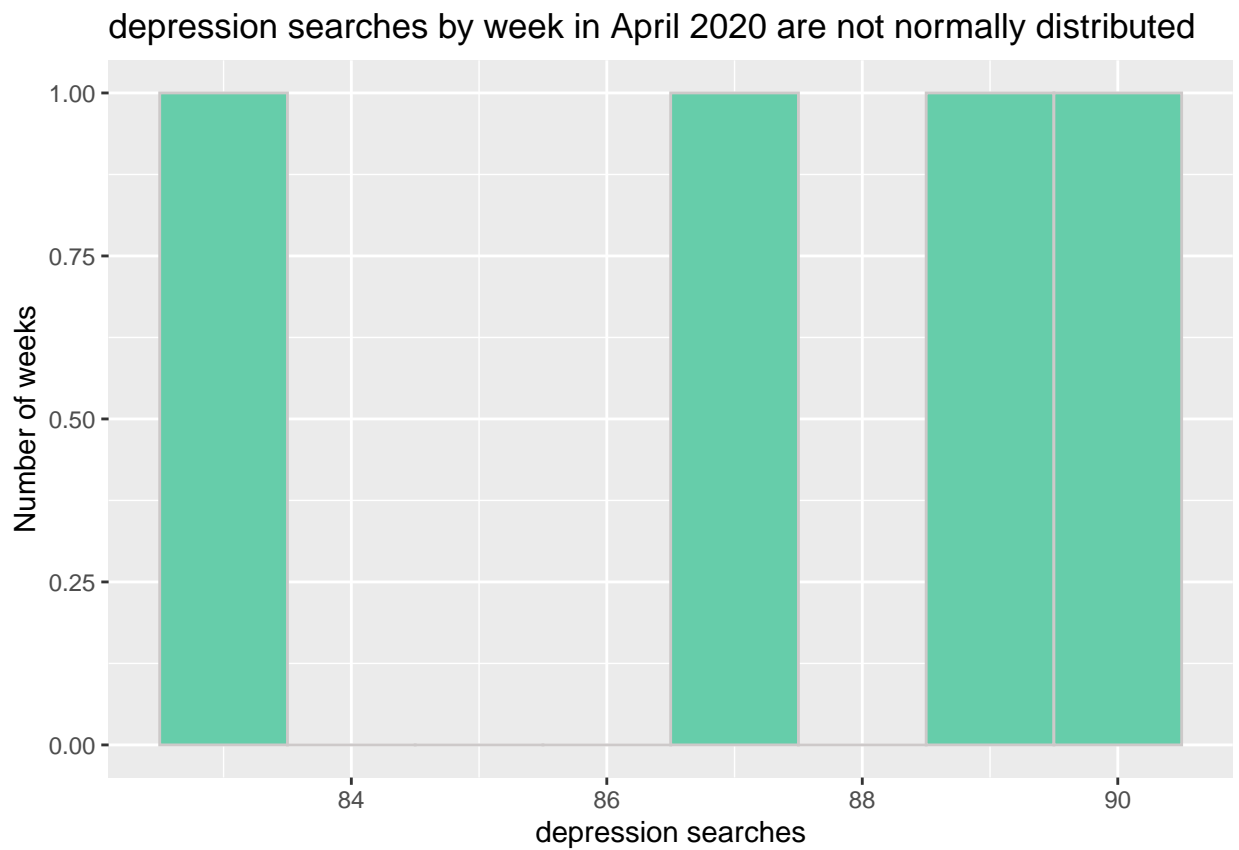


# Final Project

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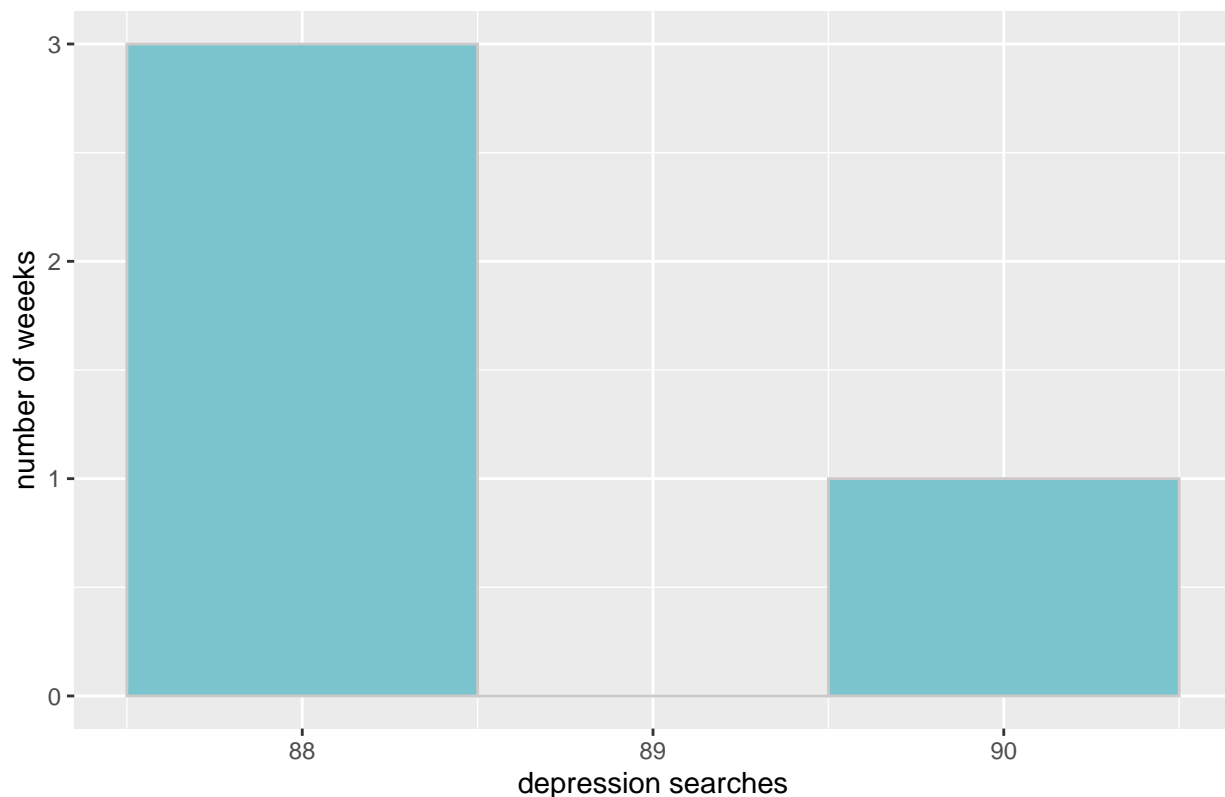
7/19/2020

Comparing depression trends between April 2020 and April 2018



n<30 and not normal distribution: assumption for t-test not satisfied

## depression searches by week in April 2020 are not normally distributed



$n < 30$  and not normal distribution: assumption for t-test not satisfied

```
##
## Paired t-test
##
## data: d2020 and d2018
## t = 0.62017, df = 3, p-value = 0.5791
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -5.164426 7.664426
## sample estimates:
## mean of the differences
## 1.25
```

The null hypothesis is that there is no difference in the mean amount of depression searches in the US between the times of April 2020 and April 2018. The alternate hypothesis is that there is a difference between the two means. Assuming that the null hypothesis is true, the model follows a t-distribution. The t-statistic is 0.755 and the  $df = 29$ . This corresponds to a p-value of 0.4561. We cannot reject the null at the  $\alpha = 0.05$  level. We do not have enough evidence to claim that there is a difference in the mean amount of depression searches in the US between the times of April 2020 and April 2018.

## COVID cases vs. depression rate

```
##           Df Sum Sq Mean Sq F value Pr(>F)
## case_cat    2  121.5   60.73    1.334  0.273
## Residuals  48 2185.2   45.52
```

The null is that there is no significant difference between the mean depression trends of states with low

COVID cases, medium COVID cases, and high COVID cases. The alternate hypothesis is that there exists at least one mean that is different. Assuming the null hypothesis is true, the model follows an F distribution with a df of 2. The F-statistic is 1.334, and the corresponding p-value is 0.273. Therefore, we can not reject the null under the  $\alpha = 0.05$  significance level. There is not enough evidence to suggest that there is at least one difference in mean depression trends of states with low, medium, and high COVID cases.

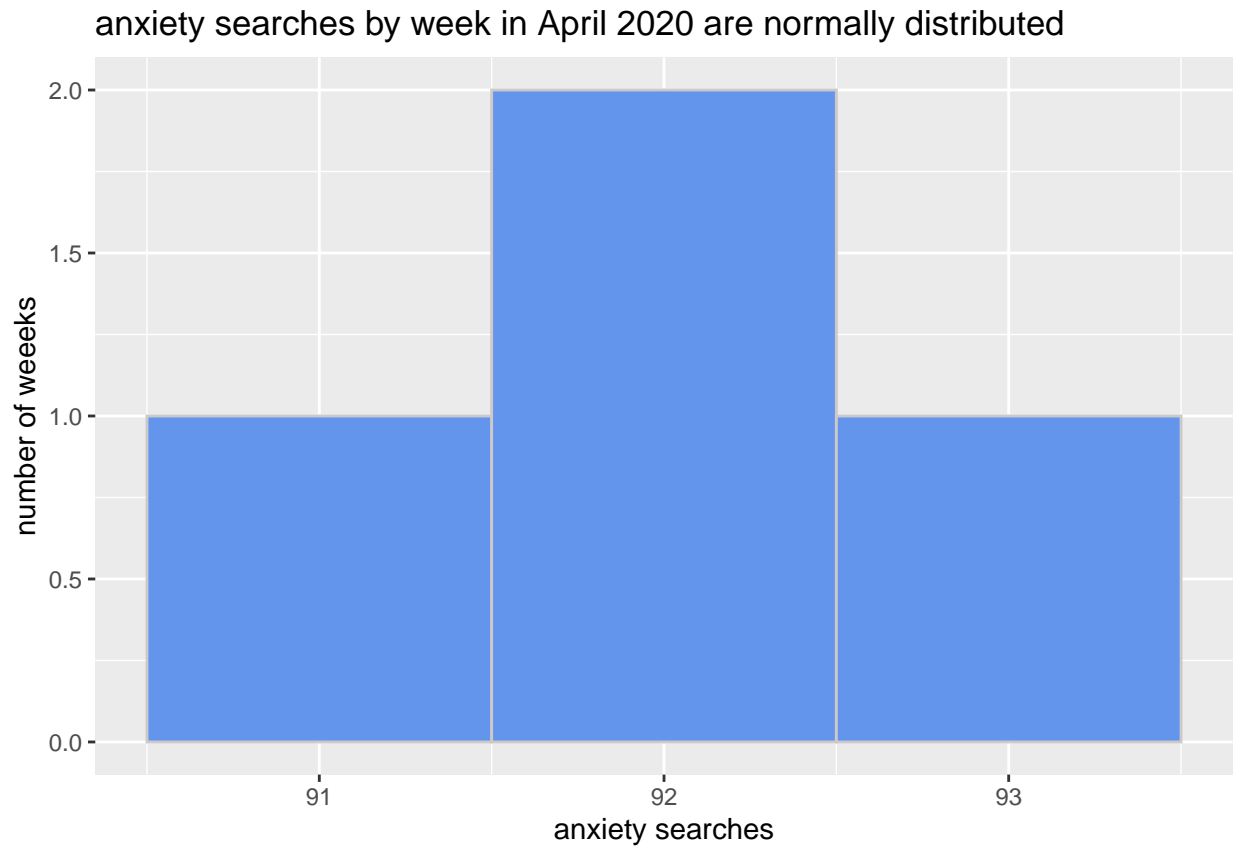
### Restrictions vs. depression

##		Df	Sum Sq	Mean Sq	F value	Pr(>F)
##	restriction_cat	2	48.5	24.25	0.516	0.6
##	Residuals	48	2258.1	47.04		

The null is that there is no significant difference between the mean depression trends of states with low restrictions, medium restrictions, and high restrictions. The alternate hypothesis is that there exists at least one mean that is different. Assuming the null hypothesis is true, the model follows an F distribution with a df of 2. The F-statistic is 0.516, and the corresponding p-value is 0.6. Therefore, we can not reject the null under the  $\alpha = 0.05$  significance level. There is not enough evidence to suggest that there is at least one difference in mean depression trends of states with low, medium, and high restrictions.

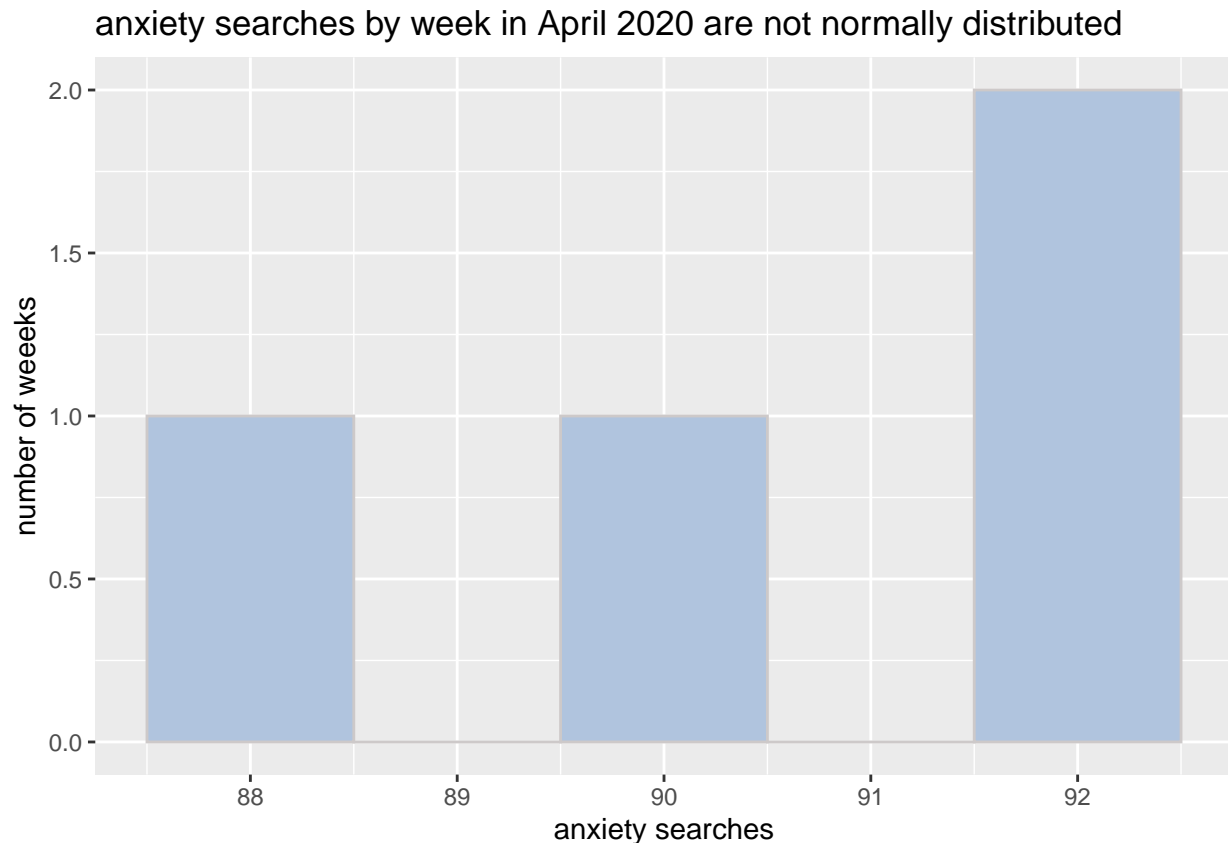
### Comparing anxiety trends in April 2020 to April 2018

```
ggplot(data = atrends2018, mapping = aes(x = anxiety)) +
  geom_histogram(color = "snow3", fill = "cornflowerblue", binwidth = 1)+
  labs(title = "anxiety searches by week in April 2020 are normally distributed",
        x = "anxiety searches",
        y = "number of weeeeks")
```



n<30, but has a normal distribution?? : assumption satisfied

```
ggplot(data = atrends2020, mapping = aes(x = anxiety)) +  
  geom_histogram(color = "snow3", fill = "lightsteelblue", binwidth = 1)+  
  labs(title = "anxiety searches by week in April 2020 are not normally distributed",  
        x = "anxiety searches",  
        y = "number of weeeeks")
```



n<30 and not normal distribution: assumption not satisfied

```
##
## Paired t-test
##
## data: a2020 and a2018
## t = -1.2603, df = 3, p-value = 0.2967
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -5.287869 2.287869
## sample estimates:
## mean of the differences
## -1.5
```

The null hypothesis is that there is no difference in the mean amount of anxiety searches in the US between the times of April 2020 and April 2018. The alternate hypothesis is that there is a difference between the two means. Assuming that the null hypothesis is true, the model follows a t-distribution. The t-statistic is 1.66 and the  $df = 29$ . This corresponds to a p-value of 0.1086. We cannot reject the null at the  $\alpha = 0.05$  level. We do not have enough evidence to claim that there is a difference in the mean amount of anxiety searches in the US between the times of April 2020 and April 2018.

### COVID cases vs. anxiety rate

```
##           Df Sum Sq Mean Sq F value Pr(>F)
## case_cat    2  384.2  192.08    3.826 0.0287 *
## Residuals  48 2410.0   50.21
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

The null is that there is no significant difference between the mean anxiety trends of states with low COVID cases, medium COVID cases, and high COVID cases. The alternate hypothesis is that there exists at least one mean that is different. Assuming the null hypothesis is true, the model follows an F distribution with a df of 2. The F-statistic is 3.826, and the corresponding p-value is 0.0287. Therefore, we can reject the null under the  $\alpha = 0.05$  significance level. There is enough evidence to suggest that there is at least one difference in mean anxiety trends of states with low, medium, and high COVID cases.

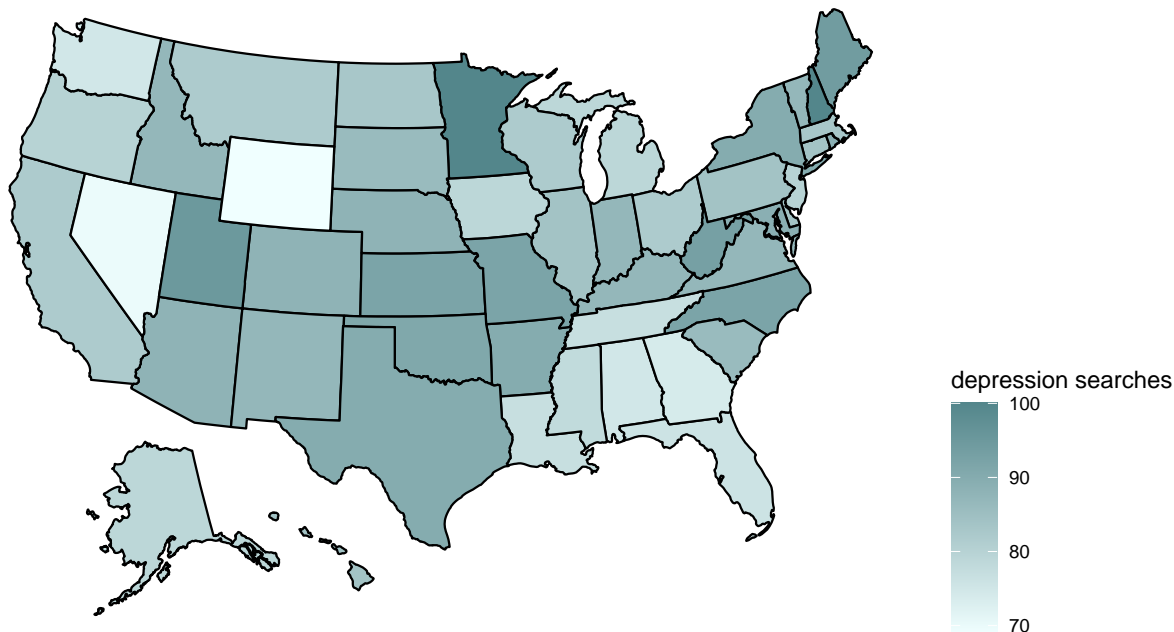
### Restrictions vs. anxiety

```
##              Df Sum Sq Mean Sq F value    Pr(>F)
## restriction_cat  2  612.9   306.43    6.743 0.00262 **
## Residuals      48 2181.3    45.44
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

The null is that there is no significant difference between the mean anxiety trends of states with low restrictions, medium restrictions, and high restrictions. The alternate hypothesis is that there exists at least one mean that is different. Assuming the null hypothesis is true, the model follows an F distribution with a df of 2. The F-statistic is 6.746, and the corresponding p-value is 0.00262. Therefore, we reject the null under the  $\alpha = 0.05$  significance level. There is enough evidence to suggest that there is at least one difference in mean anxiety trends of states with low, medium, and high restrictions.

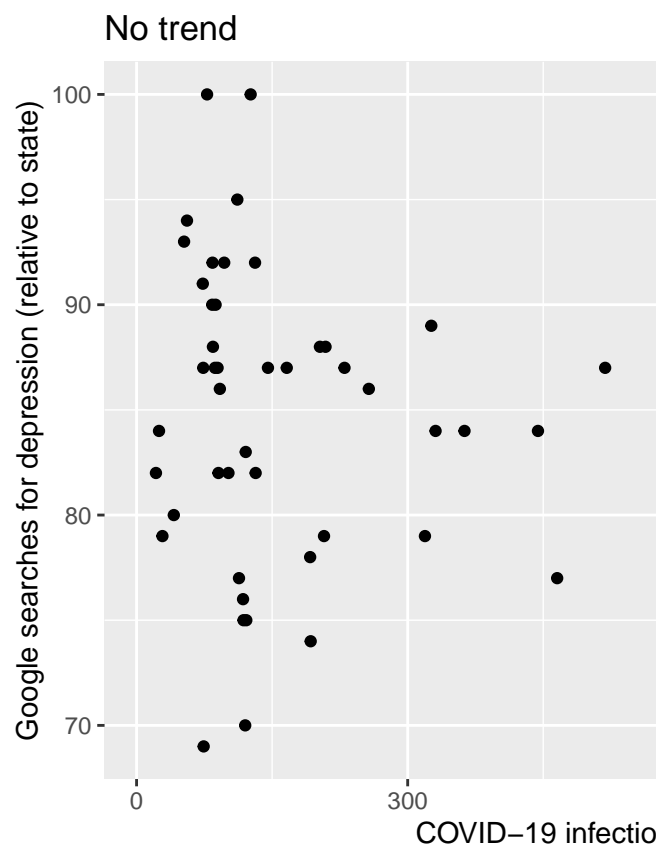
### Depression rate in each state map

```
## Warning: Use of `map_df$x` is discouraged. Use `x` instead.
## Warning: Use of `map_df$y` is discouraged. Use `y` instead.
## Warning: Use of `map_df$group` is discouraged. Use `group` instead.
```



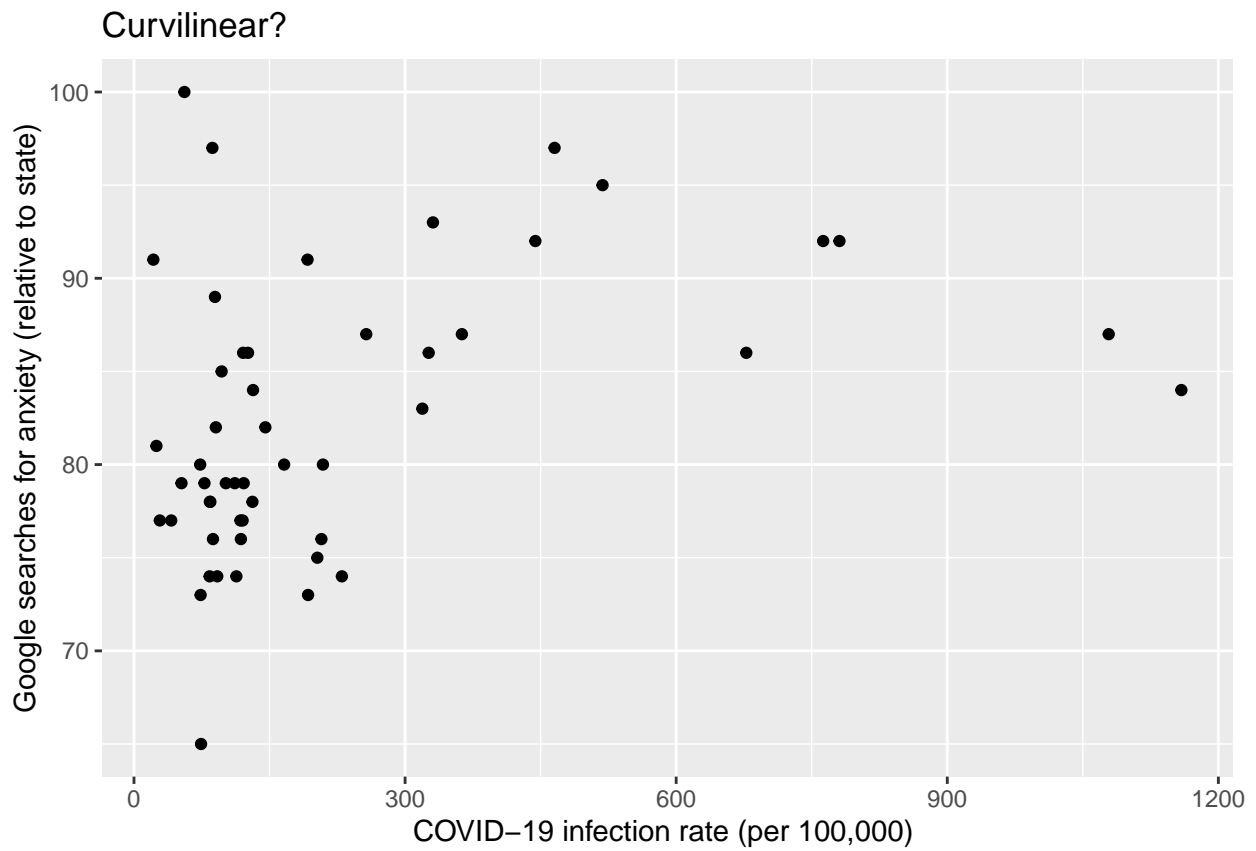
### Nour Visuals

```
ggplot(data = covidrate, mapping = aes(x = New.COVID.cases.per.100.000.in.April, y = depression)) +
  geom_point() +
  labs(title = "No trend",
        x = "COVID-19 infection rate (per 100,000) ",
        y = "Google searches for depression (relative to state)" )
```



Effect of COVID on depression/anxiety rates in each State

```
ggplot(data = covidrate, mapping = aes(x = New.COVID.cases.per.100.000.in.April, y = anxiety)) +
  geom_point() +
  labs(title = "Curvilinear?",
        x = "COVID-19 infection rate (per 100,000) ",
        y = "Google searches for anxiety (relative to state)" )
```



Effect of severity of restrictions on depression/anxiety rates in each State