

# **Influence of regional policy on the spread of SARS-COV2**

## **Project Proposal**

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## **1.Introduction**

The outbreak of COVID-19 provides us with a window to observe the state's prevention and control policy. The United States, Britain and other countries and continental European countries represented by Germany have adopted different response policies: the United States and Britain relax the control of the epidemic in order to ensure the normal operation of the economy and maintain normal social life (Alemanno, 2020). Continental European countries led by Germany have adopted loose and tight balance control measures according to the epidemic situation, seeking a balance between ensuring the normal operation of economy and society and maintaining public health (Coccia, 2021). There is no evidence that the prevention and control policies implemented by the UK, France and Germany have an impact on the spread of SARS-COV2.

In order to predict the efficiency of similar policies in European countries (Britain, France and Germany), I refer to the model of Picchioti et al. (2020) and try to use different locking parameters to evaluate different regional policies. For the ongoing SARS-COV2, it is necessary to study the transmission mode and characteristics of the virus and establish a parametric model of the virus. By comparing the impact of different policies, the model is used to show the impact of policies in different regions on the spread of SARS-COV2. Although modeling research can provide valuable insights and possible trends for virus transmission, it

can only be carried out through in-depth data analysis. Based on this, I intend to compare the policies of three European countries (Britain, France and Germany), study the prevention and control policies in Europe, America and Asia, and compare the data before and after the locking policy. To analyze whether these measures can play a role in the prevention and control of SARS-COV2.

## 2 Proposed Methods and data

### 2.1 Method

Picchiotti et al. (2020) used the SEIR model to experimentally verify the data of Italy, European countries and the United States, and compared different post blockade scenarios, which is very important for public health policymakers. I also refer to the SEIR model, in which Susceptible- Exposed- Infected- Removed constitute the main part of the model. Susceptible refers to people who have not been infected with this infectious disease and are healthy so far. Exposed refers to the people who are in the incubation period of this infectious disease, infected refers to the people who have been diagnosed, and removed refers to the people who have been removed (including recovered people and dead people). The model is as follows:

$$\begin{aligned}\frac{dS}{dt} &= -\frac{r\beta SI}{N} \\ \frac{dE}{dt} &= \frac{r\beta SI}{N} - aE \\ \frac{dI}{dt} &= aE - \gamma I \\ \frac{dR}{dt} &= \gamma I\end{aligned}$$

$\beta$ : When a susceptible person comes into contact with an infected person, his

probability of being infected.

$r$ : Number of infected people in contact with susceptible people.

$a$ : The probability that a latent person turns into an infected person can be estimated as the reciprocal of the known average incubation period  $Y$ , i.e.  $a = 1 / Y$

$\gamma$ : The probability of recovery of infected persons can be determined by the reciprocal of the average recovery period  $D$ , i.e.  $\gamma = 1/D$

(All the above parameters are greater than 0)

This paper mainly uses R software to analyze and compare the policies of different countries to explore the impact of policies on SARS-COV2.

## 2.2 Research data

For the UK, France and Germany, the policy research period is from the first SARS-COV2 case in the country to the implementation of the prevention and control policy. The period from the implementation of the prevention and control policy to the lifting of the prevention and control policy is the post blockade research period.

The data are from the data published on the government website.

Link:

<https://who.maps.arcgis.com/apps/dashboards/ead3c6475654481ca51c248d52ab9c61>

<https://coronavirus.data.gov.uk/details/cases?areaType=overview&areaName=United%20Kingdom>

<https://covid19.who.int/region/euro/country/fr>

<https://www.worldometers.info/coronavirus/country/germany/>

The study time is shown in the table below:

Country	Time
The UK	03/02/2020-23/03/2020
	23/03/2020-15/04/2020
France	24/01/2020-04/03/2020
	05/03/2020-10/05/2020
Germany	27/01/2020-12/03/2020
	13/03/2020-15/04/2020

### **3 Anticipated Outputs and Outcomes**

According to SEIR model, we can set the time change as 1 day and deduce the change curves of four populations in turn. By comparing the differences of population change curves after the implementation of different policies, we can compare the impact of these policies on virus transmission.

## 4 Project Timeline

	March 1 - March 31							April 1 - April 30														May 1 - September 31													
selected topic																																			
Proposal																																			
Introduction																																			
Literature Review																																			
methodology																																			
Collection of information on different policies																																			
Data selection																																			
model design																																			
Variable design																																			
Data sorting																																			
data processing																																			
verification																																			
Results																																			
Discussion																																			
Editing																																			
submit dissertation																																			

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