



# COVID-19 policy analysis for 10 European countries

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## Abstract

**Aim** The goal of this paper is to analyze the COVID-19 policies of 10 European countries, including Sweden, Finland, Norway, Italy, France, Germany, Poland, Belgium, the Netherlands, and Hungary, with a time-series policy analysis tool.

**Subject and methods** The results of the COVID-19 policy analysis are based on a single time-series indicator, or daily population mortality rate: the number of COVID-19 daily cumulative deaths divided by the population in millions. The lower the score, the better the policy. Although many experts believe that the COVID-19 policy outcome analysis is premature, time series analysis is an excellent analysis that can provide information on the progress and transition of policy outcomes. In other words, the proposed time series analysis tool allows policymakers to identify and quantify when mistakes were made during the on-going COVID-19 pandemic.

**Results** The COVID-19 policy analysis discovered many useful facts. Sweden failed due to the herd immunity approach. Hungary made a fundamental mistake in COVID-19 tactics. Countries such as Sweden, Hungary, Belgium, and Poland showed time-series changes that differed from the others.

**Conclusion** Public health interventions can play a key role in mitigating the COVID-19 pandemic. The proposed policy analysis tool, hiscovid demonstrated the effectiveness of the time-series score behavior for discovering when policymakers made mistakes.

**Keywords** COVID-19 policy · Snapshot score · Time-series score · Policy analysis tool · Hiscovid

## Introduction

COVID-19 policy is a matter of life and death and affects well-being. The more deaths there are, the more unhappy people become. The fewer the deaths, the fewer people are unhappy. Therefore, the impact from the well-being perspective plays an important role in evaluating COVID-19 policies. In other words, a single metric score is used throughout this study: dividing the number of COVID-19 deaths by the population in million, which is called the population mortality rate (Bauer et al. 2021; New York State 2022).

A population mortality rate is the number of deaths due to a disease divided by the total population. In other words, the mortality rate can be computed by dividing the score by 1,000,000. The time-series mortality rate is equivalent to the single metric used in this paper.

Time-series population mortality rates or time-series scores, rather than snapshot mortality rates, show the progress of the community and the outcome course of action on COVID-19. Thus, the calculated time-series scores can identify when policymakers made mistakes or when there was a change in community behavior and quantify those mistakes. In other words, snapshot mortality rates cannot identify when policymakers made mistakes because there is no progress to compare.

The introduced time-series policy analysis in this paper is called, hiscovid (Takefuji 2022). The hiscovid tool is a Python Package Index application. Hiscovid allows policymakers to run on Windows, MacOS, and Linux operating systems as long as Python is installed on the system. The following command can install hiscovid after installing Python with the pip command.

In the hiscovid analysis tool, the number of daily cumulative deaths by country is scraped over the Internet, and it is divided by the population in millions over time. In other words, score or daily population mortality rate by country is calculated by the number of daily cumulative deaths divided by the population in millions over time.

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The contribution of this paper is to introduce the time-series policy analysis tool, hiscovid, to be able to identify when policymakers made mistakes. This paper will examine the hiscovid results of 10 countries, including Sweden, Finland, Norway, Italy, France, Germany, Poland, Belgium, the Netherlands, and Hungary. They will be compared with New Zealand on time-series scores. The number of COVID-19 daily cumulative deaths monotonically increases so that the calculated scores cannot be corrected forever.

The higher the score, the more COVID-19 deaths, which makes people unhappy. If policies to control COVID-19 were effective, there would be no COVID-19 deaths, and people would be happier.

## Methods

The proposed time-series policy analysis, hiscovid allows policymakers to identify when they made mistakes or behavior changes in communities. The graphs generated have dates on the horizontal axis and scores or daily population mortality rates on the vertical axis. The calculated time series scores indicate the effectiveness of individual policies and their outcomes. The lower the score, the better the policy. The higher the score, the worse the policy. Instead of the snapshot policy analysis, time-series analysis plays a key role in identification of changes over time. A literature review was briefly conducted to explain the result of hiscovid.

Scoring is based on the daily population mortality rate: the number of COVID-19 daily cumulative deaths divided by the population in millions. The number of COVID-19 daily cumulative deaths by country is scraped over the Internet.

The COVID-19 policy analysis will discover many useful facts. Sweden failed due to the herd immunity approach. Hungary made a fundamental mistake in COVID-19 tactics. Countries such as Sweden, Hungary, Belgium, and Poland showed time-series changes that differed from the others.

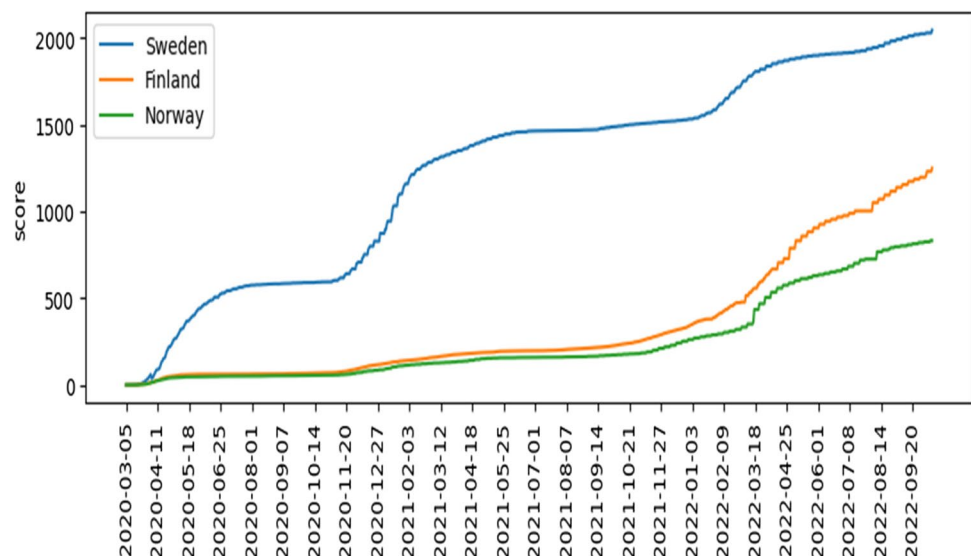
## Results

Figure 1 shows three graphs of Sweden, Finland, and Norway of time-series scores, respectively. Figure 1 can be generated by the following command.

### Sweden

Sweden is the only country that implemented the concept of herd immunity (Ludvigsson et al. 2021). However, in Sweden, the herd immunity approach failed due to the large number of COVID-19 elderly death. Then, the COVID-19 policy in Sweden was updated after the herd immunity failure. In the debate on herd immunity, the most important policy indicator, the number of COVID-19 deaths was presented (Takefuji 2021). The more deaths, the worse the COVID-19 policy. The fewer deaths, the better the policy. Therefore, a score is introduced and normalized by the population in millions for scoring individual COVID-19 policies. Figure 1 shows that Sweden made three mistakes in March 2020, November 2020, and January 2022. This result indicates that the Swedish policy is leaky. A leaky policy means that a flat graph is not observed. A flat graph indicates that COVID-19 is successfully suppressed.

**Fig. 1** Results of hiscovid for Sweden, Finland, and Norway as of Oct. 14, 2022



## Hungary

To observe the progress of four countries, namely Italy, Germany, France, and Hungary, the following command can generate the progress scores results of four countries, as shown in Fig. 2.

There is a significant difference on scores between Hungary and Italy, Germany, and France. There are two reasons the worst outcome of COVID-19 occurred in Hungary (Karáth 2020).

The first reason is due to the tactics used in Hungary. The tactics in Hungary shunned increased testing and installed lockdown limits, allowing people to go to work, go to the hairdresser, shop at the market, and attend funerals and weddings (Karáth 2020). The second reason is due to “the military dictatorship in Hungary” cited by (Karáth 2020), not by the author. The government appointed more than 100 hospital directors, who did not require medical or hospital management experience, to provide hands-on management, in order to monitor and control the use of medical resources during the pandemic. The hospital directors were not trusted, and thus soldiers and police officers were assigned to them.

Figure 2 shows that Hungary made two big mistakes in October 2020 and November 2021.

## Italy

Italy has been hit by an unprecedented crisis and was the first European country to be heavily swept by the COVID-19 pandemic (Bosa et al. 2022). The SARS-CoV-2 outbreak and related COVID-19 pandemic are the worst public health challenges Italy has endured in recent years. To observe distinguished mistakes in Italy, it was compared with the

best policy of New Zealand. Figure 3 shows that Italy made two big mistakes in March 2020 and November 2020 and a medium mistake in January 2022.

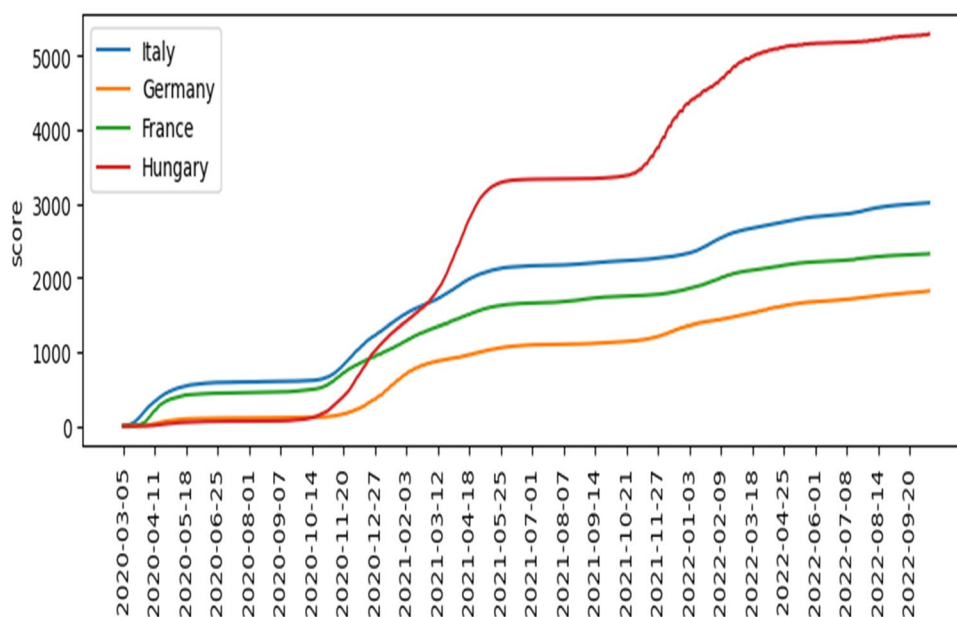
## Germany

Germany was one of the first countries to initiate so-called social distancing measures (Schartau and Kirby 2020). Germany is said to be one of the most successful countries in the world in responding to COVID-19 (Okina, et al. 2020). Is this true? From November 2020, the score of Germany has been increasing. In other words, the snapshot policy analysis is not sufficient to state the robust analysis. Two time-series scores of New Zealand and Germany are compared, as shown in Fig. 4. Figure 4 shows that New Zealand successfully suppressed the COVID-19 pandemic until March 2022. New Zealand lifted border regulations for economics from March 2022 (New Zealand government 2022). The COVID-19 policy in Germany was successful until November 2020, with a flat graph in Fig. 4. The flat graph indicates suppressing the COVID-19 pandemic successfully. The diagonal graph with steeper slope shows that the policy is not successful because of the outcome of their policy. Figure 4 shows Germany made three mistakes in March 2020, November 2020, and November 2021.

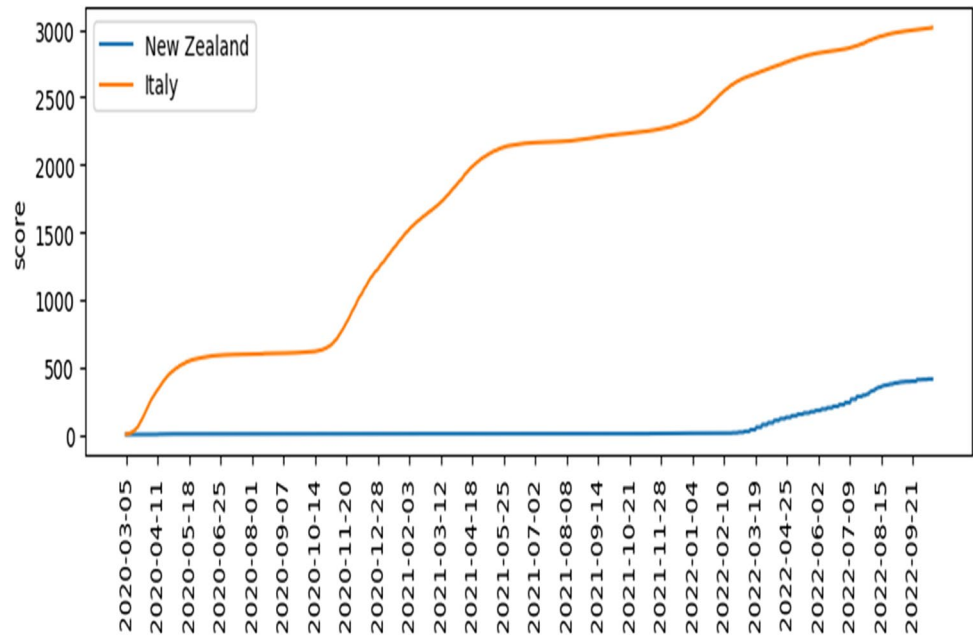
## France

Or et al. summarized France’s response to COVID-19 (Or et al. 2022). France was one of the European countries hardest hit by the Covid-19 pandemic. The pandemic brought to light structural weaknesses in the health care system, including governance and decision-making

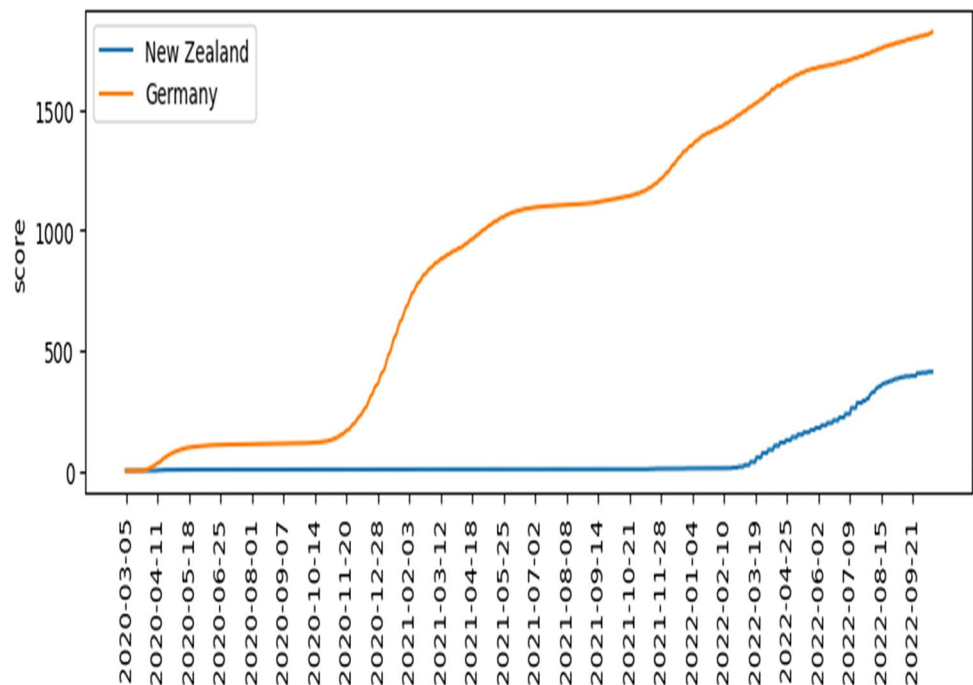
**Fig. 2** Results of hiscovid for Italy, Germany, France, and Hungary



**Fig. 3** Result of hiscovid for New Zealand and Italy



**Fig. 4** Results of hiscovid for New Zealand and Germany



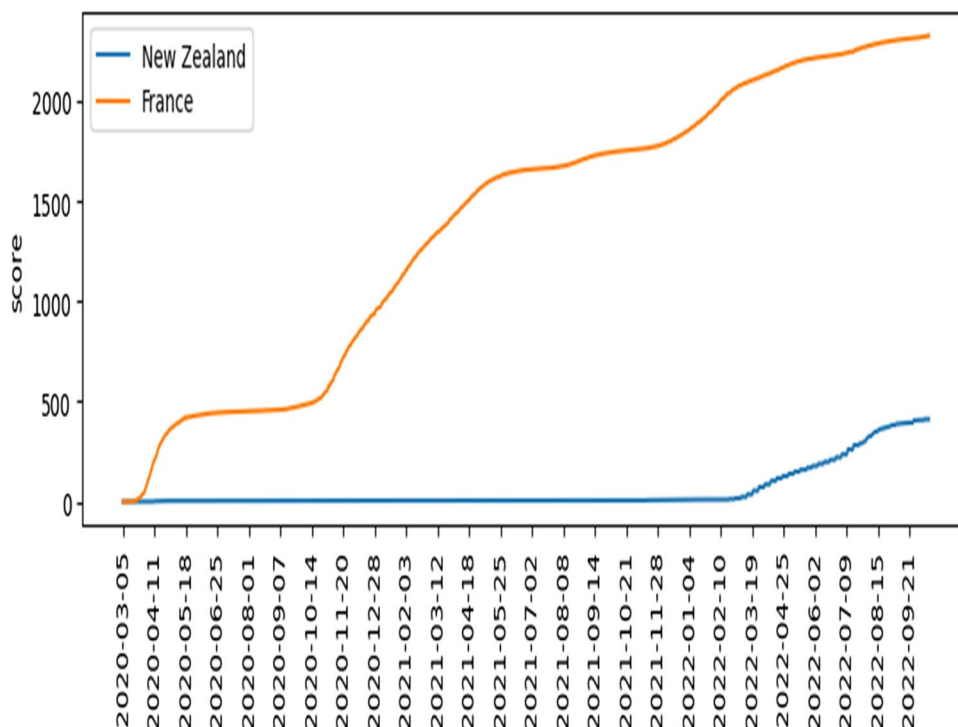
processes, but also triggered changes to improve its resilience. In conclusion, France needs to strengthen the capacity of its health care system and improve cooperation between central and local level actors through participatory decision-making that takes into account the diversity of realities and needs at the local level.

Figure 5 shows that France made three mistakes in March 2020, October 2020, and November 2021.

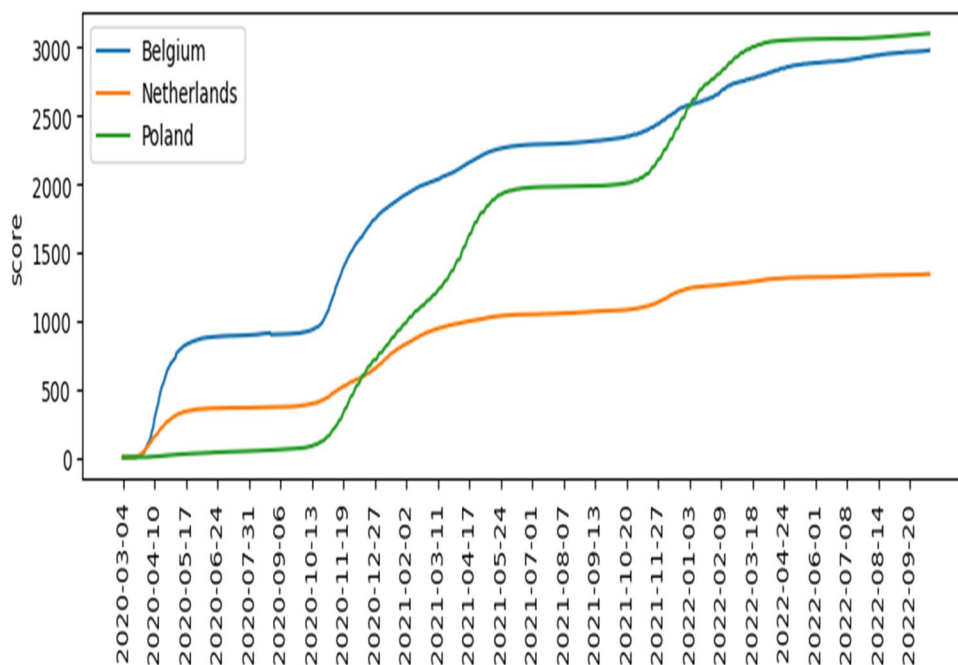
## Poland

The progress of the Belgium, Netherlands, and Poland scores, respectively, can be observed in Fig. 6. In the beginning of the COVID-19 pandemic, Poland was a successful country at suppressing COVID-19, but after October 2020, the score in Poland dramatically increased. The flat graph shows the success of the COVID-19

**Fig. 5** Results of hiscovid for New Zealand and France



**Fig. 6** Results of hiscovid for Belgium, the Netherlands, and Poland



policy, while the diagonal graph shows the failure of the COVID-19 policy. The steeper the slope of the diagonal graph, the worse the policy.

Polish covid advisers quit over the lack of science influence on policy (Dyer 2022). The Polish government had not introduced a shutdown because Poles have a “genetic resistance to regulations” developed over centuries.

Figure 6 shows that Poland made two mistakes in October 2020 and November 2021.

**Belgium**

Policymakers failed to act adequately due to the complex political situation in Belgium without a strong centralized

command from the government (Luyten and Schokkaert 2022). There are two reasons (Luyten and Schokkaert 2022). In the first wave, care home protection was not given sufficient priority. The second wave was larger than necessary because restrictive measures were not implemented in a timely manner.

The difference between New Zealand and Belgium can be observed in Fig. 7. Belgium made two big mistakes in the beginning of March 2020 and in November 2021. The score of Belgium shows the COVID-19 policy is leaky and did not suppress the COVID-19 pandemic. However, during the period of May 2020 to October 2020, there is a flat graph in Fig. 7. Figure 7 shows that Belgium made two big mistakes in March 2020 and October 2020, and a medium mistake in October 2021.

## The Netherlands

Hoekman et al. reported the Dutch COVID-19 approach (Hoekman et al. 2020). They concluded that compared to other countries, the Netherlands was slow and relatively mild in its response to the COVID-19 pandemic. This was consistent with the initial policy choice to consider COVID-19 as a severe influenza and to aim for herd immunity. The Dutch quickly abandoned containment in favor of mitigation with a focus on herd immunity. Contrary to the national policy, the three most northern provinces continued their containment strategy and were able to prevent local transmission of the virus. Figure 8 compares New Zealand and the Netherlands.

Figure 8 shows that the Netherlands made three mistakes in March 2020, October 2020, and November 2021.

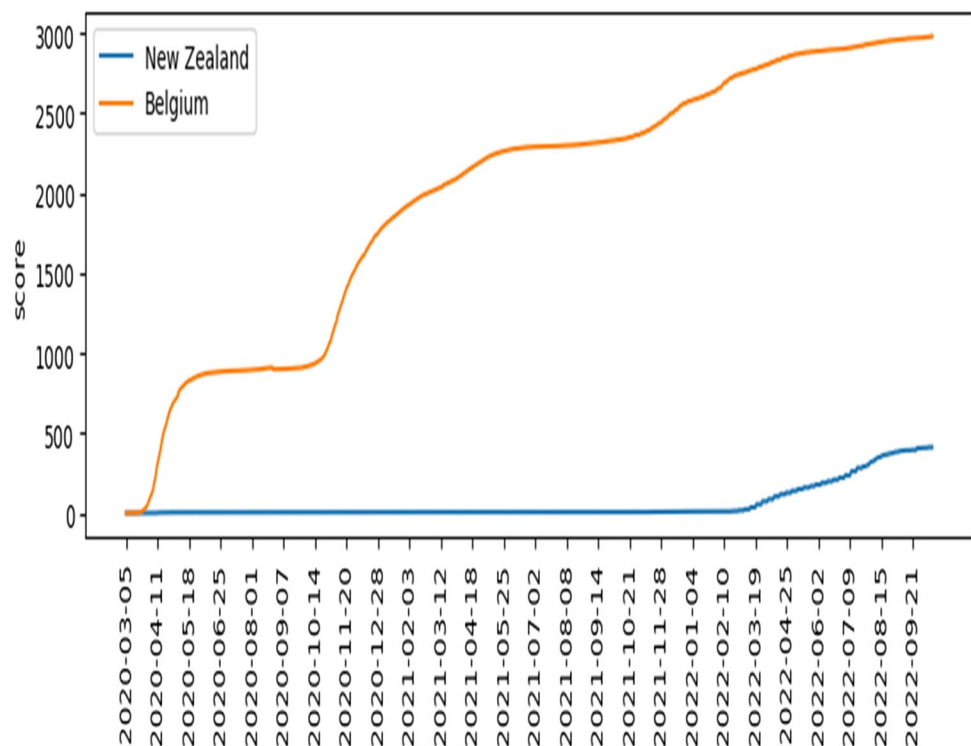
## Discussion

A time-series policy analysis of 10 countries, including Sweden, Finland, Norway, Italy, France, Germany, Poland, Belgium, the Netherlands, and Hungary, was conducted using the hiscovid tool. The hiscovid tool is based on a single metric scoring: dividing the number of COVID-19 deaths by the population in millions. As a policy analysis tool, hiscovid analyzes time-series data to easily visualize changes in scores. In other words, hiscovid allows policymakers to identify when they made mistakes. If the COVID-19 policy is successful, a flat graph can be observed. If the policy is not successful, a diagonal graph can be seen. The steeper the slope of the diagonal graph, the worse the policy.

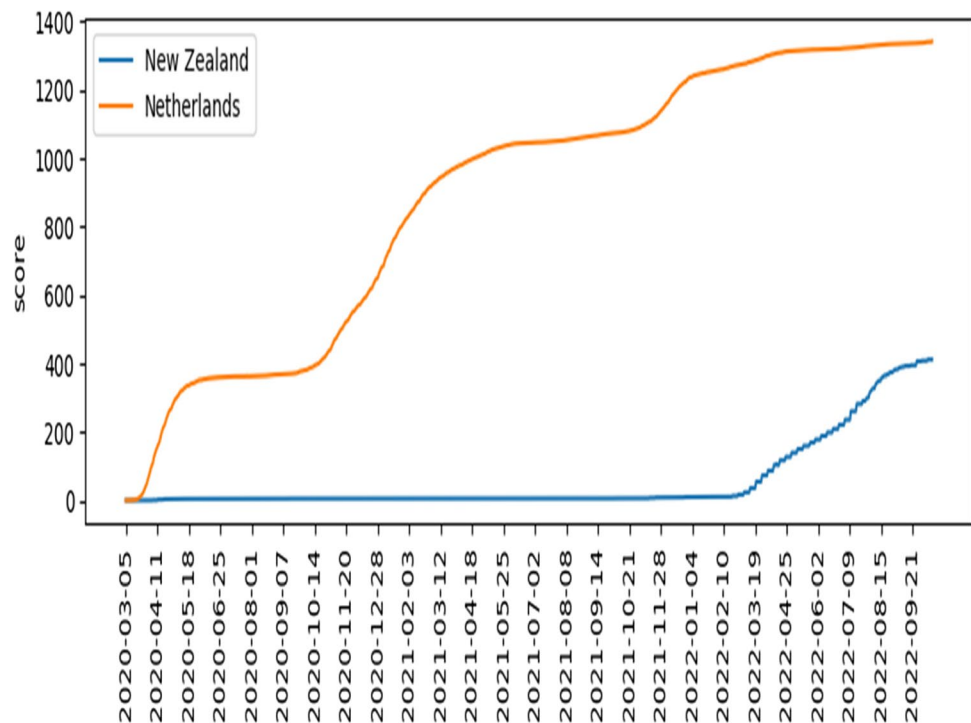
The hiscovid results of 10 countries can be summarized as follows.

1. Sweden made three mistakes in March 2020, November 2020, and January 2022. This result indicates that the Swedish policy is leaky. A leaky policy means that a flat graph is not observed. A flat graph indicates that COVID-19 is successfully suppressed.
2. Hungary made two big mistakes in October 2020 and November 2021.

**Fig. 7** Results of hiscovid for New Zealand and Belgium



**Fig. 8** Results of hiscovid for New Zealand and the Netherlands



- Italy made two big mistakes in March 2020 and November 2020, and a medium mistake in January 2022.
- Germany made three mistakes in March 2020, November 2020, and November 2021.
- France made three mistakes in March 2020, October 2020, and November 2021.
- Poland made two mistakes in October 2020 and November 2021.
- Belgium made two big mistakes in March 2020 and October 2020, and a medium mistake in October 2021.
- The Netherlands made three mistakes in March 2020, October 2020, and November 2021.

Sweden, Hungary, Italy, Germany, France, Poland, Belgium, and the Netherlands should compare their policy outcomes with the policy outcome of New Zealand. A literature review of countries' responses to COVID-19 found that results were ambiguous and individual policies could not be quantified.

## Conclusion

This paper shows how to quantify and score individual COVID-19 policy outcomes. The proposed time-series policy analysis tool, hiscovid, based on the population mortality rate – the number of COVID-19 daily cumulative deaths divided by the population in millions – can play a key role in mitigating the COVID-19 pandemic by observing the outcomes of policies to correct COVID-19 policies in the future.

**Authors' contributions** YT completed this research, wrote the program and the manuscript.

**Data availability** Data is available at the following site:  
<https://covid.ourworldindata.org/data/owid-covid-data.csv>.

## Declarations

**Ethics approval** Not applicable.

**Consent to participate** Not applicable.

**Consent for publication** Not applicable.

**Conflicts of interest** The author has no conflict of interest.

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