

# Social Impacts of COVID-19 on Influenza in Europe

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## Abstract

The impact of COVID-19 on influenza in our society englobes many aspects from the citizens behaviour during the influenza season to the interventions from health authorities. In this paper we show some important issues related to this phenomenon, by analyzing the data indicators of influenza before, during and after the COVID-19 pandemic.

## Keywords

Social Impact, COVID-19, Influenza, Europe

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## 1. Introduction

INFLUENZA—The influenza epidemic is a major health concern of governments health organizations and general population, due to the profound damage it causes yearly to all society (Hai et al., 2001), (Van Tam, 1998). Seasonal influenza viruses occur in the winter months, spreading from person-to-person. When a new type of virus appears, most people are not inoculated so these viruses may cause large outbreaks and that is when a pandemic occurs. Vaccines are the most efficient protection to the population against seasonal influenza, but some other measures like mask protection and personal distance in the daily contacts are also meaningful to prevent the disease. In general, all interventions, related measures and statistics concerning to influenza epidemic are also concerned with influenza-like illness (ILI). The World Health Organization (WHO) defines ILI when a patient has an acute respiratory infection with measured fever of  $\geq 38^{\circ}\text{C}$  and cough or sore throat (Belongia et al., 2017).

COVID-19—Starting in the end of 2019 and spreading in the beginning of 2020 the world suffered with the COVID-19 Pandemic, which lasted approx-

imately two years. For the first time in the modern world influenza was not the main seasonal disease across the world. During those two years countries closed frontiers, international travelling and also countries national mobility was restricted (Han et al., 2022). Practically all segments of society were hit in many aspects, education, commerce, transport, and all activities that required people contact were restricted (Kliger, 2021), (Mori et al., 2022), (Lopez et al., 2022). These led to changes in people way of living in almost all society segments and activities: Social Behaviour (Sam, 2022), Labour (Massar et al., 2022), Urban Behaviour (Fujii et al., 2021), (Long & Liu, 2021), (Saw et al., 2021), Education (Chairunnisak et al., 2022), (Zhu et al., 2022), Medical Education (McKinley & Ghaffarifar, 2021), Healthcare (Gadi et al., 2022), Psychology (Kollamparambil & Oyenubi, 2021) and Tourism (Marques et al., 2020).

INFLUENCE OF COVID-19 IN SOCIAL LIFE—In the period of COVID-19 public social and health measures, like social distancing, use of masks and cleaning hands with alcohol-based hand rub, were taken to reduce the transmission of coronavirus disease (COVID-19), which led to a substantially decline in influenza activity, suggesting that the measures taken for COVID-19 were effective in reducing spread of other viral respiratory diseases (Soo et al., 2020).

## 2. Influenza Virus Types and Surveillance

Influenza viruses are classified in two types: A and B. Type A has subtypes considering the antigens HA and NA. The A (H1N1), A (H3N2) and B influenza viruses have co-circulated globally. Every year new variants of influenza virus appear due to antigenic change leading to the repetition of vaccination yearly. When a new subtype of virus appears, there is no human immunity against it and this leads to a pandemic (“an uncontrolled worldwide epidemic”). The last influenza pandemic was in 2009 caused by virus A (H1N1) (Barberis et al., 2016).

Although not completely efficient, the main protection against influenza is the Annual Vaccination. Each year the **European Centre for Disease Prevention and Control (ECDC)** together with World Health Organization (WHO) recommend the virus types for inclusion in influenza vaccines, this is done in February for the northern hemisphere and in September for the southern hemisphere (WHO, 2024).

The influenza surveillance in EU countries and Iceland, Liechtenstein and Norway (EU/EAA) countries are done by the European Influenza Surveillance Network coordinated by the ECDC. The influenza surveillance is done through weekly consultations to Sentinel Medical Practices for influenza-like illness and acute respiratory infections. The data gathered by sentinel medical practices is presented in weekly data reports of ECDC. Although the actual numbers of the epidemics are greater than the sentinel numbers, this information is crucial and it is used by ECDC and WHO for coverage rates and to draft their yearly strategy for the surveillance and the vaccines recommendations for the next influenza season. The influenza season lasts from the 40th week of one year to the 20th

week of the next year and the outbreaks usually last from 6 to 8 weeks, in general in the end of a year and the beginning of the next year (WHO/EURO, 2022).

### 3. The Influenza before the COVID-19 Pandemic

The data and all information for this section and for the next section was gathered from the ECDC Annual reports and Weekly infographics for influenza (European Centre for Disease Prevention and Control, n.d.).

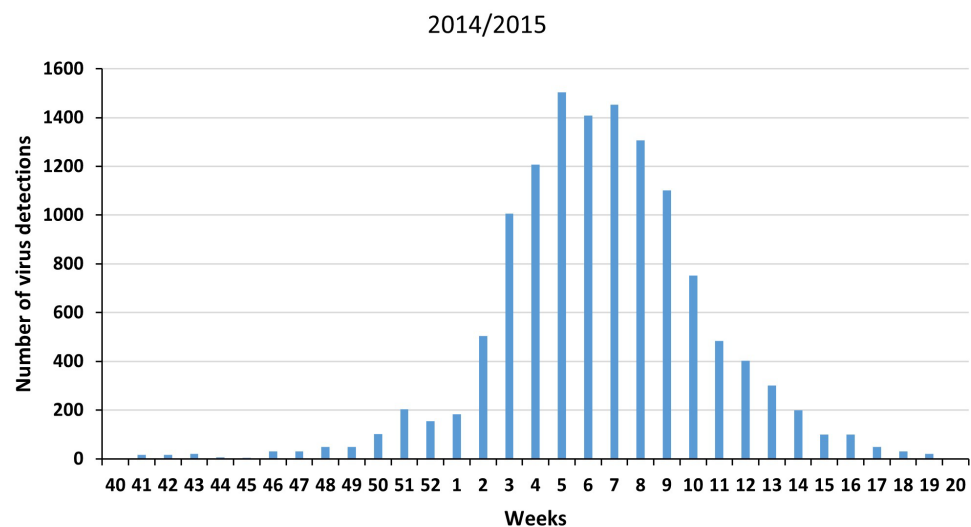
The influenza activity before the COVID-19, from the season 2014/2015 to season 2018/2019 had typical influenza virus incidences, with the major outbreak appearing in the winter, in the beginning of the year. We observe the incidence of season 2014/2015 in **Figure 1** that the influenza activity started in week 50/2014 and lasted until week 20/2015, with the major outbreak appearing in weeks 3 to 9. That season was severe compared to previous seasons, which are not shown here.

In the season 2015/2016, as in the previous season, influenza activity started in week 51/2015, peaked between weeks 4/2016 to 11/2016, and the activity lasted until week 20/2016, see **Figure 2**.

The influenza activity in the season 2016/2017, started three weeks earlier than the last two seasons and the duration was similar. The activity started in week 46/2016 and lasted until week 17/2017. The peak was from week 52/2016 to week 4/2017, see **Figure 3**.

The season 2017/2018 was more severe than the previous seasons. The influenza activity started in week 49/2017 and lasted until week 17/2018. The major outbreak was at a higher level than the previous one, lasting from week 51/2017 to week 13/2018, see **Figure 4**.

The season 2018/2019 was the last before COVID-19. The influenza activity started in week 49/2018 and lasted until week 17/2019. The peak was from week 2/2019 to week 8/2019, see **Figure 5**.



**Figure 1.** Number of virus detections by week in season 2014/2015.

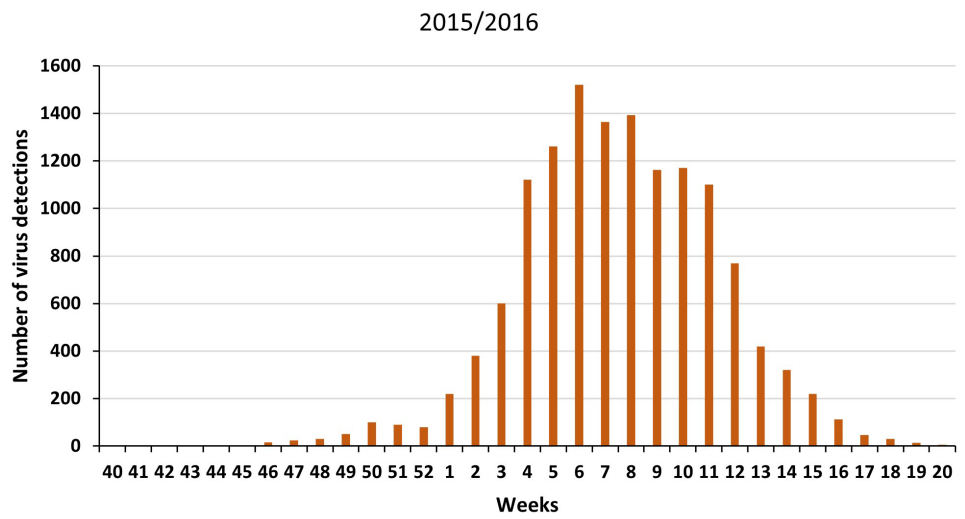


Figure 2. Number of virus detections by week in season 2015/2016.

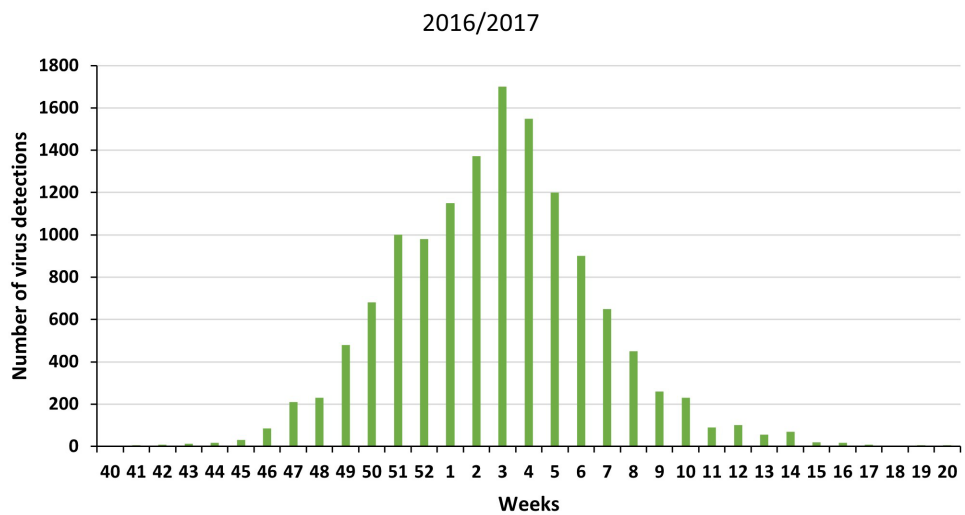


Figure 3. Number of virus detections by week in season 2016/2017.

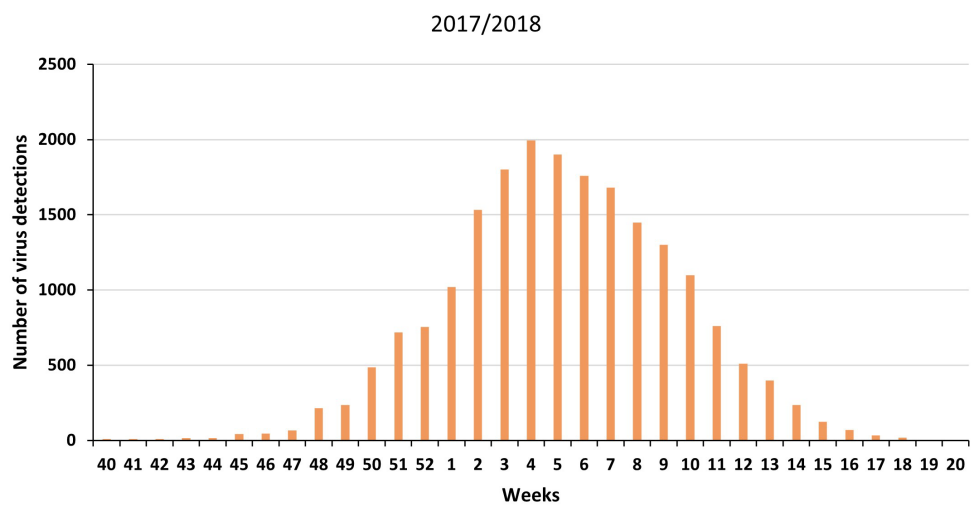
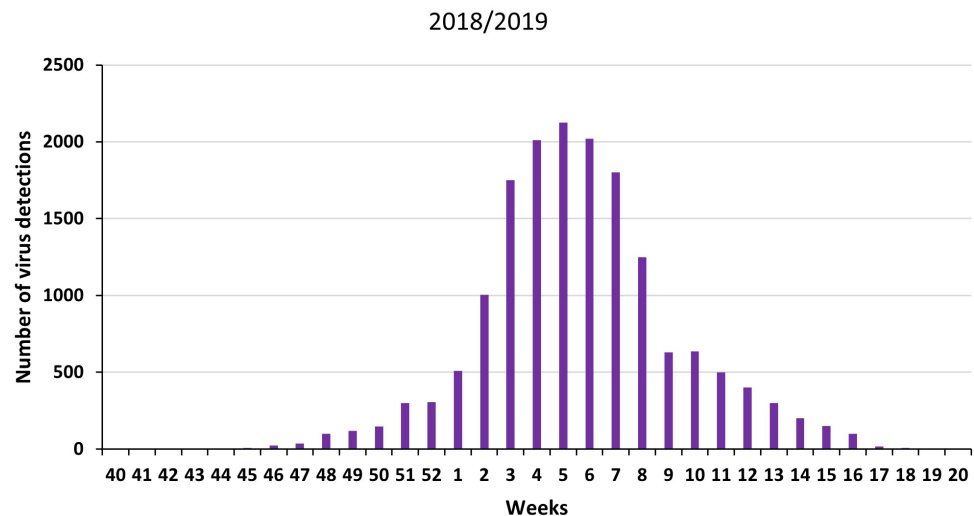


Figure 4. Number of virus detections by week in season 2017/2018.



**Figure 5.** Number of virus detections by week in season 2018/2019.

In **Figure 6** we observe the weekly virus incidence of the five seasons 2014/2015 to 2018/2019 preceding the COVID-19, and in **Figure 7**, the total number of virus incidences in those seasons, although the peak in season 2018/2019 was higher than the peaks of the other seasons (see **Figure 6**), the season 2017/2018 was considered the more severe, due to a greater total number of virus incidence (see **Figure 7**).

#### 4. The Influenza during and after the COVID-19 Pandemic

The first cases of infection for COVID-19 were detected in Wuhan, China in December 2019, the outbreak spread rapidly in the beginning of 2020 all around the world, and in March 2020, WHO declared COVID-19 a pandemic. Countries adopted circulation restrictions, with public health measures implemented to reduce transmission and all society started changing their habit contacts. We can observe that these was reflected in the influenza season 2019/2020, which has an earlier end in March of 2020, which is atypical and represented 7 weeks earlier than what was observed in the previous seasons. In that the season the influenza activity started in week 45/2019, peaked between weeks 52/2019 to 10/2020, and returned to the baseline levels in week 13/2020, see **Figure 8**.

Due to the impact of COVID-19, in which strong social restrictions and public health measures were adopted to reduce the transmission of SARS-Cov-2 virus, the influenza activity was very low in 2020/2021, with very few cases and with the number of infections detected decreasing more than 99%. Furthermore, none hospitalized cases were reported in Europe countries in this season, thus considering that the incidence number is on the baseline levels, we don't present the weekly infection graph for this season.

The season 2021/2022 represented the return of influenza activity, although in a very late onset and with a low activity compared with the seasons preceding COVID-19. These facts are consistent with the ongoing social and health measures

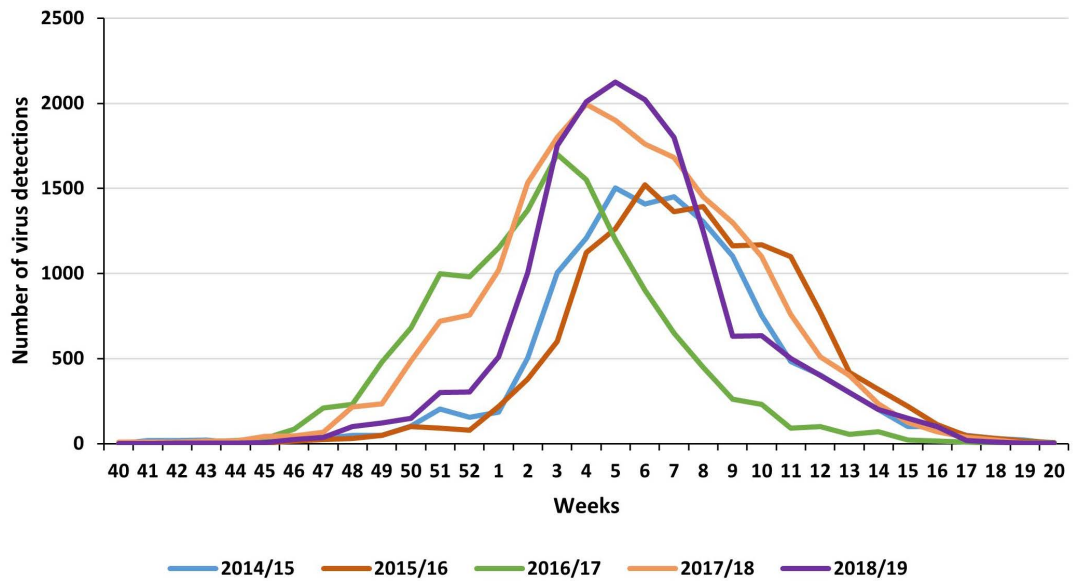


Figure 6. Number of virus detections by week from season 2014/2015 to 2018/2019.

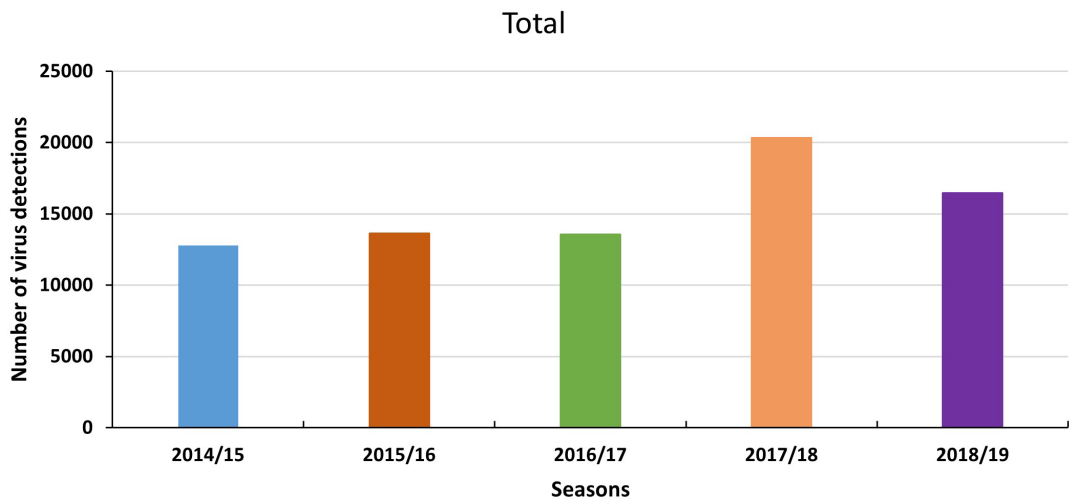


Figure 7. Total number of virus detections from season 2014/2015 to 2018/2019.

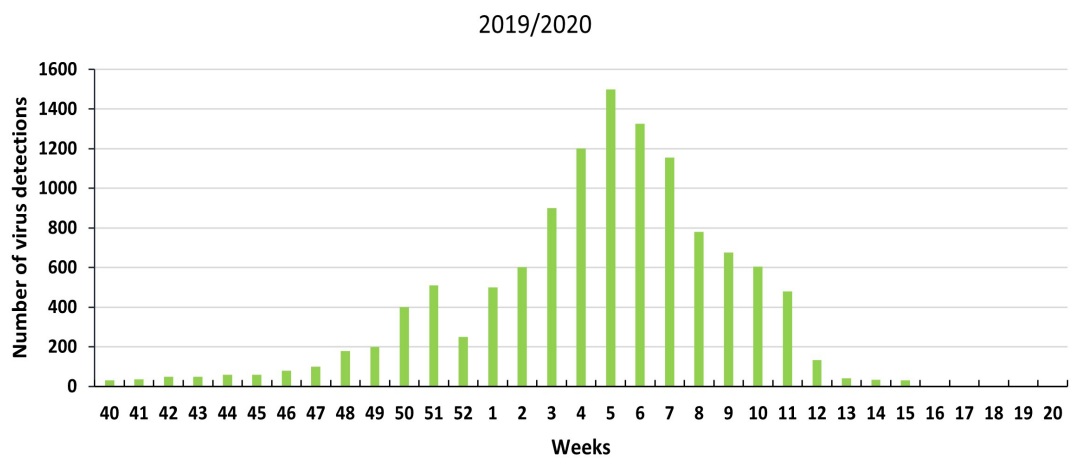


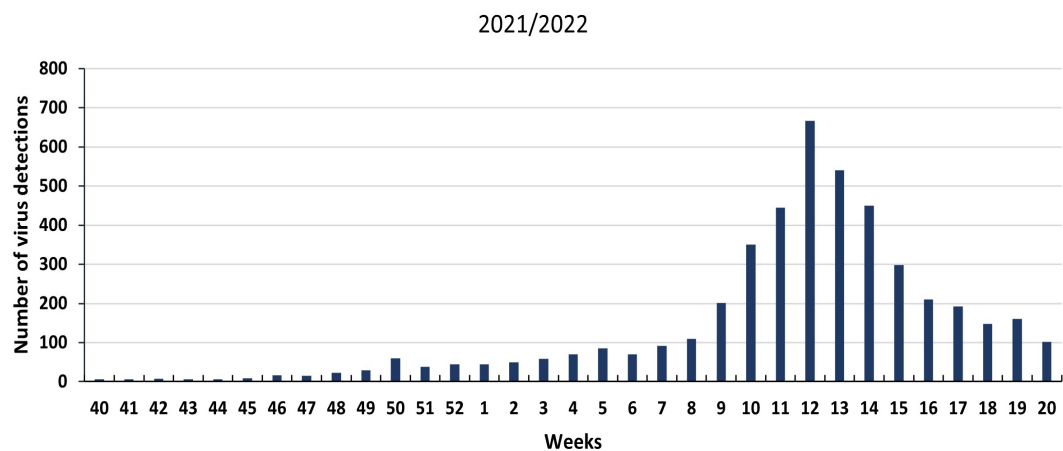
Figure 8. Number of virus detections by week in season 2019/2020.

against COVID-19 in the winter of 2021/2022. The influenza virus activity started in week 1/2022 and in week 20/2022 there was still some virus activity. The peak was from week 10/2022 to week 15/2022, see **Figure 9**.

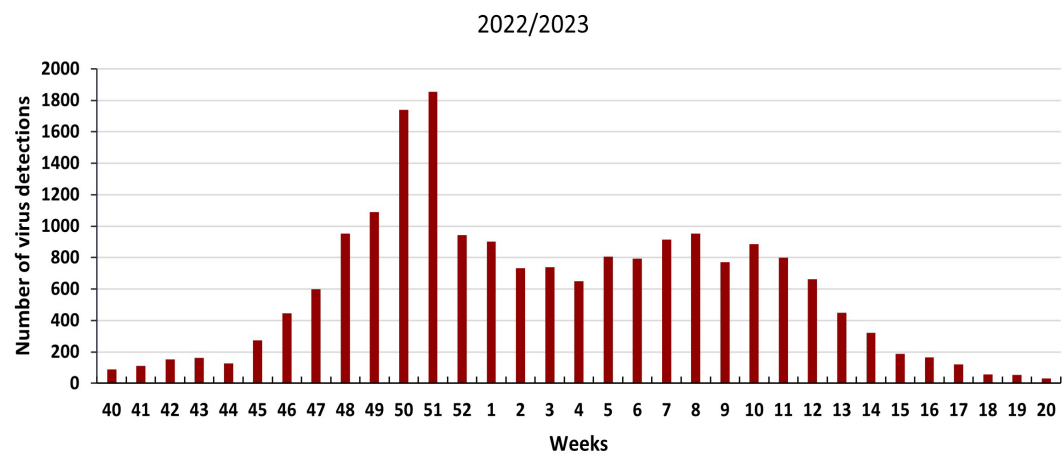
In the season 2022/2023 we had the return of the levels of a typical influenza season previous to COVID-19, with a relatively severe outbreak because the measures against COVID-19 were lifted and social contacts were like before. The influenza activity was present all through the season, with the peak appearing from week 48/2022 to week 3/2023, and this activity was high during more 10 weeks, see **Figure 10**.

The influenza activity of season 2023/2024 is being relatively mild. The influenza virus activity started in week 47/2023 and lasted until week 18/2024. The peak was from week 3/2024 to week 9/2024, see **Figure 11**.

In **Figure 12** we have a summary of the weekly influenza virus incidence of the last five seasons 2019/2020 to 2023/2024, and in **Figure 13**, the total number of virus incidences in these seasons, where we can observe that after two atypical seasons, 2020/2021 and 2021/2022, in season 2022/2023 we have the return of a typical influenza season.



**Figure 9.** Number of virus detections by week in season 2021/2022.



**Figure 10.** Number of virus detections by week in season 2022/2023.

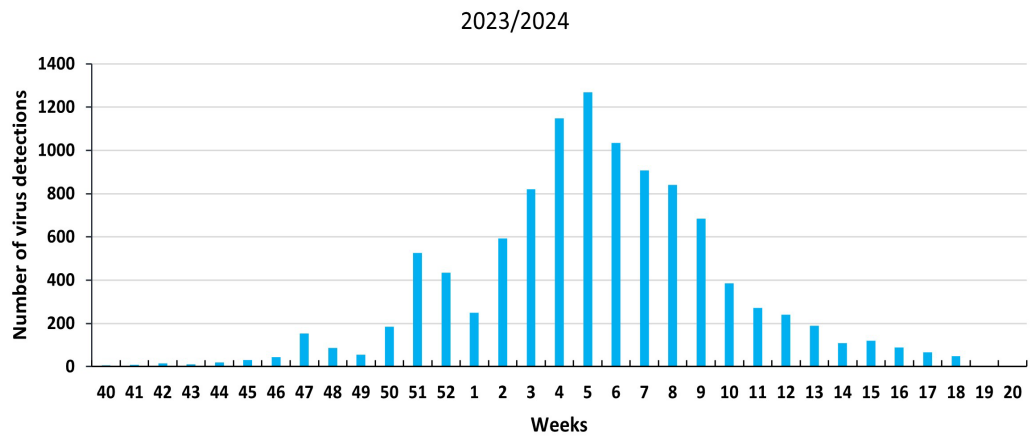


Figure 11. Number of virus detections by week in season 2023/2024.

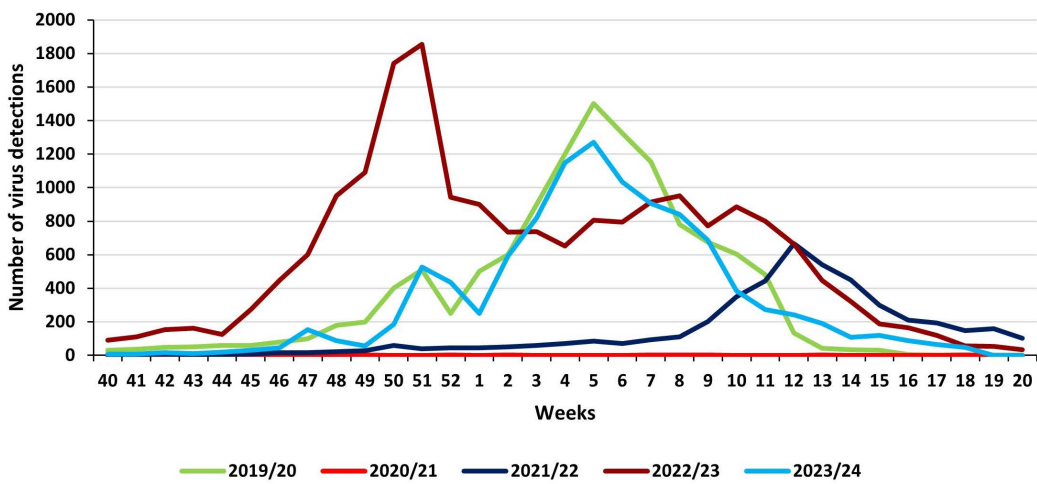


Figure 12. Number of virus detections by week from season 2019/2020 to 2023/2024.

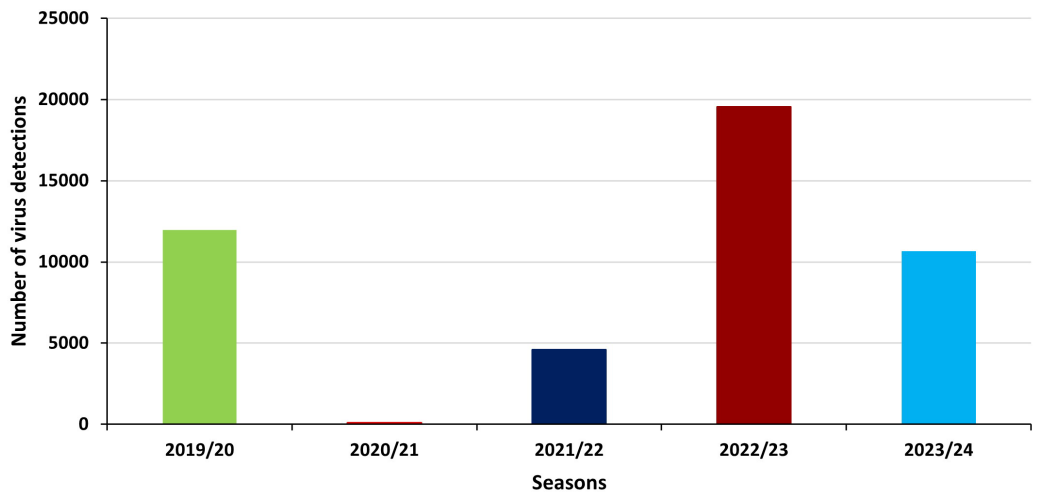
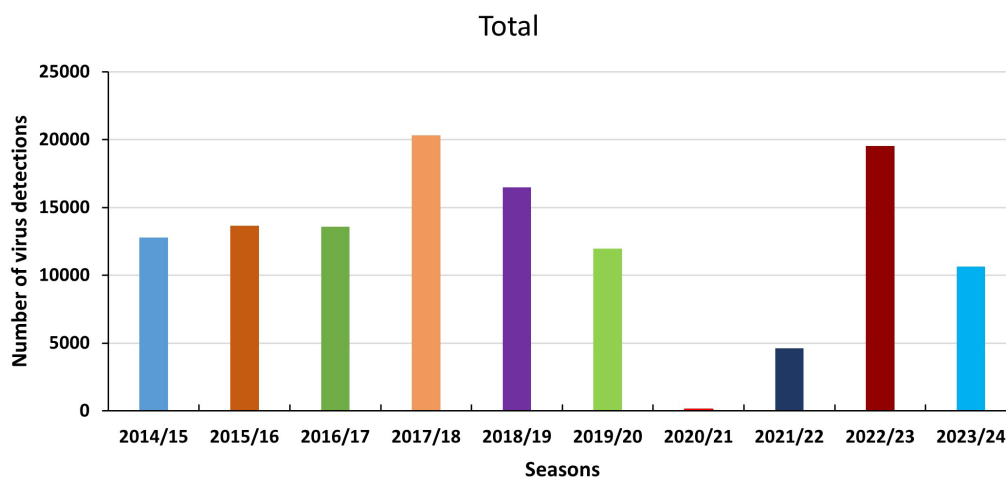


Figure 13. Total number of virus detections from season 2019/2020 to 2023/2024.

Finally, we present in **Figure 14** the total numbers of the influenza virus incidence of the seasons from 2014/2015 to 2023/2024.





**Figure 14.** Total number of virus detections from season 2014/2015 to 2023/2024.

## 5. Conclusion

Pandemic COVID-19 was a major concern for all society in all of its segments. For two years the world shut down and this was reflected directly and indirectly in the way that people live. The impact of COVID-19 on influenza, the most common seasonal disease, was great during the period of COVID-19 since we virtually didn't have influenza epidemics. After those two years society started to return to its normal life, and social habits and gatherings also restarted, including personal contacts and thus the spread of contagious diseases.

We presented how these facts affected the incidence of influenza virus in EU/EAA before, during and after COVID-19. In the season of 2020/2021, we had no influenza epidemic, and in the succeeding seasons, we observed in 2021-2022 the return of influenza virus activity. The 2022/2023 and 2023/2024 influenza seasons marked the return of influenza virus activity at almost pre-pandemic levels. Only by observing more seasons in the coming years it will be possible to obtain a more accurate conclusion of the impact of COVID-19 on influenza.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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