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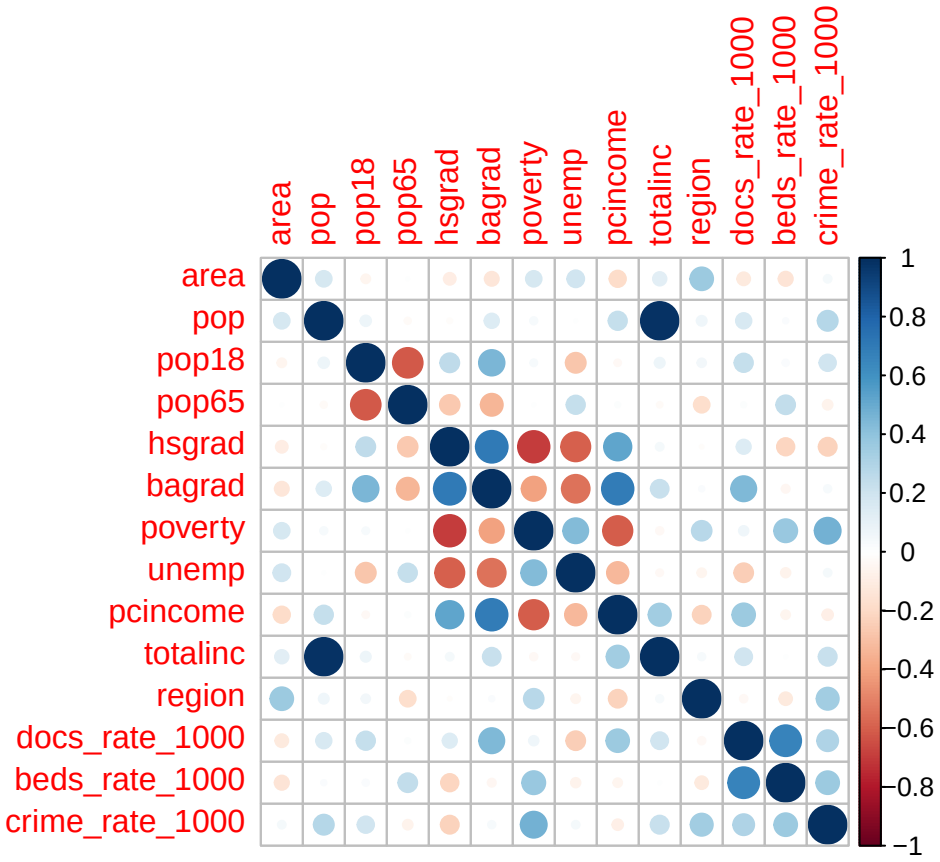
Load Data

```
cdi_df = read.csv("data/cdi.csv") %>%
  janitor::clean_names() %>%
  mutate(
    cty_state = str_c(cty,",",state),
    docs_rate_1000 = 1000 * docs/pop, # Compute number of doctors/hospital beds per 1000 people.
    beds_rate_1000 = 1000 * beds/pop,
    crime_rate_1000 = 1000 * crimes/pop) %>% # Compute number of crimes per 1000 people.)
  select(-docs,-beds,-crimes) %>%
  relocate(id,cty_state,cty)
```

Crime Rate Correlation

```
cdi_cor = cdi_df %>%
  select(-id,-cty_state, -cty, -state) %>%
  cor()

corrplot(cdi_cor)
```



According to the plot above, we can see the poverty (Percent below poverty level), beds(Number of hospital beds), docs (Number of active physicians) have positive relationship with crime rate.

Percent high school graduates (Percent of persons 25 years old or older twho completed 12 or more years of school) show a light negative relationship with crime rate.

Variable Information

```
var <- c("id", "cty", "state", "area",  "pop", "pop18", "pop65",    "docs", "beds", "crimes",   "hsgrad

var_meaning <- c("ID number", "
County name", "State name", "Land area", "Total population", "Percent of population aged 18-34", "Perce

var_info <- data.frame(var, var_meaning)

knitr::kable(var_info)
```

var	var_meaning
id	ID number
cty	County name
state	State name
area	Land area
pop	Total population

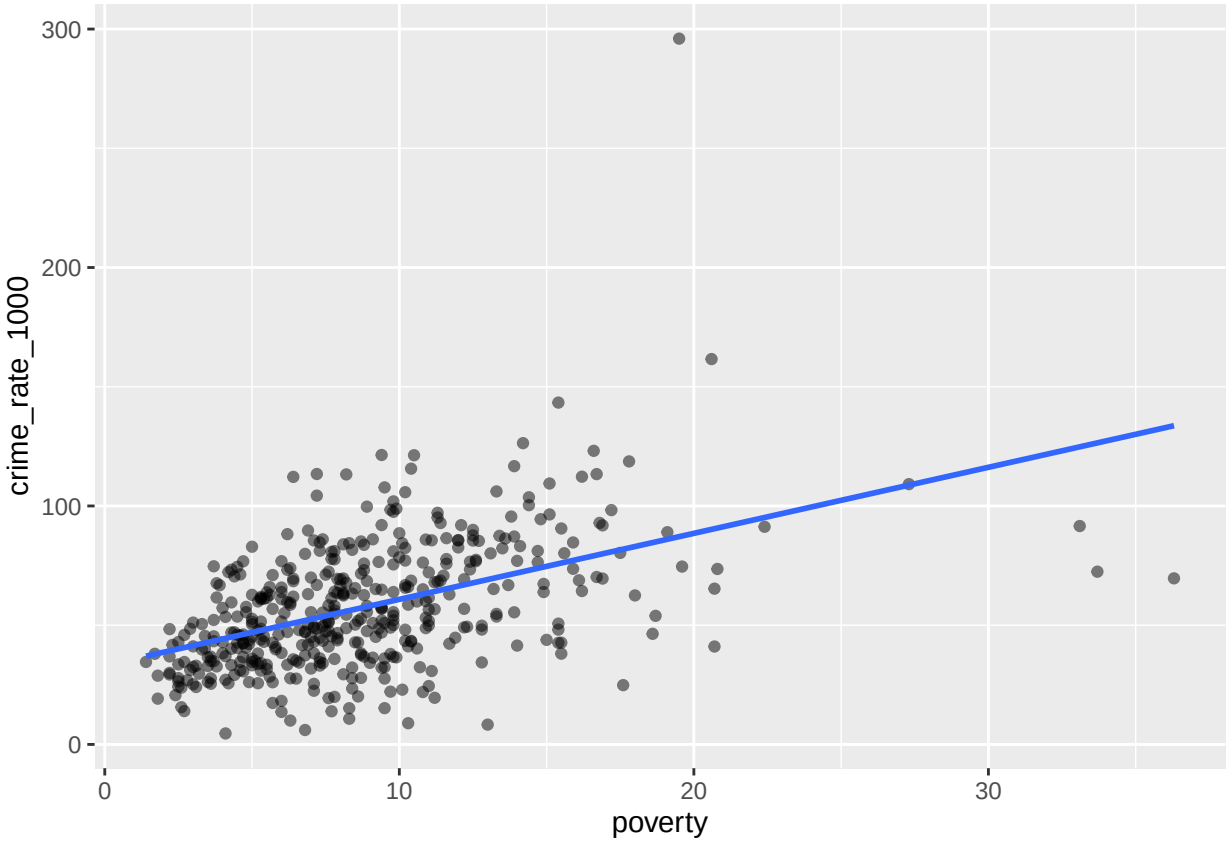
var	var_meaning
pop18	Percent of population aged 18-34
pop65	Percent of population aged 65+
docs	Number of active physicians
beds	Number of hospital beds
crimes	Total serious crimes
hsgrad	Percent high school graduates
bagrad	Percent bachelor's degrees
poverty	Percent below poverty level
unemp	Percent unemployment
pcincome	Per capita income
totalinc	Total personal income
region	Geographic region

Crime Rate v.s. Poverty

Poverty: Percent of 1990 total population with income below poverty level

```
ggplot(cdi_df, aes(x = poverty, y = crime_rate_1000)) + geom_point(alpha = .5) + geom_smooth(method = "
```

```
## `geom_smooth()` using formula 'y ~ x'
```



```r
reg_poverty = lm(cdi_df$crime_rate_1000 ~ cdi_df$poverty)
summary(reg_poverty)
```

```
##
## Call:
## lm(formula = cdi_df$crime_rate_1000 ~ cdi_df$poverty)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -64.008 -14.578  -2.561  13.605 208.853
##
## Coefficients:
##                Estimate Std. Error t value Pr(>|t|)
## (Intercept)     33.1390     2.4435   13.56   <2e-16 ***
## cdi_df$poverty   2.7690     0.2472   11.20   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 24.12 on 438 degrees of freedom
## Multiple R-squared:  0.2226, Adjusted R-squared:  0.2209
## F-statistic: 125.4 on 1 and 438 DF,  p-value: < 2.2e-16
```

```r
fitted_value =  reg_poverty$fitted.values
reg_poverty %>% broom::tidy()
```

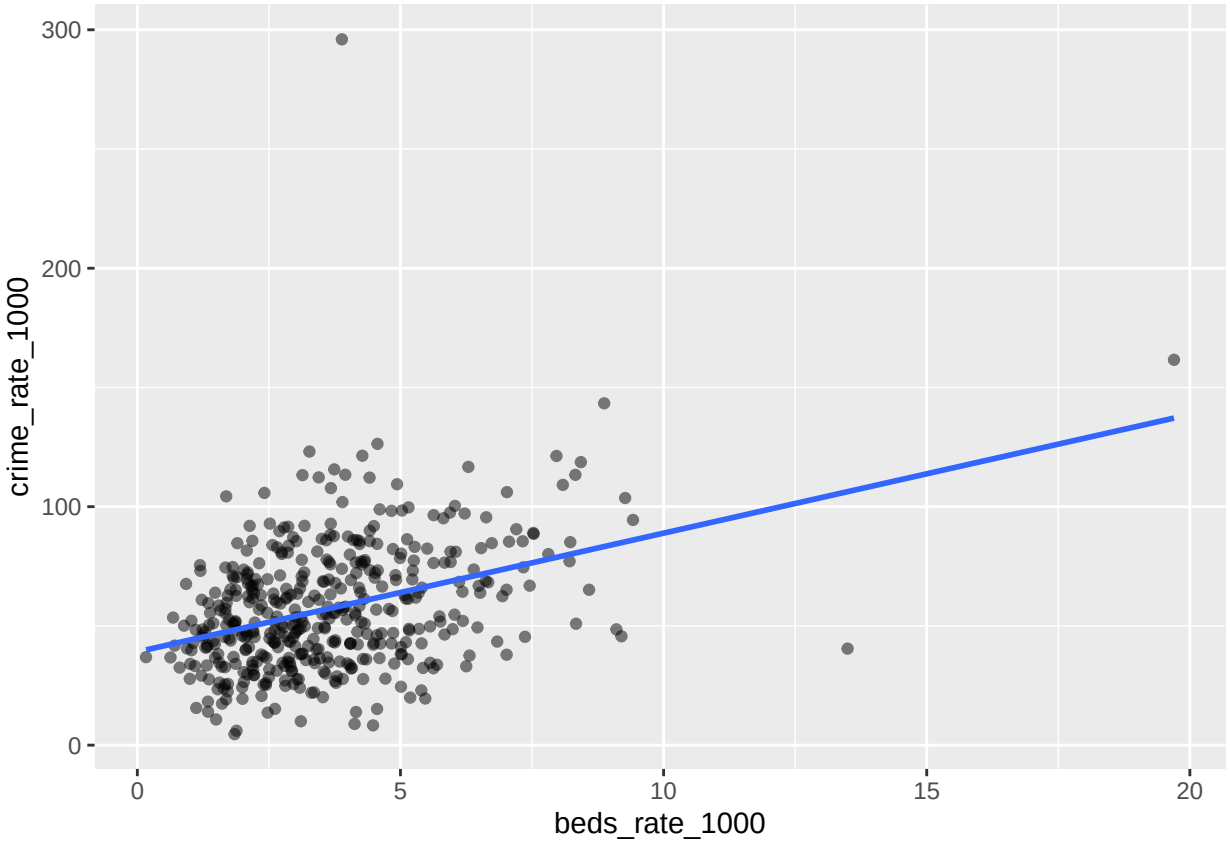
```
## # A tibble: 2 x 5
##   term           estimate std.error statistic  p.value
##   <chr>             <dbl>     <dbl>     <dbl>    <dbl>
## 1 (Intercept)       33.1      2.44       13.6 3.14e-35
## 2 cdi_df$poverty     2.77     0.247      11.2 8.92e-26
```

Crime Rate v.s. Beds

Beds: Total number of beds, cribs, and bassinets during 1990

```r
ggplot(cdi_df, aes(x = beds_rate_1000, y = crime_rate_1000)) + geom_point(alpha = .5) + geom_smooth(meth
```

```
## `geom_smooth()` using formula 'y ~ x'
```




```
reg_beds = lm(cdi_df$crime_rate_1000 ~ cdi_df$beds_rate_1000)
summary(reg_beds)
```

```
##
## Call:
## lm(formula = cdi_df$crime_rate_1000 ~ cdi_df$beds_rate_1000)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -65.817 -16.918  -2.435  14.607 237.519
##
## Coefficients:
##                         Estimate Std. Error t value Pr(>|t|)
## (Intercept)              39.1234     2.5284  15.474  < 2e-16 ***
## cdi_df$beds_rate_1000     4.9771     0.6076   8.191 2.87e-15 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 25.48 on 438 degrees of freedom
## Multiple R-squared:  0.1328, Adjusted R-squared:  0.1308
## F-statistic: 67.09 on 1 and 438 DF,  p-value: 2.875e-15
```

```
reg_beds %>% broom::tidy()
```

```
## # A tibble: 2 x 5
```

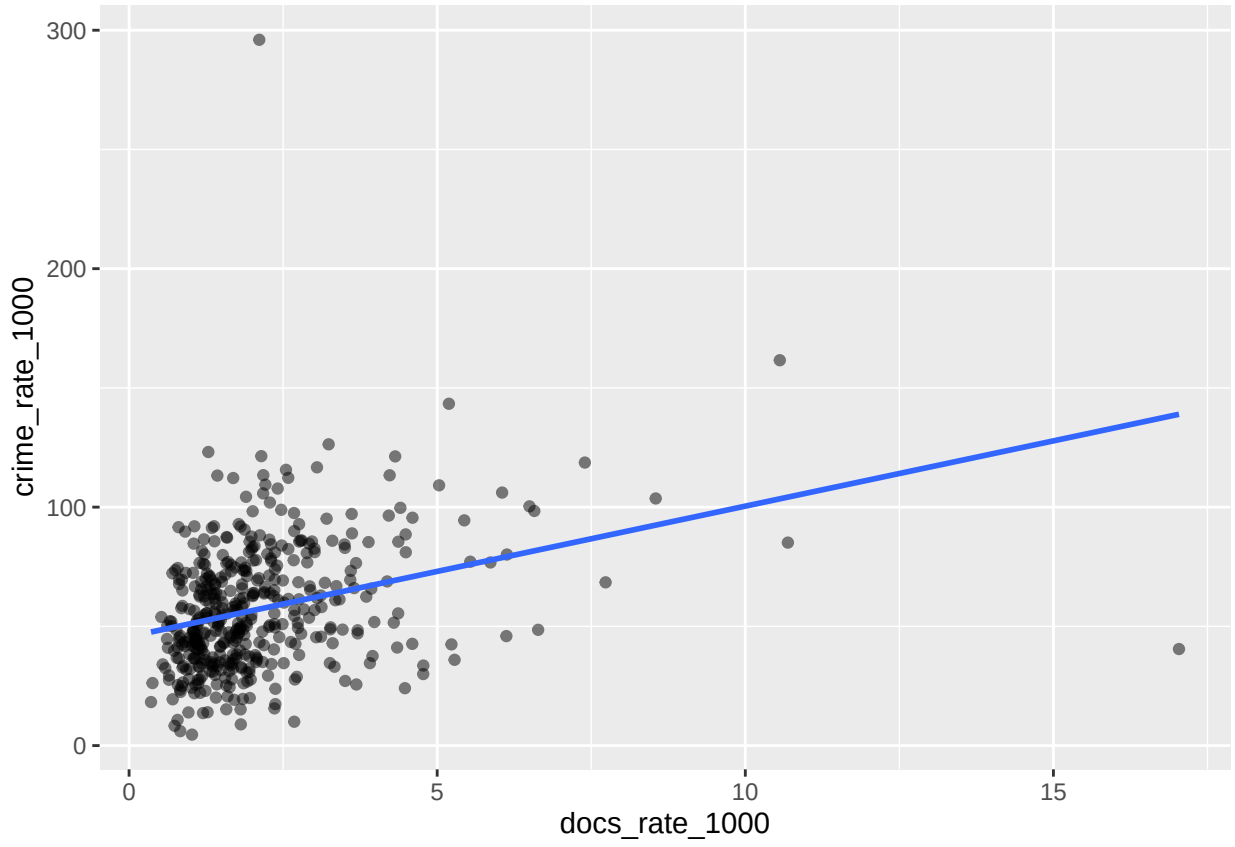
```
##   term                  estimate std.error statistic  p.value
##   <chr>                    <dbl>     <dbl>     <dbl>    <dbl>
## 1 (Intercept)              39.1      2.53      15.5  2.12e-43
## 2 cdi_df$beds_rate_1000     4.98     0.608      8.19 2.87e-15
```

Crime Rate v.s. Docs

docs (Number of active physicians)

```
ggplot(cdi_df, aes(x = docs_rate_1000, y = crime_rate_1000)) + geom_point(alpha = .5) + geom_smooth(meth
```

```
## `geom_smooth()` using formula 'y ~ x'
```




```
reg_docs = lm(cdi_df$crime_rate_1000 ~ cdi_df$docs_rate_1000)
summary(reg_docs)
```

```
##
## Call:
## lm(formula = cdi_df$crime_rate_1000 ~ cdi_df$docs_rate_1000)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -98.454 -17.719  -3.074  16.651 238.756
```

```
##
## Coefficients:
##                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)            45.6642     2.1220  21.520  < 2e-16 ***
## cdi_df$docs_rate_1000   5.4744     0.8107   6.753 4.62e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 26.04 on 438 degrees of freedom
## Multiple R-squared:  0.0943, Adjusted R-squared:  0.09223
## F-statistic:  45.6 on 1 and 438 DF,  p-value: 4.616e-11
```

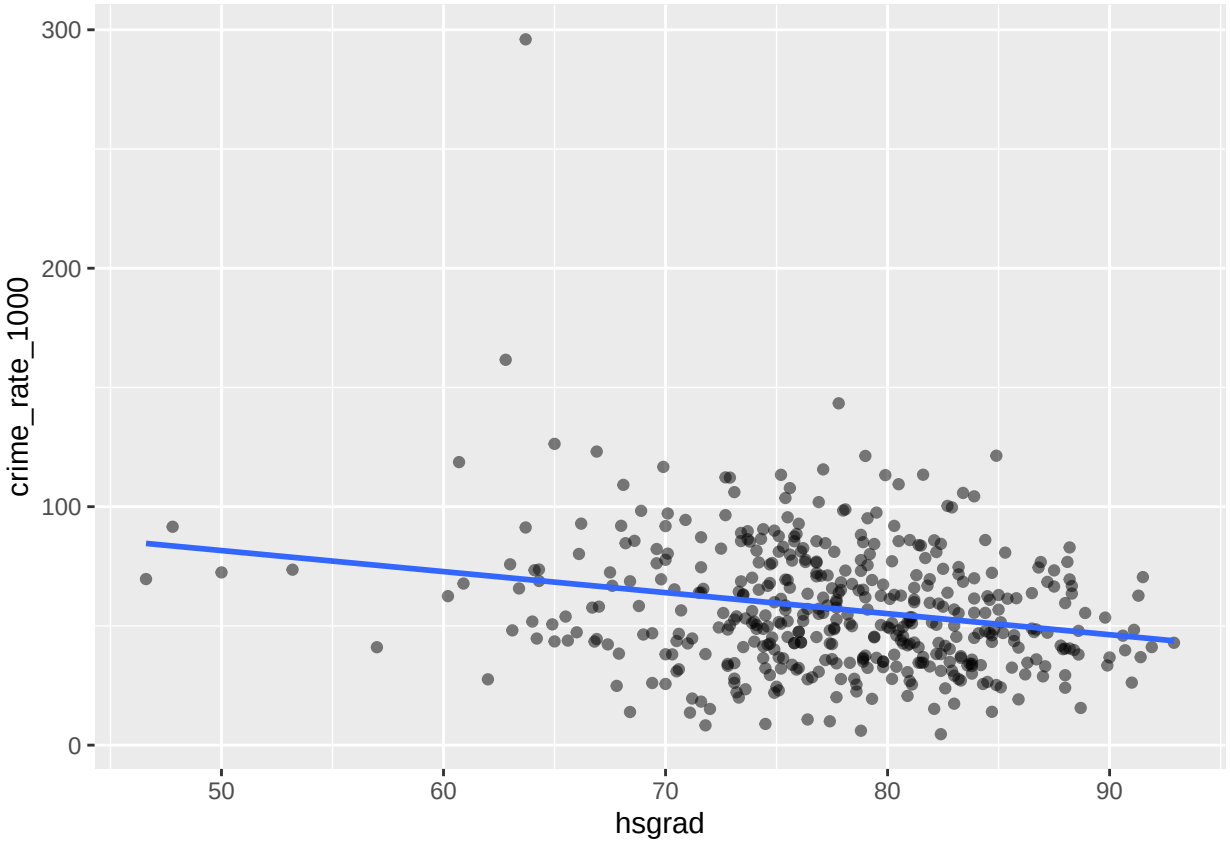
```
reg_docs %>% broom::tidy()
```

```
## # A tibble: 2 x 5
##   term                  estimate std.error statistic  p.value
##   <chr>                    <dbl>     <dbl>     <dbl>    <dbl>
## 1 (Intercept)              45.7      2.12      21.5  1.29e-70
## 2 cdi_df$docs_rate_1000     5.47     0.811      6.75 4.62e-11
```

Crime Rate v.s. hsgrad

```
ggplot(cdi_df, aes(x = hsgrad, y = crime_rate_1000)) + geom_point(alpha = .5) + geom_smooth(method = "lm
```

```
## `geom_smooth()` using formula 'y ~ x'
```




```
reg_docs = lm(cdi_df$crime_rate_1000 ~ cdi_df$hsgrad)
summary(reg_docs)
```

```
##
## Call:
## lm(formula = cdi_df$crime_rate_1000 ~ cdi_df$hsgrad)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -54.07 -18.46  -3.64  16.37 226.47
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)   125.6947    14.1191   8.902  < 2e-16 ***
## cdi_df$hsgrad  -0.8820     0.1813  -4.865  1.6e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 26.65 on 438 degrees of freedom
## Multiple R-squared:  0.05126,    Adjusted R-squared:  0.0491
## F-statistic: 23.67 on 1 and 438 DF,  p-value: 1.601e-06
```

```
reg_docs %>% broom::tidy()
```

```
## # A tibble: 2 x 5
```

```
##   term           estimate std.error statistic  p.value
##   <chr>             <dbl>     <dbl>     <dbl>    <dbl>
## 1 (Intercept)    126.       14.1        8.90 1.46e-17
## 2 cdi_df$hsgrad   -0.882     0.181     -4.86 1.60e- 6
```

Abstract

Introduction

Methods

Results

Conclusion/Discussion