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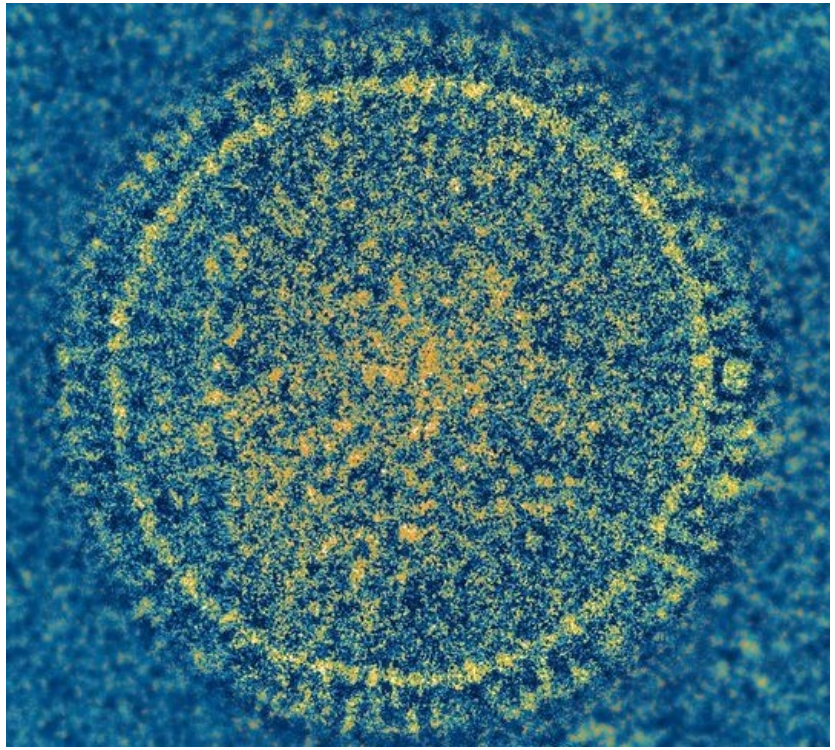
Respiratory Syncytial Virus Epidemiology and Disease Burden in Older Adults



Fiona Havers, MD, MHS, FIDSA
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Coronaviruses and Other Respiratory Diseases Division
Centers for Disease Control and Prevention

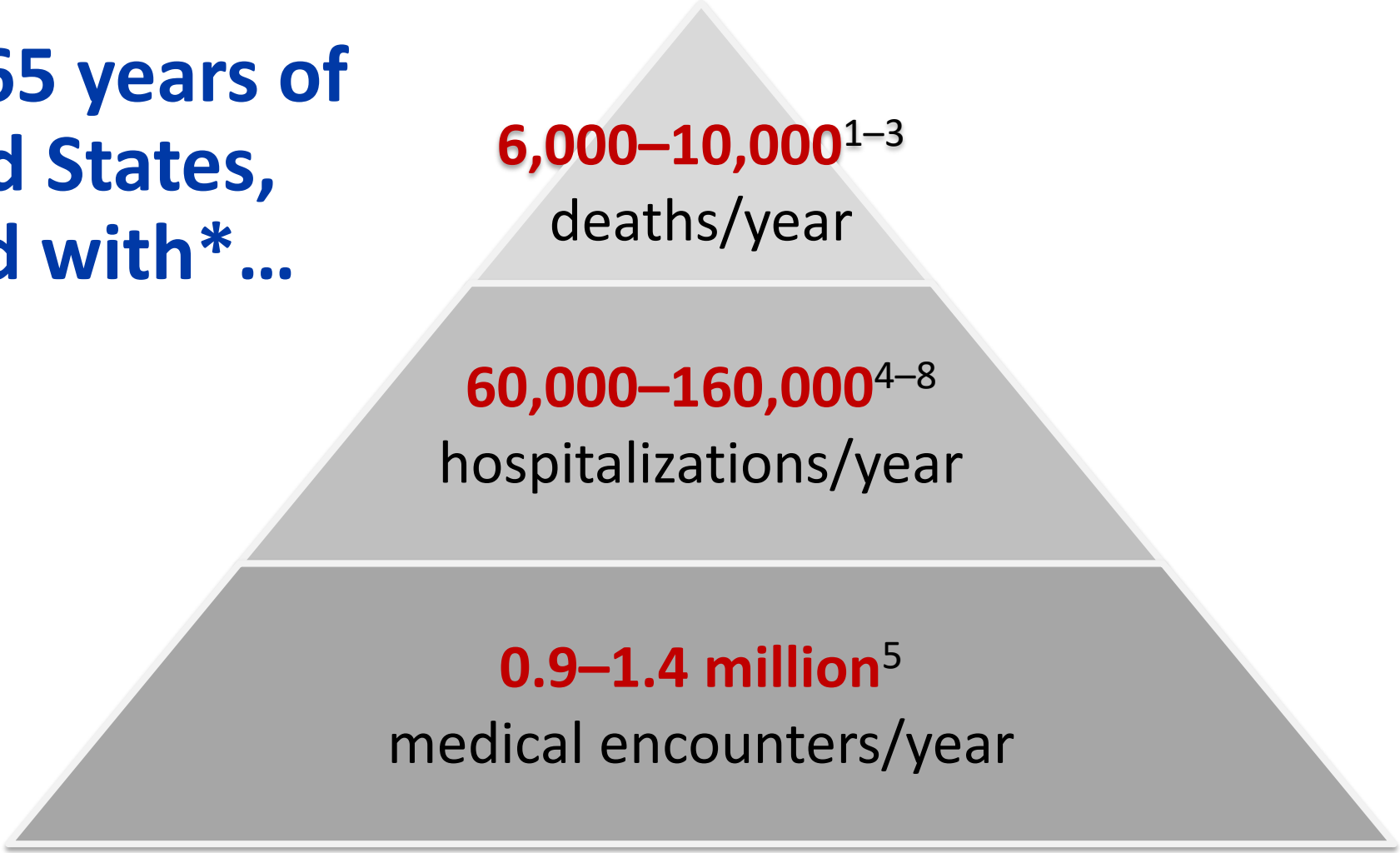
Vaccines and Related Biological Products Advisory Committee (VRBPAC)
February 28, 2023

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

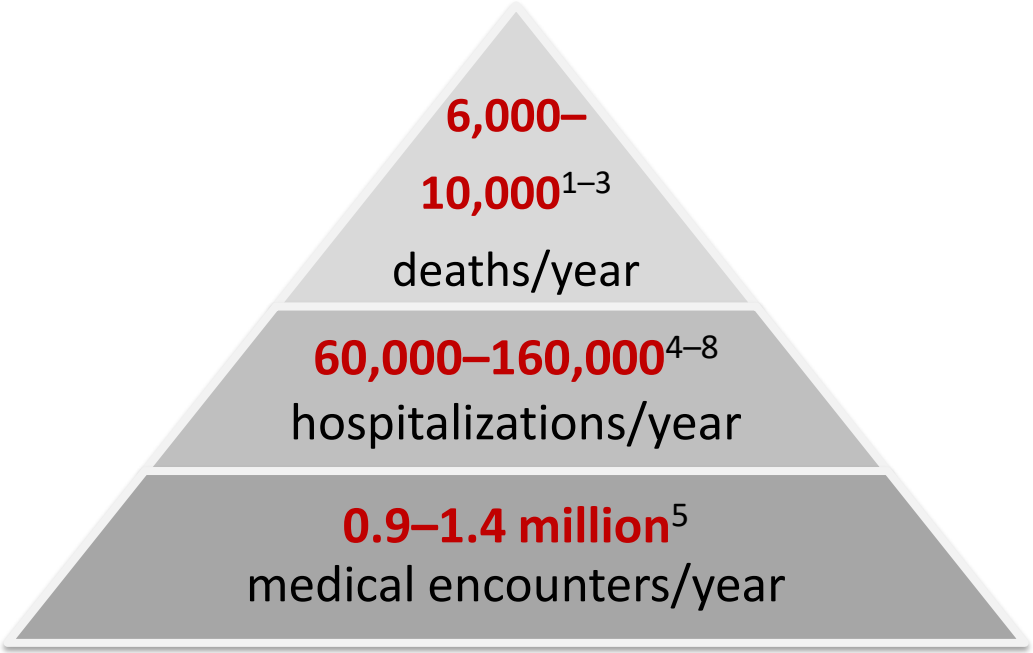
Among adults ≥65 years of age in the United States, RSV is associated with*…



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

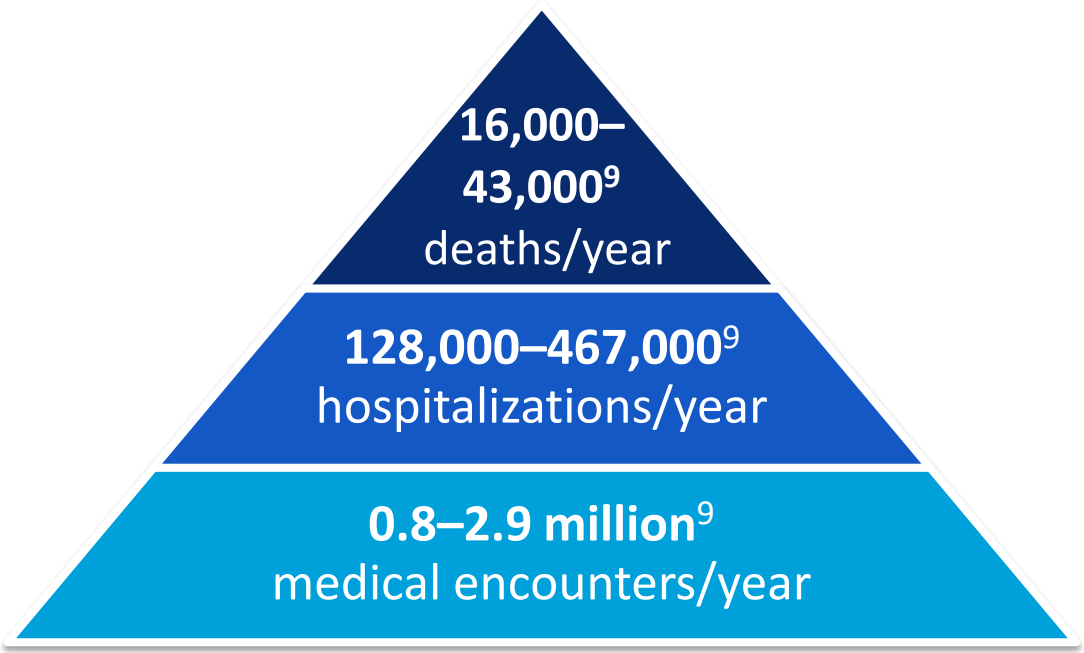
1. Thompson et al, JAMA (2003): https://doi.org/10.1001/jama.289.2.179
2. Matias et al, Influenza Other Respi Viruses (2014): https://doi.org/10.1111/irv.12258
3. Hansen et al, JAMA Network Open (2022): https://doi.org/10.1001/jamanetworkopen.2022.0527
4. Widmer et al, JAMA Network Open (2012): https://doi.org/10.1093/infdis/jis309
5. McLaughlin et al, Open Forum Infect Dis (2022): https://doi.org/10.1093/ofid/ofac300
6. Zheng et al, Pneumonia (2022): https://doi.org/10.1186/s41479-022-00098-x
7. Branche et al, Clinical Infect Dis (2022): https://doi.org/10.1093/cid/ciab595
8. CDC RSV-NET data 2016–2020 (unpublished)

RSV and influenza burden, compared



RSV

Adults aged ≥65 years



Influenza

Adults aged ≥65 years

1. Thompson et al, JAMA (2003): https://doi.org/10.1001/jama.289.2.179
2. Matias et al, Influenza Other Respi Viruses (2014): https://doi.org/10.1111/irv.12258
3. Hansen et al, JAMA Network Open (2022): https://doi.org/10.1001/jamanetworkopen.2022.0527
4. Widmer et al, JAMA Network Open (2012): https://doi.org/10.1093/infdis/jis309
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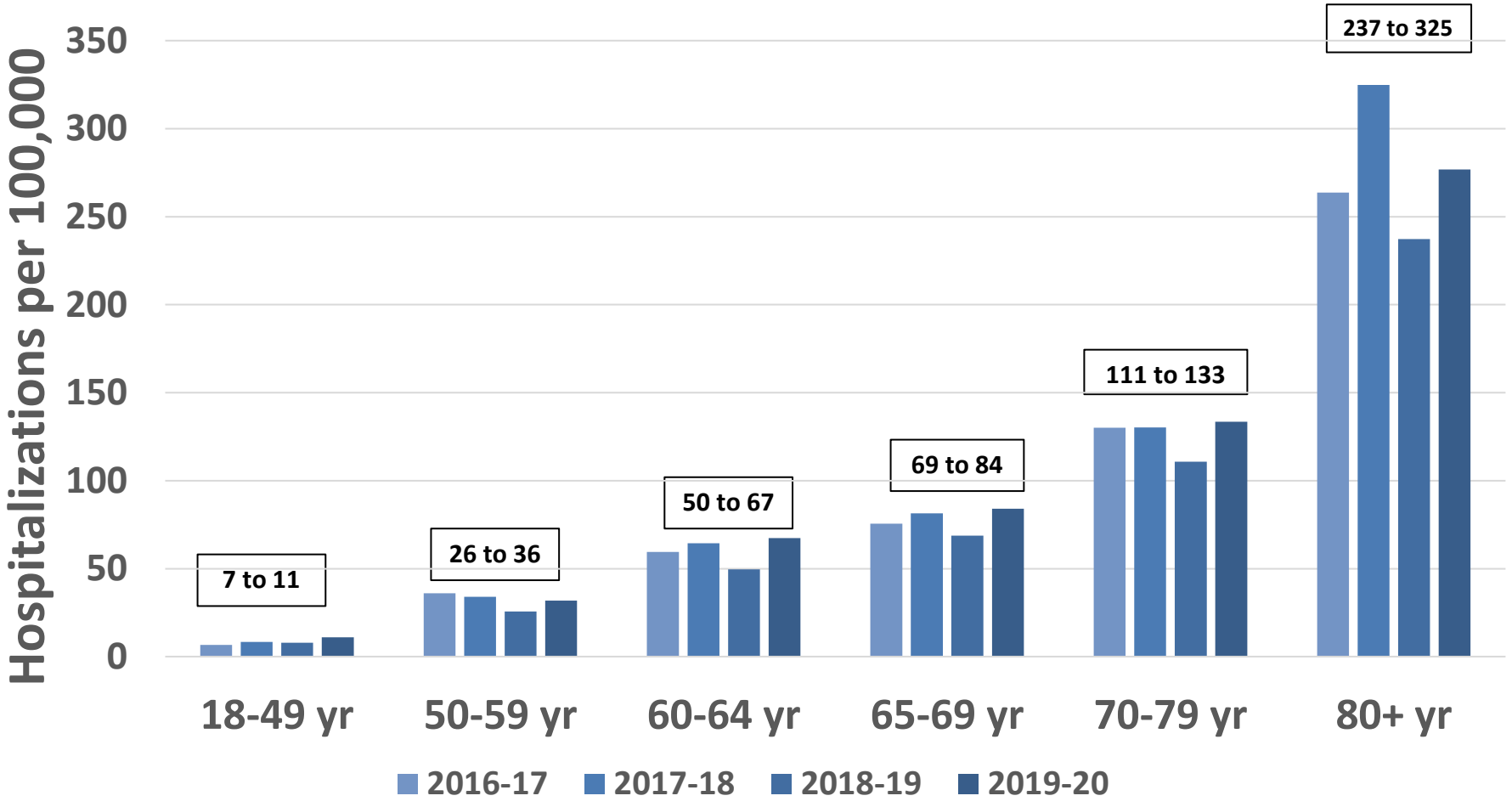
7. Branche et al, Clinical Infect Dis (2022): https://doi.org/10.1093/cid/ciab595
8. CDC RSV-NET data 2016–2020 (unpublished)
9. CDC Influenza Burden 2015-2020: https://www.cdc.gov/flu/about/burden/past-seasons.html

Population-based RSV-associated hospitalization rates by adult age group, RSV-NET 2016–2020



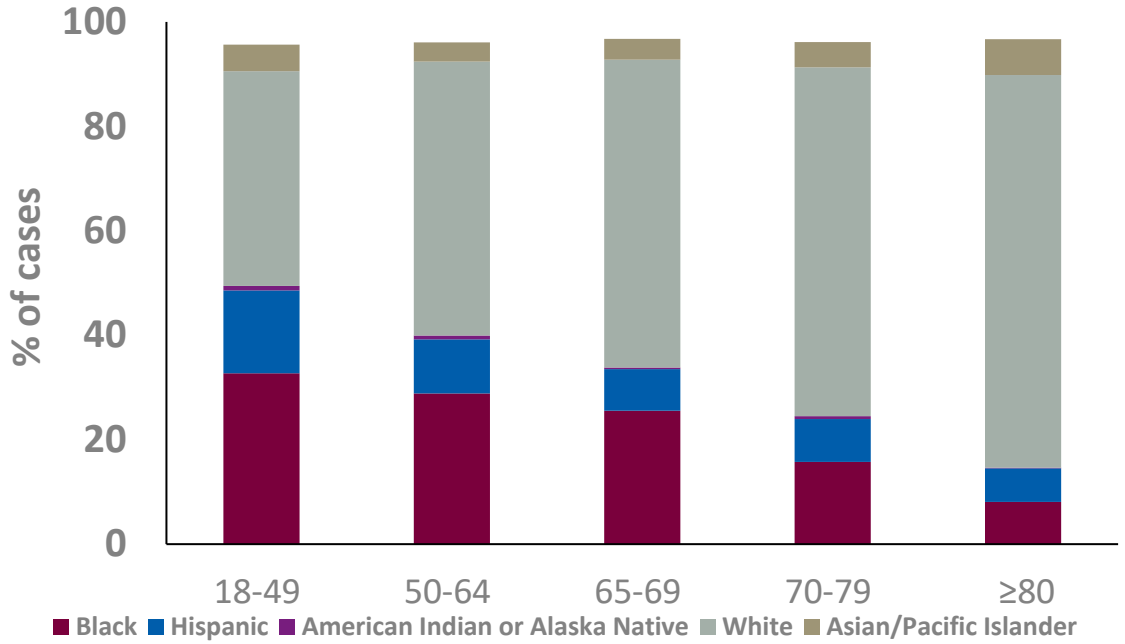
RSV-NET: unpublished data; https://www.cdc.gov/rsv/research/rsv-net/overview-methods.html. Rates are adjusted for the frequency of RSV testing during recent prior seasons and the sensitivity of RSV diagnostic tests, assuming a 95% sensitivity for PCR testing. Other studies indicate that PCR sensitivity 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

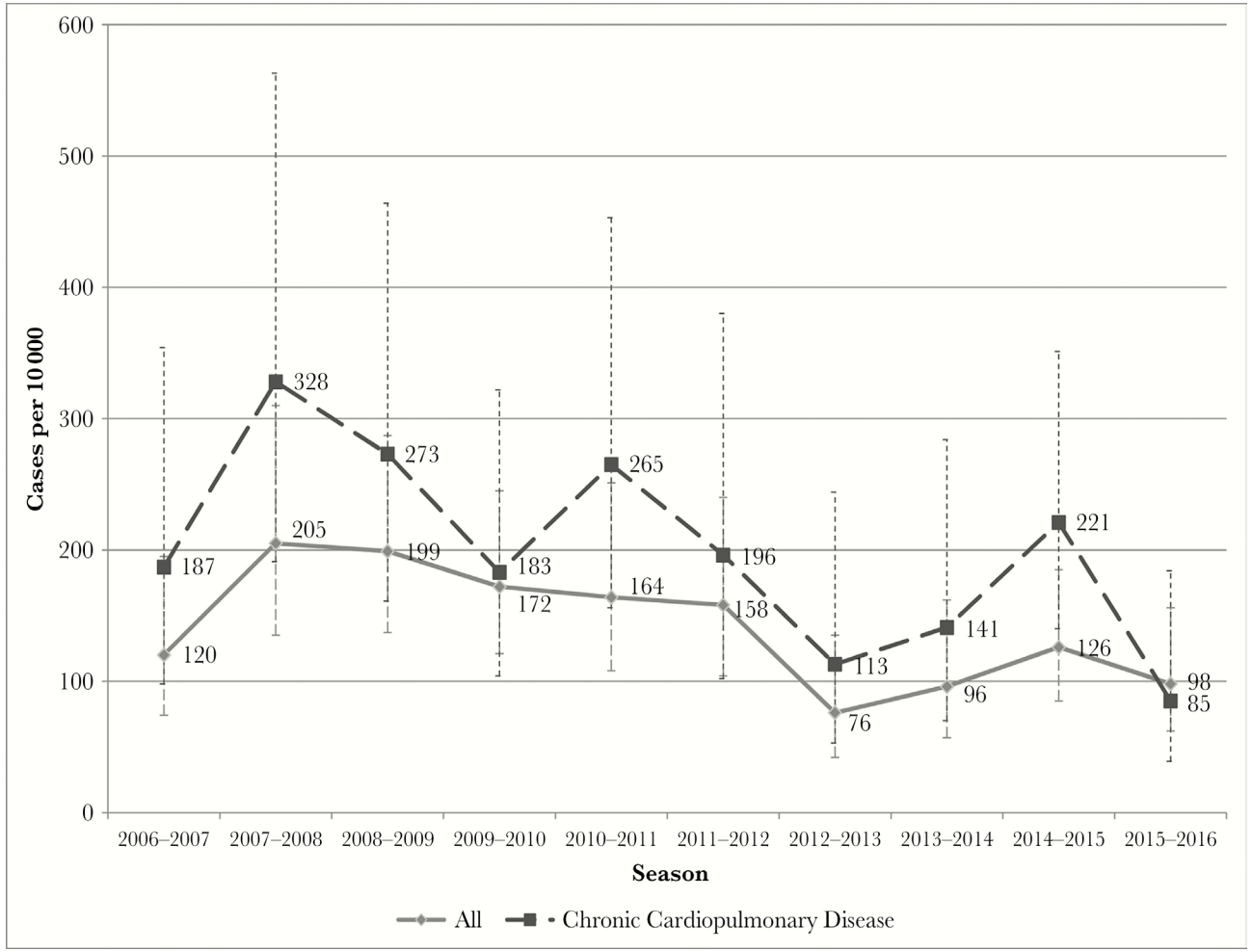
Characteristic	N (%)	Median age in years [IQR]
All		69 [56-80]
Race/ethnicity*		
American Indian/Alaska Native	70 (.5)	59 [48-72]
Asian/Pacific Islander	820 (6)	73 [57-83]
Black	2,671 (20)	60 [47-70]
Hispanic	1,421 (10)	62 [45-75]
White	8,536 (63)	72 [61-82]

Distribution of patients by age group and race/ethnicity



* Source: RSV-NET data. Preliminary analysis. From Havers, et al. "Laboratory-Confirmed RSV Hospitalization Rates among Adults in the United State, by Race and Ethnicity Across Four Seasons – RSV-NET, 2018-19 through 2022-23 seasons." Poster presented at RSVVW'23 Conference, Lisbon, Portugal, February 2023. Black, White, American Indian/Alaska Native and Asian/Pacific Islander people were categorized as non-Hispanic; Hispanic people could be of any race. Surveillance for 2018-19 and 2019-20 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 - January 28, 2023 only.

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



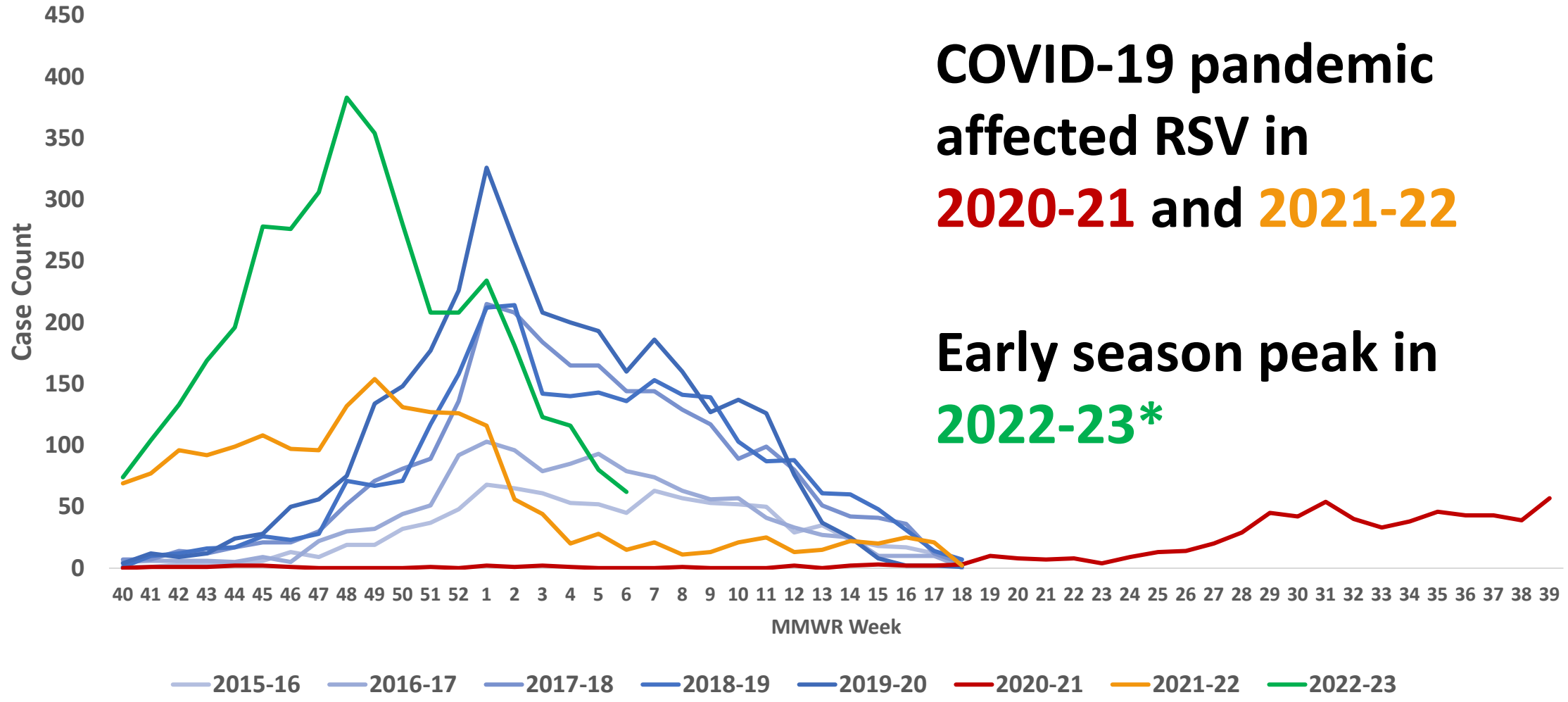
- **11%** of outpatients with acute respiratory illness
- **19%** had a serious outcome[1]
- Rates nearly **2x** higher in patients with chronic cardiopulmonary disease compared with others

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

Belongia, et al. Open Forum Infect Dis, Volume 5, Issue 12, December 2018, ofy316, https://doi.org/10.1093/ofid/ofy316

[1] Serious outcome defined as hospitalization, emergency department visit and pneumonia.

RSV hospitalizations in adults by season: RSV-NET 2015-2023



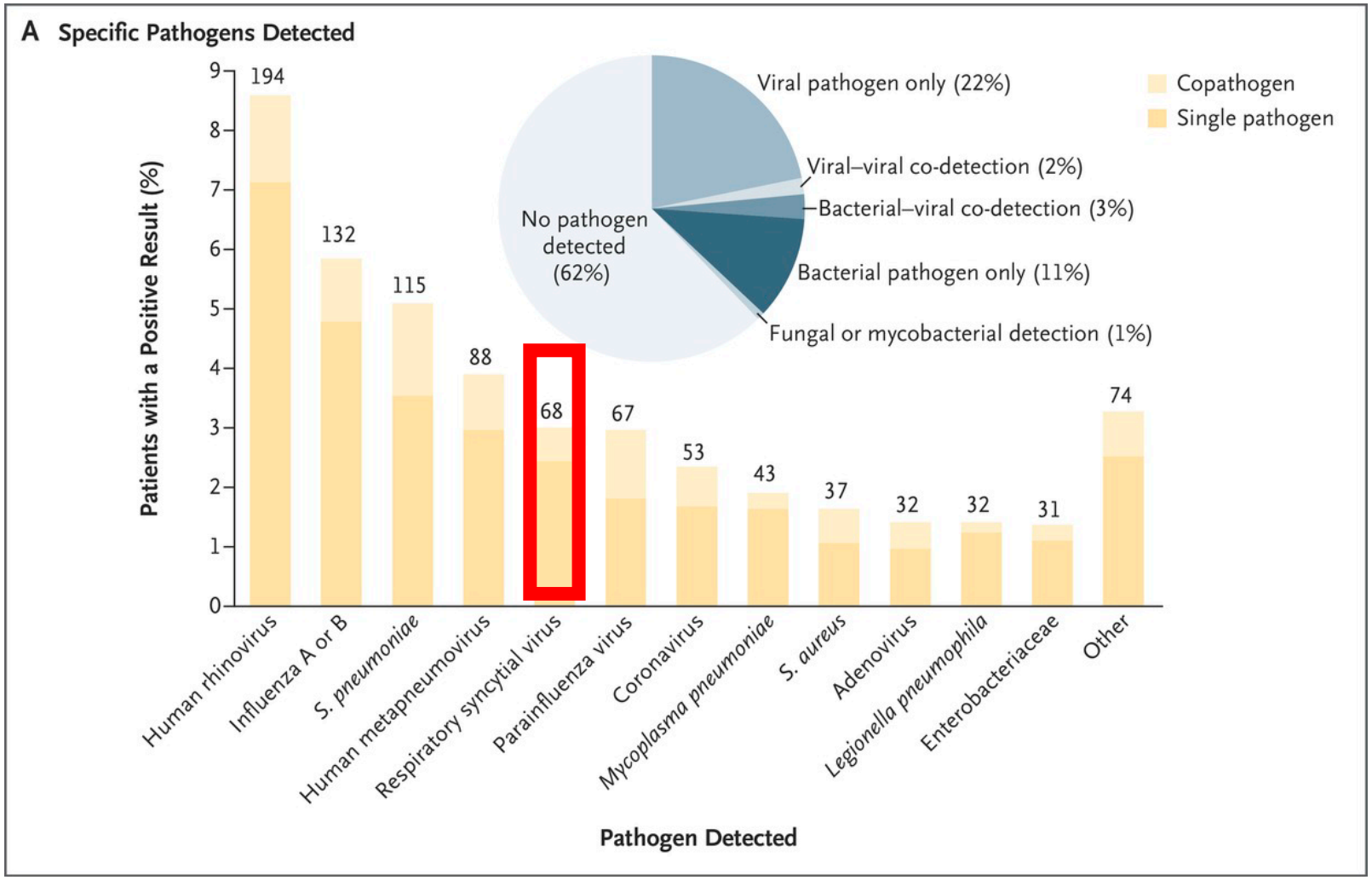
COVID-19 pandemic affected RSV in 2020-21 and 2021-22

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



Jain S et al. N Engl J Med 2015;373:415-427

EPIC study:
Pathogen Detection among U.S. Adults with Community-Acquired Pneumonia Requiring Hospitalization, 2010–2012.

- **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

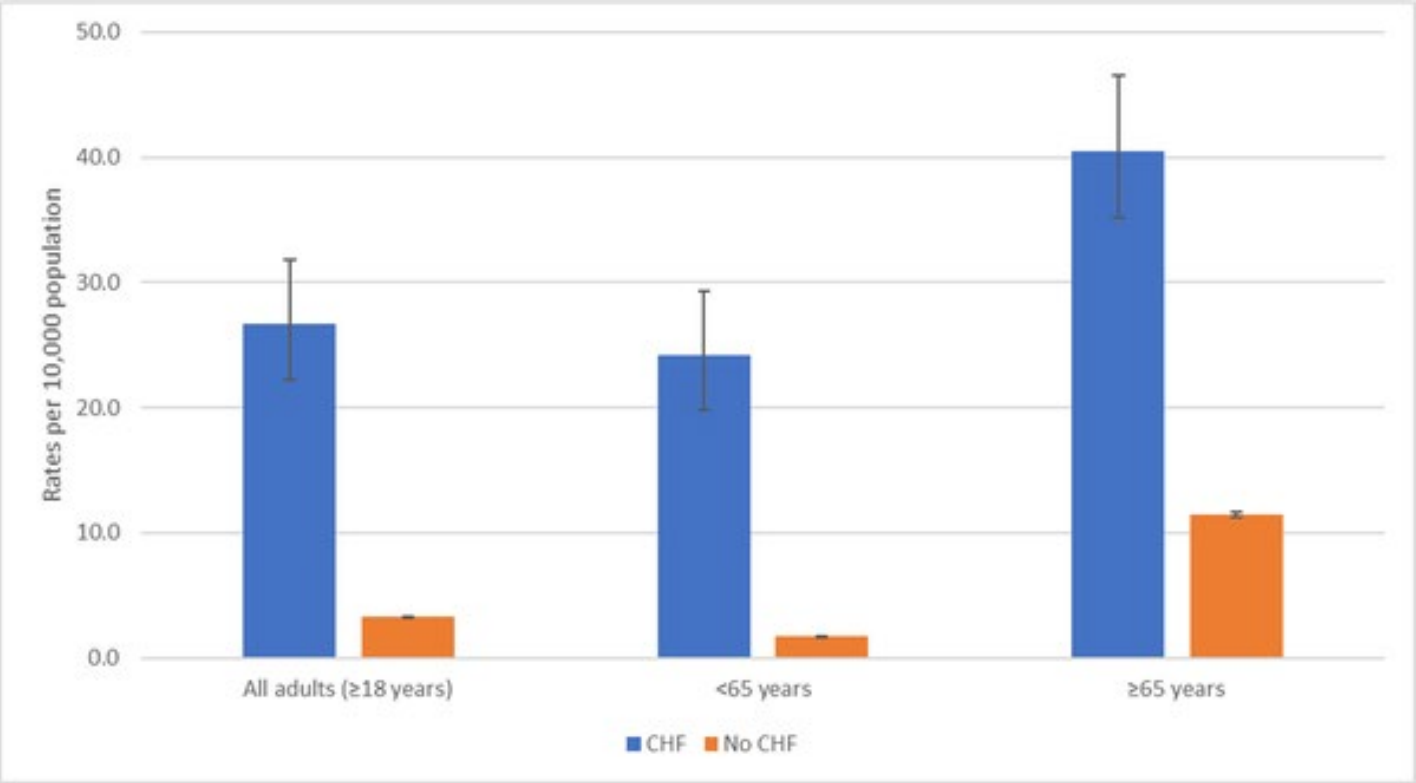
Major underlying condition categories (n=4,970)	N=4,970	%
Cardiovascular disease	2833	57.0
Chronic lung disease	2486	50.0
Diabetes mellitus	1692	34.0
Renal disease	1378	27.7
Immunocompromised condition	1126	22.7
Neurologic disorder	1041	21.0
Chronic metabolic disease (except diabetes)	934	18.8
Liver disease	332	6.7
Blood disorders/ hemoglobinopathy	132	2.7
Other disease or condition	429	8.7

Source: CDC unpublished data.

94% of hospitalized adults have underlying medical conditions:

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

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).

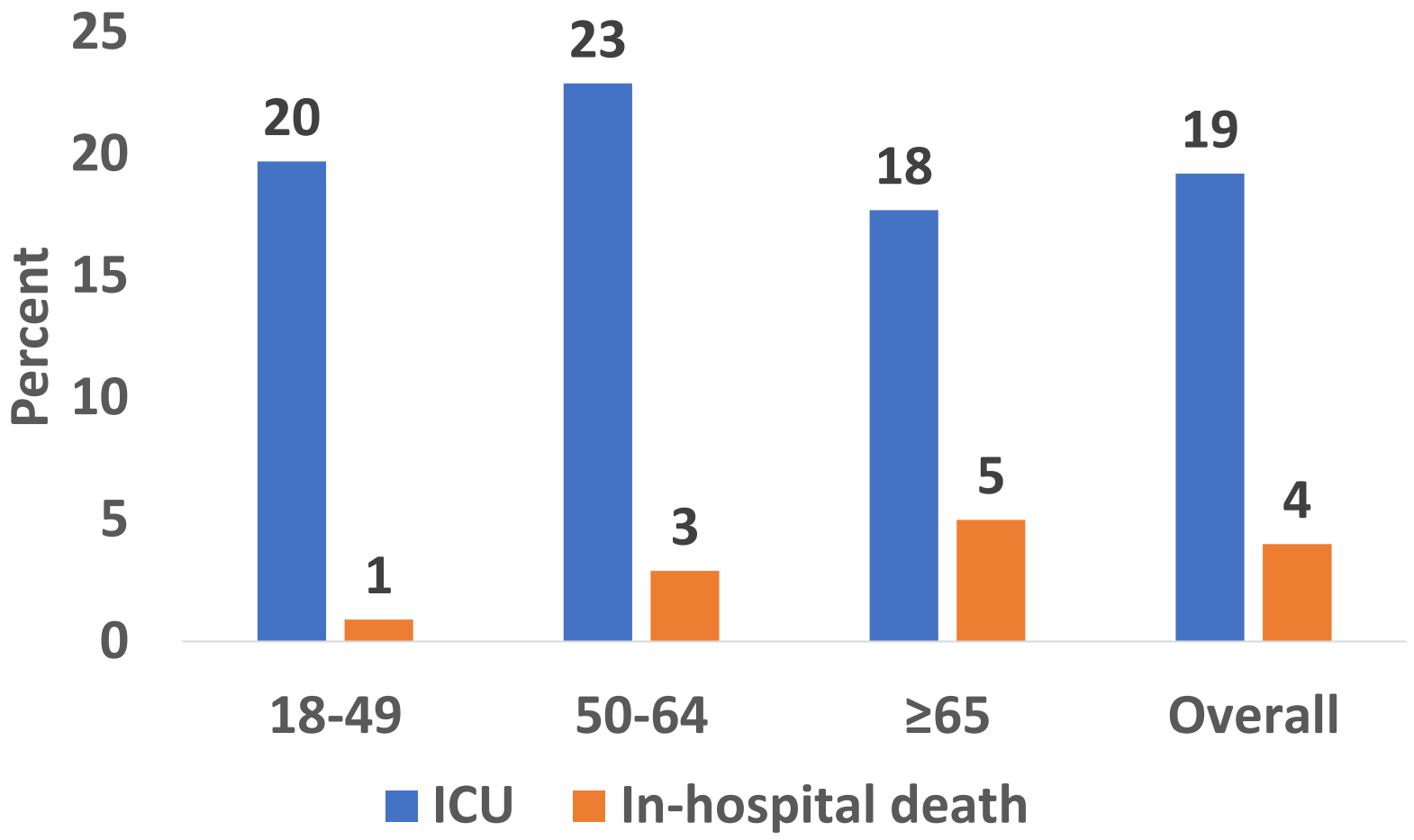
Kujawski SA, Whitaker M, Ritchey MD, Reingold AL, Chai SJ, et al. (2022) Rates of respiratory syncytial virus (RSV)-associated hospitalization among adults with congestive heart failure—United States, 2015–2017. PLOS ONE 17(3): e0264890. https://doi.org/10.1371/journal.pone.0264890
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0264890

RSV in immunocompromised adults at high risk for severe disease

- Greatest risk among:
  - Lung transplant recipients[1]
  - Hematopoietic cell transplant (HCT) recipients[2]
  - 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[3,4]
- Severe outcomes in immunocompromised patients
  - Progression to lower respiratory tract infection common
  - Mortality high: 26% among HCT with proven/probable lower respiratory tract infection[5]

[1] Manuel O, et al. Clin Transplant 2019 Sep; 33(9):e13511. [2] Chemaly RF. CID 2014; 59 Suppl5; S344-51. [3]Weinberg A, et al. Transpl Infect Dis 2010 Aug 1; 12(3):330-5. [4]Milstone AP, Eur Respir J 2006; 28: 131-137. [5] Waghmare A., et. al. JI. 2017;216:1235–44

Outcomes among adults ≥18 years hospitalized for RSV: RSV-NET 2017-18 to 2019-20 seasons (n=8,214)



Severe outcomes frequent among adults hospitalized for RSV of all ages

Source: CDC unpublished data.

Long-term care facility (LTCF) residents vulnerable to outbreaks and serious illness

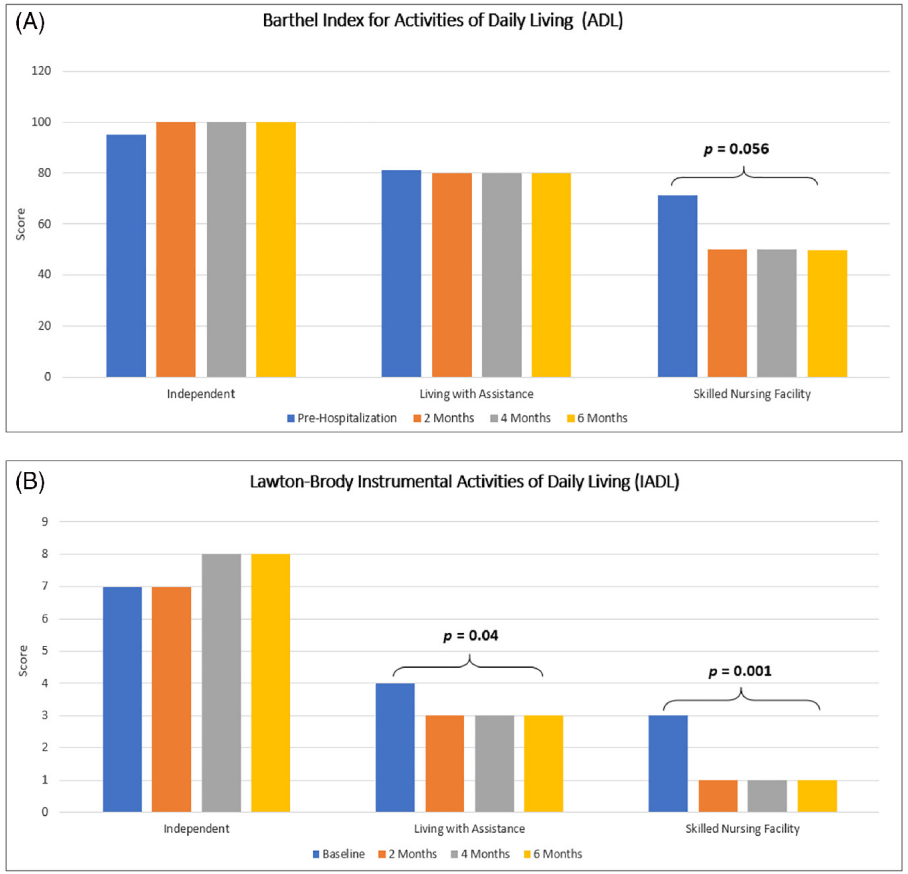
- Frequent cause of symptomatic illnesses in LTCF residents[1]
- High attack rate in outbreak settings
  - » **13.5%** over 1 month[2]
- Study of Medicare data estimated RSV-attributable hospitalizations[2]
  - 2,909,106 LCTF residents ≥65 years
  - 6,196 cardiorespiratory hospitalizations

Attributable cost	**$51,503,105** ($38,899,971 – $64,106,240)
Length of stay (LOS)	**5.3 days** (SE 4.6)
Attributable LOS	**32,008 days** (95% CI 24,267 – 39,749)

[1]Childs A., et al. BMC Geriatr. 2019 Aug 5; 19(1):210. Funding: Sanofi Pasteur. Caram LB, et al. J Am Geriatr Soc 2009; 57(3): 482-5. [2]Bosco E, et al. JAMA Netw Open. 2021 Jun 1; 4(6): e2111806. Funding: Sanofi Pasteur. Abbreviations: SE: Standard error; CI: Confidence Interval

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



Change in functional status in adults ≥60 year of age at pre-hospitalization and 2, 4, and 6 months after RSV hospitalization for (A) the Barthel Index of Activities of Daily Living (ADL) and (B) the Lawton Brody Instrumental Activities of Daily. Each panel shows data for baseline.

Branche AR, et al. Change in functional status associated with respiratory syncytial virus infection in hospitalized older ad. J Influenza Other Respir Viruses. 2022 Nov;16(6):1151-1160. https://doi.org/10.1111/irv.13043

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

- RSV-NET team
- Michael Melgar
- Meredith McMorrow
- RSV-NET Site Principal Investigators and Surveillance Officers
- Emerging Infections Program
- State and local health partners
- Many others….

Questions?

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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