

Effect of COVID-19 on Pool Permit Applications

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Abstract

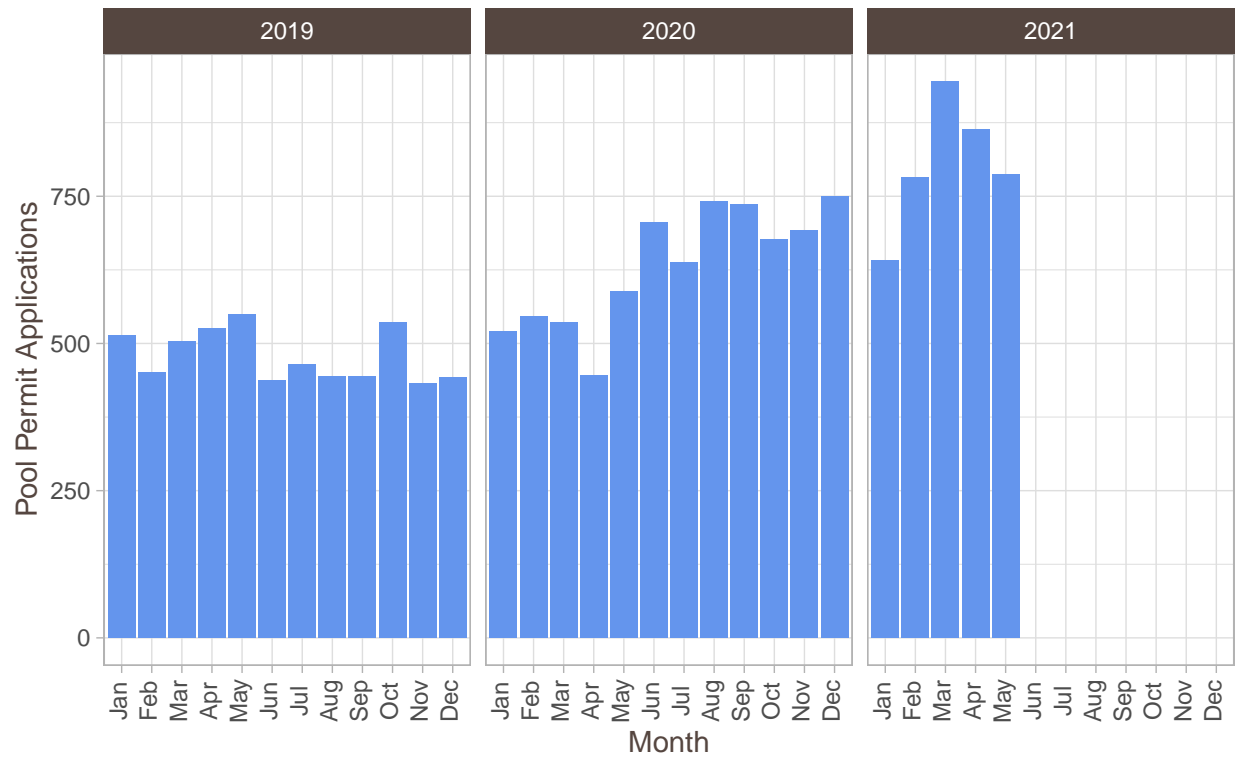
The preventative measures taken to stop the spread of COVID-19 has necessitated the general population's sequestration in their own homes. This study seeks to answer whether the societal changes brought about by the COVID pandemic are associated with an increase in applications for pool permits, working under the hypothesis that more resources will be spent on home improvement if a greater portion of time is spent there. This analysis is accomplished by comparing the application rate of the 13 months leading up to the pandemic to that of the 13 months after it started. We shall show that between these two intervals, there is an estimated increase of **50%** in pool permit applications. We are 95% confident that the increase for the entire United States is at least **46.1%**. This study also compares the application rates of 2018 to 2020, finding an estimated increase of **39.7%**. We are 95% confident that 2020's application rate is at least **35.7%** greater than that of 2018 for the entire United States.

Data

The data have been scraped from the websites of eleven United States counties from January 2019 to May 2021, for a total of 17340 applications.

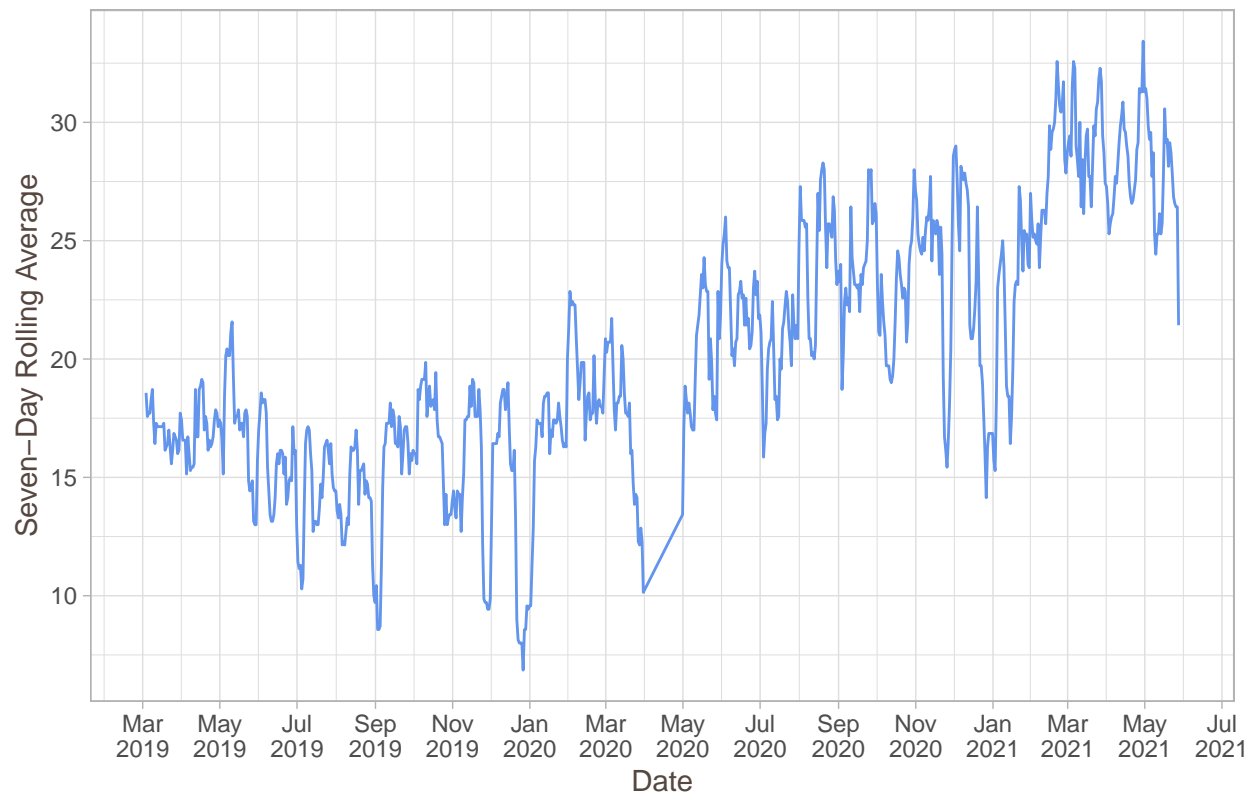
County	State	Count
atlanta	GA	518
charlotte	FL	4800
clark	NV	3540
contra_costa	CA	848
kern	CA	545
maricopa	AZ	2962
martin	FL	1917
monroe	FL	567
orange	CA	88
san_mateo	CA	110
wake	NC	1445

Pool Permit Applications by Month

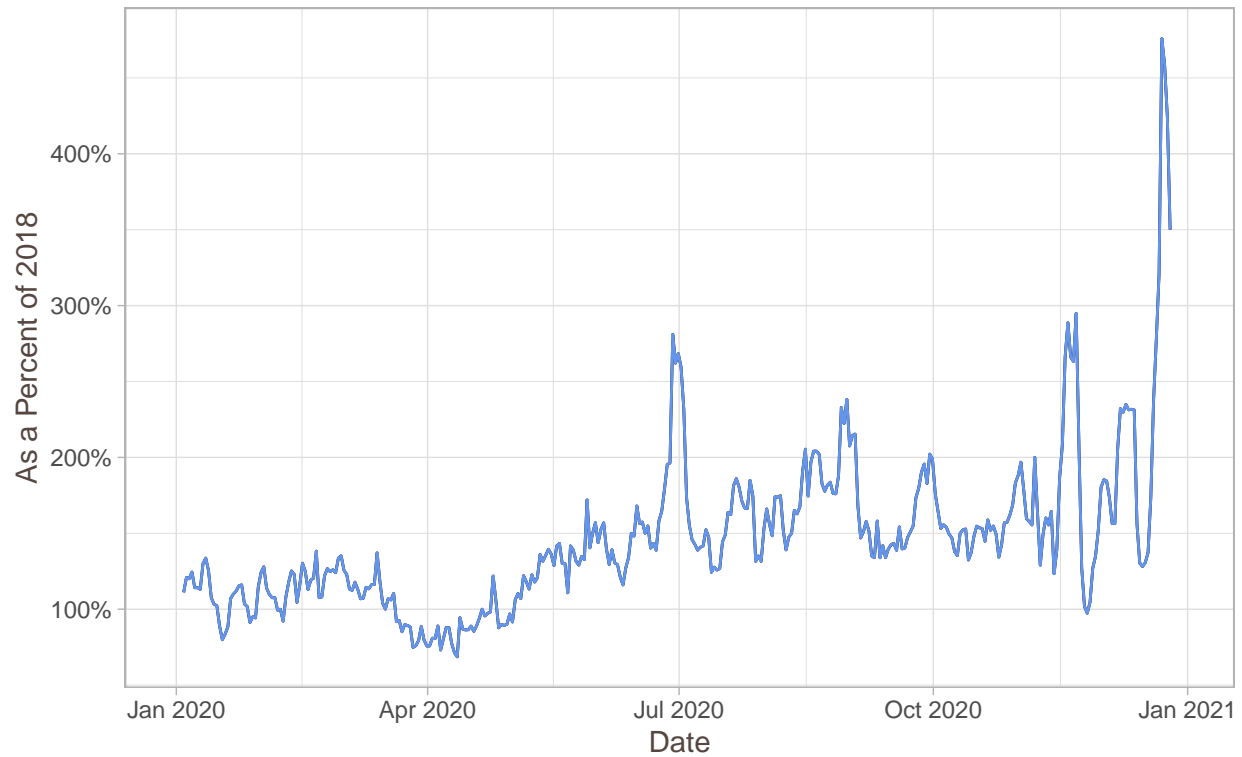


Data gathered on June 16th, 2021

Seven-Day Rolling Averages of Pool Permit Applications



2020 Pool Permit Applications Indexed to 2018



Using the above seven-day rolling average

Analysis - Before vs. After Lockdown

When looking at the number of permit applications per month, there seems to be a definite increase after the onset of the pandemic. For the purpose of analysis, we will disregard April 2020, as the sharp drop in permit applications at this time could be attributed to the general panic shifting the public's focus away from luxuries such as swimming pools.

We shall then examine two intervals of 13 months each: March 2019 to March 2020, and May 2020 to May 2021.

To ascertain whether there has been an increase in application rate from the first to the second interval, a 95% confidence interval for the Poisson rate ratio shall suffice.

After Lockdown	Total Applications	Average Applications Per Day	Number of Days
FALSE	6381	16.07	397
TRUE	9549	24.11	396

Raw Test Output - Before vs. After Lockdown

```
##
## Comparison of Poisson rates
##
## data: sample_summary$`Total Applications` time base: sample_summary$`Number of Days`
## count1 = 9549, expected count1 = 7955, p-value < 2.2e-16
## alternative hypothesis: true rate ratio is greater than 1
## 95 percent confidence interval:
```

```
## 1.46071      Inf
## sample estimates:
## rate ratio
## 1.500253
```

Analysis - 2018 vs. 2020

To gain a more complete picture, we shall use the same process to compare 2018 to 2020.

Year	Total Applications	Average Applications Per Day	Number of Days
2018	5408	14.86	364
2020	7576	20.76	365

Raw Test Output - 2018 vs. 2020

```
##
## Comparison of Poisson rates
##
## data:  rev(sample_summary_2$`Total Applications`) time base: rev(sample_summary_2$`Number of Days`)
## count1 = 7576, expected count1 = 6500.9, p-value < 2.2e-16
## alternative hypothesis: true rate ratio is greater than 1
## 95 percent confidence interval:
## 1.356541      Inf
## sample estimates:
## rate ratio
## 1.39705
```

Conclusion

From the sample data, we estimate that the rate ratio comparing after and before the pandemic is 1.5, meaning a **50%** increase in applications. Furthermore, we can say with 95% certainty that the true rate ratio in pool permit applications for the entire United States is at minimum 1.461, meaning a **46.1%** increase.

When we compare the average pool permit application rate of 2020 to 2018, we estimate from the sample that the rate ratio between 2020 and 2018 is 1.397, meaning a **39.7%** increase. We are 95% certain that the true rate ratio between the two years for the entire United States is at least 1.357, meaning a **35.7%** increase.