COVID-19 public health measures and respiratory syncytial virus

In New South Wales (NSW), Australia, the public health response was highly effective in controlling the early phase of the COVID-19 pandemic.[1] During this time, clinicians reported fewer than expected presentations and admissions with acute respiratory illness to the Sydney Children's Hospitals Network (SCHN). Respiratory syncytial virus is among the most common viruses that cause hospitalisation in children and has predictable winter seasonality.[2] We aimed to quantify the change in frequency and burden of acute respiratory syncytial virus-associated illness presenting to SCHN, the largest provider of tertiary paediatric services in Australia, in 2020 compared with previous years.

We analysed three separate datasets from the SCHN electronic records from Jan 1, 2015, to June 30, 2020, in children younger than 16 years: (1) laboratory tests for respiratory syncytial virus by PCR; (2) hospital admissions for bronchiolitis coded by the ICD-10 Australian Modification (J21.0, J21.1, J21.8, and J21.9); and (3) emergency department attendances for acute respiratory illness coded by the Systematised Nomenclature of Medicine Clinical Terminology (appendix p 4). For each dataset, we plotted counts by month and did a time series analysis comparing the frequencies in the peak respiratory syncytial virus epidemic months (April–June) in 2020 with those in 2015–19.

We observed concurrent lower frequencies of respiratory syncytial virus (A and B) detection, admission to hospital for bronchiolitis, and emergency department attendance for acute respiratory illnesses (appendix p 1) in 2020 compared with preceding years. The observed mean frequency of respiratory syncytial virus detections from April to June, 2020, was 94·3% (SE 22·8) lower than predicted on the basis of the underlying trend of 2015–19 data (absolute reduced frequency per epidemic month [ARF] 99 [SE 24]; p=0·026). The observed mean frequency of bronchiolitis admissions was 85·9% (SE 15·2) lower than predicted (ARF 130 [SE 23]; p=0·011), and that of emergency department attendance was 70·8% (SE 16·3) lower than predicted (ARF 915 [SE 211]; p=0·023; appendix pp 2, 3). We also observed an 89·1% (SE 32·7) reduction in bronchiolitis admissions to the intensive care unit (ARF 16 [SE 6]; p=0·074). The reduction in respiratory syncytial virus detections cannot be accounted for by reduced testing because the number of tests done in 2020 was double the number done in previous years (data not shown).

The aggressive public health interventions aimed at preventing severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission has created a natural experiment of their effect on respiratory syncytial virus-associated illness and other communicable diseases. Here, we show a strong association between the implementation of these measures and the burden of respiratory syncytial virus disease among children in Sydney, NSW. Given that handwashing and isolation are known to affect nosocomial respiratory syncytial virus transmission, some effect might have been expected,[3] but the size of the apparent impact at a population level is startling. Respiratory syncytial virus is one of the most burdensome viruses globally, and bronchiolitis (up to 80% of which is caused by respiratory syncytial virus) is a leading cause of hospital admission in young children.[4,5] Efforts to develop vaccines and other preventive measures to address this considerable burden remain unfulfilled. Australians reported a very high uptake (>84%) of enhanced hygiene and physical distancing measures in March, 2020.[6] Handwashing damages the lipid envelope that surrounds respiratory syncytial virus, thereby impairing its ability to infect host cells.

Population lockdowns are justifiable to contain transmission of high lethality pandemics but are undesirable due to their wider negative impacts on society. The observation we report here should prompt deeper analysis to identify which components of the public health intervention were most effective for preventing respiratory syncytial virus infection in 2020, and prompt a discussion about which interventions, such as those described by Dalton and colleagues,[7] might be sustainable for future primary prevention of seasonal respiratory disease in children. School closures in NSW occurred for a brief period (March 23–April 29, 2020; appendix p 1), and early childhood education centres remained open throughout this period, although attendance rates decreased. Mask wearing was neither recommended, nor practised widely in the community before July, 2020.

Our findings might be limited by idiosyncrasies in both the social and pandemic contexts in NSW. Furthermore, the relative effects of hygiene measures, physical distancing, and reduced population movement could not be directly assessed. An important caveat is that the period we studied was brief, and it remains to be seen whether community transmission of respiratory syncytial virus has been averted in 2020 or merely delayed, especially as restrictions are relaxed. The small uptick in emergency department attendances and bronchiolitis admissions in June, 2020 (appendix p 1) was not associated with increased respiratory syncytial virus detections. Our laboratory reported almost exclusively rhinovirus detections in June, 2020 (results not shown). Rhinoviruses are easily transmitted between children in close contact

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and are non-enveloped so might be inherently less susceptible to inactivation by handwashing.

There are legitimate concerns about a range of potential negative effects of lockdowns; it will be crucial to assess and quantify these consequences, and we support efforts to actively mitigate them.[8] Nonetheless, our results suggest that the beneficial effect of lockdown on transmission of respiratory syncytial virus in NSW has been impressive.

We declare no competing interests. PNB, GS, TS, JD-P, AMK, NW, KM, CM, and RL conceptualised the study. NH, JS, and JD analysed the data. NH and PNB produced the figures. PNB, NH, JS, JD, TS, AMK, KM, and RL interpreted the data. PNB wrote the first draft. All authors reviewed and revised the manuscript. The corresponding author had full access to all of the data and the final responsibility to submit for publication.

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