

The impact of COVID-19 public health measures on detections of influenza and respiratory syncytial virus in children during the 2020 Australian winter

Daniel K. Yeoh^{1,2*}, David A. Foley^{1*}, Cara A. Minney-Smith³, Andrew C. Martin⁴, Ariel O. Mace^{4,5,7},
Chisha T. Sikazwe^{3,6}, Huong Le⁷, Avram Levy^{3,6}, Christopher C. Blyth^{1,3,7,8}, Hannah C. Moore⁷

- 1) Infectious Diseases Department, Perth Children's Hospital, Perth, Australia
- 2) Sir Peter MacCallum Department of Oncology, University of Melbourne, Parkville, Victoria
- 3) Department of Microbiology, PathWest Laboratory Medicine WA, Perth, Australia
- 4) Department of General Paediatrics, Perth Children's Hospital, Perth, Australia
- 5) Department of General Paediatrics, Fiona Stanley Hospital, Perth, Australia
- 6) Faculty of Health and Medical Sciences, University of Western Australia, Perth, Australia
- 7) Wesfarmers Centre for Vaccines and Infectious Diseases, Telethon Kids Institute, University of Western Australia, Perth, Australia
- 8) School of Medicine, University of Western Australia, Perth, Australia
- 9)

*D.K.Y. and D.A.F. contributed equally to this manuscript

Corresponding Author:

Daniel K. Yeoh

Department of Infectious Diseases

Perth Children's Hospital, 15 Hospital Avenue, Perth

Western Australia 6009, Australia

Phone: +618 6456 2222

Email: daniel.yeoh@health.wa.gov.au

Abstract

Public health measures during the COVID-19 pandemic have potential to impact transmission of other respiratory viruses. We found 98.0% and 99.4% reductions in RSV and influenza detections respectively in Western Australian children through winter 2020; despite reopening of schools. Border closures have likely been important in limiting introductions from abroad.

Keywords:

influenza; RSV; COVID-19; southern hemisphere; children

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Introduction

Coronavirus disease (COVID-19) has had a profound impact in 2020 with a broad range of public health measures implemented regionally, targeted at controlling transmission of severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2). Interventions have included physical distancing, stay-at-home orders, school closures, travel restrictions and border closures; measures not specific to SARS-CoV-2, therefore providing potential to impact transmission of other respiratory viruses. The initiation of COVID-19 restrictions in the Northern hemisphere coincided with the end of winter, with some reports documenting a concurrent early end to local influenza and respiratory syncytial virus (RSV) seasons.(1, 2) In contrast, restrictions in Australia were implemented just prior to the Southern hemisphere winter, the usual period of peak local RSV and influenza infections.(3)

Western Australia (WA) covers the western third of Australia, with a population of 2.64 million, of which the majority are concentrated in a single metropolitan area.(4) WA has experienced minimal local transmission of SARS-CoV-2 with the majority of cases (562/655) linked to international travel. Community SARS-CoV-2 transmission has been absent since the end of April 2020,(5) allowing a staged relaxation of lockdown measures whilst WA state borders to international and inter-state travellers have remained closed.

As yet there are limited data describing the impact of COVID-19 restrictions on influenza and RSV transmission through the Southern hemisphere winter. In addition, the combination of relaxation of internal COVID-19 restrictions in WA and ongoing border closures represent a unique setting to observe the relative impact of these measures on influenza and RSV activity. We aim here to describe the weekly detections of paediatric RSV and influenza through winter 2020 in WA, compared to the previous eight seasons in the context of local COVID-19 restrictions.

Methods

Laboratory data were prospectively collected as part of routine regional public health surveillance, collated per week, from January 2012 to 30th August 2020. Cases were defined as detections of influenza or RSV by validated nucleic acid or antigen detection kits in children (<16 years of age) resident in the metropolitan area. Laboratory results were provided by PathWest Laboratory Medicine, the only public pathology provider to the state servicing all but three hospitals admitting paediatric patients in WA. Samples were drawn from all public hospitals and emergency departments. Average epidemic curves for the period 2012 to 2019 were calculated using a World Health Organisation (WHO) described method.(6)

Timeline of public health measures

As part of a national response, the international border was closed to non-residents on the 20th March (week 12). On the 6th April (week 15) the WA state border was closed to other Australian states. Borders remain closed at the time of writing. Exemptions are required to enter from interstate, and mandatory quarantine of all arrivals for 14 days is required.(7)

State-wide stay-at-home restrictions were in place from 29th March to 27th April with a concurrent extended school holiday period (week 14-17 – Figure 1: Period 1). From 27th April restrictions were sequentially lifted; schools were reopened on the 29th April with increased cleaning and some physical distancing measures (week 18-26 - Figure 1: Period 2). From 27th June to present (week 27 onwards, Figure 1: Period 3), whilst physical distancing and respiratory hygiene continue to be encouraged, the majority of local restrictions have been removed, except the limitation of major sport and entertainment venues to 50 percent capacity; schools have returned to all normal activities with no limits on size of student gatherings.(7)

Results

In the period 2012-2019, the annual number of RSV cases ranged from 532 to 707 (mean = 629 cases), with the median epidemic peak occurring in week 27. For influenza, annual cases ranged from 134 to 498 (mean = 278 cases), with the median epidemic peak occurring in week 34 (Figure 1).

For the first 13 weeks of 2020, prior to local COVID-19 restrictions, RSV (n=29) and influenza (n=24) detections were comparable to the average of previous seasons (Figure 1). Following the initiation of local COVID-19 restrictions in week 14, influenza and RSV activity declined and remained very low relative to previous seasons, even following the sequential relaxation of local COVID-19 restrictions. A total of 10 cases of RSV and 1 case of influenza were detected from week 14 to 35. Compared with average detections from weeks 14 to 35 in pre-pandemic years, RSV detections were 98.0% lower and influenza detections 99.4% lower.

The total number of samples tested in 2020 was higher than previous seasons, thus the percentage positive of tests for RSV (0.28%) and influenza (0.03%) for the period from week 14 to 35 were substantially lower than previous seasons (2012-2019 range for RSV: 23.3%-30.4%; for influenza: 3.6%-16.4%).

Discussion

The initial public health measures implemented in WA likely facilitated rapid control of SARS-CoV-2 transmission. The implementation of these measures coincided with the period leading into winter, when RSV and influenza detections peak locally. Early regional reports from Australia indicated an initial decline in respiratory virus detection(8) and related hospital admissions(9) immediately following the implementation of COVID-19 restrictions. We observed a similar initial reduction in RSV and influenza detections amongst Western Australian children followed by a near complete absence over the subsequent four months, confirming that low RSV and influenza activity has been sustained in WA throughout the winter period (week 23-35).

Earlier reports from the northern hemisphere attributed the observed shortening of influenza and RSV seasons to the implementation of local COVID-19 restrictions.(1, 2) We observed persistent low influenza and RSV activity, even following the relaxation of local COVID-19 restrictions; indicating international and perhaps to a lesser extent, national, border restrictions may have played an important role by preventing external introductions of these viruses. In WA, schools reopened in late April; attendance was >85% by mid-May.(10) School aged children are recognised to play a central role in the transmission of both influenza and RSV.(11, 12) At the time of writing, schools have remained open at almost full capacity for 4 months without a notable increase in RSV and influenza detections. Although physical distancing and improved hygiene are likely contributing factors,(13) the scarcity of RSV and influenza cases is consistent with the absence of a sizeable local reservoir.

It has been hypothesised that changes in health-seeking behaviour in the setting of COVID-19 restrictions may have contributed to observed reductions in influenza and RSV activity. (9) (14)

Notably, in our data the percentage positive of tests collected, a frequently used marker for under-detection, remained very low for influenza and RSV throughout the winter period in 2020.

Furthermore, a relative return to normal health-seeking behaviour would be anticipated in WA in the absence of local SARS-CoV-2 transmission and relaxation of local restrictions. The persistence of low RSV and influenza activity in this setting is likely consistent with a true lack of local infections.

There are wide-ranging potential implications of the observed low RSV and influenza activity. For RSV, with a large cohort of immunologically naïve children and low-level local transmission, a delayed peak may yet be observed. Alternatively, the following RSV season may be larger than previous years, with greater morbidity across age ranges. Considering the year to year variation in influenza peak and rate of infections, and the absence of clear ongoing transmission currently, it is uncertain whether a delayed local influenza season will occur this year. Similar to RSV, a reduction in population immunity related to current reduced influenza transmission may render the population more vulnerable in the following season. Considering the broader reduction in southern hemisphere influenza detections evident in WHO surveillance data,(14) together with the likely persistence of some travel restrictions, the northern hemisphere may experience a similarly attenuated influenza

season in the coming winter, although protective local COVID-19 restrictions will likely have lifted in some regions. Conversely, influenza vaccine development may be hampered by a lack of southern hemisphere reference samples limiting the ability to predict potential circulating strains.

A relative strength of this study is its utilisation of data collated as part of existing surveillance activities, ongoing prior to the emergence of COVID-19. In addition, the elimination of local SARS-CoV-2 transmission with resultant relaxation of restrictions including the reopening of schools is relatively unique to WA, facilitating the assessment of the relative impact of initial local restrictions and ongoing border closures on viral detections.

Our analysis does not include hospital admission data. As our surveillance data is drawn from hospitals and emergency departments, we cannot completely exclude that changes in health-seeking behaviour related to COVID-19 may have impacted viral detections in 2020. We are now planning to assess paediatric emergency department and hospital admission data for overall health service utilisation patterns by diagnosis and age group to examine the broader impact of COVID-19 restrictions.

Following implementation of COVID-19 restrictions just prior to winter, RSV and influenza activity has remained low in WA even following relaxation of internal restrictions. This is likely due to the impact of closure of external borders and the resultant prevention of viral introductions. The impact of reduced local RSV and influenza activity on the Northern Hemisphere winter season and future local seasons remains uncertain and warrants ongoing surveillance.

Notes

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Potential conflicts of interest.

All authors: No reported conflicts of interest.

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Figure 1 Legend:

Title: Figure 1 - (a) Respiratory syncytial virus and (b) Influenza detections in children from metropolitan Western Australian to the end of winter 2020 in the context of COVID-19 restrictions compared to average epidemic curve (2012-2019)

Borders Closed – week 12 – international borders closed to all non-residents; 14-day quarantine required for all arrivals

Period 1 - week 14 to 17 - State-wide stay-at-home restrictions in place with school holidays extended; borders closed to inter-state travellers (week 14)

Period 2 - week 18 to 26 - restrictions sequentially lifted, allowing gatherings of 10 (week 18), 20 (week 21) and 100 (week 24) people; schools reopened with increased cleaning and some physical distancing measures.

Period 3 - week 27 to 35 - majority of local restrictions removed, except the limitation of major sport and entertainment venues to 50 percent capacity; schools returned to all normal activities.

EYTD – End of year to date

Average epidemic curve – 2012-2019

Figure 1(a): Respiratory Syncytial Virus

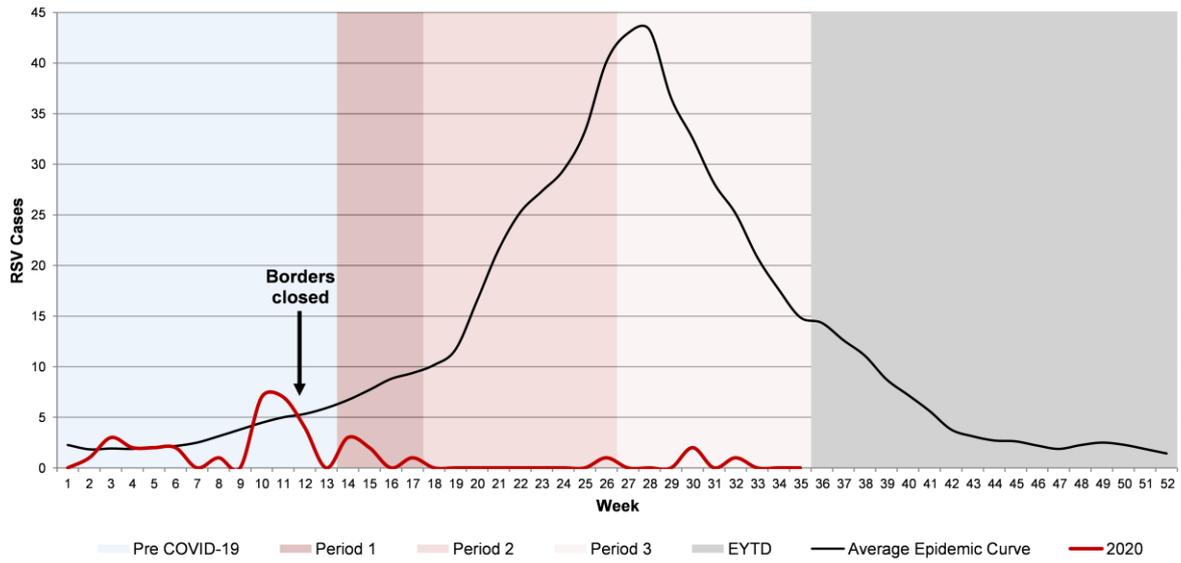
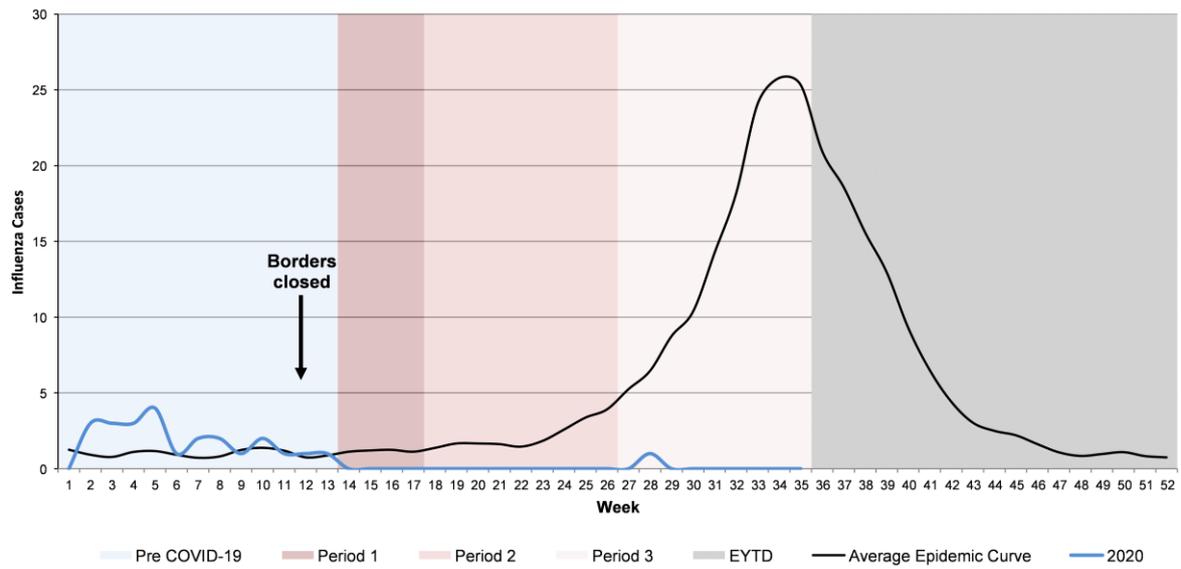


Figure 1(b): Influenza



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