



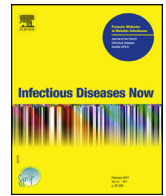
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Short communication

Bronchiolitis epidemics in France during the SARS-CoV-2 pandemic: The 2020–2021 and 2021–2022 seasons



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ABSTRACT

Objectives: We described bronchiolitis epidemics during the 2020–2021 and 2021–2022 seasons in France and their interaction with the COVID outbreak.

Patients and methods: Data on family physician (FP) visits, emergency department (ED) visits, hospitalizations for bronchiolitis for children < 2 years, and hospital virological data were analyzed and compared with previous seasons (2015–2020).

Results: The 2020–2021 epidemic arrived very late, and its impact was lower than in previous seasons (2015–2020) (FP visits: –23%, ED visits: –38%, and hospitalizations: –30%). The 2021–2022 epidemic started early (week 40) and lasted for a relatively long time (13 weeks). The impact was higher than in 2015–2020 (FP visits: +13%, ED visits: +34%, hospitalizations: +28%).

Conclusion: Findings from the 2020–2021 epidemic may be linked to the implementation of non-pharmaceutical COVID-19 prevention measures. For 2021–2022, findings may be linked to an “immunity debt” resulting from the lower impact of the previous season.

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Abréviations

RSV Respiratory syncytial virus
 NPI non-pharmaceutical interventions
 FP Family physician
 ED emergency department

1. Introduction

Bronchiolitis affects children under two years old during seasonal epidemics. The respiratory syncytial virus (RSV) is mainly implicated in the disease. The 2020 SARS-CoV-2 pandemic triggered non-pharmaceutical interventions (NPI) including social

distancing, lockdowns, curfews, school closures, and use of facial masks. These measures reduced SARS-CoV-2 and other respiratory virus transmission, including RSV and influenza [1,2].

This communication describes bronchiolitis epidemics in children under two years old during the 2020–2021 and 2021–2022 seasons in mainland France and compares them with previous epidemics.

2. Methods

2.1. Data

Bronchiolitis surveillance in France is coordinated by the French national public health agency (*Santé publique France*), and is based on data from: i) family physicians (FP) from the *SOS Médecins* network (61 associations and over 1,300 FPs); ii) emergency departments (ED) from the Oscour Network (approximately 700, representing 93.3% of all-cause ED visits in France) [3]; and iii)

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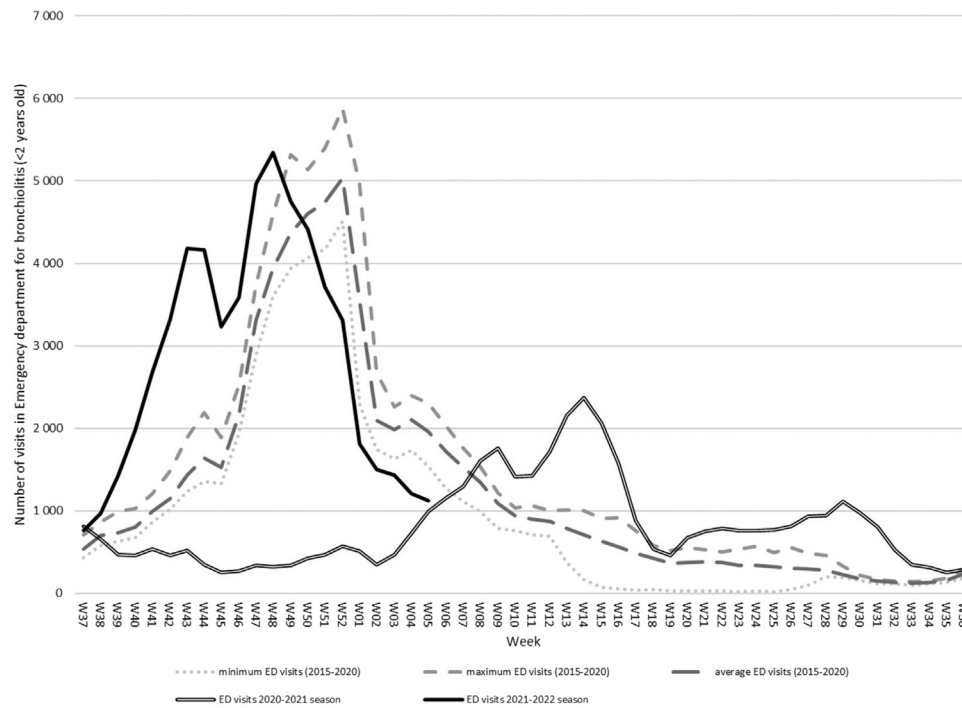


Fig. 1. Emergency department (ED) visits for acute bronchiolitis, children under two years of age (619 hospitals), mainland France, 2015–2022.

virological data on hospitalized patients from the Renal Network (38 university and regional hospitals).

Daily ED data from computerized medical records include ED visits and post-ED hospitalizations for bronchiolitis in children under two years old. Bronchiolitis case definitions used for FP and ED visits are described elsewhere [4]. Data on SARS-CoV-2 infection (using the ICD-10-CM definition) associated with diagnosed bronchiolitis are also collected. The Renal Network provides weekly virological data, including RSV test results (by nucleic acid amplification).

2.2. Theory

The national epidemic threshold calculation fits three time-series models (periodic regression, robust periodic regression, Markov models) to the weekly numbers of bronchiolitis cases reported during the previous five seasons. A statistical alarm is generated when the number of cases exceeds the 95% prediction limit. An epidemic phase is declared when at least one alarm is generated for both Oscore and SOS Médecins data, or at least two alarms for Oscore data [5,6].

We compared the following data for the 2020–2021 and 2021–2022 epidemics with data from the five previous seasons (2015–2020, reference) for bronchiolitis in children under two years old: the epidemic start and end times, its duration, the number of FP visits, ED visits and post-ED hospitalizations (number, range, average, and proportions of FP visits, ED visits and hospitalizations for bronchiolitis compared to all-cause visits or hospitalizations), and finally, the percentage of RSV-positive tests among all tests for hospitalized patients.

We took into account the 60 SOS Médecins units and 619 EDs that continuously participated throughout the monitoring period.

3. Results

In mainland France, the temporality of the seasonal bronchiolitis epidemic is very regular. It usually begins in mid-November (W46,

range: [W44–W46]), reaches a peak in December [W48–W52] and finishes at the end of January (W04 [W01–W07]). Average duration is therefore 11.4 weeks [10–14 weeks].

The 2020–2021 bronchiolitis epidemic started on W07/2021 (mid-February), 13 weeks later than the reference seasons. It peaked on W13 (end of March) and ended on W16 (mid-April) after 10 weeks. A second statistical alarm was observed from W20 to W31 (mid-May to early August) after a full epidemic duration of 22 weeks. From W08 to W17 and from W20 to W36, the weekly numbers of FP visits, ED visits and hospitalizations were higher or close to the highest values of reference seasons for the same weeks (Figs. 1–3).

During the epidemic period, the impact on children under 2 years old was lower than the average values of reference seasons in terms of the number of FP visits (5,146 vs. 6,689 [range: 5,685–7,577]; –23%), ED visits (27,488 vs. 38,362 [34,632–44,160]; –38%), and hospitalizations for bronchiolitis (11,229 vs. 14,301 [12,525–16,017]; –30%). The hospitalization rate increased slightly (0.41 vs. 0.39 [0.36–0.39], +10%). The percentages of visits and hospitalizations for bronchiolitis among all-cause visits and hospitalizations, respectively, were lower than the average values for the reference seasons (FP visits: 4.3% vs. 8.2% [7.8–8.9], –47%; ED visits: 6.8% vs. 12.6% [11.7–14.8], –46%; hospitalizations: 18.4% vs. 29.6% [27.3–33.0], –38%). This was in a context where FP and ED all-cause visits and hospitalizations increased (+46%, +32%, +26%) because of the SARS-COV-2 pandemic.

Among the 1,959 ED visits for bronchiolitis with an associated diagnosis described, 38 (1.9%) were diagnosed with COVID-19.

The percentage of RSV-positive tests in the Renal Network rose from 7% in W07 to 11% in W13, and was 5% in both W20/2021 and W31/2021 (Fig. 3). It remained lower than the maximum value observed during the reference seasons (39% in W50/2015).

The 2021–2022 bronchiolitis epidemic started in W40/2021 (beginning of October), six weeks earlier than reference seasons, peaked in W48, and ended in W01/2022. The weekly numbers of FP visits, ED visits and of hospitalizations for bronchiolitis during the first weeks were higher than those in the reference seasons for

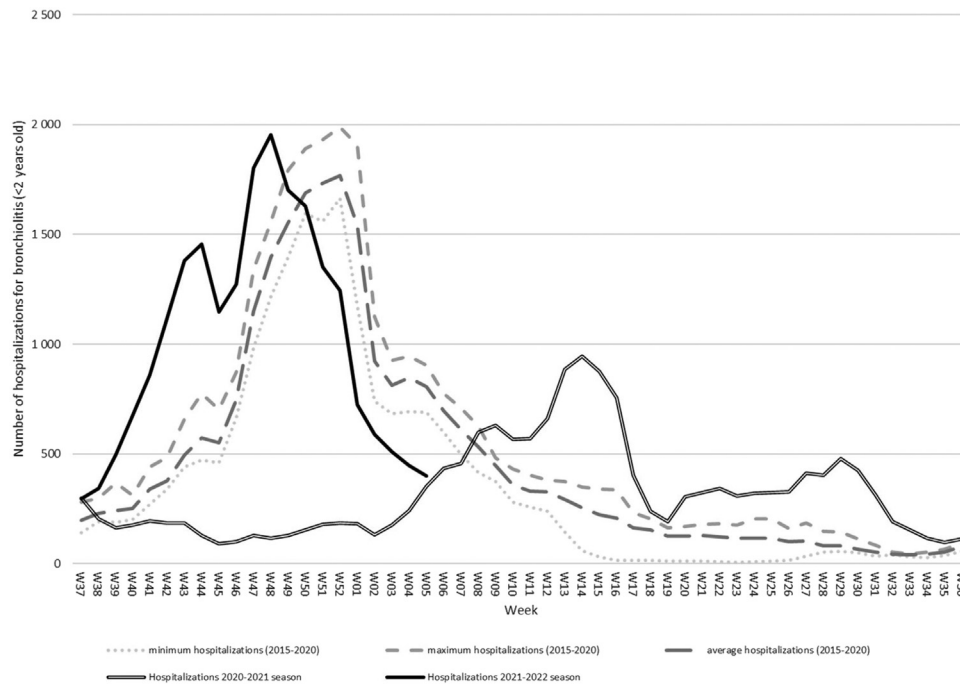


Fig. 2. Hospitalization for acute bronchiolitis in France, children under two years of age (619 hospitals), mainland France, 2015–2022.

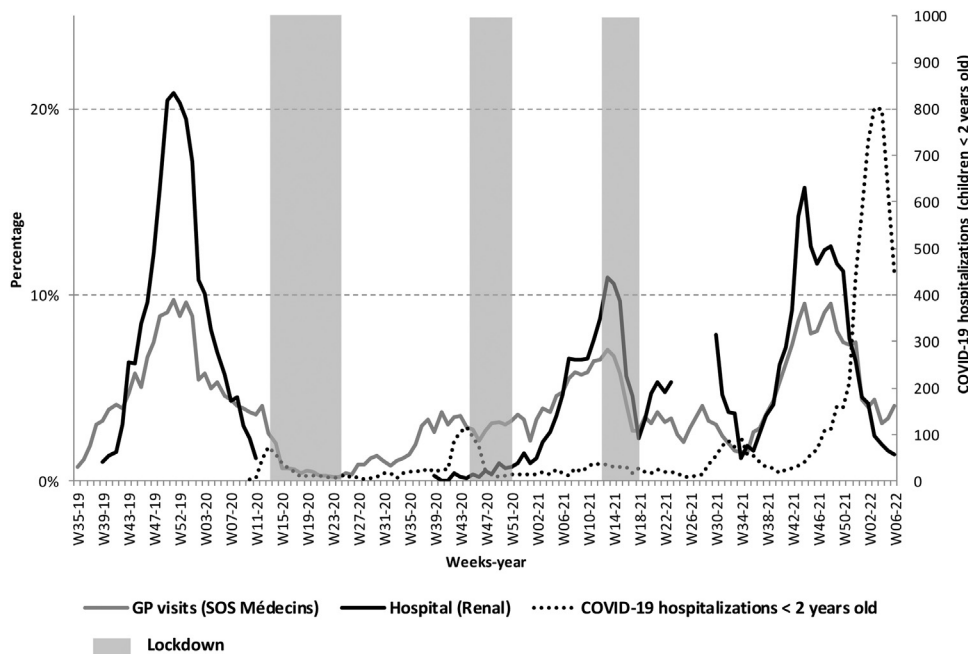


Fig. 3. Percentage of hospital (Renal Laboratory Network) positive tests for respiratory syncytial virus, all ages, percentage of FP visits for bronchiolitis (SOS Médecins), COVID-19 hospitalizations in children under 2 years of age, and lockdown period, France, Week 38/2019 – week 06/2022.

the same period, but lower than or close to the maximum values observed (Figs. 1–3).

During the epidemic period (13 weeks), the impact was higher than the average values of the reference seasons (FP visits: 7,551 vs. 6,689; +13%, ED visits: 51,444 vs. 38,362; +34%, hospitalizations: 18,315 vs. 14,301; +28%). The hospitalization rate remained stable (0.36 vs. 0.39; –5%). The percentages of ED visits and hospitalizations for bronchiolitis among all-cause visits and hospitalizations, respectively, during the epidemic were higher than the average values for the reference seasons (ED visits: 13.2% vs. 12.6%; +5%, hospitalizations: 32.0% vs. 29.6%; +8%), and the percentage of FP visits was lower (7.3% vs. 8.2%; –11%). All-cause visits increased

because of the ongoing SARS-COV-2 pandemic (FP visits: +26%, ED visits: +28%, hospitalizations: +18%).

Among the 15,059 ED visits for bronchiolitis with associated diagnoses described, 63 (0.4%) were diagnosed with COVID-19.

During the 2021–2022 epidemic, the percentage of RSV tests rose from 6% in W40 to 16% in W44, but remained lower than the highest percentages observed in the reference seasons.

4. Discussion

The 2020–2021 bronchiolitis epidemic in France occurred very late. For children under two years old, its impact was lower than

in reference seasons (2015–2022) in terms of FP visits (–23%), ED visits (–38%), and hospitalizations for bronchiolitis (–30%). From mid-March (W12) to mid-May 2020 (W20), a strict lockdown was implemented to reduce the spread of SARS-CoV-2. This included closing schools and daycare centers [7]. During the second lockdown (W44/2020 to W51/2020), schools and daycare centers were open but wearing a face mask was mandatory for children over six years old from November 2020 [8]. As reported elsewhere, personal NPI in the COVID-19 era have greatly modified the natural epidemic course of RSV [2,9–12]. Our results suggest that COVID-19-related hygiene measures implemented by older children and adults are effective in reducing RSV infections in children under two years old, and should be promoted in the future even after the current COVID-19 pandemic.

The relatively small epidemic in 2020–2021 was likely to result in an increase in the proportion of RSV-susceptible children, creating an “immunity debt” [9]. Thereby, experts suggested that RSV epidemics to come might be of greater magnitude [11,13].

The 2021–2022 bronchiolitis epidemic in France started early, beginning when adherence to COVID-19 NPI was declining [14]. The epidemic was long, with maximum weekly numbers of ED visits and hospitalizations close to the highest values observed in the reference seasons (2015–2020). The hospitalization rate was not higher than in the reference seasons. The early epidemic start was reported in several countries, although a stronger impact was not systematically reported [15–17]. The stronger impact observed in France could be at least partly linked to an “immunity debt” resulting from the low epidemic impact during the 2020–2021 season. The differing impacts in the two seasons counterbalanced each other (2021–2022: FP visits: +13%, ED visits: +34%, hospitalizations: +28% in 2021–2022 vs. –23%, –38%, –30% in 2020–2021), which could suggest that the immunity debt was compensated in 2022.

Viral interference is one hypothesis to explain the low RSV circulation during the 2020–2021 season, also reported for other viruses [11,18]. More specifically, in France, while the 2021–2022 bronchiolitis epidemic coincided with the fifth wave of SARS-CoV-2 infections in November 2021 due to the Delta variant, its decline in December 2021 coincided with a very strong SARS-CoV-2 infections wave due to the Omicron variant (Fig. 3) [19].

SARS-CoV-2 may cause bronchiolitis requiring hospitalization [20]. It cannot be excluded that cases of bronchiolitis reported in children under two years of age were linked to the concomitant circulation of SARS-CoV-2. However, the percentage of COVID-19 diagnoses associated with bronchiolitis diagnoses in our surveillance data was very low (2020–2021: 1.9% and 2021–2022: 0.4%).

5. Conclusion

The limited impact of the 2020–2021 bronchiolitis epidemic in France was certainly related to the implementation of personal NPI against COVID-19 by older children and adults. This result advocates the strengthening of hygiene measures for people in contact with youngest children during future seasonal epidemics.

The higher impact of the 2021–2022 bronchiolitis epidemic may be at least partly related to the “immunity debt” which resulted from the low impact of the 2020–2021 epidemic. The differing impacts during the two epidemics could suggest that such debt was counterbalanced in 2022.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the 1964 Helsinki declaration and its later amendments.

Contribution of authors

Sophie Vaux designed the study, analyzed the data, wrote and reviewed the article. Cécile Forgeot and Isabelle Pontais designed the study, collected the data and reviewed the article. Delphine Viriot, Yann Savitch and Isabelle Parent du Chatelet designed the study and reviewed the article. Agnès Barondeau-Leuret, Serge Smadja, Martine Valette and Vincent Enouf collected the data and reviewed the article.

Disclosure of interest

The authors declare that they have no competing interest.

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