

Changing Epidemiology of Respiratory Syncytial Virus in Australia - delayed re-emergence in Victoria compared to WA/NSW after prolonged lock-down for COVID-19

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Dear editor,

we read with interest the winter suppression of respiratory syncytial virus (RSV) in Western Australia (WA) reported by Yeoh et al [1], with a spring and summer surge commencing in September-October 2020 [2], similar to reports in New South Wales (NSW), Australia [3]. We have observed a similar but delayed RSV resurgence in Melbourne, Australia. We report RSV surveillance data in children 2 years and younger from The Royal Children's Hospital (RCH) in Melbourne, Victoria, the largest tertiary paediatric hospital in the state. Data were collected from 29 May 2017 to 28 February 2021. RSV was detected on nasopharyngeal and/or oropharyngeal samples using reverse transcription polymerase chain reaction (RT-PCR).

COVID-19 public health measures in Australia are mainly jurisdiction-based and WA's border remained closed to Victoria for most of 2020. Victoria experienced more intense restrictions than all other Australian states throughout 2020 due to higher rates of COVID-19 community transmission. Notably, Victoria's schools were closed for 4 months compared with WA's single week. Unlike WA and NSW, masks were mandated in all public places in Victoria, visitors to the home were banned, night-time curfew and travel restrictions were in place, with gradual easing from September. All jurisdictions had mandatory hotel quarantine for international arrivals and Victoria ceased their international intake completely from July until December [4].

Similar to WA and NSW, RSV infections were suppressed in Victoria throughout winter 2020 (week 22-35, Figure 1). Beginning late January 2021 (week 4, Figure 1) we observed a delayed surge in RSV, comparable to that in WA and NSW in late 2020. Furthermore, the percentage of RSV positive tests across all ages in February 2021 (32.8%) exceeded the pre-COVID mean winter peak (30.4%) and the February average (5.6%) for the 3-year period prior. A 2.9-fold increase in hospital admissions and a 3.1-fold increase in intensive care unit admissions for bronchiolitis were observed in February 2021, when compared to the February average across 2017-2020. Our median age of positive cases in 2021 was 13.2 months (11.4 months in 2017-2019). The majority of RSV viruses in our outbreak were RSV-A subtype with only sporadic RSV-B detected.

The reasons for the delayed surge in RSV cases in Victoria compared to WA and NSW is unclear. Victoria's surge coincided with the late January school return following the summer holiday break. However, we did not experience a similar surge when school returned in early June or mid-October, in both instances after months of public-health mandated closure. WA maintained open schools throughout the majority of 2020 and still suppressed their winter surge. It is possible that the atypical surges resulted from interstate travel increasing over the school holiday period, less likely is international arrivals as we have strict hotel quarantine infection control measures. Molecular characterisation of circulating strains, currently underway, will determine the relatedness of strains and delineate transmission dynamics that may have underpinned the later surge in Victoria.

The late resurgence of RSV in Victoria compared to WA and NSW, highlights the effectiveness of COVID-19 public health measures against RSV as well as the epidemic potential of seasonal respiratory viruses after a pandemic. The fact that this surge occurred

in summer indicates that RSV seasonality may be less dependent on colder temperatures in winter and more dependent on behaviours that promote or mitigate viral transmission. As we are now heading towards winter in Australia, uncertainty regarding the trajectory of Victoria's current RSV surge has led to a decision to commence Palivizumab 2 months early at our institution. We anticipate that this data will help to inform health service preparedness as the Northern Hemisphere approaches their summer months, highlighting the potential susceptibility to a rapid resurgence of RSV, even if there has been little or no RSV during the winter season.

Potential conflicts of interest:

N.C. has received payments to their institution for RSV surveillance (WHO supported) and for travel and accommodation related to RSV surveillance meeting (WHO supported). K.M. was formerly a member of the DSMB for the global Novavax maternal immunization trial. D.F.W has received a theme research grant at Murdoch Children's Research Institute. All other authors have no potential conflicts to disclose.

References:

1. Yeoh DK, Foley DA, Minney-Smith CA, et al. The impact of COVID-19 public health measures on detections of influenza and respiratory syncytial virus in children during the 2020 Australian winter. *Clin Infect Dis* **2020**.
2. Foley DA, Yeoh DK, Minney-Smith CA, et al. The Interseasonal Resurgence of Respiratory Syncytial Virus in Australian Children Following the Reduction of Coronavirus Disease 2019-Related Public Health Measures. *Clin Infect Dis* **2021**.
3. Britton PN, Hu N, Saravanos G, et al. COVID-19 public health measures and respiratory syncytial virus. *Lancet Child Adolesc Health* **2020**; 4(11): e42-e3.
4. Department of Health and Human Services Victoria, Australia. Victoria's restriction levels. Available at: <https://www.dhhs.vic.gov.au/victorias-restriction-levels-covid-19> accessed 2/3/2021
5. Parliament of Australia - COVID-19 a chronology of state and territory government announcements. Available at: https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp2021/Chronologies/COVID-19StateTerritoryGovernmentAnnouncements#_Toc52275800

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Figure 1 Legend: The average number of RSV cases per week from 2017-2019 (blue line) and the absolute number of RSV detections during the COVID-19 pandemic (red line) in children 2 years and younger in relation to public health interventions in Victoria, Australia. Data shows a steep rise in RSV cases contemporaneous with relaxation of COVID-19 public health measures. Timing of the resurgence is delayed compared to NSW and WA.

Period 1: no restrictions; *Period 2*: Lock-down 1.0 - stay-at-home orders, school and university closures, borders closed to non-residents and mandatory hotel quarantine for returning residents, limits on gatherings; *Period 3* – restrictions eased; *Period 4* - Lock-down 2.0 - severe restrictions, stay-at-home orders, no international arrivals, mandatory masks, evening curfews, schools, universities and retail shops closed; *Period 5* - no international arrivals, restrictions easing, mandatory masks in certain settings, staged return of schools to onsite learning, some non-essential businesses re-open; *Period 6* - further easing of restrictions, international travel allowed from week 50, mandatory masks in certain indoor settings, easing of limits on gatherings, most businesses re-open, schools return to onsite learning (school holidays week 51-3). [4]

** The timing of public health measures listed here are approximate - source [5] and [4].

Figure 1

