

The Global Surveillance Project: Persistence and Transmission of SARS-CoV-2 in Western Europe

Kasen Culler, James Francis Oehmke, Charles B Moss, Robert L Murphy, Michael G Ison, Chad J Achenbach, Danielle Resnick, Lauren Nadya Singh, Janine White, Joshua Marco Mitchel Faber, Michael J Boctor and Lori Ann Post

Background

- The COVID-19 pandemic has had a severe impact in Western Europe, especially as they now experience a second wave of infection
- National governments are struggling to control the infection due to increased pushback from local governments reluctant to shut down businesses and quarantine citizens a second time
- Different countries have experienced varying infectivity rates and mortalities, likely due to differences in preventative public health policies, public adherence to implemented policies, and socio-cultural/demographic population characteristics
- Existing public health surveillance, such as the tracking tools developed by the World Health Organization (WHO) and John Hopkins Center for Systems Science and Engineering (CSSE) have been helpful in forecasting case numbers, but ultimately suffer from incomplete case ascertainment and data contamination.
- These systems are limited in their tendency to include only the most severe cases and leave mild and undiagnosed infections uncouncted

Goal

- Create a more advanced methodology for tracking and estimating COVID transmission in European regions in order to more reliably evaluate which policies are most effective and identify other factors that may be associated with transmission rates
- Ultimately, measure acceleration/deceleration rates in the transmission of SARS-CoV-2 in Western Europe to inform governments in their decision-making regarding disease control, mitigation strategies and reopening policies

Methods

- Utilize data from "Our World In Data" GitHub repository to create panels of 34 countries in Western Europe with 47-50 days in each panel
- Specify empirical difference equation in which the number of new positive cases in each country on each day is a function of the prior number of cases, the level of testing and weekly shift variables that account for differences in transmission rate compared to previous weeks
- Results in a dynamic panel model estimated using the generalized method of moments (GMM) approach by implementing the Arellano-Bond estimator in R

Pandemic Progression in Europe



Table 1. Weekly Europe SARS-CoV-2 Trends by Country

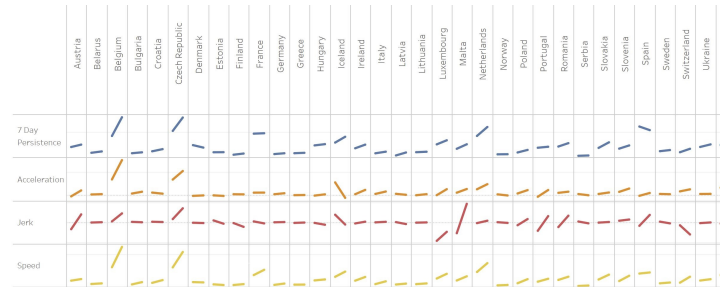


Table 2. 7-Day Persistence Difference

7-Day Persistence 10/7/2020		7-Day Persistence 10/14/2020	
Spain	24.14	Belgium	31.45
Czech Republic	20.68	Czech Republic	31.23
France	18.51	Netherlands	23.76
Netherlands	16.71	Spain	21.29
Belgium	16.68	United Kingdom	18.87

Results

- Countries with the largest COVID caseloads and infection rates also had positive acceleration and jerk as well as large 7-day persistence rates
- UK, Spain, and Belgium had the highest number of observed cases during the first two weeks of October, and their infection rate increased in week 2

Conclusions/Implications

- This dynamic data suggests that the second wave of the COVID-19 pandemic has breached European borders
- In particular, Belgium, Czech Republic and the Netherlands are at risk for rapid expansion in the transmission of COVID-19
- Rates of jerk became positive throughout October along with increases in speed and acceleration, and the 7-day persistence rate during the second week was larger than the first, indicating that the second wave of the COVID-19 pandemic occurred between weeks 1 and 2 of October
- Given the substantial 7-day persistence rates in large countries like the UK, Spain and the Netherlands, it is imperative that efforts be made to target superspreader events

Limitations

- Data is collected at the country level, and is therefore reliant on accurate reporting from within each country
- Data collection mechanisms differ by country and even by region within a country, leading to potential weekend effects, missing data points, and other contamination

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