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Inpatient Burden of Respiratory Syncytial Virus, COVID-19, or Influenza in the United States Among Children < 5 Years of Age

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INTRODUCTION

- Respiratory syncytial virus (RSV), COVID-19, and influenza are leading causes of acute respiratory illness in children.
  - Children under 5 years of age with RSV, COVID-19, or influenza have an increased risk of severe disease and hospitalization as compared to older pediatric groups.
- Limited data exist comparing the clinical burden of RSV to COVID-19 and influenza, especially in those <5 years old.

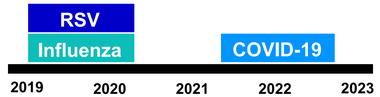
OBJECTIVE

To compare differences in clinical outcomes of young children hospitalized for RSV compared with COVID-19, and separately RSV compared to influenza.

METHODS

- **Data Source:** PINC AI Healthcare Database, a de-identified, hospital-based, service-level, all-payer database representing ~25% of United States hospital admissions.
- **Study Population:** Retrospective cohort of children <5 years old hospitalized for RSV or influenza (April 2019-March 2020, given COVID-19 pandemic disruptions), or COVID-19 (April 2021-July 2023) (**Figure 1**).

Figure 1. Study Timeline



- **Clinical Outcomes:** Length of stay (LOS), supplemental oxygen use (O2), intensive care unit (ICU) admission, invasive mechanical ventilation (IMV), and in-hospital mortality.
- **Statistical Analyses:** Adjusted risk ratios (aRR) with 95% confidence intervals (CI) were estimated using weighted Poisson regression to compare RSV with COVID-19 and RSV with influenza.

RESULTS

Study Population and Demographics

- The final study cohort included 33,644 children; 56.4% of children were male, and 60.1% were <1 year old (**Table**).

19,015 children hospitalized for RSV (in a 12-month period)

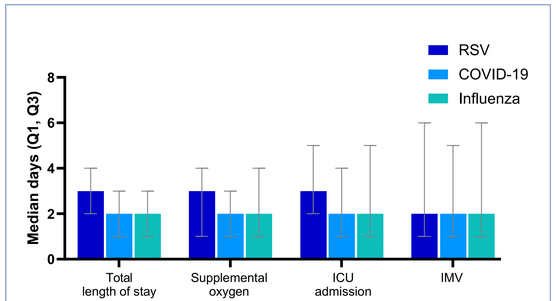
10,316 children hospitalized for COVID-19 (in a 28-month period)

4,313 children hospitalized for influenza (in a 12-month period)

Clinical Outcomes

- Median number of days for total LOS, supplemental O2 use, ICU admissions, and IMV requirement were similar for each of RSV, COVID-19, and influenza (**Figure 2**).
- In-hospital mortality occurred more often among patients hospitalized for COVID-19 (0.5%) than for RSV (0.1%) or influenza (0.3%).

Figure 2. Unweighted Median Number of Days for Key Clinical Outcomes Among Children Aged <5 Years Admitted for RSV, COVID-19, or Influenza



Abbreviations: ICU, intensive care unit; IMV, invasive mechanical ventilation; Q1, first quartile; Q3 third quartile; RSV, respiratory syncytial virus.

Table. Unweighted Patient Characteristics and Comorbid Conditions*

	RSV	COVID-19	Influenza
	n=19,015	n=10,316	n=4,313
Age group, n (%)			
< 1 year	12,954 (68.1)	5,756 (55.8)	1,497 (34.7)
1 year	3,450 (18.1)	1,943 (18.8)	1,019 (23.6)
2 years	1,477 (7.8)	1,089 (10.6)	702 (16.3)
3 years	737 (3.9)	835 (8.1)	610 (14.1)
4 years	397 (2.1)	693 (6.7)	485 (11.2)
Sex, n (%)			
Female	8,414 (44.2)	4,441 (43.0)	1,828 (42.4)
Male	10,601 (55.8)	5,875 (57.0)	2,485 (57.6)
Comorbidities, n (%)			
Asthma/reactive airway disease	2,358 (12.4)	790 (7.7)	670 (15.5)
Immunocompromised	934 (4.9)	1,711 (16.6)	570 (13.2)
Other immune condition	290 (1.5)	747 (7.2)	279 (6.5)

Abbreviations: RSV, respiratory syncytial virus.
***All variables were balanced after weighting except hospital census division, indicating no remaining differences in demographics or comorbidities between the groups in adjusted models.**

Comparative Risks

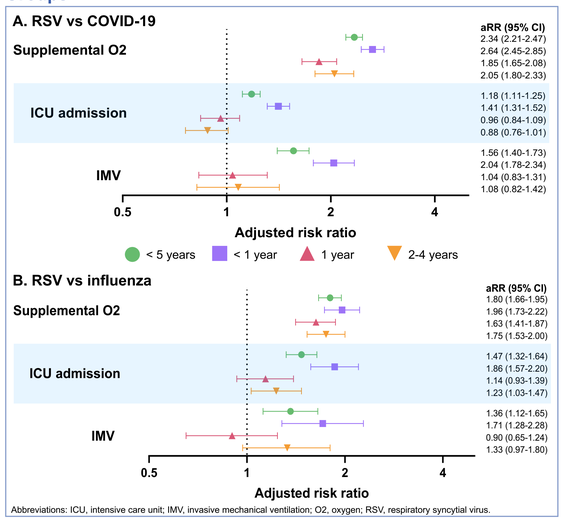
- In weighted models, RSV, compared with COVID-19 or influenza, was associated with greater risk of all measures of severe disease in children <5 years, including risk of supplemental O2, ICU admission, and IMV (**Figure 3**).
- Compared with COVID-19, RSV was associated with >2-fold increased risk of supplemental O2 use and >1.5-fold higher risk of IMV.

RSV vs COVID-19 SuppO_2: aRR 2.34 (95% CI, 2.21-2.47)

RSV vs COVID-19 IMV: aRR 1.56 (95% CI, 1.40-1.73)

- In subgroup analyses (age groups of <1; 1, and 2-4), RSV-associated risks remained elevated compared with those of COVID-19 and influenza, particularly for children aged <1 year, as compared with older age groups

Figure 3. Adjusted Risk Ratios for Severe Outcomes in Hospitalized Children Age < 5 Years, Overall and By Age Groups



Abbreviations: ICU, intensive care unit; IMV, invasive mechanical ventilation; O2, oxygen; RSV, respiratory syncytial virus.

CONCLUSIONS

- **Hospitalization Risks**
  - RSV led to higher risks of supplemental O2 use, ICU admission, and IMV compared with COVID-19 and influenza.
- **Mortality Risk**
  - COVID-19 had the highest risk of in-hospital mortality among the three viruses.
- **Preventive Measures**
  - The severe outcomes observed in this study underscore the need for preventive measures such as maternal and childhood vaccination as well as monoclonal antibodies.

STRENGTHS AND LIMITATIONS

Strengths

- This is the first study to compare the clinical burden in children under 5 years of age hospitalized for RSV to COVID-19 and influenza.

Limitations

- The database reports age in yearly increments, so analysis of the < 6-month subgroup was not possible.

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