CY Tech Sciences et Techniques

Effectiveness of nationwide lockdown in the prevention of COVID-19 spreading

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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 used a complete COVID-19 dataset (Max Roser & Hasell, 2020), a collection of the COVID-19 data maintained by Our World in Data. The dataset has been updated daily and contains worldwide historical data on the pandemic up to the date of publication, including data on confirmed cases, deaths, hospitalizations, testing, and 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 plotted the values corresponding to the new cases per day in France and observed the difference between the lockdown's start and end.

This study's goal was to understand better the effectiveness of government policies in preventing COVID-19 spread. Therefore, we plotted the weekly new cases with the **Stringency index**, a composite measure based on nine response indicators, including school closures, workplace closures, and travel bans, re-scaled to a value from 0 to 100 (100 is the strictest response). Besides France, we also plotted the data of South Korea as references.

Python coupling with the Jupyter notebook was our main toolbox for this study. To analyze and plot interactive graphs, we used numerous data manipulation and visualization libraries such as Pandas, Matplotlib, Seaborn, and Plotly.

3 Results

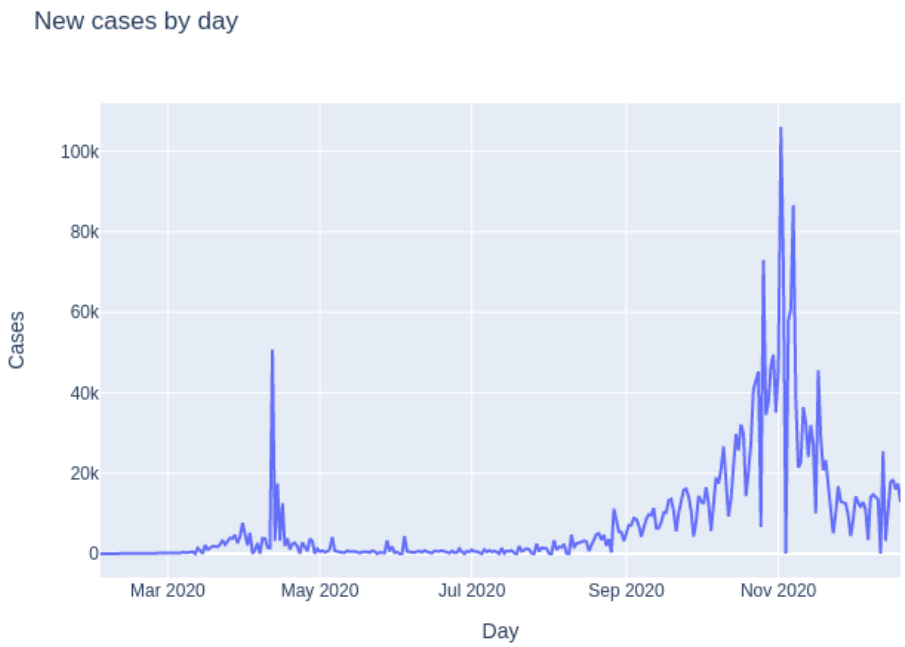

Figure 1: Daily new cases in France

Figure 1 shows that the first wave of COVID-19 in France started in March 2020, reached its peak on April 12$^{\text{th}}$ with more than 50,000 new cases, and ended in May 2020. The second wave started at the end of August 2020 and reached its peak on November 2$^{\text{nd}}$ with 106,091 new cases, which is twice as large as the peak of the first wave.

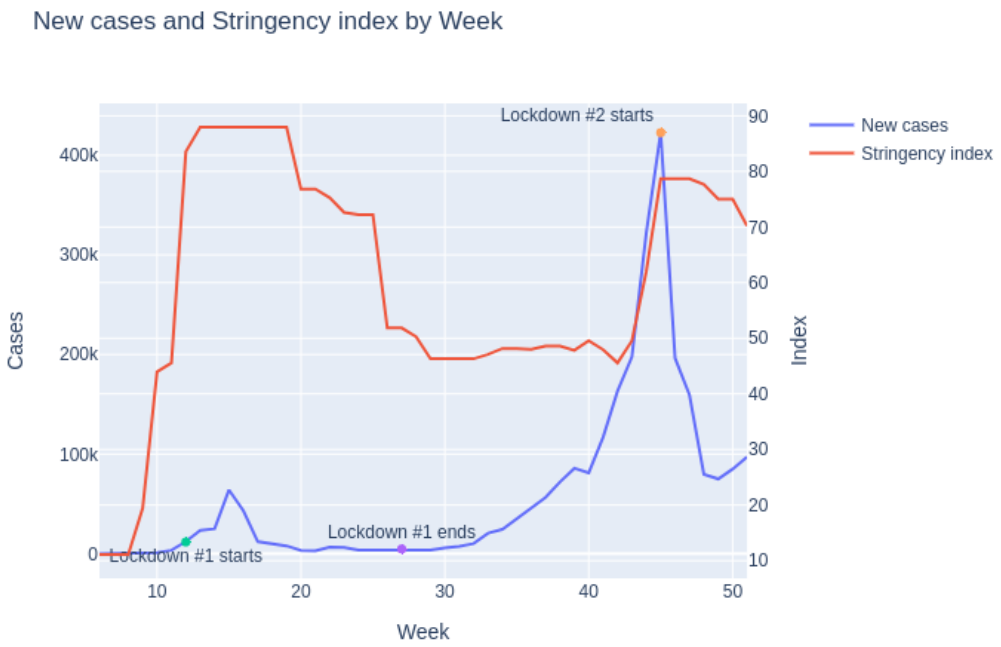

Figure 2: Weekly new cases and stringency index in France

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

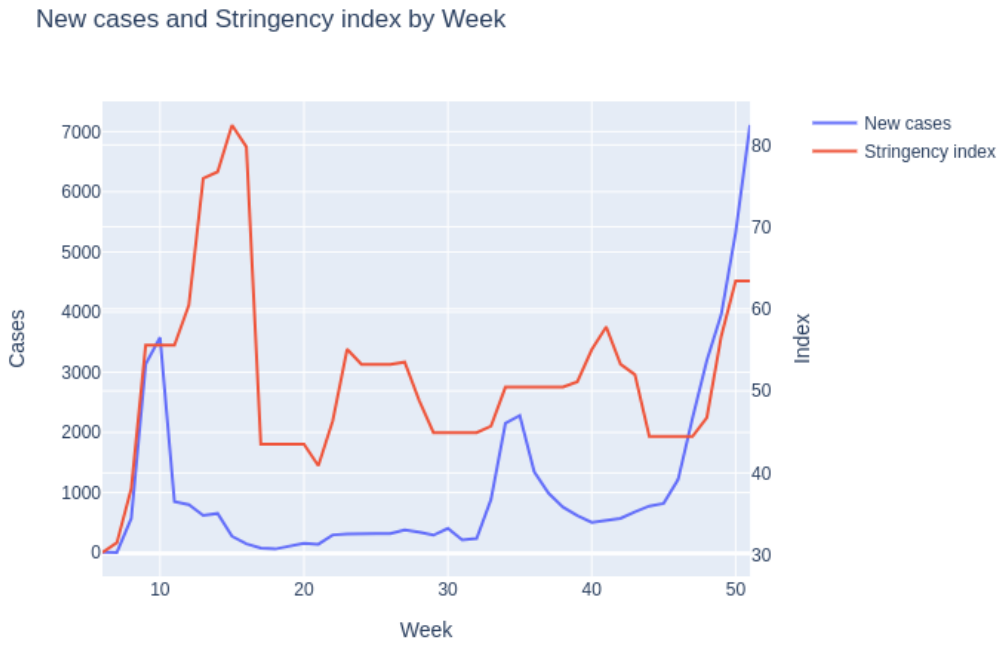

Figure 3: Weekly new cases and stringency index in South Korea

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 was 55.56, and the first peak of Korean weekly new cases was made with 3578 cases. After that, it dropped by four times in the next week to 848 cases. However, unlike France, when the government maintained or lowered its stringency index when the new-cases curve was concaving down, South Korea's government decided to keep raising the stringency index, which reached its peak in Week 15 with the value of 82.41. They only lowered the stringency index to the medium value (43.52) in Week 17 when weekly new cases were less than 300. They re-raised 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. Figure2 shows that France's daily new cases decreased after three weeks of 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 did 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 30^{th}, 2020. During this time, the daily new cases immediately dropped by half after one week. The second lockdown showed positive results much faster than the previous one, maybe because the government did not have to re-educate its citizens about the lockdown because people already respected the damage of this worldwide pandemic.

We conclude that the nationwide lockdown helped 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 in France dropped after a short time.

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

Since nationwide lockdown dragged a substantial negative impact on the country's economy (AFP, 2020), we may ask ourselves: was lockdown the best answer to this COVID-19 pandemic? Were there any solutions that brought minor damage to the economy but could 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 vast pandemic: They applied a strategy called

4T, which included Test, Trace, Treat, and Transparency. First, they organized large numbers of rapid tests to find the infected patient. Then they used an intelligent tracking system that significantly reduced the time for epidemiological investigation. Next, they overhauled hospitals, with designated infectious disease hospitals for COVID-19 and community treatment centers for mild cases. Finally, the Transparency consisted of twice-daily press briefings (Walker, 2020).

We see that a nationwide lockdown was not the only viable response to fight the spreading of COVID-19. There were other strategies like the test-and-trace of South Korea's government. However, it worked well in one country does not mean it would do the same in another country. Therefore, the government needs to choose the best suitable response for their country. After all, they were voted to solve these kind of problems.

References

AFP. (2020). French economy sees record drop in wake of coronavirus lockdowns. *France 24*. Retrieved from https://www.france24.com/en/20200731-french-economy-sees-record-drop-in-wake-of-coronavirus-crisis

Hilton, T. (2020). South korea conquered coronavirus without a lockdown: a model to follow? *Al Arabiya English*. Retrieved from https://english.alarabiya.net/en/features/2020/04/03/South-Korea-conquered-coronavirus-without-a-lockdown-a-model-to-follow-

Kamps, B. S., & Hoffmann, C. (2020). *Covid reference*. Steinhäuser Verlag. Retrieved from https://covidreference.com

Max Roser, E. O.-O., Hannah Ritchie, & Hasell, J. (2020). Coronavirus pandemic (covid-19). *Our World in Data*. Retrieved from https://ourworldindata.org/coronavirus

Pietsch, B. (2020). 'we are at war': France's president just announced a 15-day lockdown, banning public gatherings and walks outdoors. *Business Insider*. Retrieved from https://www.businessinsider.com/coronavirus-france-president-macron-announces-15-day-lockdown-2020-3

Roberts, M. (2020). Coronavirus: France's first known case 'was in december'. *BBC News*. Retrieved from https://www.bbc.com/news/world-europe-52526554

Tenbus, L. (2020). Why there isn't a cure for covid-19. *GBMC HealthCare*. Retrieved from https://www.gbmc.org/why-we-havent-found-a-cure-for-covid-19

Walker, M. (2020). How south korea avoided a covid-19 lockdown. *MedPage Today*. Retrieved from https://www.medpagetoday.com/meetingcoverage/aasld/89690

WebMD. (2020). Coronavirus incubation period. *WebMD*. Retrieved from https://www.webmd.com/lung/coronavirus-incubation-period