

# The relationship between air pollution and COVID-19

## Motivation

In 2020, the world's most searched word for Google was "Coronavirus", which did 100 times more than the demand for air pollution. In recent years, air pollution has killed 7 million people a year, and 2.5 million people have died since the outbreak in Coronavirus disease (COVID-19). Therefore, our team is motivated to study these two concepts and determine whether there is a relationship between them.



Each person represents 1 million people. COVID-19 has caused 2.5 million death toll so far. Whereas, the average death toll caused by air pollution is 7 million per year.

## Hypothesis

Air pollution is a major cause of respiratory illness. Most areas with high levels of air pollution are at high risk for airborne diseases.

The aim is to study the two-way hypothesis between Coronavirus disease (COVID-19) and air pollution.

1. According to the World Health Organization, Coronavirus disease (COVID-19) is also respiratory disease. Hence, air pollution has the effects on the death toll of COVID-19.
2. Air pollution has decreased during the lockdown.

## Data

This study draws the link between Covid-19 and air pollution from January 1, 2019 to December 31, 2020 in the top 11 affected countries. Utilizing quantile-on-quantile (QQ) estimation technique, we examine in what manner the quantiles of Covid-19 affect the quantiles of air pollution. PM2.5 as a measure of air pollution. The daily mean data of PM2.5 is sourced from DiscoMap, which in turn used microdata from European Environment Agency, while the death of air pollution per year and death of COVID has been taken from the official website of the World Health Organization and Worldometers. Tools we used are correlation and simple graphs with 2 variables. To display quantile regression analysis, scan the QR code.

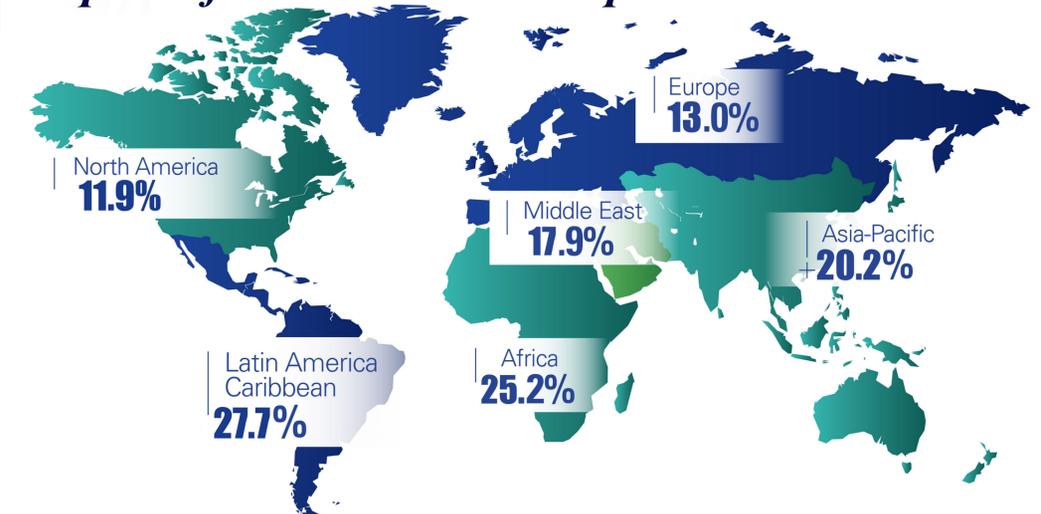
## Methodology

The non-parametric quantile regression model applied in the study is shown in the following equation:

$$COVID19 = \gamma^\sigma(PM2.5) + \mu^\sigma$$

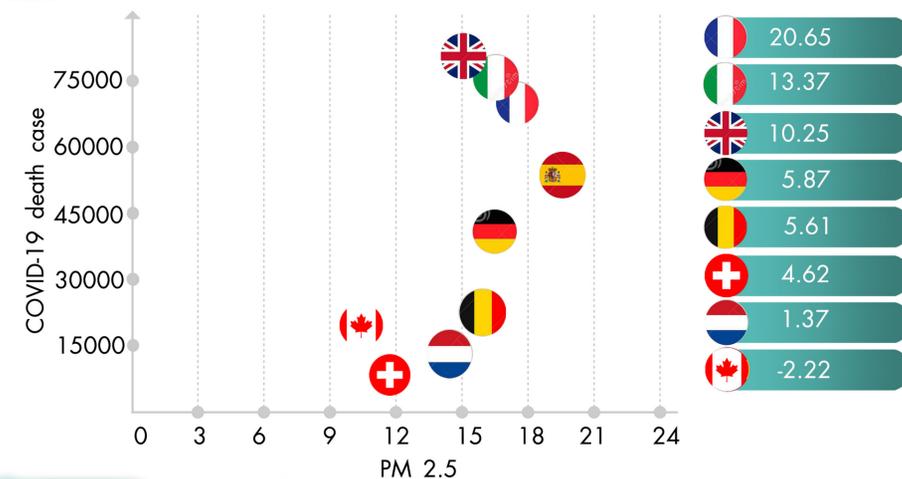
where COVID19 represent the number of confirmed COVID-19 cases, PM2.5 denotes country's air pollution, the conditional  $\sigma$ th quantile distribution of PM2.5 is denoted by  $\sigma$ , the quantile error term, whose conditional  $\sigma$ th quantile is equivalent to 0 is designated by  $(.)$ ;  $\mu^\sigma, \gamma^\sigma$  unidentified function as no former evidence on inter-linkages between PM2.5 and COVID-19 is available.

## Impact of COVID-19 on air pollution



The percentages on the map above displays the decrease in air pollution from 2019-2020 by location.

## Impact of air pollution on COVID-19



The numbers behind the flag show the coefficient by people from 0.8 quantile of countries. This means that if 2.5pm were to increase by one unit the probability of death could be increased or decreased by the coefficient next to the flag. For example, in France, if the 2.5pm were to increase by 100 units this has the probability to result in the death of 2065 people.

## Conclusion and Discussion

In this research our goal was to use quantile on quantile method to show the effects that air pollution has on death. The analysis proves our hypothesis that air pollution has decreased after COVID-19. This leads us to our critical conclusion that mankind's so-called silent death of air pollution is also declining. Therefore, if people are educated and maintain this lifestyle, we can contribute tremendously to not only minimizing death tolls but also impact Mother Nature and most importantly our future generations positively.