Respiratory Syncytial Virus
Epidemiology and Disease
Burden in Older Adults

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Vaccines and Related Biological Products Advisory Committee (VRBPAC)
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RSV Epidemiology and Burden
Epidemiology of RSV in older adults

- Frequent cause of severe respiratory illness in older adults
- Lower awareness of RSV in adults among healthcare providers and the public
- Under detection: RSV testing often not performed
- No specific recommended vaccine or treatment in adults
Among adults ≥65 years of age in the United States, RSV is associated with*...

*There is substantial uncertainty in burden of disease, reflected in wide ranges here.

1. Thompson et al, JAMA (2003): [https://doi.org/10.1001/jama.289.2.179](https://doi.org/10.1001/jama.289.2.179)
8. CDC RSV-NET data 2016–2020 (unpublished)
RSV and influenza burden, compared

**RSV**  
Adults aged ≥65 years

- 6,000–10,000\(^1\)–\(^3\) deaths/year
- 60,000–160,000\(^4\)–\(^8\) hospitalizations/year
- 0.9–1.4 million\(^5\) medical encounters/year

**Influenza**  
Adults aged ≥65 years

- 16,000–43,000\(^9\) deaths/year
- 128,000–467,000\(^9\) hospitalizations/year
- 0.8–2.9 million\(^9\) medical encounters/year

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1. Thompson et al, JAMA (2003): [https://doi.org/10.1001/jama.289.2.179](https://doi.org/10.1001/jama.289.2.179)
8. CDC RSV-NET data 2016–2020 (unpublished)
Population-based RSV-associated hospitalization rates by adult age group, RSV-NET 2016–2020

RSV-NET: unpublished data; https://www.cdc.gov/rsv/research/rsv-net/overview-methods.html. Rates are adjusted for the frequency of RSV testing during recent prior seasons and the sensitivity of RSV diagnostic tests, assuming a 95% sensitivity for PCR testing. Other studies indicate that PCR sensitivity may be lower.
Race and ethnicity of RSV-associated hospitalizations varied by age group: RSV-NET, 2018-19 through 2022-23

Median age of hospitalized patients by race/ethnicity

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N (%)</th>
<th>Median age in years [IQR]</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>69 [56-80]</td>
<td></td>
</tr>
<tr>
<td>Race/ethnicity*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>70 (.5) 59 [48-72]</td>
<td></td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>820 (6) 73 [57-83]</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>2,671 (20) 60 [47-70]</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>1,421 (10) 62 [45-75]</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>8,536 (63) 72 [61-82]</td>
<td></td>
</tr>
</tbody>
</table>

Distribution of patients by age group and race/ethnicity

Substantial burden of medically attended outpatient visits for RSV in older adults

- **11%** of outpatients with acute respiratory illness
- **19%** had a serious outcome\(^1\)
- Rates nearly **2x** higher in patients with chronic cardiopulmonary disease compared with others

Seasonal incidence and 95% confidence limits of medically attended RSV by age group in a community cohort of adults ≥60 years old

\(^1\) Serious outcome defined as hospitalization, emergency department visit and pneumonia.
COVID-19 pandemic affected RSV in 2020-21 and 2021-22

Early season peak in 2022-23*

* Surveillance for 2015-16 through 2019-20 seasons were conducted from October – April; for 2020-21 and 2021-22 surveillance was conducted continuously from October – September. Data for 2022-23 season through October 1, 2022 – February 11, 2023 only.
Clinical outcomes and co-morbid conditions
RSV is a frequent cause of pneumonia in hospitalized adults


- RSV detected in 3% of adults hospitalized with pneumonia
- RSV was fifth most commonly detected pathogen
Underlying medical conditions among adults ≥18 years hospitalized for RSV: RSV-NET 2014-2018

Major underlying condition categories (n=4,970)  

<table>
<thead>
<tr>
<th>Condition Category</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular disease</td>
<td>2833</td>
<td>57.0</td>
</tr>
<tr>
<td>Chronic lung disease</td>
<td>2486</td>
<td>50.0</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1692</td>
<td>34.0</td>
</tr>
<tr>
<td>Renal disease</td>
<td>1378</td>
<td>27.7</td>
</tr>
<tr>
<td>Immunocompromised condition</td>
<td>1126</td>
<td>22.7</td>
</tr>
<tr>
<td>Neurologic disorder</td>
<td>1041</td>
<td>21.0</td>
</tr>
<tr>
<td>Chronic metabolic disease (except diabetes)</td>
<td>934</td>
<td>18.8</td>
</tr>
<tr>
<td>Liver disease</td>
<td>332</td>
<td>6.7</td>
</tr>
<tr>
<td>Blood disorders/ hemoglobinopathy</td>
<td>132</td>
<td>2.7</td>
</tr>
<tr>
<td>Other disease or condition</td>
<td>429</td>
<td>8.7</td>
</tr>
</tbody>
</table>

94% of hospitalized adults have underlying medical conditions:

- 46%: 1-2 conditions
- 48%: ≥3 conditions

Source: CDC unpublished data.
RSV hospitalization rates much higher in those with congestive heart failure: RSV-NET 2015-2017

28% hospitalized cases had CHF

Higher rates in adults with CHF:
- Overall: 8x
- 50-64: 14x
- ≥65 years: 3.5x

Adjusted rates (per 10,000 population) of RSV-associated hospitalization by congestive heart failure (CHF) status, RSV-NET, 2015–2017 (N = 2042).

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0264890
RSV in immunocompromised adults at high risk for severe disease

- Greatest risk among:
  - Lung transplant recipients
  - Hematopoietic cell transplant (HCT) recipients
  - Other immunocompromised populations including patients receiving chemotherapy for lymphoma and leukemia

- Incidence of symptomatic illness: 12% (2-year period) and 16% (single season) in lung transplant patients

- Severe outcomes in immunocompromised patients
  - Progression to lower respiratory tract infection common
  - Mortality high: 26% among HCT with proven/probable lower respiratory tract infection

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Severe outcomes frequent among adults hospitalized for RSV of all ages.
Long-term care facility (LTCF) residents vulnerable to outbreaks and serious illness

- Frequent cause of symptomatic illnesses in LTCF residents
- High attack rate in outbreak settings
  - 13.5% over 1 month
- Study of Medicare data estimated RSV-attributable hospitalizations
  - 2,909,106 LTCF residents ≥65 years
  - 6,196 cardiorespiratory hospitalizations

<table>
<thead>
<tr>
<th>Attributable cost</th>
<th>$51,503,105 ($38,899,971 – $64,106,240)</th>
</tr>
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<tbody>
<tr>
<td>Length of stay (LOS)</td>
<td>5.3 days (SE 4.6)</td>
</tr>
<tr>
<td>Attributable LOS</td>
<td>32,008 days (95% CI 24,267 – 39,749)</td>
</tr>
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RSV-associated hospitalization in older adults results in loss in functional status

- Cohort study of 302 adults aged ≥60 years hospitalized with RSV in NYC and Rochester, NY
- Scores of Instrumental Activities of Daily Living (IADL) and Activities of Daily Living (ADL) decreased from pre-hospitalization to admission and remain decreased at discharge
- 14% required higher level of care at discharge
- One third of patients experienced decreased IADL and ADL scores at 6 months post-discharge

RSV is a major cause of severe illness in older adults

- Frequent, often unrecognized, cause of severe respiratory illnesses
- Hospitalization rates increase with increasing age
- High burden of severe disease with variability across seasons
- Adults with co-morbidities, immunocompromised adults, and long-term care facility residents may be particularly at risk for severe illness
- High proportion of those hospitalized with laboratory-confirmed RSV have severe outcomes, including ICU admission and death
- Long-term health consequences
Acknowledgements

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- Many others....