



CY TECH SCIENCES ET TECHNIQUES

**Effectiveness of nationwide
lockdown in the prevention of
COVID-19 spreading:
A systematic review and
meta-analysis**

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1 Introduction

Since December 1st, 2019, the world has suffered from a big sanitary crisis. Began in China, the COVID-19 has spread all over the world. This pandemic's main issue is that this particular virus is very infectious, and many people die every day. Since COVID-19 is a new virus, which means that no one has a natural immunity to it and there were not any effective vaccine or treatment against it (Tenbus, 2020), the world had to be locked down in order to limit the propagation of this contagious virus (Kamps & Hoffmann, 2020).

In France, the first nationwide lockdown began on March 16th, 2020. Everybody had to stay at home and to avoid going out for three whole months. All unnecessary businesses, such as stores, restaurants, and bars, were closed in such a situation. Moreover, a large part of the population had to stop working. Therefore the state had to take charge of them, with partial unemployment, for instance. As such, the country's economy worsened in favor of saving people's lives from the virus. However, was this maneuver successful (Pietsch, 2020)?

In this study, we want to determine the extent to which the nationwide lockdown is related to the new-cases curve. We hypothesize that the lockdown had the effect of reducing the number of new cases to a reasonable amount.

2 Methods

We use a complete COVID-19 dataset (Max Roser & Hasell, 2020), a collection of the COVID-19 data maintained by *Our World in Data*. The dataset is updated daily and contains all worldwide historical data on the pandemic up to the date of publication, including data on confirmed cases, deaths, hospitalizations, and testing, as well as other variables of potential interest.

We mainly focus on France's data from February 2020 to December 2020 to see how the national lockdown in this country affected its number of daily new cases. We plot the values corresponding to the new cases per day in France and observe the difference between the start and the end of the lockdown.

To have a better understanding of the effectiveness of government policies on preventing COVID-19 spread, we plot the weekly new cases side by side the *Stringency index*, which is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest response). Besides

France, we also plot the data of South Korea as references.

Python coupling with *Jupyter notebook* is our main toolbox for this study. To analyze and plot interactive graphs, we use *Python*'s libraries such as *Pandas* for Data Manipulation; *Matplotlib*, *Seaborn*, and *Plotly* for Data Visualization.

3 Results

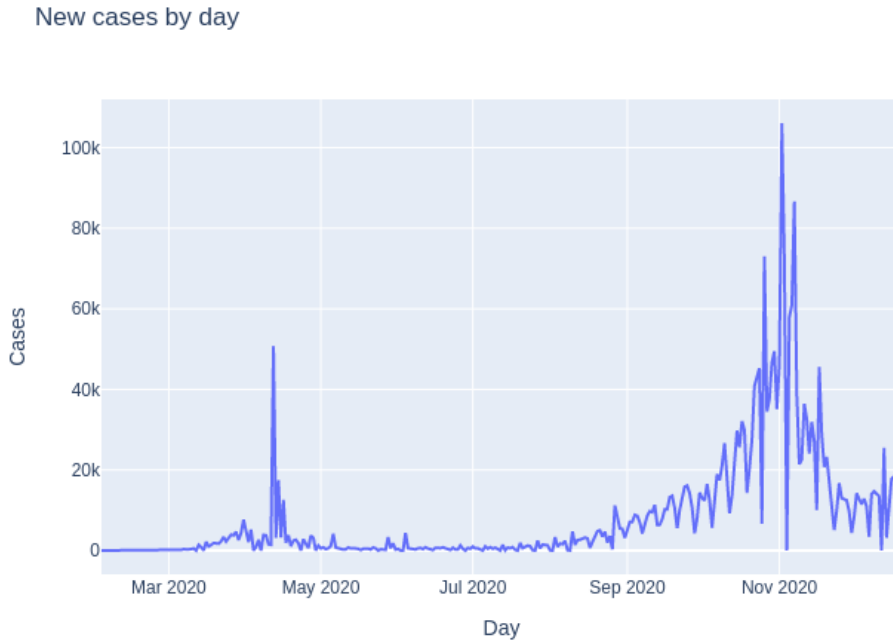


Figure 1: Daily new cases in France

Figure 1 shows that the first wave of COVID-19 in France starts in March 2020, reaches its peak on April 12nd with more than 50,000 new cases, and ends in May 2020. The second wave starts at the end of August 2020, reaches its peak on November 2nd with 106,091 new cases, which is twice as large as the peak of the first wave.

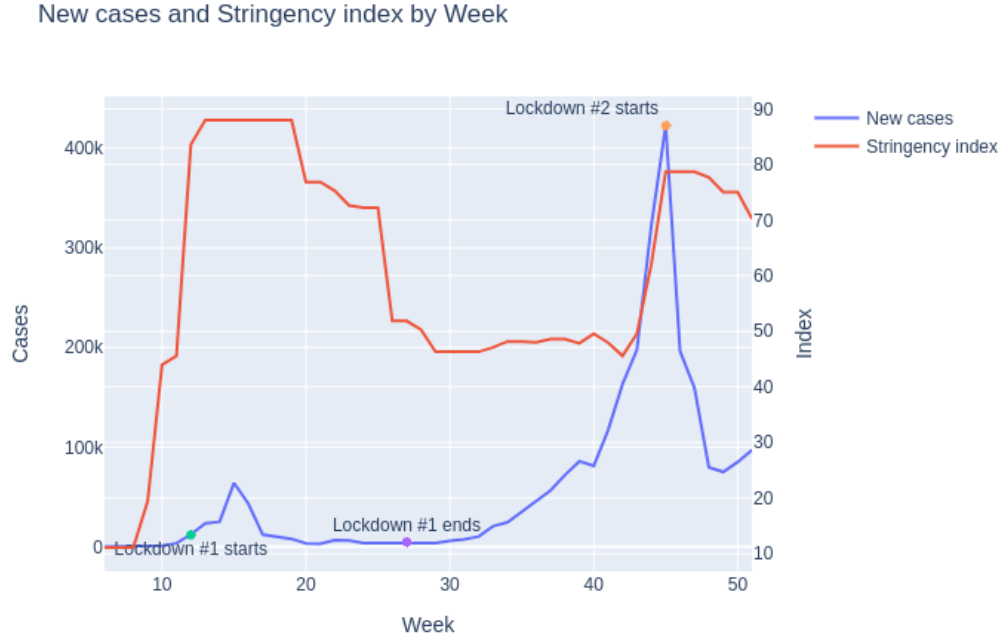


Figure 2: Weekly new cases and stringency index in France

Figure 2 contains the weekly new cases and France's stringency index from February 2020 (Week 6) to December 2020 (Week 51). French government started to respond to the COVID-19 pandemic since Week 9 and put the country to a high alert level in Week 12 with the first nationwide lockdown. The stringency index's peak is 87.96 during this lockdown. It takes three weeks to obtain a positive result, which is the decreasing of daily new cases. The first lockdown ends in Week 27, and the stringency index drops to around 50. French's stringency index starts to rise again in Week 43. It reaches 78.7 in Week 45, which is when the second nationwide lockdown starts. The daily new cases drop immediately after the second lockdown.

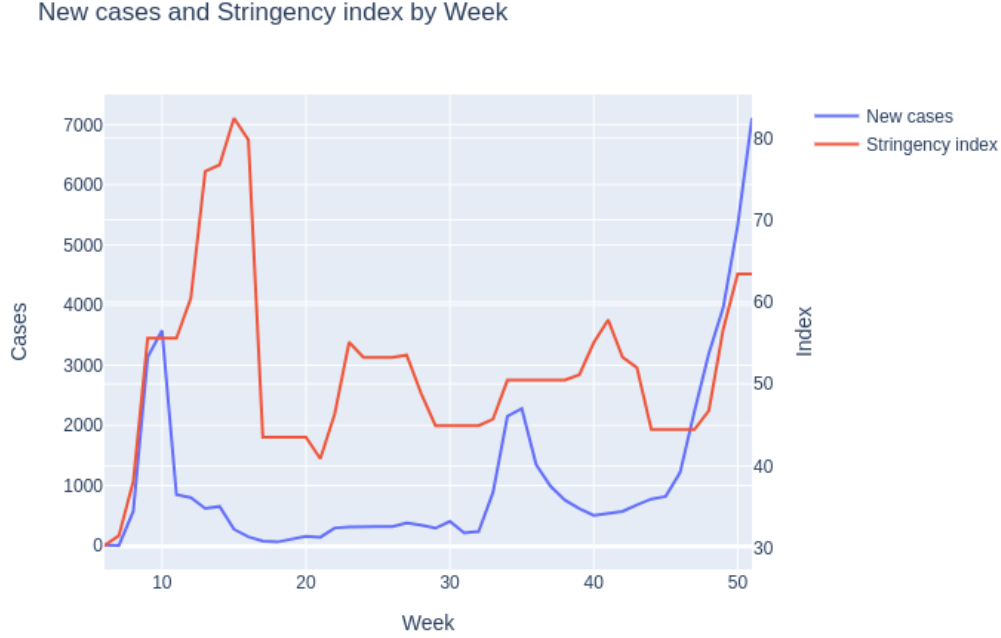


Figure 3: Weekly new cases and stringency index in South Korea

Figure 3 shows the weekly new cases and stringency index of South Korea in the same period. South Korea's government started to respond to the pandemic in Week 8. In Week 10, the stringency index is 55.56, and the first peak of Korean weekly new cases was made with 3578 cases. It drops by four times in the next week to 848. However, unlike France, when the government maintains or lowers its stringency index when the new-cases curve is concave down, South Korea's government decided to keep raising the stringency index, which reaches its peak in Week 15 with the value of 82.41. They only lower the stringency index to the medium value (43.52) in Week 17 when weekly new cases are less than 300. They re-raise the stringency index when the weekly new case value is more than 300.

4 Discussion

4.1 How France’s nationwide lockdown affect its daily new cases?

France’s patient zero of COVID-19 was discovered back in December 2019 ([Roberts, 2020](#)). At that time, people did not think that it would become a Once-in-a-Century Pandemic. France’s government reacted with a nationwide lockdown that began on March 16th, 2020, and the first wave was gone after two months in May 2020. Figure 2 shows that France’s daily new cases decrease after three weeks from the lockdown. We know that this coronavirus has around two weeks of incubation, which means people need up to 14 days to have symptoms since they have been infected ([WebMD, 2020](#)). So this may be the reason why the nationwide lockdown does not decrease the daily new cases immediately.

France’s government reacted to the second wave of COVID-19 with the same strategy: a second nationwide lockdown took effect from October 30th, 2020. In this time, the daily new cases immediately drop by half after one week. The second lockdown shows positive results much faster than the previous one, maybe because the government does not have to re-educate its citizen about the lockdown and people already respect the damage of this worldwide pandemic.

We conclude that the nationwide lockdown helps prevent the spreading of the COVID-19 pandemic based on what we observe in France’s data. In fact, at both attempts, the daily new cases of France drops after a short time.

4.2 Is nationwide lockdown the government’s best response to the pandemic?

Since nationwide lockdown drags a substantial negative impact on the country’s economy ([AFP, 2020](#)), we may ask ourselves that: Is lockdown the best answer to this COVID-19 pandemic?; Are there any solutions that bring less damage to the economy but can still control the pandemic?

Unlike France, where considerable increases in cases were met with countrywide lockdowns, South Korea never imposed any curfew or stopped its people from going to work and still managed to stabilize the infection rate ([Hilton, 2020](#)).

Learned from the lessons of the previous MERS outbreak, the South Korean government changed their testing and tracing services to have the capacity to respond to such a huge pandemic: They apply a 4T strategy, which includes Test, Trace, Treat, and Transparency. First, they organize

significant large numbers amount of rapid tests to find the infected patient. Then they use a smart tracking system significantly reduced time for epidemiological investigation. They even overhauled hospitals, with designated infectious disease hospitals for COVID-19 and community treatment centers for mild cases. The “transparency” consisted of twice-daily press briefings ([Walker, 2020](#)).

We see that nationwide lockdown is not the only viable response to fight the spreading of COVID-19. There are other strategies like the test-and-trace of South Korea’s government. However, it works well in one country does not mean it will do the same in another country. The government needs to choose the best suitable response for their country. After all, they were voted to solve this kind of problem.

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