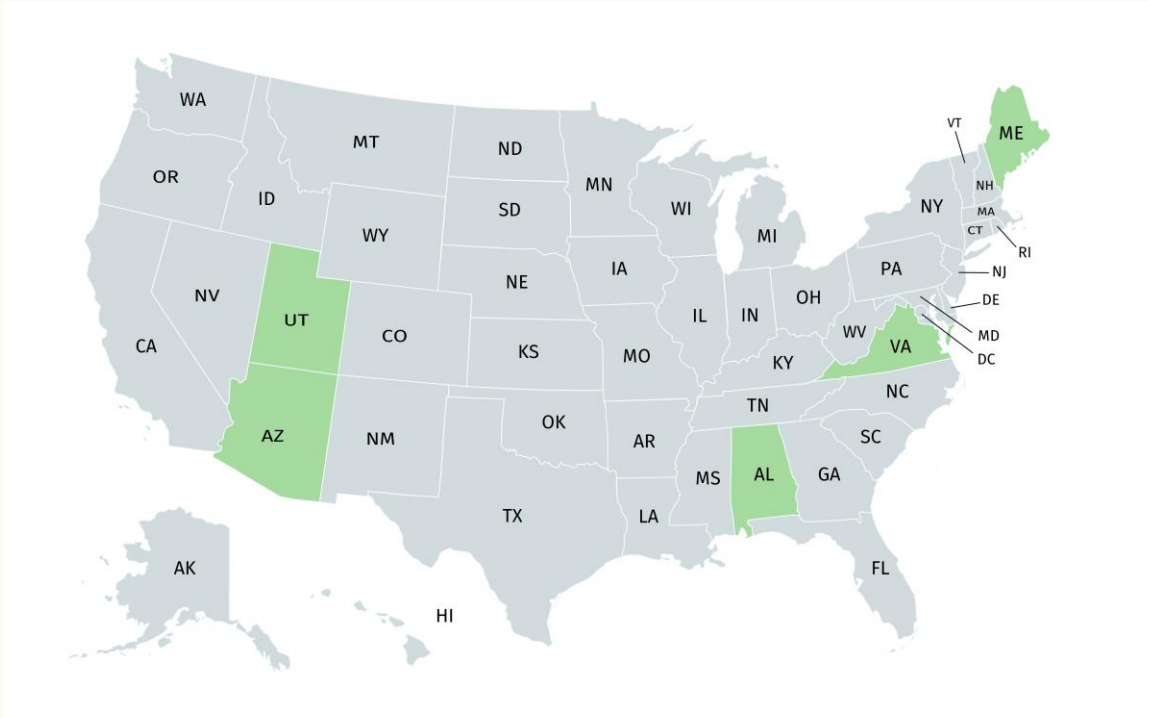


Our Questions

- Do rates of violent and non-violent crime increase with temperature?
- Do states with more forest cover experience lower crime rates?
- As temperatures continue to increase due to anthropogenic climate change, does our data predict that we can expect a rise in crime?

Our Focus

THE STATES



ARIZONA, UTAH, MAINE, VIRGINIA, ALABAMA

THE DATA WE COLLECTED

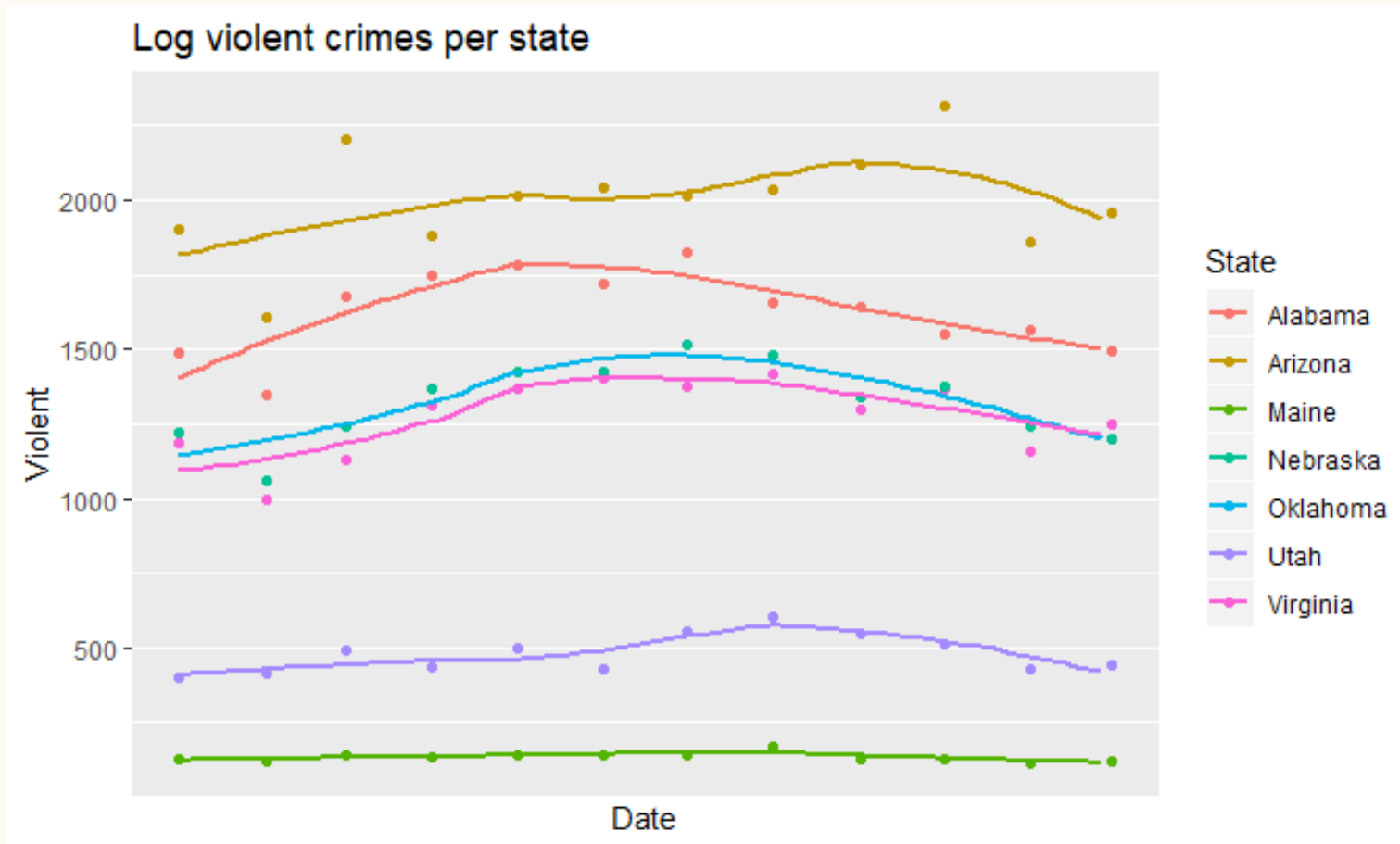
- Crime
 - Sourced from state government websites
- Weather
 - National Centers for Environmental Information
- Tree Cover
 - i-Tree Canopy

The Data

Date	Year	State	Violent	Nonviolent	F_temp	Date	Year	State	Violent	Nonviolent	F_temp	Date	Year	State	Violent	Nonviolent	F_temp
2020-01-14	2014	Maine	124	1950	14.2	2020-01-15	2015	Utah	552	7090	32.1	2020-01-16	2016	Alabama	1925	11463	43.0
2020-02-14	2014	Maine	120	1550	15.7	2020-02-15	2015	Utah	431	6215	38.9	2020-02-16	2016	Alabama	1635	9200	49.8
2020-03-14	2014	Maine	139	1725	18.1	2020-03-15	2015	Utah	540	6965	44.9	2020-03-16	2016	Alabama	2034	10393	59.7
2020-04-14	2014	Maine	132	2125	38.7	2020-04-15	2015	Utah	487	6725	47.1	2020-04-16	2016	Alabama	2085	10824	63.6
2020-05-14	2014	Maine	140	2300	51.7	2020-05-15	2015	Utah	542	7254	53.8	2020-05-16	2016	Alabama	2318	11859	70.2
2020-06-14	2014	Maine	141	2450	61.6	2020-06-15	2015	Utah	581	7539	70.0	2020-06-16	2016	Alabama	2159	11798	79.2
2020-07-14	2014	Maine	143	2875	67.2	2020-07-15	2015	Utah	597	8004	70.1	2020-07-16	2016	Alabama	2274	12565	82.0
2020-08-14	2014	Maine	167	2700	64.4	2020-08-15	2015	Utah	630	8258	71.0	2020-08-16	2016	Alabama	2224	12509	81.6
2020-09-14	2014	Maine	125	2350	56.4	2020-09-15	2015	Utah	609	7814	65.5	2020-09-16	2016	Alabama	2277	11989	78.6
2020-10-14	2014	Maine	125	2300	48.5	2020-10-15	2015	Utah	560	7852	54.3	2020-10-16	2016	Alabama	2231	12506	68.5
2020-11-14	2014	Maine	113	1800	31.8	2020-11-15	2015	Utah	492	7262	34.5	2020-11-16	2016	Alabama	1790	10880	57.8
2020-12-14	2014	Maine	121	1850	26.0	2020-12-15	2015	Utah	485	7225	26.6	2020-12-16	2016	Alabama	2100	12030	50.1

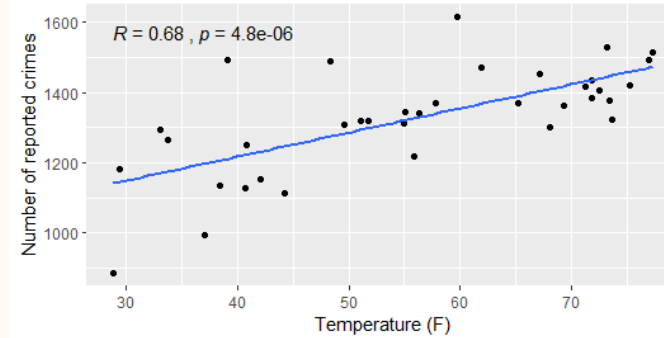
- Working with data over a 3-year period by each month from 2014 to 2016
- Crime data has been separated into Violent and Nonviolent offenses

Exploratory Data Analysis – Discovering Patterns

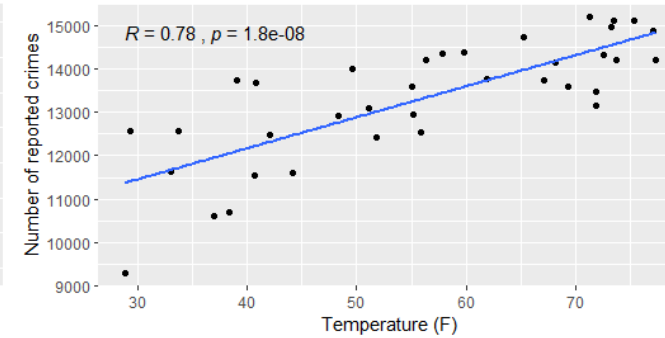


Exploratory Data Analysis – Discovering Patterns

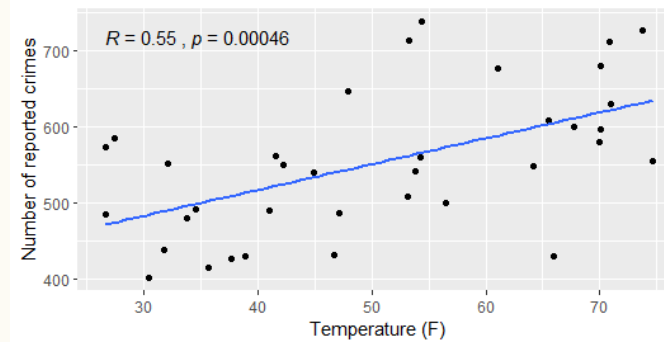
A Violent Crime - Virginia



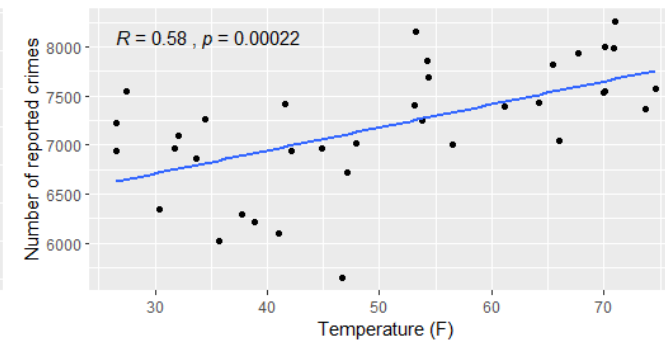
B Non-Violent Crime - Virginia



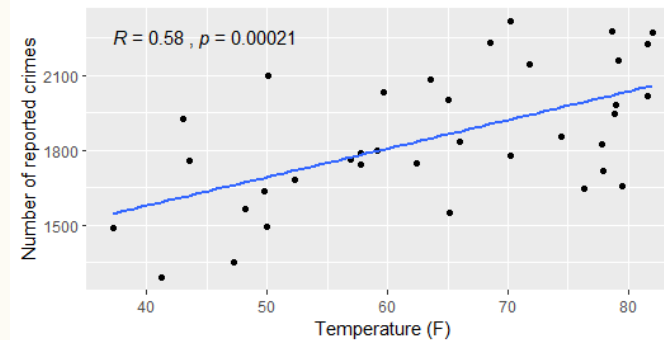
A Violent Crime - Utah



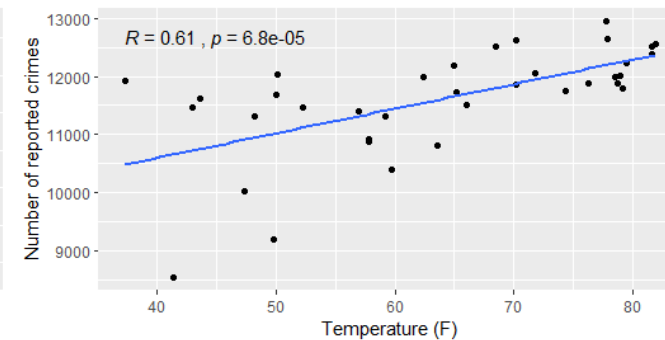
B Non-Violent Crime - Utah



A Violent Crime - Alabama

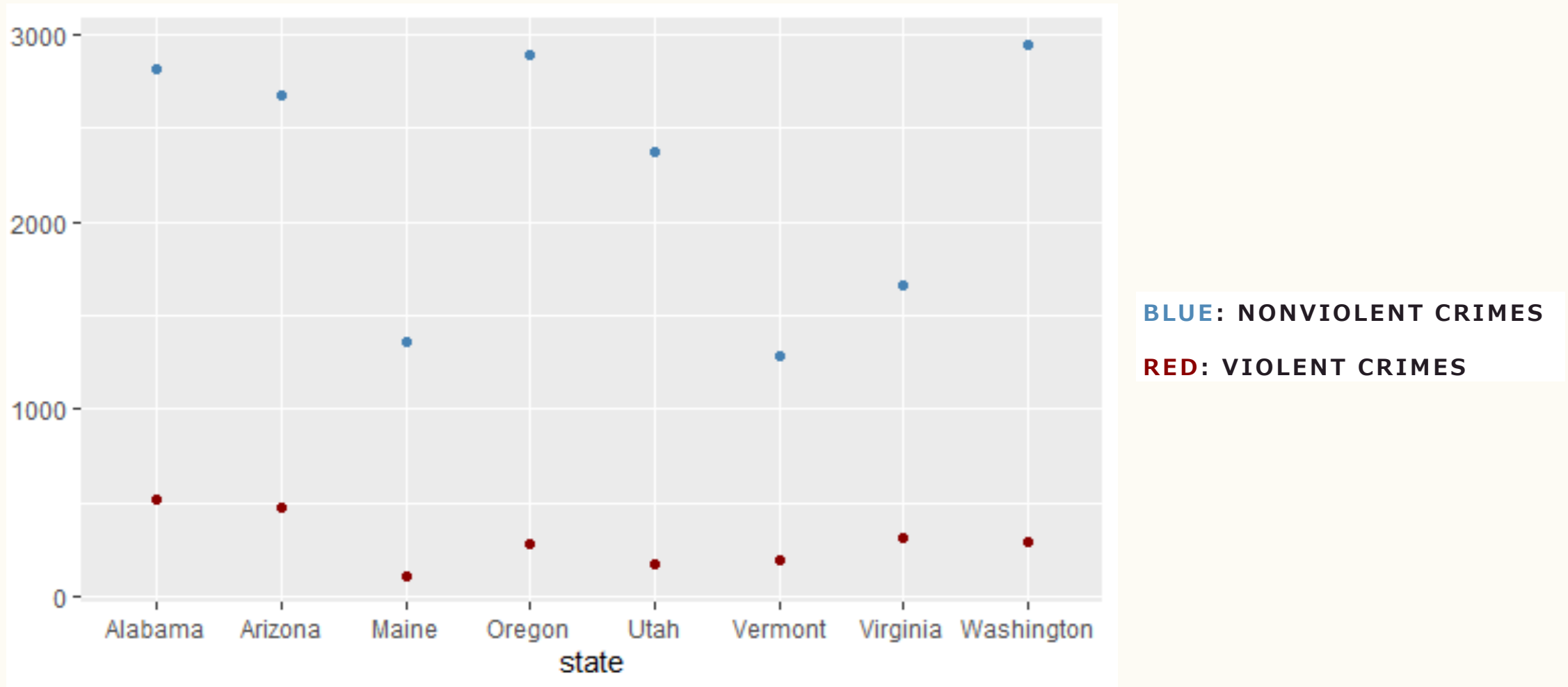


B Non-Violent Crime - Alabama

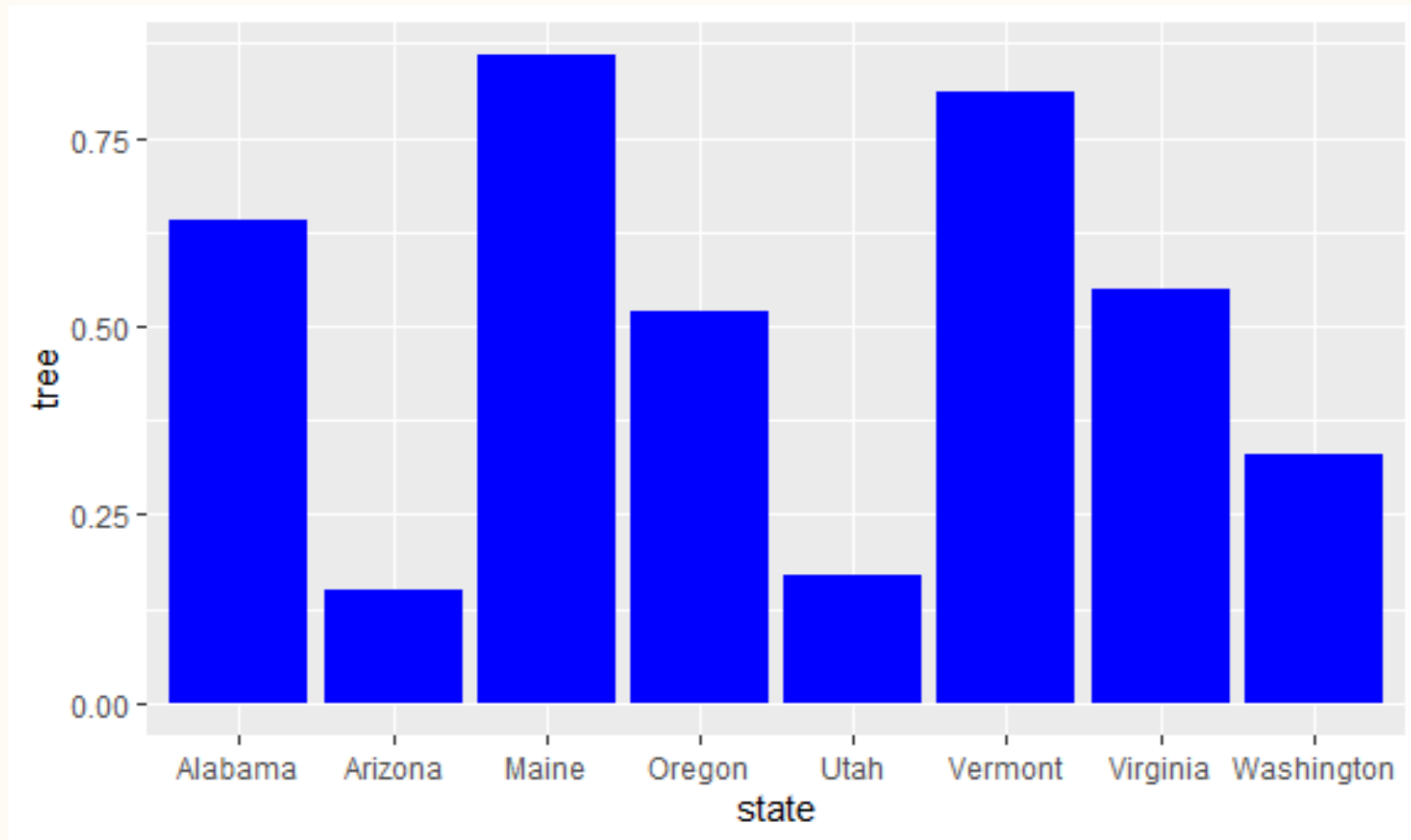


Exploratory Data Analysis – Discovering Patterns

AVERAGE ANNUAL CRIME RATE BY STATE (PER 100K PEOPLE IN 2018)



Exploratory Data Analysis – Discovering Patterns



Linear Regressions

VIOLENT CRIME

- Explanatory Variables
 - Temperature
 - Tree cover
- Dependent Variable
 - Violent crime

$$ViolentCrime = \beta_0 + \beta_1 * TreeCover$$

$$ViolentCrime = \beta_0 + \beta_1 * Temperature$$

NONVIOLENT CRIME

- Explanatory Variables
 - Temperature
 - Tree cover
- Dependent Variables
 - Nonviolent crime

$$NonviolentCrime = \beta_0 + \beta_1 * TreeCover$$

$$NonviolentCrime = \beta_0 + \beta_1 * Temperature$$

Violent Crime

TREE COVER VS VIOLENT CRIME

Call:

```
lm(formula = violcrime ~ tree, data = df)
```

Residuals:

Min	1Q	Median	3Q	Max
-179.32	-64.53	-21.11	47.70	246.62

Coefficients:

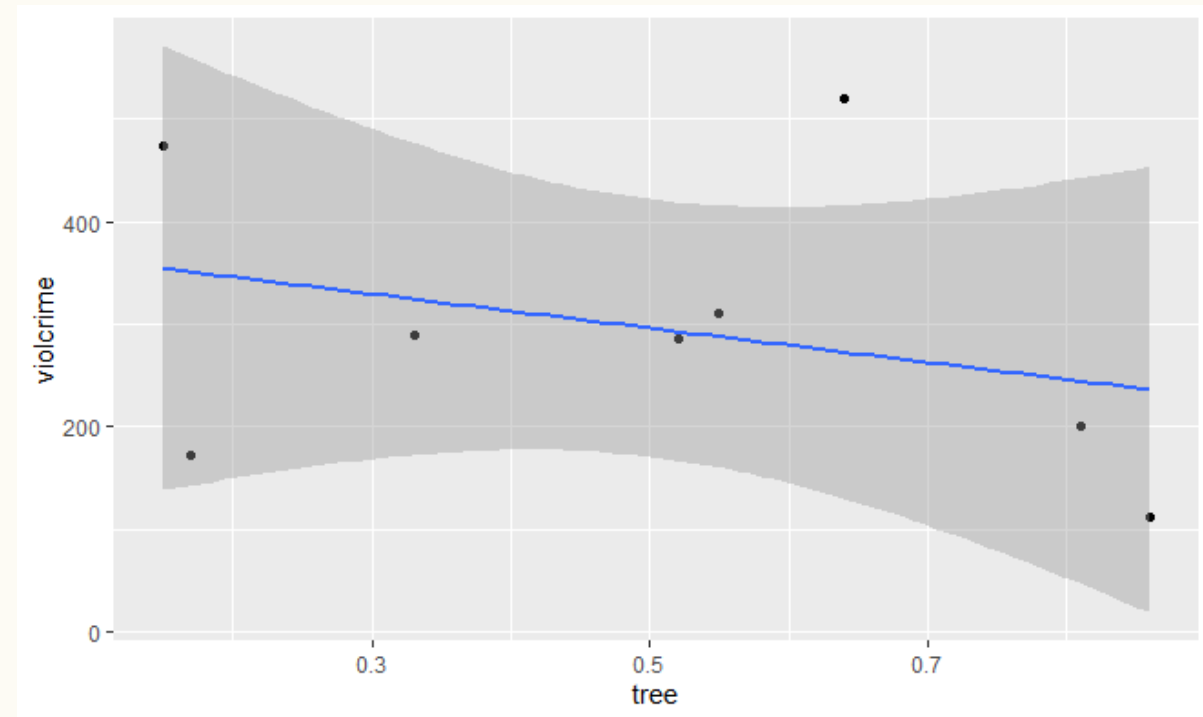
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	379.7	114.8	3.307	0.0163 *
tree	-166.7	203.8	-0.818	0.4446

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 145.3 on 6 degrees of freedom

Multiple R-squared: 0.1003, Adjusted R-squared: -0.04962

F-statistic: 0.6691 on 1 and 6 DF, p-value: 0.4446



Violent Crime

TEMPERATURE VS VIOLENT CRIME

Call:
lm(formula = Violent ~ F_temp, data = STATE_CRIME_DATA)

Residuals:

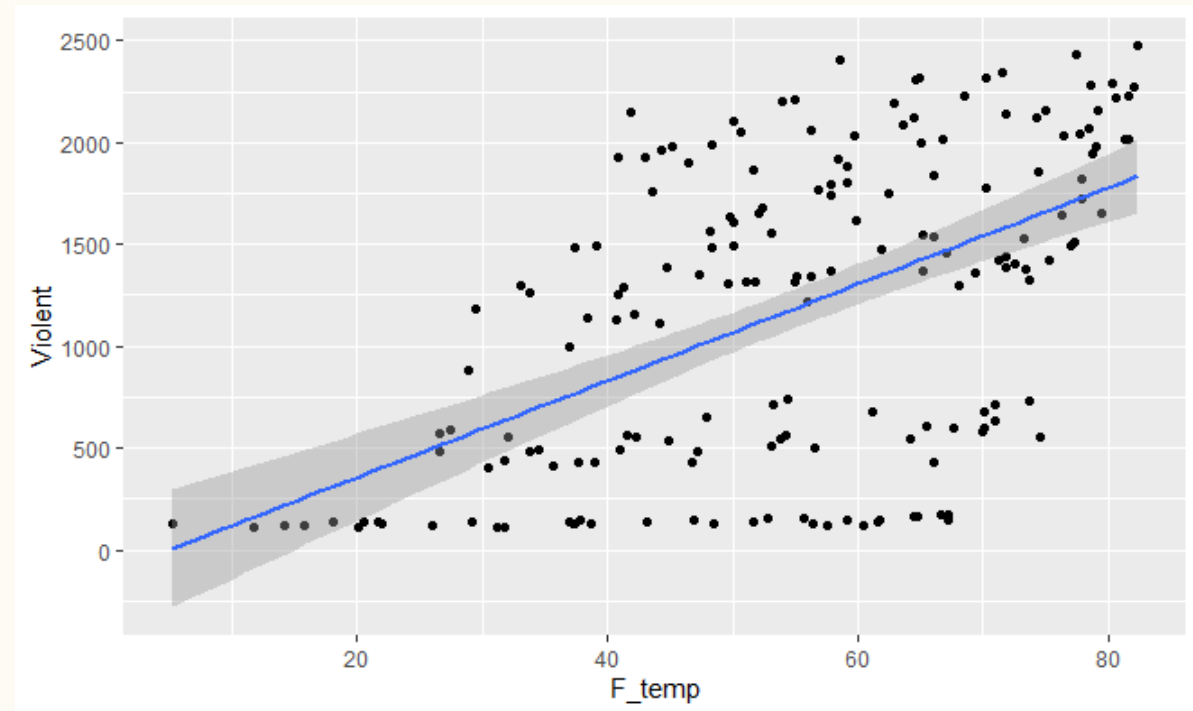
Min	1Q	Median	3Q	Max
-255.632	-70.307	6.808	39.314	280.416

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	943.436	73.361	12.860	1.29e-14 ***
F_temp	6.858	1.265	5.423	4.85e-06 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 114 on 34 degrees of freedom
(144 observations deleted due to missingness)
Multiple R-squared: 0.4638, Adjusted R-squared: 0.448
F-statistic: 29.41 on 1 and 34 DF, p-value: 4.847e-06



Nonviolent Crime

TREE COVER VS VIOLENT CRIME

Call:

```
lm(formula = nonviolcrime ~ tree, data = df)
```

Residuals:

Min	1Q	Median	3Q	Max
-507.8	-444.9	-232.8	465.4	797.5

Coefficients:

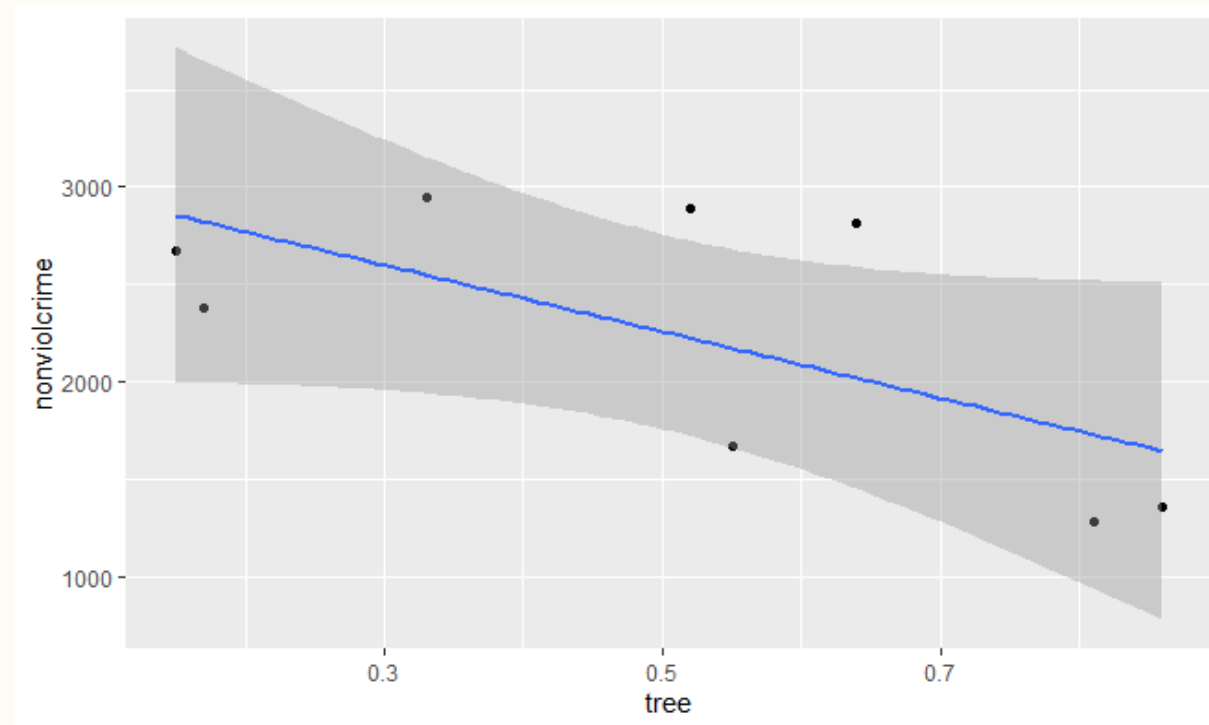
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	3112.1	457.4	6.804	0.000494 ***
tree	-1706.9	811.9	-2.102	0.080236 .

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 578.9 on 6 degrees of freedom

Multiple R-squared: 0.4241, Adjusted R-squared: 0.3282

F-statistic: 4.419 on 1 and 6 DF, p-value: 0.08024



Nonviolent Crime

TEMPERATURE VS VIOLENT CRIME

Call:
lm(formula = Nonviolent ~ F_temp, data =
STATE_CRIME_DATA)

Residuals:

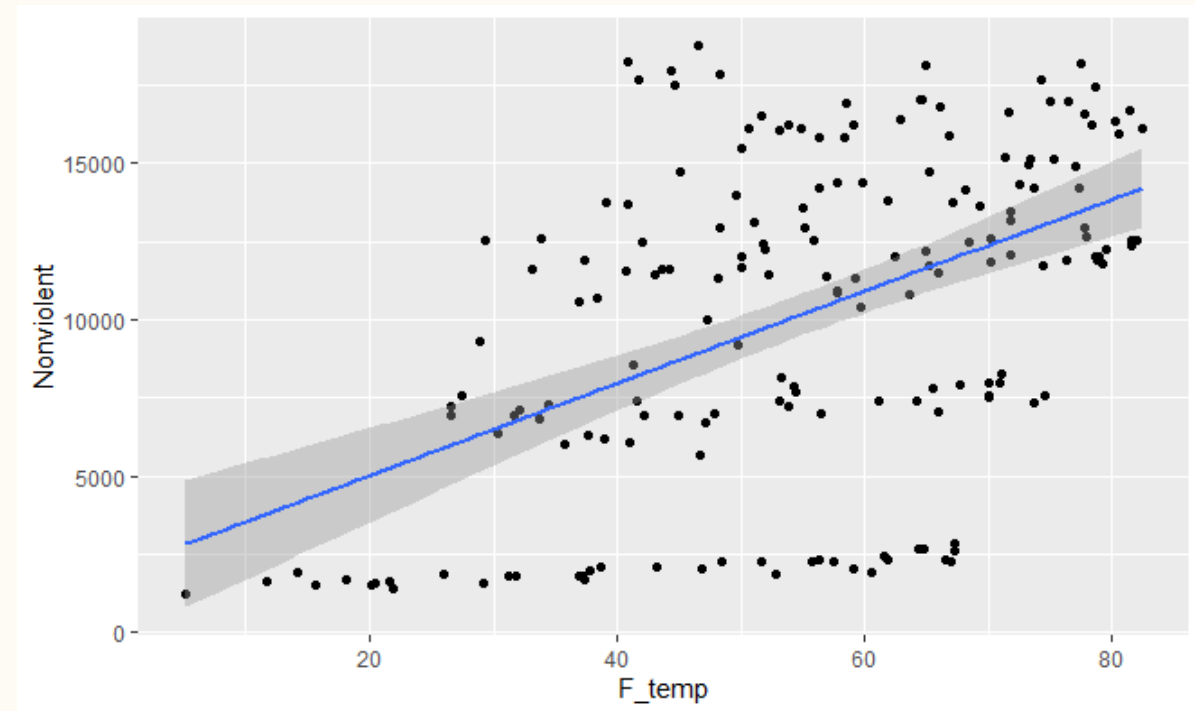
Min	1Q	Median	3Q	Max
-2095.62	-638.18	53.61	769.90	1626.45

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	9305.820	568.684	16.36	< 2e-16 ***
F_temp	71.758	9.803	7.32	1.76e-08 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 883.7 on 34 degrees of freedom
(144 observations deleted due to missingness)
Multiple R-squared: 0.6118, Adjusted R-squared: 0.6004
F-statistic: 53.58 on 1 and 34 DF, p-value: 1.765e-08



Conclusion

- For both Violent and Non-Violent Crimes, increasing temperatures have shown higher rates of crime rates based on data collected. Both linear regressions had a positive correlation between increases in temperature and Violent and Non-violent crime rates.
- While for it was an opposite result for tree coverage, states with higher tree cover coverage showed a lower rate of crime in both Violent and Non-Violent Crimes. Linear regressions for both Violent and Non-Violent crimes with tree coverage supported this claim showing that increased tree coverage decreased the rate of crime.

