COVID-19 Health Outcomes: Healthcare, and Government Intervention

Mark Pérez Clanton

Group 34 mprez@wisc.edu

1 Abstract

In this paper I aim to study the main health outcomes of the COVID-19 pandemic in terms of number of cases and deaths. Specifically, I investigate whether government intervention in citizens life's and healthcare rendered better outcomes. I do so by using pre-pandemic and pandemic-related data. I conclude that public healthcare spending has no direct relationship on Covid-19 health outcomes. Overall, testing serves as the best tool to combat the pandemic in order to detect cases and reduce the expected death rate.

2 Context

Over the past year, the COVID-19 virus has had a devastating effect on people's lives. As of April 30, 2021, the number of worldwide deaths is about 3.17 million. As a response measure to the health crisis, most countries around the world have seen their governments intervene via restrictions on personal mobility, among others.

This paper is in large part motivated to study whether claims made by politicians such as Bernie Sanders (Savage, 2021), Alexandria Ocassio-Cortez (AOC n.d.), or Spain's own Pablo Iglesias (El Plural, 2020) are true on paper. Among the topics, I will study whether government spending and funding of healthcare directly and consistently impacted health outcomes of the COVID-19 pandemic.

3 Data

All data comes from either the World Bank Database (World Bank, n.d.) or an Our World in Data GitHub (OWID, 2021) page related to the COVID-19 pandemic.

This study is solely dedicated to 2020 health outcomes for countries with reported GDP's per capita of more than $10,000. This was done in the name of consistency. Poorer countries had a lesser availability of resources to combat the pandemic and provided less data. All in all, this list comes down 61 countries.

Most variables are self-explanatory with the exceptions being:

- Medical Capital: Variable generated to measure the infrastructure of each country's healthcare system. It is generated by summing up the normalized values of Hospital Beds per 1000, Physicians per 1000, and Nurses per 1000.
- Oxford Stringency Index. This variable is a quantification of government restrictions based on 20 pandemic related policy indicators such as school closures and travel restrictions (Oxford, 2020).

For this last statistic, the value used was the average Stringency index for each country throughout 2020.

4 Analysis

4.1 Distribution of Dependent Variables

As seen in *Figures 1 and 2*, the distribution of the frequency of cases and deaths is not consistent. This is especially true for the number of cases per million habitants. However, the distribution of the death rate slightly resembles a skewed normal distribution.

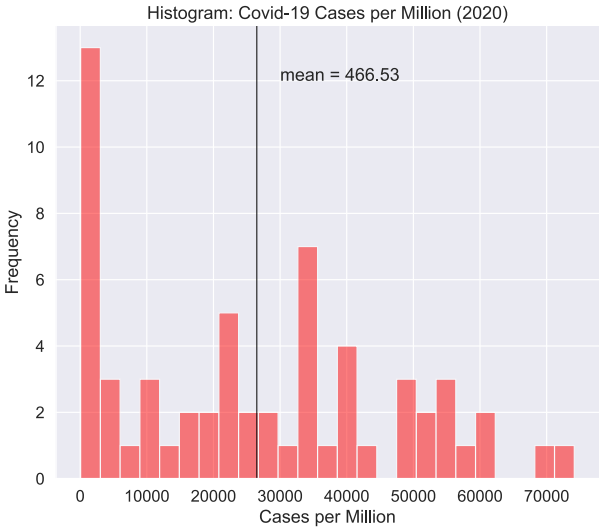

Figure 1

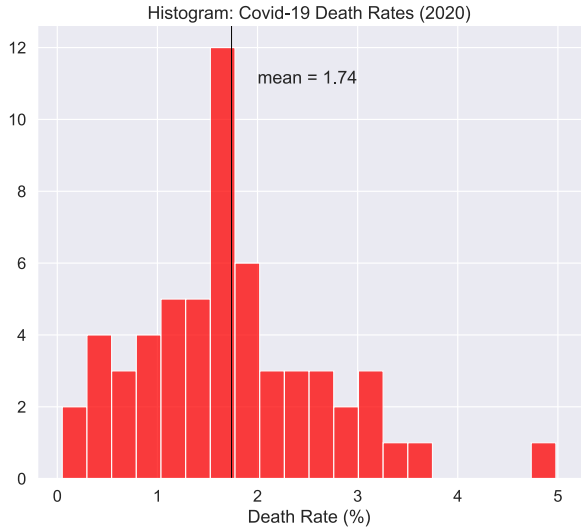

Figure 2

4.2 Covid-19 Cases per Million

Notably, the expected number of cases per million rises with GDP per capita. Yet, as seen in *Figure 3*, we can see that population density is not the factor driving this phenomena (the biggest point is Singapore). As a matter a fact, the correlation coefficient among these two variables is of $\rho = -0.072$.

Figures 4 and 5 suggest the existence of "moral hazard" in healthcare systems with larger shares of public financing. The expected number of cases decreases as out of pocket health expenditure increases. More specifically, *Figure 4* has a $\rho = 0.234$, while *Figure 5* has a $\rho = -0.379$.

Surprisingly, the relationships of the Oxford stringency index and the number of tests per million have a positive correlation with the number of cases per million habitants. In this case, *Figure 6* displays a $\rho = 0.342$ while *Figure 7* has $\rho = 0.259$. Given the shape of *Figure 7*, this better resembles an exponential relationship which suggests that governments restrictions served as reactionary and not preventative measures.

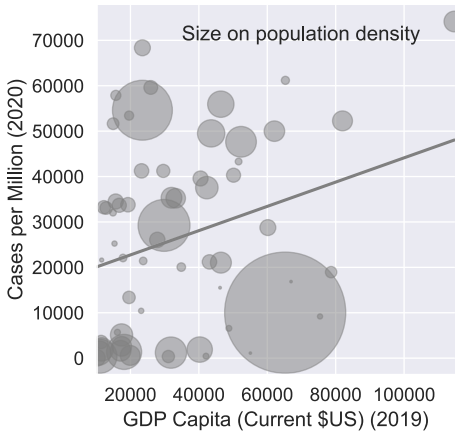

Figure 3

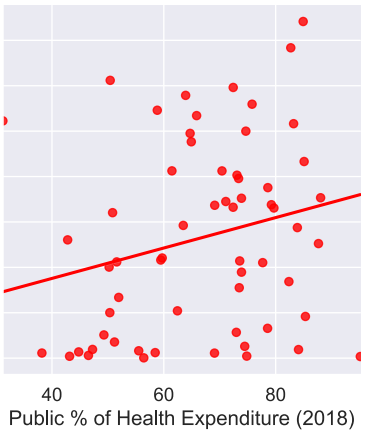

Figure 4

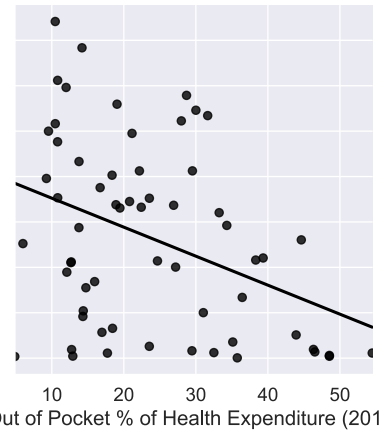

Figure 5

Figure 6

Figure 7

4.3 Covid-19 Death Rate

Surprisingly, as we can see in *Figures 8 and 9*, there seems to be some indication that as healthcare quantity grows, the expected death rate does as well. Here, the relationships are of $\rho = 0.233$ and $\rho = 0.133$ respectively. As a simple interpretation, one could suggest that there was overconfidence in health services in more healthcare-wealthy countries. Especially from vulnerable people who are at higher risk of death. Populations with a higher share of elders experienced a higher death rate with a $\rho = 0.318$.

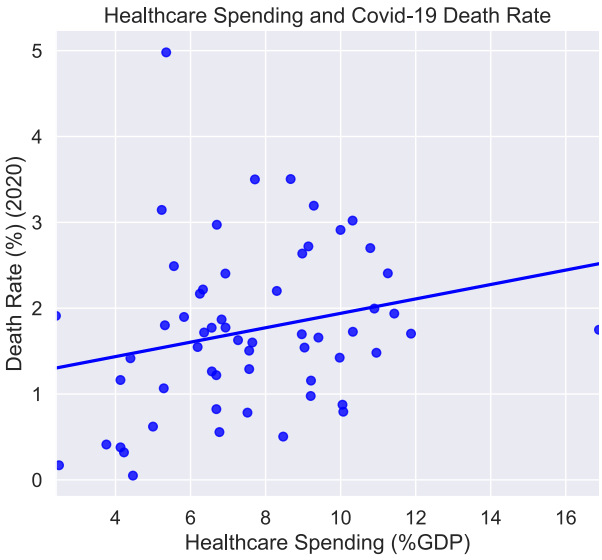

Figure 8

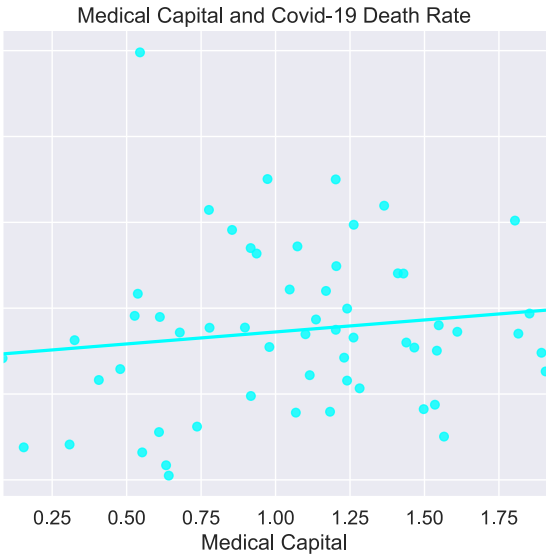

Figure 9

As seen in *Figure 10*, testing is among the strongest deterrents of higher death rates $\rho = -0.361$. On the other hand, *Figure 11* suggests that a higher stringency index leads to a higher expected death rate $\rho = 0.243$. However, this is once again likely due to restrictions being put in place as reactionary instead of preventative measures.

Figures 12 and 13 compare publicly funded and privatized healthcare systems. As showcased, the relationships are of $\rho = -0.045$ and $\rho = 0.106$ respectively. These are some of the weakest relationships tested up to now but they do indicate that traditional pay-for-service systems perform worse.

In order to determine whether there is a direct relationship in between Covid-19 deaths and publicly funded healthcare, we must look at all the statistical evidence. Table 1 showcases the results of the regression:

$$Y = \alpha X + \epsilon$$

Where: Y =Death Rate, and X =Public Share of Total Health Expenditure

As shown in the regression table, there exists no statistical significance. There is no evidence which suggests a direct relationship in between the mentioned variables.

Figure 10

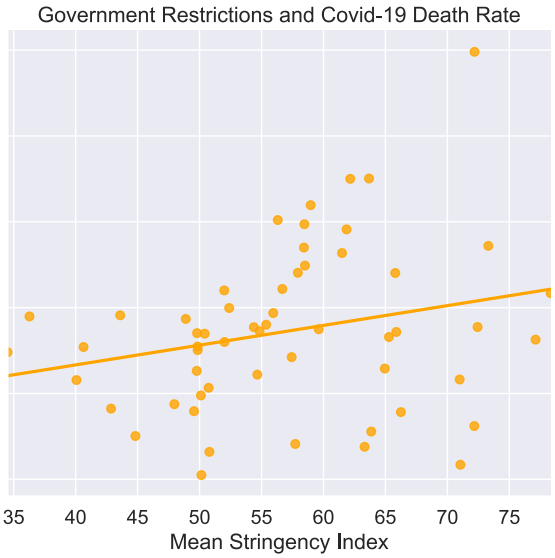

Figure 11

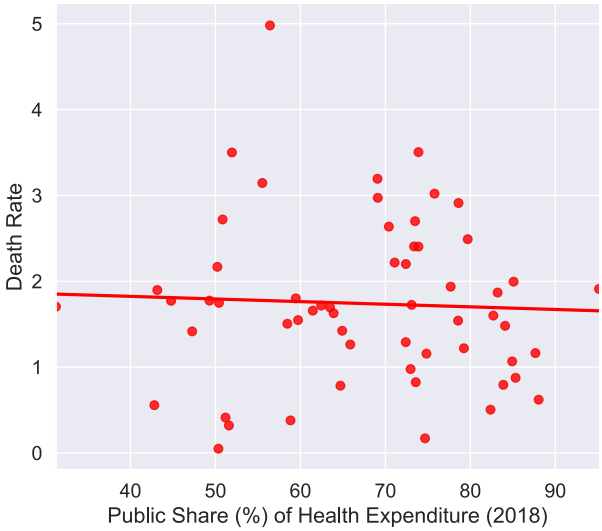

Figure 12

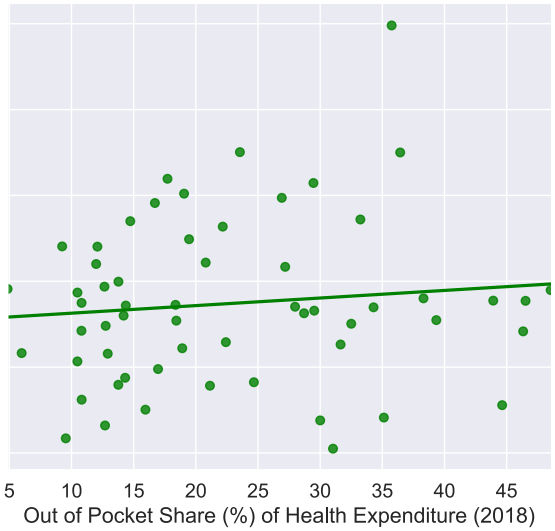

Figure 13

Dep. Variable:	Covid_Death_Rate_	**R-squared:**	0.002
Model:	OLS	**Adj. R-squared:**	-0.016
Method:	Least Squares	**F-statistic:**	0.1139
Date:	Fri, 30 Apr 2021	**Prob (F-statistic):**	0.737
Time:	19:56:25	**Log-Likelihood:**	-78.879
No. Observations:	58	**AIC:**	161.8
Df Residuals:	56	**BIC:**	165.9
Df Model:	1		

	coef	**std err**	**t**	**P> |t|**	**[0.025**	**0.975]**
Intercept	1.9461	0.623	3.126	0.003	0.699	3.193
X	-0.0031	0.009	-0.338	0.737	-0.021	0.015

Omnibus:	7.154	**Durbin-Watson:**	1.841
Prob(Omnibus):	0.028	**Jarque-Bera (JB):**	6.335
Skew:	0.669	**Prob(JB):**	0.0421
Kurtosis:	3.911	**Cond. No.**	340.

Table 1

5 Conclusion

This paper aimed to study the direct relationships of Covid-19 health outcomes with: healthcare structure and government intervention. Per the data studied above, the strongest relationships are:

- Negative relationship in between number of cases and percent health expenditure financed out of pocket.
- Positive relationship in between number of cases and number of tests.
- Negative relationship in between death rate and number of tests.

The amount of public heath expenditure has no direct statistical impact on the health outcomes of Covid-19. Testing serves as the best way to combat contagion and death in the pandemic.

This report serves as a preliminary response to the questions posed. Moving forward would require working with time-series models with advanced econometric techniques to best predict the health outcomes of the pandemic.

6 References

- Savage, L. (2021) Bernie's Plan to Give Everyone Health Care During the Pandemic Could Transform Our Health System. *Jacobin Mag.* https://www.jacobinmag.com/2021/01/bernie-sanders-health-care-covid-19
- Ocasio-Cortez, A. (n.d.) Medicare for All. *AOC.* https://www.ocasiocortez.com/issues?lang=en
- El Plural (2020, May 17) Pablo Iglesias: "Las privatizaciones no solo fueron una vergüenza, han sido un fracaso". *El Plural.* https://www.elplural.com/politica/espana/pablo-iglesias-privatizaciones-no-verguenza-fracaso_239916102
- World Bank (n.d.) Retrieved on March 13, 2021. https://data.worldbank.org/
- OWID (2021, April 21) https://github.com/owid/covid-19-data/tree/master/public/data
- Oxford (2020) COVID-19 Government Response Tracker. *Oxford.* https://www.bsg.ox.ac.uk/research/research-projects/covid-19-government-response-tracker