Research Proposal: Effect of state policies and population on the spread of COVID-19?

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Background and Research Question

The COVID-19 pandemic is the first pandemic seen in a century, affecting each individual worldwide. While many countries issued lockdowns, travel quarantines, and other COVID-19 restrictions on a federal level, the US federal government placed the power with the governors to regulate the implementation of these restrictions on a state-by-state basis. There has been increased skepticism on the true effectiveness of restrictions in slowing down the spread of COVID-19, especially due to the amount of economic impact resulting from these procedures.

From this, we will be investigating the following research question:
`Does a state's implementation of closures of public spaces, stay at home orders, and face mask mandates have an effect on their COVID-19 case counts?`

Data sources

1. COVID-19 US State Policy Database A database of state policy responses to the pandemic, compiled by researchers at the Boston University School of Public Health.
2. NY Times Covid-19 Data Repository A series of data files with cumulative counts of coronavirus cases in the United States, at the state and county level, over time.

From data source (1), we expect to get variables:
- Closure and reopenings: Start and end dates of closures of public spaces
- Stay at home: Start and end dates of stay at home policies
- Face masks: Start and end date of face mask mandates
- Population per square mile: State's population per square mile

From data source (2) we expect to get the variable:
- Weekly COVID-19 case counts

Methodology and Expected outcome

We will investigate the causal effect the following variables have on the 7-day moving average of cumulative COVID-19 cases:
- Closure and reopenings (whether a stay-at-home order was in effect at that time and number of days since it started)
- When mask mandates were required (as an indicator variable, and number of days since the mandate started)
- Whether the state implemented legal consequences for violating stay-at-home orders

We will assume that these variables have no effect on COVID-19 cases, and will construct tests to investigate whether a relationship exists using three regression models, starting with stay at home and population per square mile as our key explanatory variables in our limited model.