Revealing Seasonal Patterns in the Post-Pandemic Era:
A Comparative Analysis of Timing and Hospitalization Burden of Influenza and COVID-19: US, EU and UK

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Conflict of interest and funding

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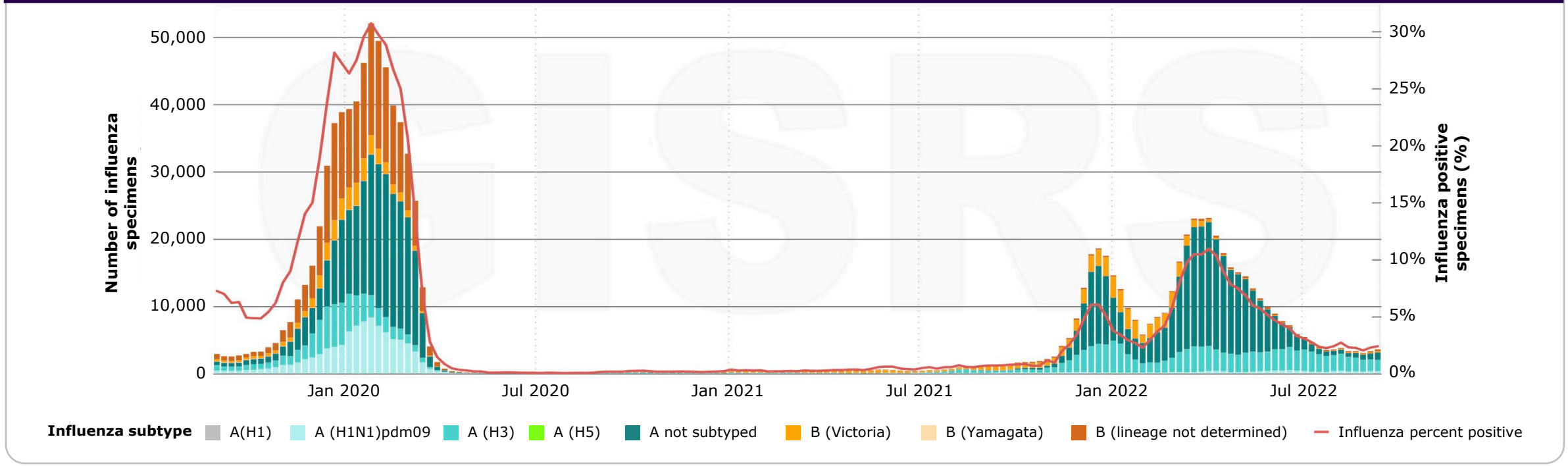
Influenza disappeared during the COVID-19 pandemic

In 2020 many countries implemented non-pharmaceutical interventions (NPI) to interrupt the transmission of SARS-CoV-2

These measures also led to influenza hospitalization burden plummeting close to undetectable levels in 2021[1]

In 2022, with the loosening of NPI restrictions, influenza activity increased slowly, with a lower burden than in pre-pandemic years and peaking earlier in the season

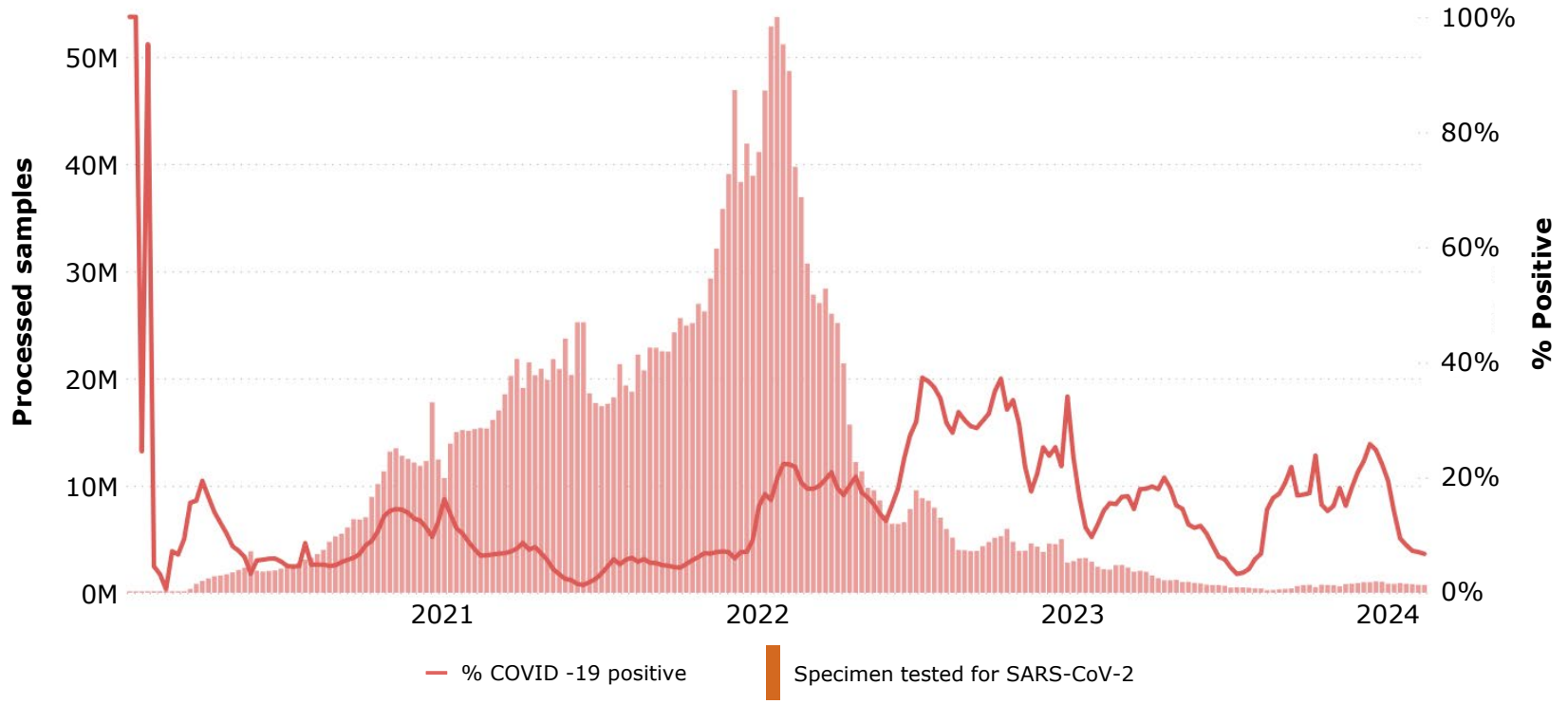
Influenza virus detections by subtype reported to FluNet[2]



References: 1. CDC. 2023-2024 U.S. Flu Season: Preliminary In-Season Burden Estimates | CDC [Internet]. 2024 [cited 2024 May 17]. Available from: About Estimated Flu Burden | Flu Burden | CDC Accessed September 2024; Nørgaard SK, et al. *Eurosurveillance.* 2024;29(15):2400178. **2.** Figure: Global Influenza Surveillance & Response System. https://worldhealthorg.shinyapps.io/flunetchart/ Accessed September 2024

SARS-CoV-2 global circulation remains unpredictable

SARS-CoV-2 virus detections reported to FluNet[1]



SARS-CoV-2 has not settled into consistent seasonal transmission patterns, prompting concerns about viral interaction with influenza, and the appropriateness of concomitant vaccination campaigns[2]

Since the COVID-19 pandemic there has been a keen interest in generating comparative data on the burden and timing of influenza and SARS-CoV-2, to help understand the potential future interaction of these pathogens, and to inform public health planning (e.g. vaccination campaigns)

References: 1. Figure: Global Influenza Surveillance & Response System. https://www.who.int/initiatives/global-influenza-surveillance-and-response-system. Accessed September 2024 **2.** CDC. 2023. Getting a Flu Vaccine and other Recommended Vaccines at the Same Time | CDC (Assessed March 2024) Available from: https://www.cdc.gov/flu/season/faq-flu-season-2023-2024.htm Accessed September 2024

Objective

To compare the burden and timing of ***SARS-CoV-2*** and ***influenza*** associated hospitalizations during the post-pandemic period

Methods

- Retrospective descriptive analysis of *laboratory-confirmed hospitalization data* for influenza and SARS-CoV-2 over the past two years: *2022–2023* to *2023–2024*[1,2]
- To capture winter seasonality, the year was defined as beginning on week 27 and ending on week 26 of the subsequent year[3]

Geographical Regions [Data Sources]

- England [UK HSA[3]]
- Four countries in Europe (EU): France, Germany, Italy, Spain [ERVISS]
- USA [CDC]

Parameters analyzed include:

- Weekly hospitalization rates in England and USA
- Absolute numbers of hospitalizations in the EU and USA

Outcomes:

- Laboratory-confirmed hospitalizations for influenza and SARS-CoV-2 by calendar week

UK HSA: UK Health Security Agency; ERVISS: European Respiratory Virus Surveillance Summary; CDC: Centers for Disease Control and Prevention

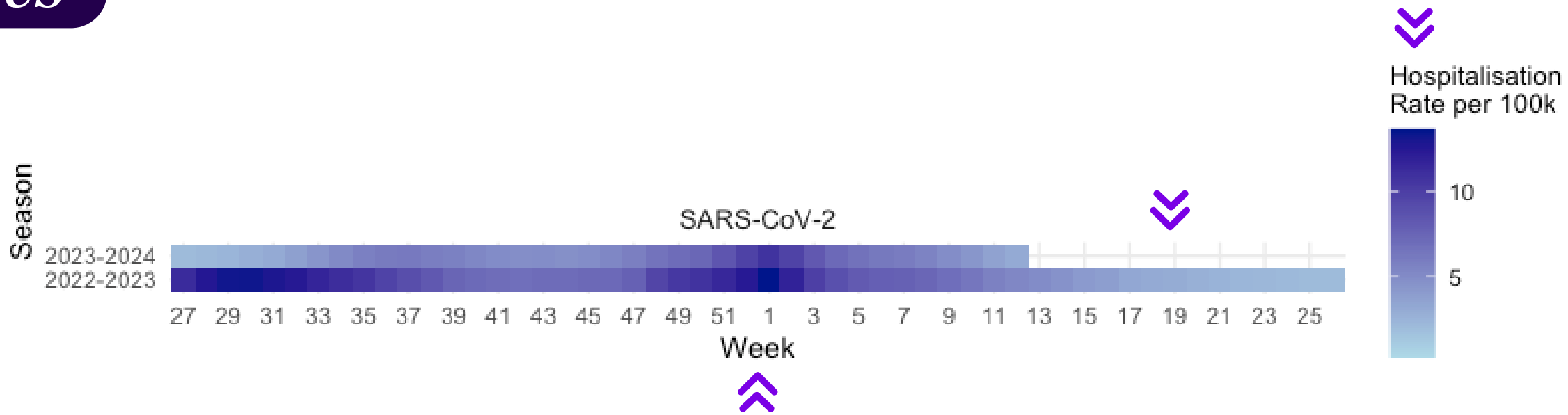
References: 1. Respiratory_viruses_weekly_data/data at main · EU-ECDC/Respiratory_viruses_weekly_data · GitHub [Internet]. [cited 2024 Jun 26]. Available from: https://github.com/EU-ECDC/Respiratory_viruses_weekly_data/tree/main/data Accessed September 2024. **2.** Respiratory Virus Response (RVR) United States Hospitalization Metrics. Available from: https://catalog.data.gov/dataset/respiratory-virus-response-rvr-united-states-hospitalization-metrics-by-jurisdiction-times Accessed September 2024. **3.** National flu and COVID-19 surveillance reports: 2023 to 2024 season - GOV.UK [Internet]. [cited 2024 Jun 26]. Available from: https://www.gov.uk/government/statistics/national-flu-and-covid-19-surveillance-reports-2023-to-2024-season Accessed September 2024.

Results - Seasonality

Evolution of Influenza and SARS-CoV-2 activity: 2022-2023 and 2023-2024

(annual period defined as epi* week 27 year n - week 26 year n+1)

US



*epidemiological week

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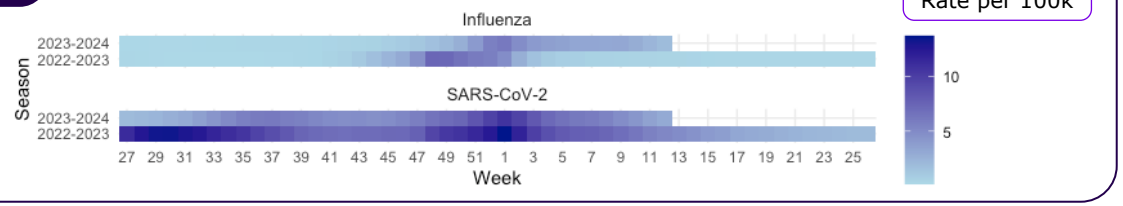
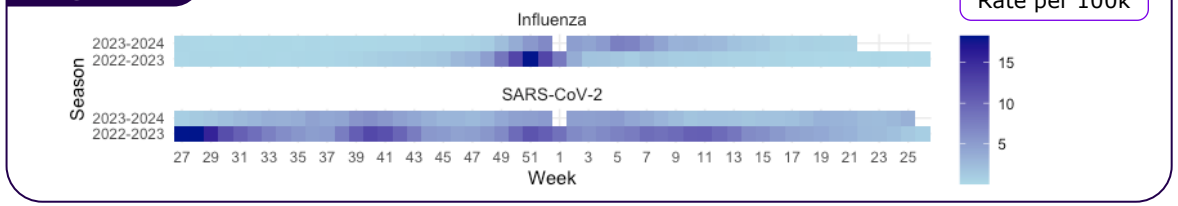
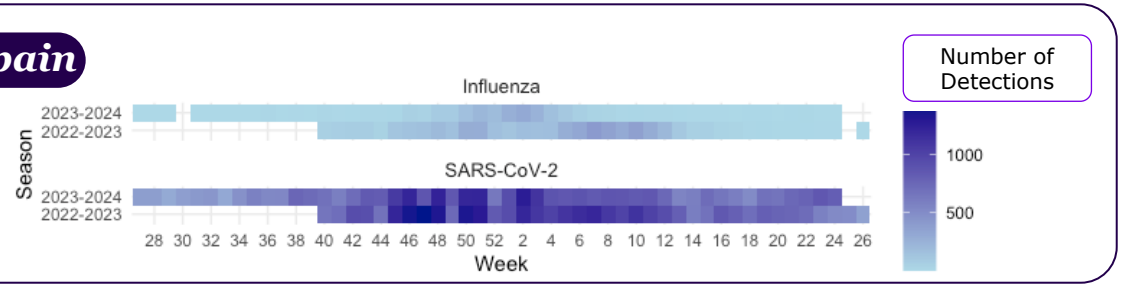


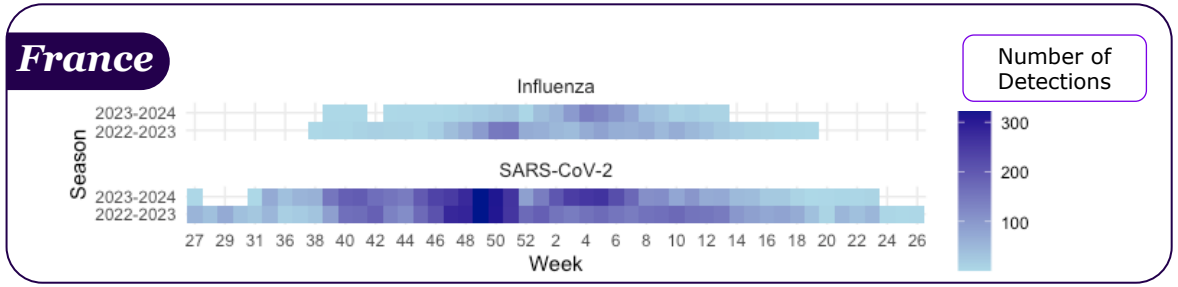
England



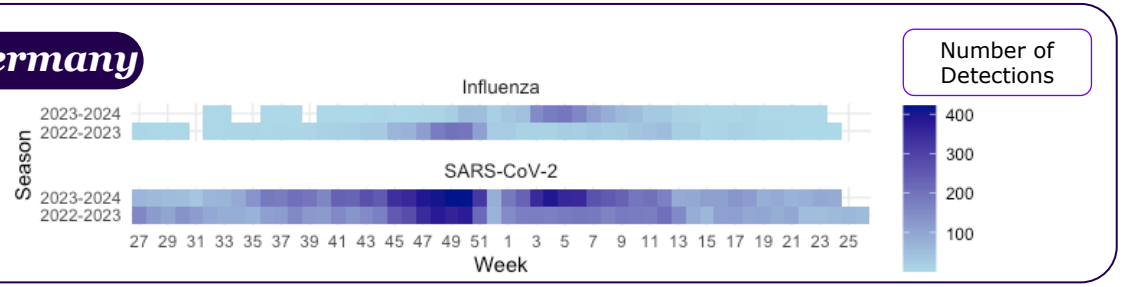
Spain



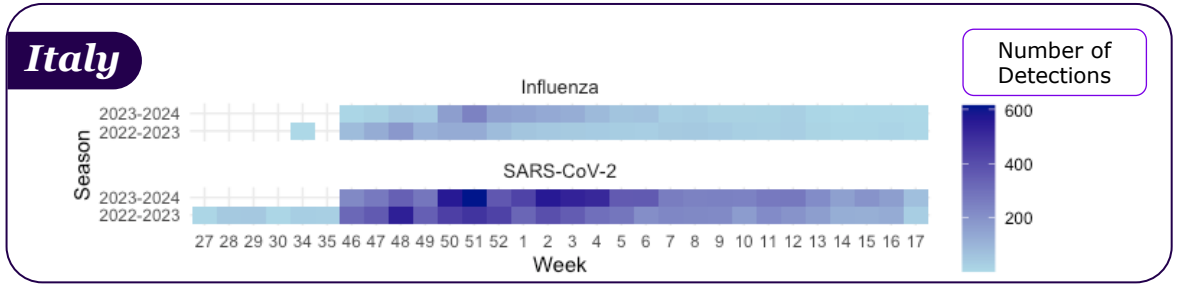
France



Germany



Italy



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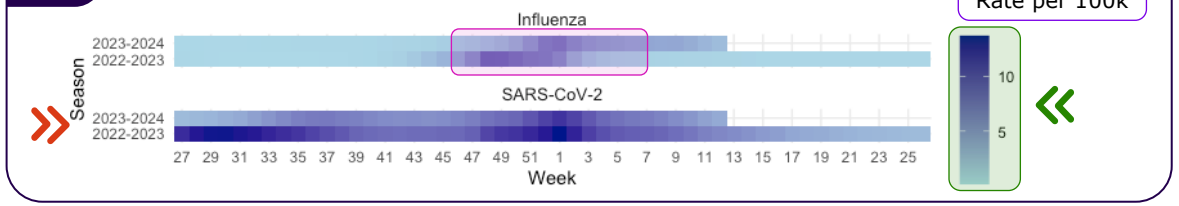
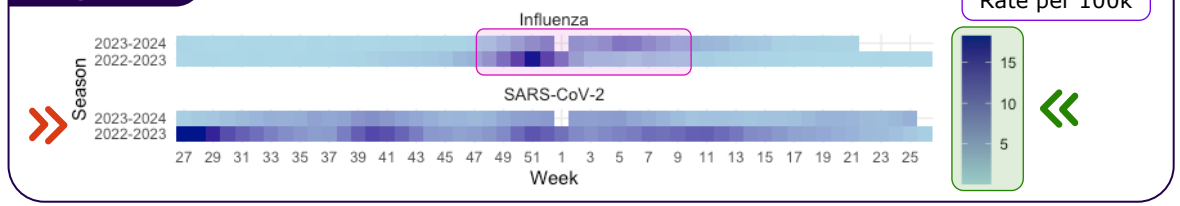
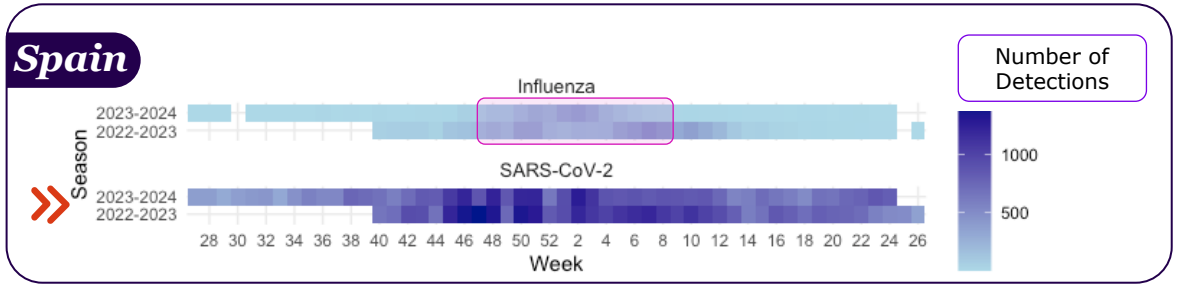


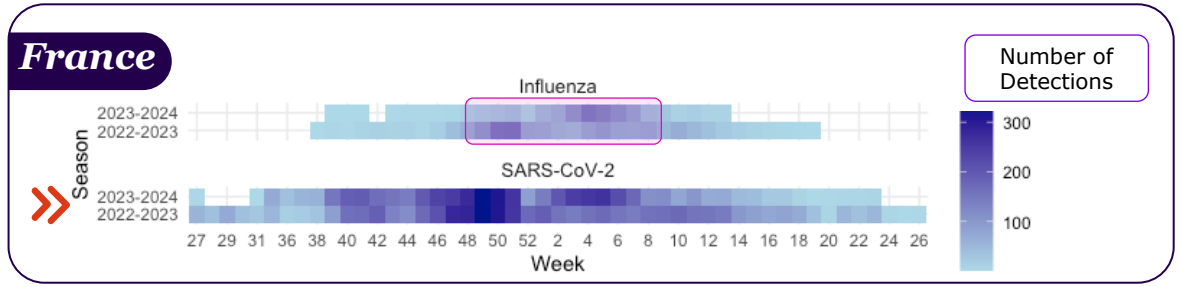
England



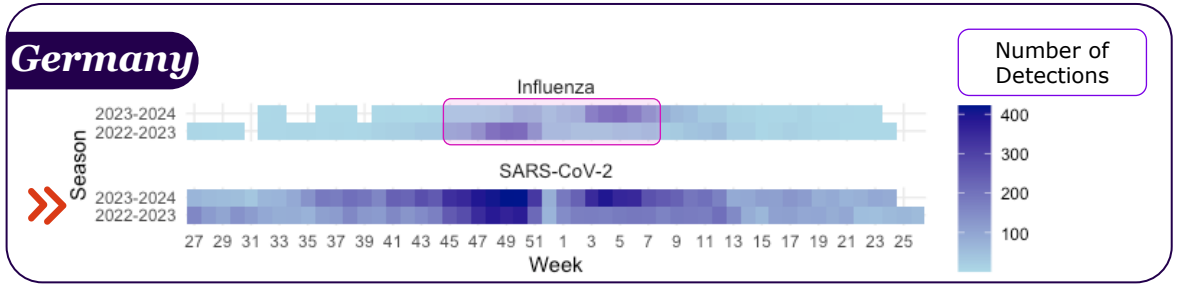
Spain



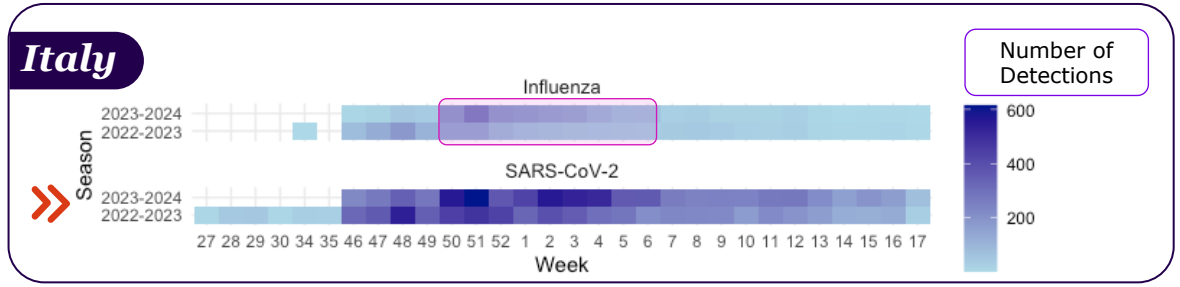
France



Germany



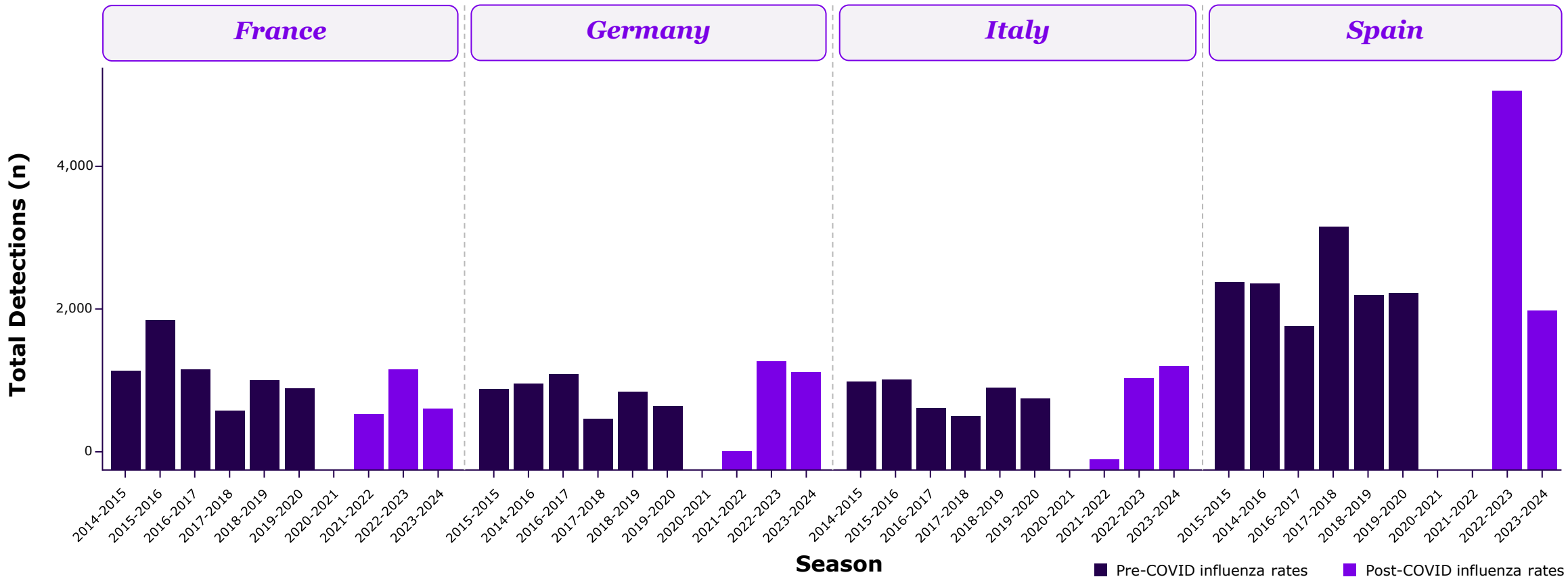
Italy



*epidemiological week

Influenza burden has returned to pre-COVID levels

Total Number of Hospitalizations attributed to laboratory-confirmed Influenza[1]

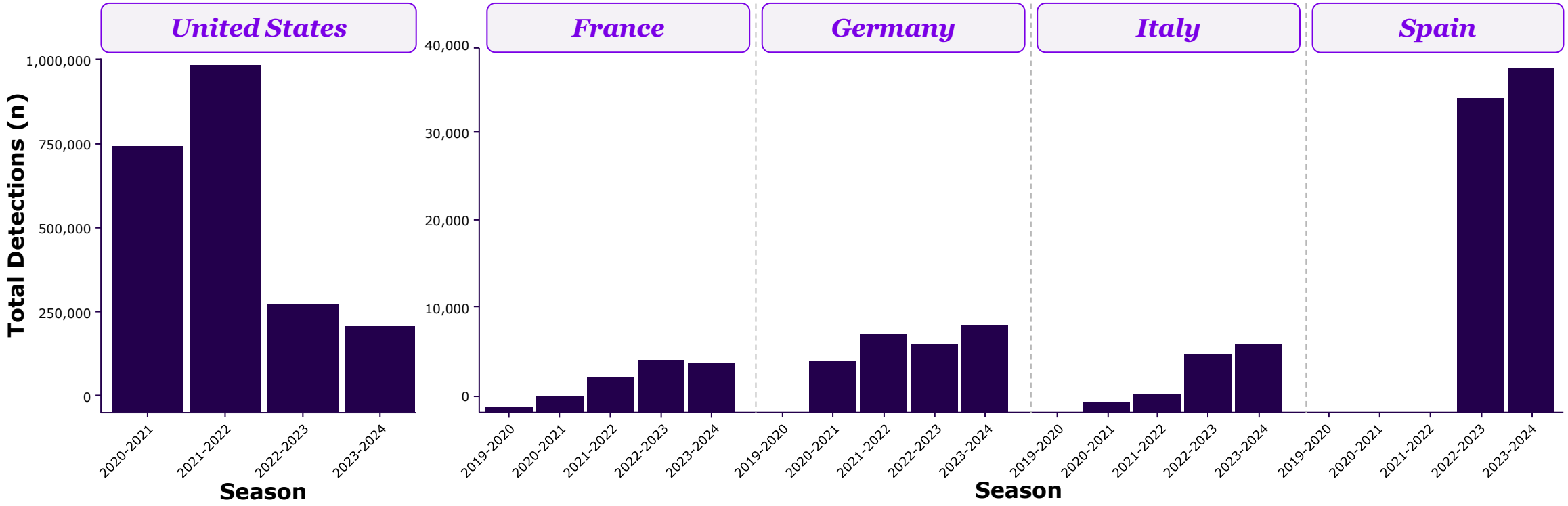


References: 1. Respiratory_viruses_weekly_data/data at main · EU-ECDC/Respiratory_viruses_weekly_data · GitHub [Internet]. [cited 2024 Jun 26]. Available from: https://github.com/EU-ECDC/Respiratory_viruses_weekly_data/tree/main/data Accessed September 2024

SARS-CoV-2 associated hospitalization remains significant

Total Number of Hospitalizations attributed to laboratory-confirmed SARS-CoV-2[1,2]

Annual cumulative hospitalizations for COVID-19 were 4, 5, and 12 times higher than influenza in the US, Germany, and Spain, respectively



References: 1. Respiratory_viruses_weekly_data/data at main · EU-ECDC/Respiratory_viruses_weekly_data · GitHub [Internet]. [cited 2024 Jun 26]. Available from: https://github.com/EU-ECDC/Respiratory_viruses_weekly_data/tree/main/data Accessed September 2024. **2.** Respiratory Virus Response (RVR) United States Hospitalization Metrics. Available from: https://catalog.data.gov/dataset/respiratory-virus-response-rvr-united-states-hospitalization-metrics-by-jurisdiction-times Accessed September 2024.

Limitations

- Testing is no longer free to access in many key countries and declines in testing practices have been noted across all countries included in this study
  - We are currently looking into how sampling and testing of respiratory viruses has changed pre- and post-pandemic – more to come

The data sources for Europe were national surveillance networks, therefore the hospitalisation data shown in this study is an under-representation of true influenza and SARS-CoV-2 related burden

- Cumulative hospitalizations for England were not assessed due to missing data:
  - The UKHSA and ERVISS do not publish the hospital network catchment population size. Therefore, absolute numbers of hospitalisations could not be calculated for the England data

Summary

In the post-pandemic era, SARS-COV-2-related hospitalizations have exacerbated the seasonal surge in respiratory disease burden on healthcare systems

Given the resurgence of influenza-related hospitalization to pre-pandemic levels, the study highlights the necessity of maximizing vaccination coverage for **both** diseases

Although there is an upsurge in SARS-CoV-2 associated hospitalizations in the winter period, overlapping with influenza circulation, the virus is not restricted to specific seasons. Continuous surveillance and prevention measures are essential

Further research is warranted to inform concomitant vaccination policies, including analyzing hospitalization data across multiple seasons/ years, evaluating temporal durability of vaccine-induced immunity and overlap of key risk groups for respiratory pathogens

Thank you