

# Impact of Social Distancing and Travel Restrictions on non-COVID-19 Respiratory Hospital Admissions in Young Children in Rural Alaska

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Abstract:

Hospitalizations due to non-COVID-19 respiratory illnesses decreased dramatically after social distancing was implemented in a high-risk population in rural Alaska. Our data from the past ten respiratory seasons show that this decline is unprecedented. This demonstrates the potential secondary benefits of implementing social distancing and travel restrictions on respiratory illnesses.

Keyword: Social Distancing, travel restriction, Respiratory illness, RSV

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## Background

Social distancing was implemented in many regions in the spring of 2020 to limit the spread of SARS-CoV-2, the virus responsible for coronavirus disease 2019 (COVID-19). Many reports have compared the respiratory illness rates during social distancing to one or two previous seasons; however, it is important to evaluate the difference over multiple seasons due to year to year variations in influenza, respiratory syncytial virus (RSV), and other respiratory illnesses[1-3]. People in the remote Yukon-Kuskokwim Delta (YKD) region of Alaska have a high burden of respiratory illnesses, with up to ten times the rate of infant hospitalization for pneumonia compared to the general US population[4] and the highest reported rates of infant RSV hospitalization in the United States, reaching 259 per 1,000 infants[5]. All YKD residents who require hospitalization go through the YKD Regional Hospital (YKDRH), allowing detection of all hospitalizations in this population. Our team has conducted passive surveillance for RSV and acute respiratory infection (ARI) hospitalizations in YKD children under 3 years of age since 1996[6].

Three social distancing mandates were issued by the Governor of Alaska in the spring of 2020. The first, on March 20<sup>th</sup>, closed all schools, the second, on March 27<sup>th</sup>, limited intrastate travel and travel to small communities, and the third, on March 28<sup>th</sup>, closed non-essential businesses, prohibited public gatherings, and required people stay 6 feet apart from non-household members. These mandates limited both the transmission of pathogens within the YKD and the introduction of pathogens from outside regions.

At that time, no cases of SARS-CoV-2 were documented within the YKD and there was no evidence it was circulating in this population. We compared the total, ARI, and RSV hospitalization rate in YKD children <3 years in the first 5 months of 2020 to the previous ten respiratory illness seasons.

## Methods

Hospitalization data for YKD children <3 years of age were collected from the electronic medical records of YKDRH and the referral hospital from July 1, 2009 to May 18, 2020. Admission and discharge dates, International Classification of Diseases (ICD)9<sup>th</sup>/10<sup>th</sup> - Clinical Modification (CM) discharge diagnosis codes, birth date, and RSV test results and dates were collected. Children with ARI were identified using ICD 9-CM: 033, 466, 480-487, 507, ICD-10-CM: J10, J11.00, J12-J18, A48.1, B25.0, A37.91, A22.1, B44.0, J69, J21, while respiratory failure was identified by ICD-9-CM codes: 518.5, and 518.8 and ICD 10-CM code: J96.0 . Hospitalization admission data were merged if a child was re-admitted within 3 days of a previous admission's discharge date. If a child was transferred between hospitals, data from both admissions were combined. Admission rates were calculated after de-duplication for ARI, RSV, and respiratory failure per 1000 infants <1 year of age using the YKD census population for each year. Rate ratios with 95% confidence intervals were calculated using Poisson regression to compare seasonal and monthly rates. Percentages of ARI hospitalizations were calculated by week and compared using the Chi-Square test. High season was defined as January 1<sup>st</sup> to May 25<sup>th</sup> and low as May 26<sup>th</sup> to December 31<sup>st</sup>. Statistical analyses were done in SAS 9.4 and differences were considered statistically significant if  $p < 0.05$ .

Alaska's COVID-19 health mandates were downloaded from the State of Alaska website (<https://covid19.alaska.gov/health-mandates/>). The surveillance and manuscript were approved by the Alaska Area Institutional Review Board, the YK Health Corporation, and the Alaska Native Tribal Health Consortium.

## Results

During the 2019-2020 respiratory season through May, 2020, a peak in admissions for children <3 years of age due to ARI and RSV occurred in the fourth week of February 2020 (Figure, Part A and B). After this peak, both dropped off dramatically in the first week of April 2020, with only one ARI hospitalization between April 7<sup>th</sup> and May 15<sup>th</sup> and the last case of RSV occurring on March 28<sup>th</sup>.

Data from the previous 10 seasons show that ARI and RSV patterns varied between seasons. While many of the years had low levels of hospitalization over an extended period, the 2019-2020 season appeared similar to the 2009-2010 season with a well-defined peak in cases in early spring. The 2019-2020 season was second only to the 2009-2010 season in peak number of admissions. During the 2019-2020 study season the rate of ARI (194.5 per 1000 infants) and RSV (74.0 per 1000) was similar to the averages for the preceding ten years for both metrics (ARI: 224.8 per 1000,  $p=0.14$  and RSV: 61.9 per 1000,  $p=0.26$ ). The 2019-2020 season was unique in that the number of ARI admissions per week went to zero by the second week of April and there were no ARI admissions between the last week of April and the third week of May. Prior to the COVID pandemic season, the earliest week with no ARI admissions, was the third week of June. Among all 26 seasons of data, no previous season had a four week stretch with no ARI admissions. During the previous 10 seasons, 22.8% of ARI admissions occurred between March 28<sup>th</sup> and May 15<sup>th</sup>; in contrast only 3.6% of ARI admissions occurred in this time period in the 2019-2020 season ( $p<0.0001$ ).

The total number of hospitalizations dropped after the implementation of the mandates, with the most pronounced decline occurring in the percentage of ARI admissions,

which dropped to zero (Figure, Part C). When ARI admissions are removed from analysis, no distinct decline in non-ARI admissions is seen (Figure, Part D). During the preceding seasons there were fluctuations in the percentage of ARI admissions, going from an average of 51% in the low season to 67% during the high season, but no other season had the sustained decline seen in 2020.

The hospitalization rate for respiratory failure in January and February 2020 was higher than the previous five-year average (117.1 vs 43.2,  $p=0.004$ ). In contrast, the rate of admissions for respiratory failure in 2020 was similar to the previous five-year average in March (125.0 vs 68.3,  $p=0.17$ ) and April (17.9 vs 46.8,  $p=0.35$ ). No deaths in YKD children under three years of age were reported from March 1, 2020 to the time of the writing of this manuscript (May 29, 2020, personal communication, Ellen Hodges, Clinical Director, YKDRH).

## Discussion

Our data suggest that social distancing and travel restrictions can impact non-COVID-19 respiratory hospitalizations in a population with disproportionately high rates of respiratory illness. The dramatic decrease in both ARI and RSV admissions in March 2020 is distinctly different from the trends seen in the ten preceding respiratory illness seasons. Our data show that the decrease in ARI and RSV admissions started prior to the mandates, possibly due to self-imposed changes in behavior or a natural decrease from a high peak of RSV in March. Most impressively, for four consecutive weeks in 2019-2020, there were no

children <3 years of age admitted to the hospital for respiratory illnesses, something not seen in the preceding 26 years of surveillance.

One limitation of our study is the inability to distinguish what proportion of the decline in ARI hospitalizations in YKD children is due to avoidance of care versus a decrease in circulation of respiratory pathogens secondary to the health mandates. Numerous reports show people avoided medical care for a range of conditions during the peak months of the pandemic, resulting in in-home deaths and delayed diagnoses [7-9]. We hypothesize that if the precipitous decline was due only to avoidance of care, there would have been an increased number of children presenting late to care, leading to an increase in critically ill children and deaths due to ARI. Instead, only one child was hospitalized with respiratory failure and no respiratory related deaths were recorded in April or May. Because of the lack of severe respiratory outcomes in this population, we conclude that the observed decline was primarily driven by the reduction in pathogen circulation due to travel restrictions and social distancing.

Our data show a large amount of variability in ARI admissions year to year, therefore comparing the 2019-2020 season to one or two other seasons, as done in other publications, may be misleading. Here we compare the 2019-2020 season to the ten preceding seasons and show a precipitous and sustained decline in ARI admissions related to the start of social distancing mandates.

These data compare ARI hospital admissions during the recent 2019-2020 season with ten preceding seasons in a unique population in rural Alaska with a history of very high rates of respiratory hospitalizations and limited medical accessibility. Due to its extreme isolation, all children receive care from a single health center or are transferred by small

airplane to higher-level care at a single tertiary medical center, thus allowing us to detect all hospitalizations. SARS-CoV-2 was not circulating in the region during the study period; therefore, it was possible for us to assess the possible impact of travel restrictions and social distancing on hospitalization for other non-COVID-19 respiratory illnesses in children. This information about the impact of behavior change on respiratory admissions suggests potential secondary benefits of implementing social distancing and travel restrictions.

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## NOTES

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Figure: Four week rolling average number of hospitalizations per 1,000 children less than three years old during the 2009-2020 respiratory seasons, Yukon-Kuskokwim Delta, Alaska.

The arrows indicate the first rolling average to include the week that school closures and social distancing mandates started. Black line shows the 2019-2020 respiratory season, grey lines show the ARI seasons from 2009 and 2019. The dashed line shows 2009-2010 season.

ARI: acute respiratory illness, RSV: Respiratory Syncytial Virus, non-ARI: all hospitalization not related to ARI

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Figure 1

