# Working title

The impact of R&D spending on COVID-19 mortality rates.

# Abstract

This paper aims to study the impact of average R&D spending, in general and by sector, on COVID-19 mortality rates. The underlying hypothesis that would explain this relationship would be that countries that invest in R&D give more weight to the input of scientists when making policy. The independent variable in the model is COVID deaths as a percentage of infections, and we control for all other factors that may influence COVID mortality such as underlying health and socioeconomic conditions.

# Introduction

Most of the focus around the COVID pandemic has been towards how fast the virus is spreading, and how to control it. However, another metric that is usually overlooked in the public policy debate is the percentage of deaths out of total cases. Mortality is more likely constrained by the capacity of the healthcare system, and how strictly are health protocols being followed. While it is probably not something that a government could dramatically impact through policy at this advanced stage of the crisis, there is inference to make about the impact of trusting scientists and funding them so that they can help preventing calamities, or at least mitigate them.

# Background

As country income, overall health of the population and healthcare access are known to have an effect on COVID-19 mortality rates. “The findings of this country level analysis on COVID-19 related health outcomes suggest that low levels of national preparedness, scale of testing, as well as population characteristics such as obesity, advanced age and higher per capita GDP are associated with increased national case load and mortality.” (Chaudhry et al., 2020) In addition to underlying health conditions, the same study looked at government action. In particular, they looked at different levels of border closure (complete, partial, open) combined with different levels of lockdown (complete, partial, curfew only, time from first reported case in China, time from first case in reference country)

# Research question

What is the impact of R&D spending on a country’s capacity to minimize COVID-19 casualties?

# Methodology

R&D spending does not magically make people healthier, instead, it represents a proxy for how important research is to a country, and how seriously they take warnings from scientists. The main hypothesis is that countries that take science more seriously should be able to deal with COVID more effectively, because they listen to the right people when making policy. It is undeniable that lockdown measures and strict health protocols like wearing certain types of masks everywhere have turned into a political debate in many countries. In the process of answering the herein mentioned research question, we will discover how good of a proxy R&D spending is for swift effective government actions and country preparedness.

# Data

Mortality: [Mortality Risk of COVID-19 - Statistics and Research - Our World in Data](https://ourworldindata.org/mortality-risk-covid)

The number of deaths as a percentage of total cases. This dataset is being updated frequently, and we will use the latest version available.

R&D spending by country and by field: [Science,technology and innovation (unesco.org)](http://data.uis.unesco.org/Index.aspx?DataSetCode=SCN_DS&lang=en)

This dataset goes back a number of years, we can average the latest number of years and use average R&D in our cross sectional analysis.

Control variables:

[Healthcare Access and Quality Index, 2015 (ourworldindata.org)](https://ourworldindata.org/grapher/healthcare-access-and-quality-index)

Other factors such as underlying health conditions and income:

Obesity: [Ranking (% obesity by country), 2016 | World Obesity Federation Global Obesity Observatory](https://data.worldobesity.org/rankings/?age=a&sex=m)

PPP income: [GDP per capita, PPP (constant 2017 international $) | Data (worldbank.org)](https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.KD)

It is also possible to include other control variables such as chronic diseases (diabetes and high blood pressure).

# Expected findings

I expect that past R&D spending even in fields that are not medicine related would have a significant effect on mortality, even though it would be a relatively small one compared to income and underlying health problems.

# Preliminary literature

Chaudhry R., Dranitsaris G., Mubashir T., Bratoszko J., Riazi S. (2020) *A country level analysis measuring the impact of government actions, country preparedness and socioeconomic factors on COVID-19 mortality and related health outcomes*, EClinicalMedicine, Volume 25, 100464, August 01, 2020

De Siqueira J., Almeida L., Zica B., Brum., Barcelo A., Galil A., (2020) *Impact of obesity on hospitalizations and mortality, due to COVID-19: A systematic review*, Obesity Research & Clinical Practice, Volume 14, Issue 5, September–October 2020, Pages 398-403

GBD 2016 Healthcare Access and Quality Collaborators, (2018) *Measuring performance on the Healthcare Access and Quality Index for 195 countries and territories and selected subnational locations: a systematic analysis from the Global Burden of Disease Study 2016, TheLancet, Volume 391, Issue 10136, P2236-2271, June 02, 2018*