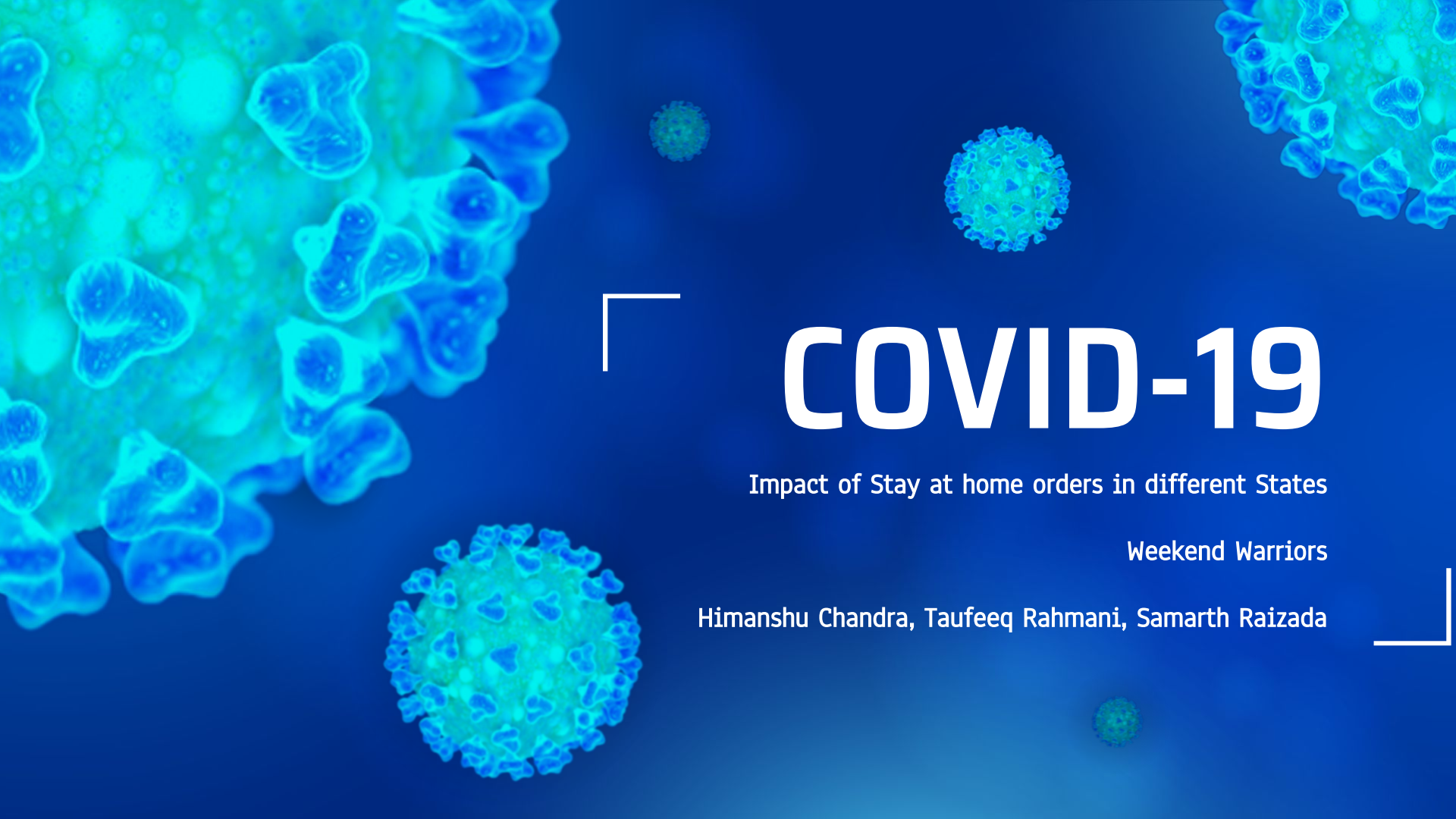


COVID-19

Impact of Stay at home orders in different States

Weekend Warriors

Himanshu Chandra, Taufeeq Rahmani, Samarth Raizada

Background

- Stay-at-home orders have been hailed as major source of defence against spread of COVID-19
- All 50 states across the United States issued a stay-at-home order at sometime during the last 3 months.
- It had huge implications on people and economy
- There has been consensus that stay-at-home orders were helpful for containing the pandemic
    - How do we quantify the benefit of stay-at-home orders?

01.

Assumptions and Hypothesis

02.

Exploratory Data Analysis

03.

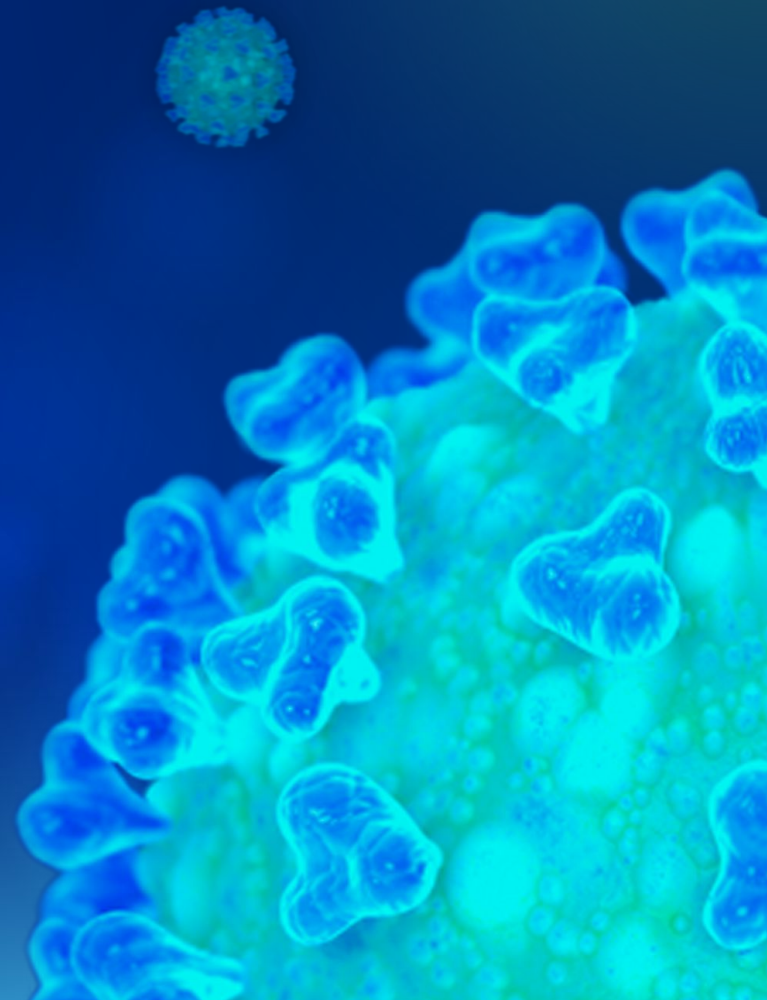
Approach

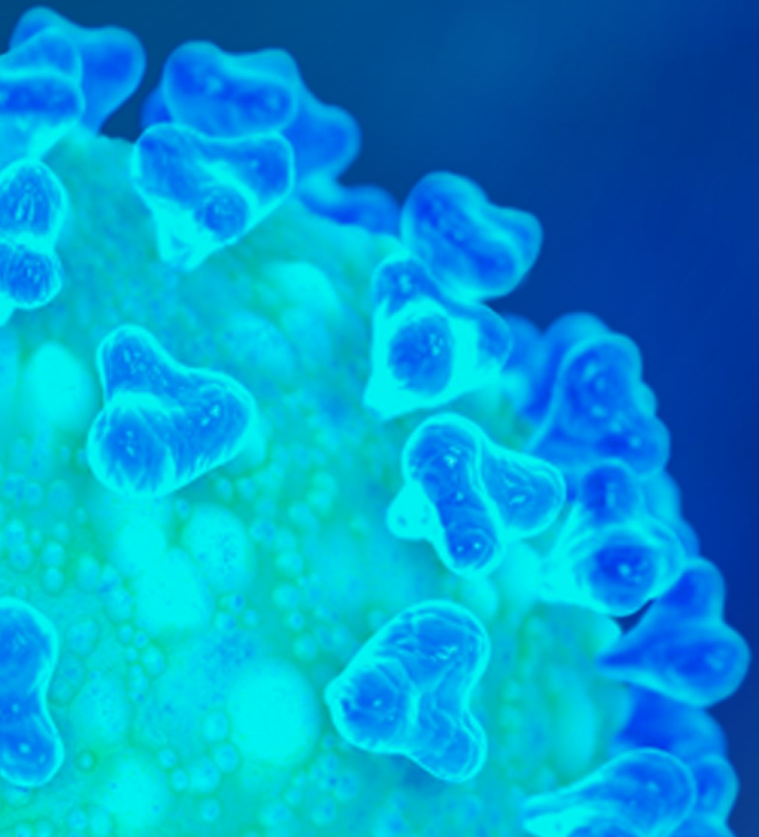
04.

Key Takeaways

“We cannot say this loudly enough or clearly enough or often enough: All countries can still change the course of this pandemic”

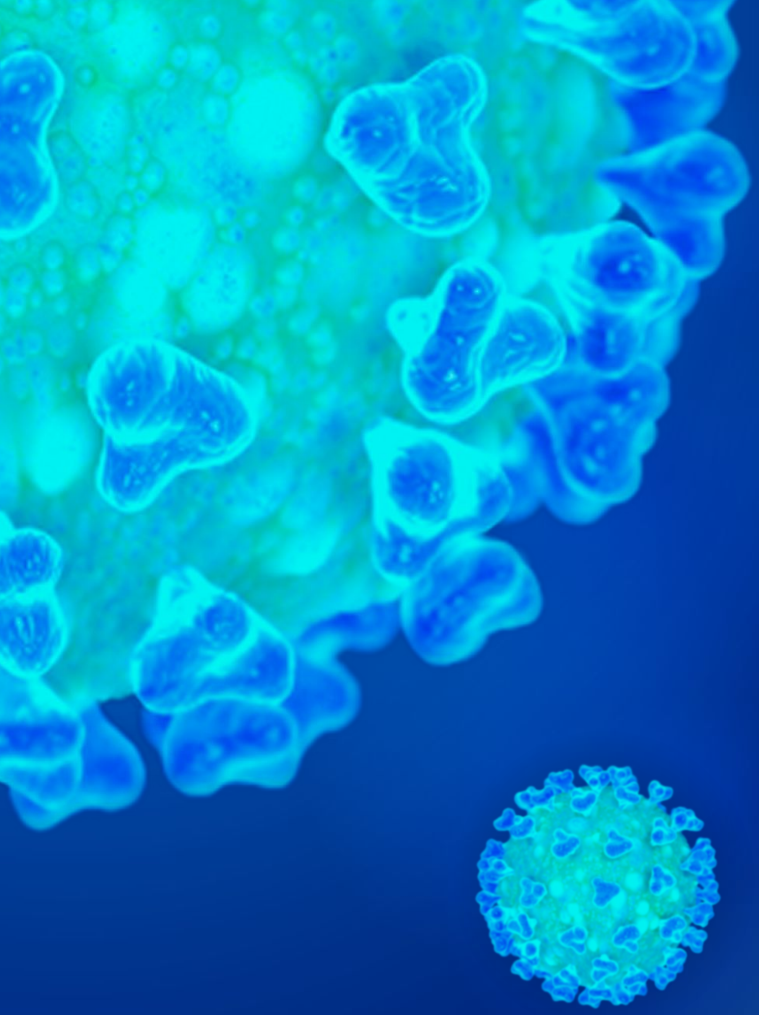
—DR. TEDROS ADHANOM GHEBREYESUS, WORLD HEALTH ORGANIZATION’S DIRECTOR GENERAL





COVID-19

COVID-19 is an infectious disease caused by the recently found virus known as SARS-CoV-2 (or coronavirus). Before the outbreak originated in Wuhan, China on December 2019, there was no information about this virus



01.

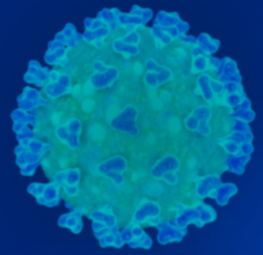
Assumptions and Hypothesis

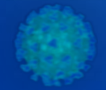
Assumptions and Hypothesis

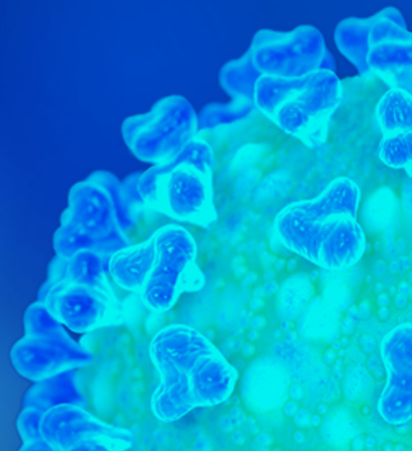
- The number of cases have been stable in US around 25k mark daily since 25th march.
- Stay at Home order have an impact in the daily cases of a state
- The states have an impact of stay at home immediately

02

STATS ABOUT CORONAVIRUS







USA has 2.1m cases as of June 2020

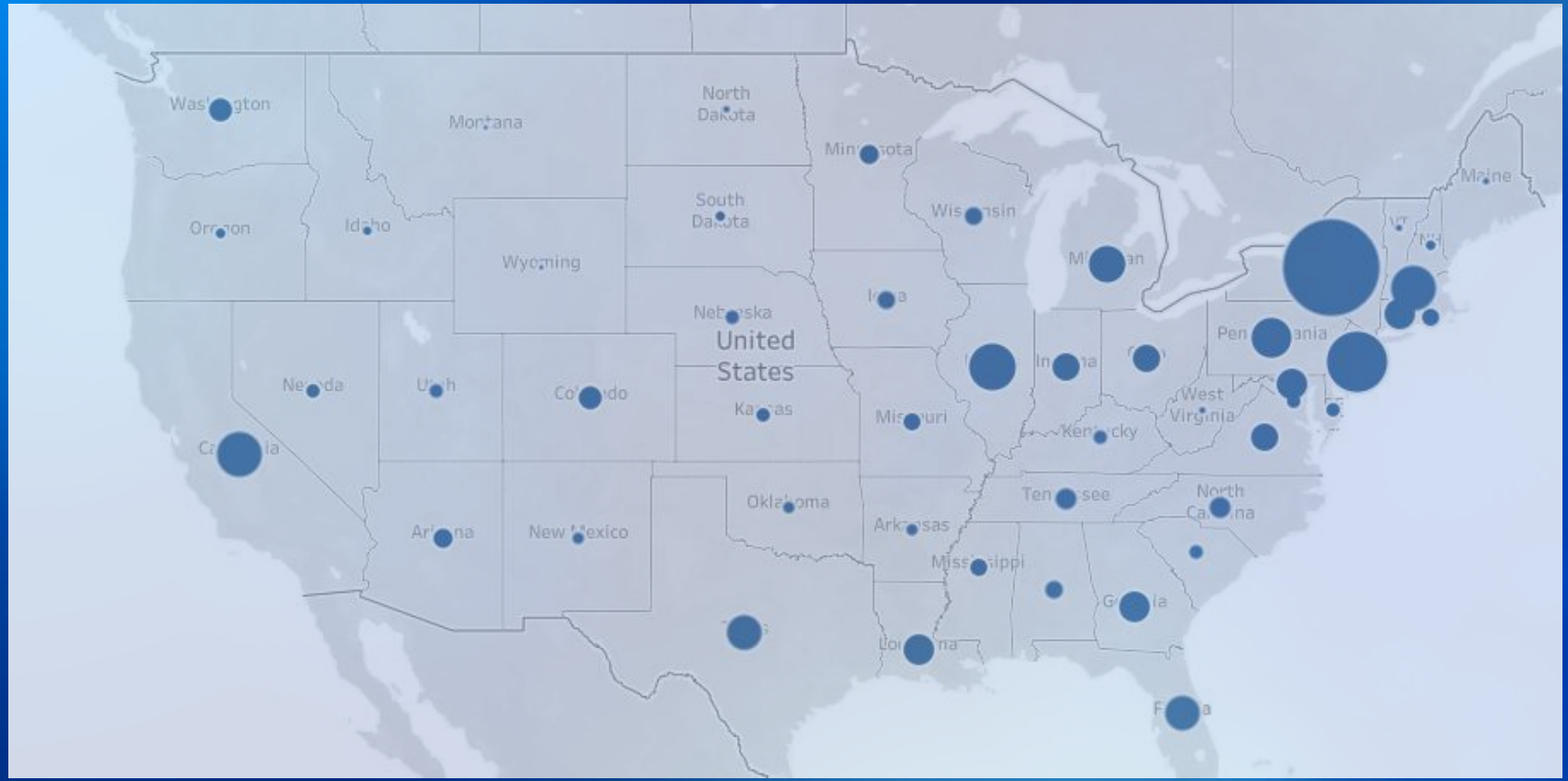
2.1m

Reported cases in USA as of June 2020

3.4%

Global death rate of this novel coronavirus disease

New York state is the epicenter of the pandemic in USA



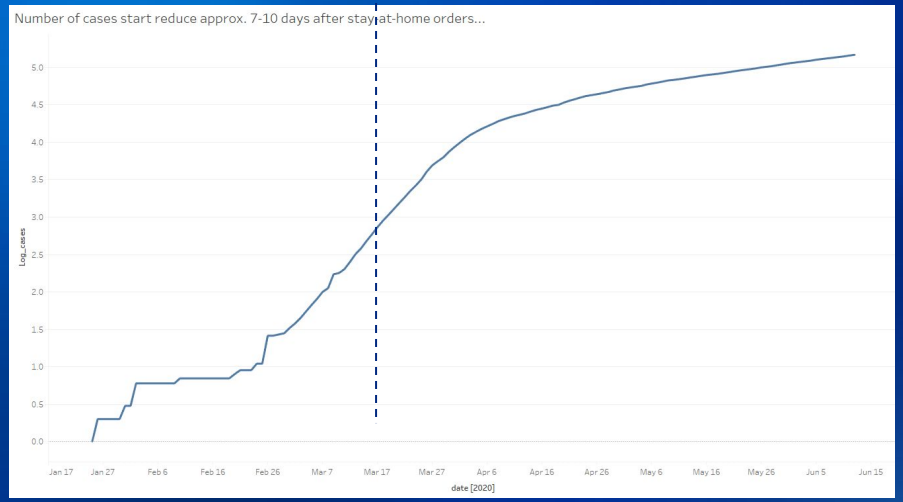
5 STATES WITH THE HIGHEST NUMBER OF CASES

	CONFIRMED	DEATHS
New York	404,423	30,909
New Jersey	169,407	12,728
California	150,267	5062
Illinois	131,871	6289
Massachusetts	105,395	7576

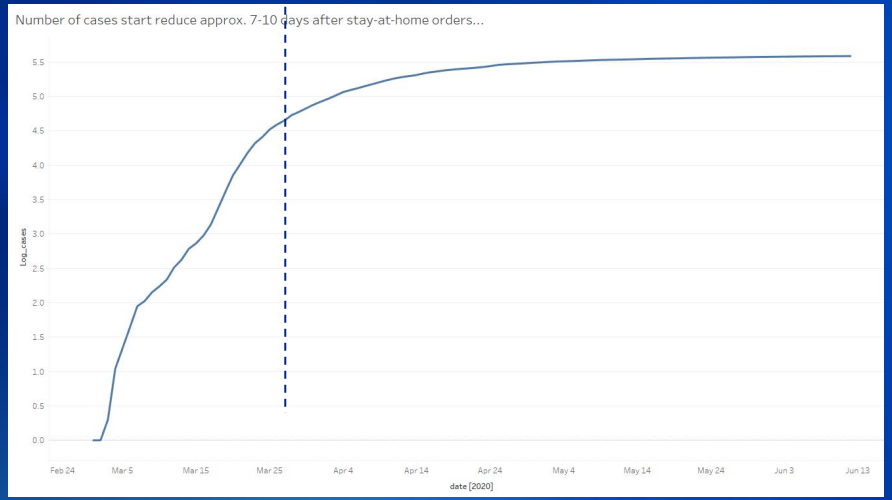
At one point, 95% of US population was ordered to Stay-at-home

Number of cases start to reduce approx. 7-10 days after stay-at-home orders went into effect....

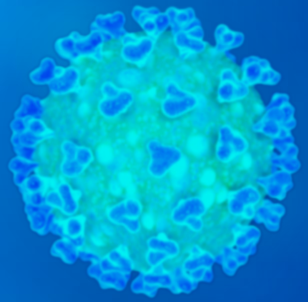
California

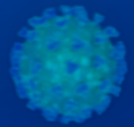


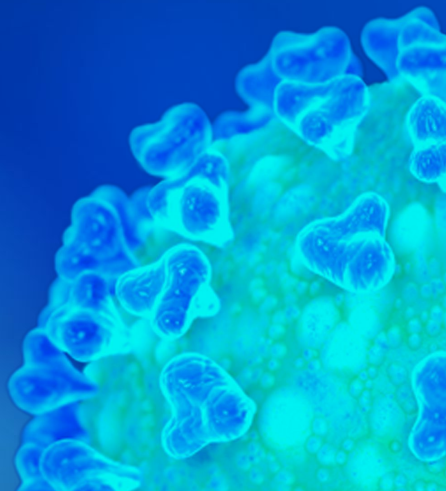
New York



How do we quantify the impact of stay-at-home? (Approach)







Methodology

1. Historical data for 45 states on stay-at-home orders was taken date wise from Feb 20th to Apr 15.
2. A dummy variable corresponding to the dates when the stay at home orders were in effect (treatment) was introduced in the dataset.
3. This data was fed into a linear regression model which regressed the number of infections on date-wise dummy of stay-at-home orders accounting for state-specific fixed effects.

Key Takeaways

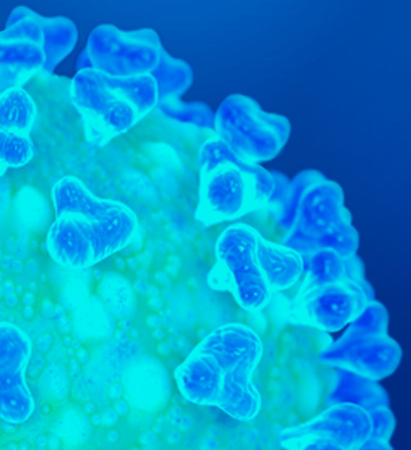
- The data showed that when offset by 7 days, most of the states , notably Kentucky, Michigan, Kansas witnessed decreased incidence of new cases.
- Virginia, Utah, Texas, South dakota, South Carolina, Rhode Islands, Pennsylvania, ohio, Northern Mariana Islands, North Dakota, New york, New Jersey, Missouri, Mississippi ,Minnesota, Massachusetts, Maryland, Iowa, Indiana, Illinois, Georgia , Florida, Connecticut, Colorado and California with increase in cases despite stay at home order

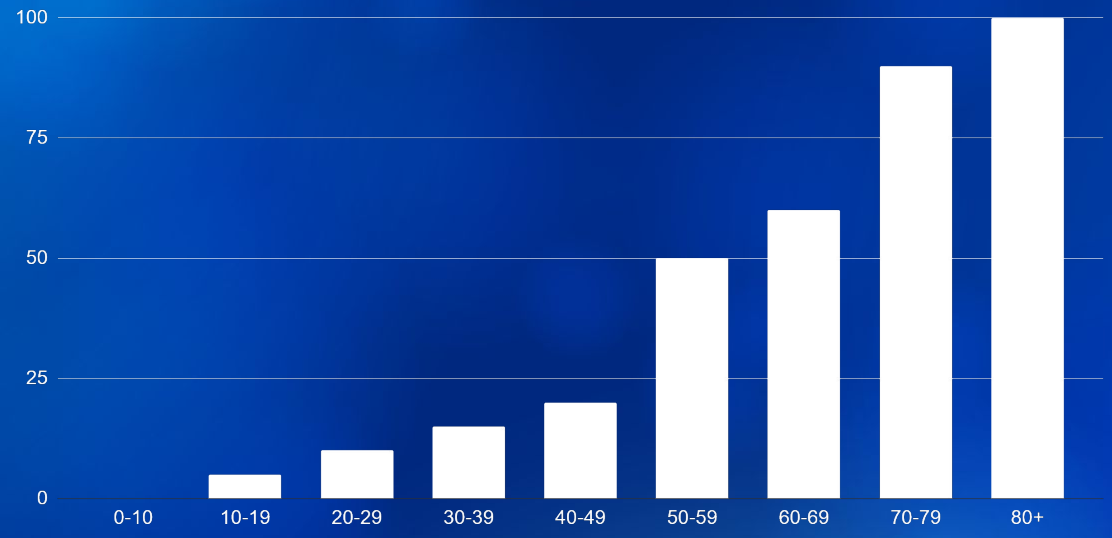
Next Steps...

- The analysis could be further enriched if a 14 day offset could be used, but at this point, it would lead to an unacceptably low number of data points resulting in the model overfitting.
- A number of confounds exist (see Acyclic graph in appendix) which could affect the quality of analysis and estimation of true coefficient. These can be eliminated by use of a suitable instrumental variable (also in appendix)

Appendix

Older people are more susceptible to COVID-19





Regression results

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.18005	0.45915	-0.392	0.69497	
isstayhome	0.13113	0.16987	0.772	0.44018	
stateAlaska	-0.21605	0.65735	-0.329	0.74242	
stateArizona	-0.06760	0.64510	-0.105	0.91655	
stateArkansas	-0.91820	0.64866	-1.416	0.15699	
stateCalifornia	0.04527	0.64558	0.070	0.94410	
stateColorado	0.08410	0.64380	0.131	0.89607	
stateConnecticut	0.16698	0.64974	0.257	0.79719	
stateDelaware	-0.12511	0.64839	-0.193	0.84700	
stateDistrict of Columbia	-0.05451	0.64928	-0.084	0.93310	
stateFlorida	0.03624	0.64371	0.056	0.95511	
stateGeorgia	0.14894	0.64652	0.230	0.81782	
stateGuam	-1.98125	0.74371	-2.664	0.00775	**
stateHawaii	-0.15190	0.67127	-0.226	0.82099	
stateIdaho	-0.10688	0.66581	-0.161	0.87248	
stateIllinois	0.01782	0.65117	0.027	0.97817	
stateIndiana	0.07963	0.64457	0.124	0.90168	
stateIowa	0.04929	0.64652	0.076	0.93923	
stateKansas	-1.00792	0.64395	-1.565	0.11761	
stateKentucky	-3.01840	0.64652	-4.669	3.13e-06	***
stateLouisiana	-0.08118	0.64860	-0.125	0.90040	
stateMaine	-0.04828	0.64791	-0.075	0.94060	
stateMaryland	0.03760	0.64525	0.058	0.95354	
stateMassachusetts	0.10002	0.64652	0.155	0.87706	
stateMichigan	-0.23243	0.64958	-0.358	0.72050	
stateMinnesota	0.01846	0.64612	0.029	0.97721	
stateMississippi	0.04885	0.64372	0.076	0.93952	
stateMissouri	0.06910	0.64652	0.107	0.91490	
stateMontana	-0.04010	0.68881	-0.058	0.95358	
stateNebraska	-0.04293	0.64652	-0.066	0.94706	
stateNevada	-0.01548	0.64496	-0.024	0.98086	
stateNew Hampshire	-0.01567	0.64958	-0.024	0.98075	
stateNew Jersey	0.02182	0.65295	0.033	0.97334	
stateNew Mexico	-0.07020	0.65084	-0.108	0.91411	
stateNew York	0.07837	0.65019	0.121	0.90406	
stateNorth Carolina	-0.04410	0.64436	-0.068	0.94544	
stateNorth Dakota	0.09571	0.64652	0.148	0.88232	
stateNorthern Mariana Islands	0.37223	1.19248	0.312	0.75494	
stateOhio	0.04101	0.65019	0.063	0.94971	
stateOklahoma	-0.02549	0.64652	-0.039	0.96855	
stateOregon	-0.06727	0.64652	-0.104	0.91714	
statePennsylvania	0.08770	0.64417	0.136	0.89172	

Directed Acyclic Graph Showing Confounding factors for our Analysis