Exploring Respiratory Syncytial Virus and Influenza Trends Pre and Post-COVID-19 in the US and EU-5 Countries

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Background

- Extremely low levels of RSV and influenza activity were observed during the COVID-19 pandemic as a result of non-pharmaceutical interventions implemented during the pandemic such as mask wearing and social distancing
- Public Health England anticipated potential rebounds of respiratory viruses activity in 2022, following the end of those interventions[1]. **We conducted interrupted time series analyses (ITS) to assess the evolution of RSV/influenza activities following the end of the pandemic.**

Methods

- Weekly RSV and influenza incidences (cases and hospitalizations) were collected from national surveillance systems over the period 2016-2023 for the following countries: US, EU-4 (France, Germany, Spain, Italy) and the UK. Populations of interest were: overall population (RSV and influenza), 65+ years old population (influenza) and pediatric population (RSV). We considered the COVID-19 period to start on March 2020 and end in: Q1 2022 for France/US/Germany/Spain/Italy and 05/2021 for the UK.
- We performed ITS using ARIMA models (R 4.3.1 software) to analyze changes in rates pre- and post-COVID-19 for Influenza and RSV. Incidence of RSV/Influenza cases and hospitalizations were selected as dependent variables and time as an independent variable. The step value (short-term change in the value after COVID-19 - i.e., the difference between the actual observed value and the predicted value) and ramp value (indicating slope change in the value - i.e., the difference in the slope after COVID-19) were introduced as independent variables to construct the ITS. We used p-value Ljung-Box Test's to test model fit, a p-value >0.5 meaning there was no significant autocorrelation and models were a good fit.

Results

- Incidence of influenza-related General Practitioner (GP) visits in France showed short-term decreases after the COVID-19 outbreak, with step values of -51.18 and -39.59 in the overall and 65+ populations, respectively. However, rates increased substantially after the decline, with ramp values of 1.1 (p= 0.89) and 1.49 (p=0.21), respectively (i.e., increases in incidence of 1.1 and 1.49 every week). However, a short-term rise in influenza-related hospitalizations was observed, which persisted in the long-term (step= 81.64, ramp= 1.31 ; p=0.02) (**Figure 1**).
- Comparable findings were found for RSV cases in France, with step and ramp values of -45.53 and 0.92, respectively (p=0.004) (**Figure 1D**).
- ITS for Germany followed a similar trend for influenza cases in 65+y (step= 0.63, ramp= 0.08 ; p=0.87). However, a ramp value of -0.34 was observed for influenza cases in the general population, highlighting a long-term decrease in incidence post-COVID-19 (**Figure 2**). ITS for the US also revealed a long-term increase in % of GP visit for influenza-like illness (ramp= 0.049).
- Finally, influenza and RSV data post COVID-19 pandemic were not available for Italy and Spain. Similarly, RSV and influenza-related hospitalization data could not be retrieved for Germany.

Figure 1: ITS (France) - Influenza-related GP visits p10,000 overall population (A) and 65+y (B), influenza-related hospitalization p10,000 overall population (C), RSV cases p10,000 pediatric population (D)

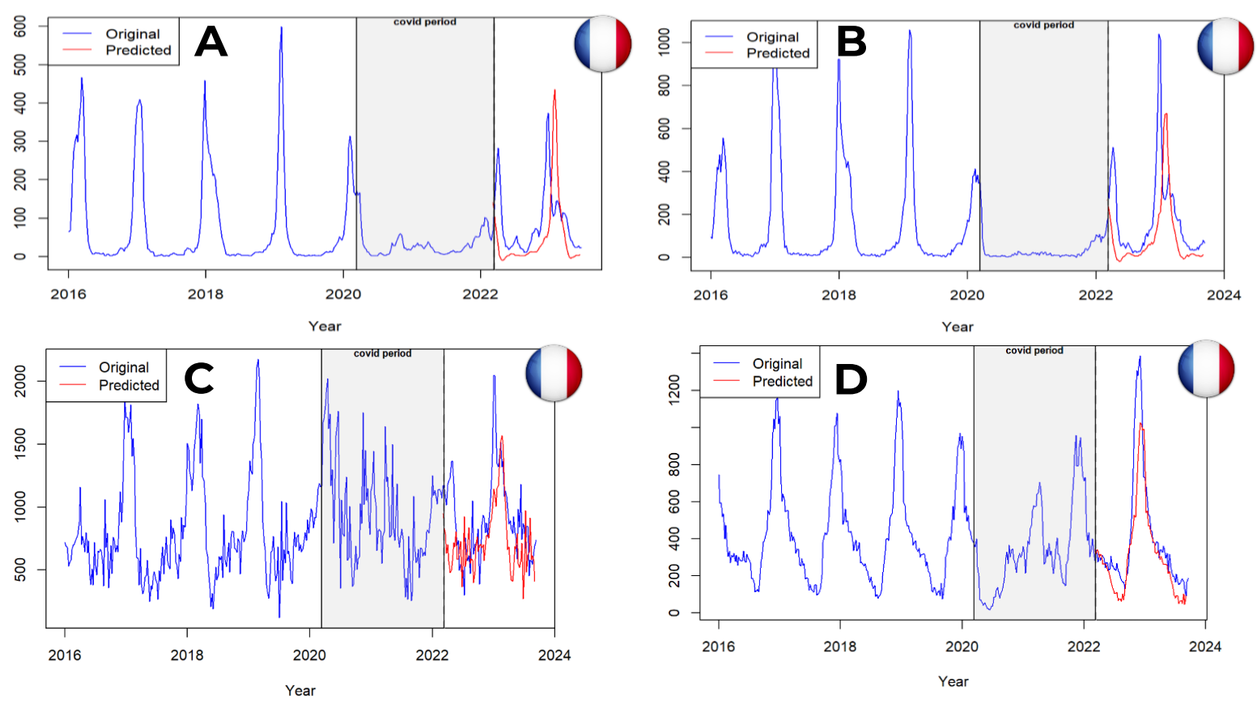


Figure 2: ITS (Germany) - Influenza-related cases p100,000 overall population (A) and 65+y (B)

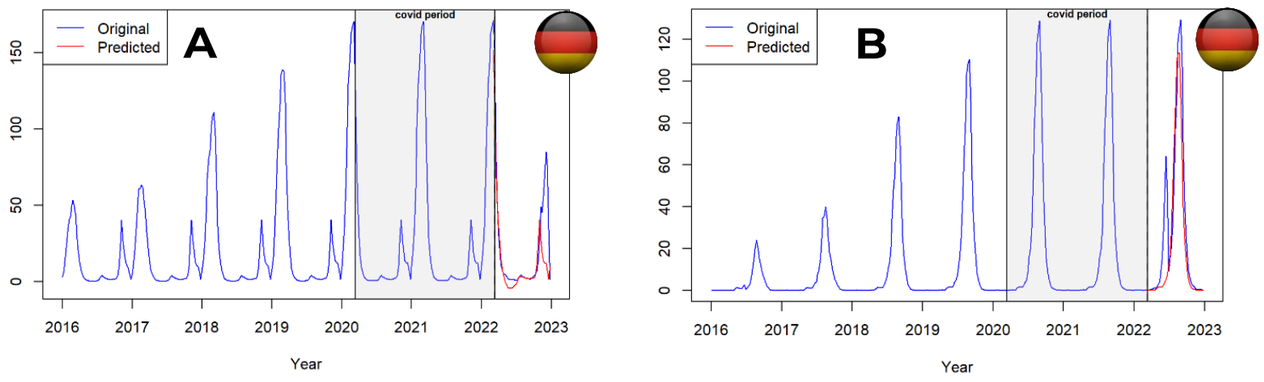
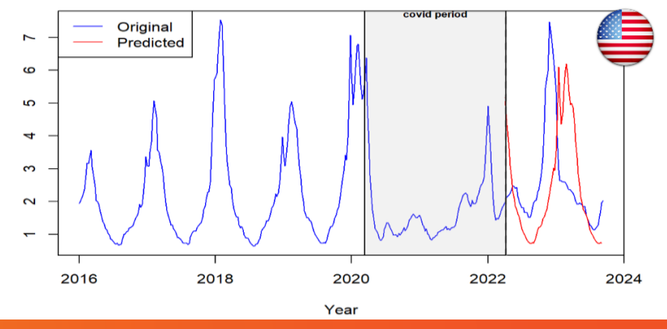


Figure 3: ITS (United States) - % of visits for influenza-like illness overall population



Discussion

- Our results are in line with predictions and observations reported in other studies and are suggestive of a rebound in influenza and RSV activity following the COVID-19 pandemic[2,3]. As, such, it is important to maintain high levels of influenza vaccination in high-risk populations.
- Similarly, these findings can be used to raise awareness around RSV disease and promote immunization considering the recent launches in this space, with nirsevimab (monoclonal antibody anti RSV) and RSV vaccines that will be available for the 2023/24 season.

1. NHS England. The NHS influenza immunisation programme 2022 to 2023 [Internet]. 2022.
2. Lee SS, Viboud C, Petersen E. Understanding the rebound of influenza in the post COVID-19 pandemic period holds important clues for epidemiology and control. Int J Infect Dis. 2022 Sep;122:1002–4.
3. Ali ST, Lau YC, Shan S, Ryu S, Du Z, Wang L, et al. Prediction of upcoming global infection burden of influenza seasons after relaxation of public health and social measures during the COVID-19 pandemic: a modelling study. The Lancet Global Health. 2022 Nov;10(11):e1612–22.

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