# Changing pattern of respiratory virus detections among school-aged children in a small community – Dane County, Wisconsin, September-December 2022

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**Abstract**

Widespread school closures and other non-pharmaceutical interventions (NPIs), used to limit the spread of SARS-CoV-2, significantly disrupted transmission patterns of seasonal respiratory viruses. As NPIs were relaxed, populations were vulnerable to resurgence. This study within a small community assessed acute respiratory illness among kindergarten through grade 12 students as they returned to public schools from September through December 2022 without masking and distancing requirements. The 277 specimens collected demonstrated a shift from rhinovirus to influenza. With continued circulation of SARS-CoV-2 and return of seasonal respiratory viruses, understanding evolving transmission patterns will play an important role in reducing disease burden.

**Changing pattern of respiratory virus detections among school-aged children in a small community – Dane County, Wisconsin, September-December 2022**

Short Title: Changing pattern of respiratory viruses in 2022

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Abstract

Widespread school closures and other non-pharmaceutical interventions (NPIs), used to limit the spread of SARS-CoV-2, significantly disrupted transmission patterns of seasonal respiratory viruses. As NPIs were relaxed, populations were vulnerable to resurgence. This study within a small community assessed acute respiratory illness among kindergarten through grade 12 students as they returned to public schools from September through December 2022 without masking and distancing requirements. The 277 specimens collected demonstrated a shift from rhinovirus to influenza. With continued circulation of SARS-CoV-2 and return of seasonal respiratory viruses, understanding evolving transmission patterns will play an important role in reducing disease burden.

**Introduction:** Acute respiratory infections (ARI) in school-aged children serve as a bellwether for pattens of ARI in the broader community.[1,2] Prolonged, widespread use of nonpharmaceutical interventions (NPIs) to mitigate the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic significantly altered usual circulation of all respiratory viruses.[3,4] As NPIs were relaxed, however, opportunities for respiratory pathogen resurgence increased. Subsequently, theoretical concerns regarding possibly significant, convergent impacts of respiratory syncytial virus (RSV) and influenza virus, along with SARS-CoV-2, became a reality in late 2022.[5]

We used an ongoing community-based, laboratory-supported study of ARI in school-aged children in a small community to characterize occurrences of respiratory viruses in the late SARS-CoV-2 pandemic period (September – December 2022), as children returned to public schools in the absence of masking and distancing.

**Methods:** The ORegon CHild Absenteeism due to Respiratory Disease Study [ORCHARDS; Oregon School District (OSD), Oregon, WI; enrollment ~ 4,100 in 7 schools)] is a prospective, community-based observational study enrolling 4-year-old kindergarten through $12^{th}$ grade (4K-12; 4-18 years-old) children with ARI after parental consent. ORCHARDS has afforded continuous collection of data and respiratory specimens since January 2015; study design and methods are described in detail elsewhere (Protocol 2013-1357 approved by University of Wisconsin Health Sciences-IRB).[6] Since March 2020, ORCHARDS has utilized participant-collected respiratory specimens. Specimens are evaluated for SARS-CoV-2 and influenza A and B using reverse transcription polymerase chain reaction and for 14 additional viruses using a multiplexed respiratory pathogen panel at the Wisconsin State Laboratory of Hygiene.[6]

The 2022-2023 academic year began on September 1, with winter break commencing on December 22. The OSD did not employ masking or distancing requirements during this observation period. We present the number of detections of respiratory viruses as well as the percent of detections by week over 16-weeks, from September 5 through December 25, 2022. Absenteeism is expressed as the average daily number of students absent due to illness for each week.

**Results:** During the 16-week period, we received 277 participant specimens. Of these, 229 (82.7%) had positive virus detection, including 28 dual virus detections (10.1%) and two triple virus detections (0.7%). Participants per week mirrored OSD illness-related absenteeism (figure 1) and was highly correlated with it ($r=0.902$; $p<0.001$). SARS-CoV-2 detections were relatively stable over the observation period (mean ± SD: 1.3±1.3 detections/week; figure 2a and figure 2b). Rhinovirus/enterovirus (R/E) cases predominated

in the first eight weeks (n=45; 66.2% of detections) declining to 12.4% (n=24) in the second eight weeks; influenza A was initially detected on November 1 and comprised 56.0% (n=108) of detections in the second eight weeks, the majority (75.9%; n=82) being H3 viruses.

A wide variety of other respiratory viruses were detected including RSVA (n=18), coronavirus-HKU1 (CoV-HKU1: 14), human metapneumovirus (hMPV: 7), parainfluenza 4 (PIV4: 7), adenovirus (Ad: 6), RSVB (4), PIV1 (3), CoV-OC43 (2), and PIV3 (2).

**Discussion:** During autumn 2022, as children returned to school without NPIs, a wide variety of respiratory viruses was detected in a small community setting, along with a steady, but low level of SARS-CoV-2. Initial dominance of R/E subsided as influenza A virus activity increased in this community. RSV activity was noted throughout, declining as influenza virus increased.

This study's generalizability is limited by the small geographical study area and the possibility of selection bias by participants' willingness to enroll. Conversely, use of a long-standing laboratory-supported, community-based, participatory platform [4,6] and previous findings that illness absenteeism mirrors detections of respiratory viruses in this study setting [2] reinforce the present findings.

As SARS-CoV-2 transitions into endemicity and NPI use subsides, other respiratory viruses are returning to prominence in communities calling for better understanding of respiratory virus patterns.

**References**

1. Temte JL, Meiman JG, Gangnon RE. School sessions are correlated with seasonal outbreaks of medically attended respiratory infections: electronic health record time series analysis, Wisconsin 2004-2011. *Epidemiol Infect* . 2019;147:e127. doi:10.1017/S0950268818003424

2. Temte JL, Barlow S, Goss M, et al. Cause-specific student absenteeism monitoring in K-12 schools for detection of increased influenza activity in the surrounding community-Dane County, Wisconsin, 2014-2020. *PLoS One* . 2022;17(4):e0267111. Published 2022 Apr 19.

3. Lepak AJ, Taylor LN, Stone CA, et al. Association of changes in seasonal respiratory virus activity and ambulatory antibiotic prescriptions with the COVID-19 pandemic. *JAMA Intern Med* . 2021;181(10):1399-1402. doi:10.1001/jamainternmed.2021.2621

4. Chow EJ, Uyeki TM, Chu HY. The effects of the COVID-19 pandemic on community respiratory virus activity [published online ahead of print, 2022 Oct 17]. *Nat Rev Microbiol.* 2022;1-16. doi:10.1038/s41579-022-00807-9

5. Furlow B. Triple-demic overwhelms paediatric units in US hospitals [published online ahead of print, 2022 Dec 15]. *Lancet Child Adolesc Health* . 2022;S2352-4642(22)00372-8. doi:10.1016/S2352-4642(22)00372-8

6. Temte JL, Barlow S, Goss M, et al. The Oregon Child Absenteeism Due to Respiratory Disease Study (ORCHARDS): Rationale, objectives, and design. *Influenza Other Respir Viruses* . 2022;16(2):340-350. doi:10.1111/irv.12920

**Figures**

**Figure 1.** Number of 4K through 12$^{th}$ grade participants providing respiratory specimens per week (narrow red bars) and average daily illness-associated absenteeism each week from the Oregon School District (Oregon, WI: wide blue bars) for period from September 5 through December 25, 2022.

**Figure 2a** Number of detections of respiratory viruses* per week from participants in the ORegon CHild Absenteeism due to Respiratory Infection Study (ORCHARDS, Oregon, WI) from September 5 through December 25, 2022.

**Figure 2b.** Percent of detections by virus type* and week.

*AH1 = influenza A(H1); AH3 = influenza A(H3); Au = influenza A unsubtypable; R/E = rhinovirus/enterovirus; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2; RSV = respiratory syncytial virus type A and B; PIV = parainfluenza virus type 1, 2 and 4; Ad = adenovirus; hMPV = human metapneumovirus; sCoV = seasonal coronavirus HKU1 and OC43.