Co-sponsored with

QuidelOrtho™

CardinalHealth™

More Than a Cold

An update on RSV prevalence, prevention and testing

May 29, 2024

Agenda

1. RSV epidemiology, seasonality and global burden
2. Infant risks and prevention
3. Adult RSV and vaccinations
4. Respiratory symptom overlap and testing
5. Impact on patients, providers and society

RSV epidemiology, seasonality and global burden

RSV is a major cause of hospitalization and death

According to the CDC and NIH, respiratory syncytial virus (RSV) is implicated in large numbers of outpatient visits, hospitalizations, and deaths in both the U.S. and worldwide.

RSV affects an estimated **64 million** worldwide.

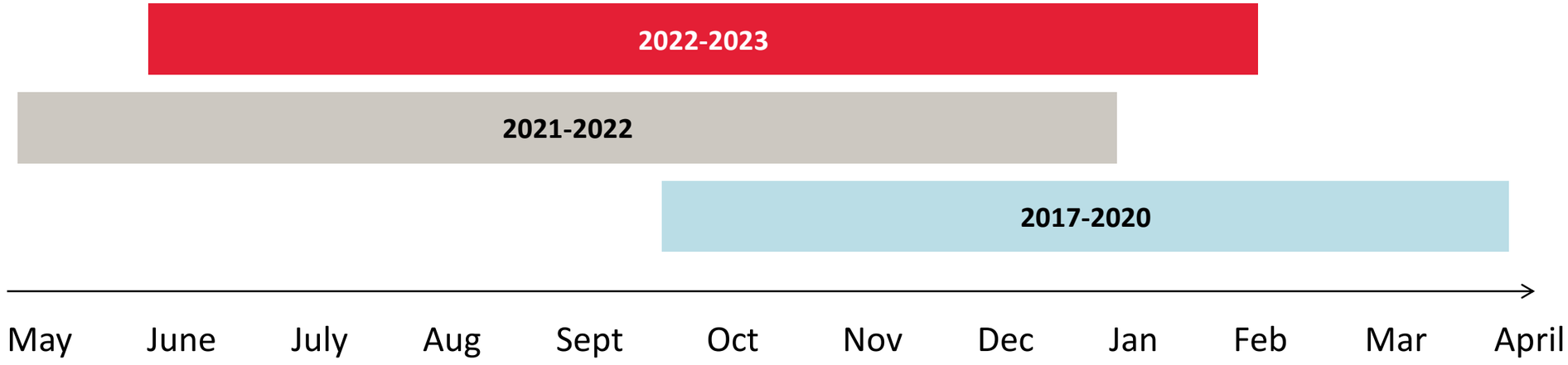
2.1 million U.S. outpatient visits in children under 5 and **58,000-80,000** hospitalizations.

60,000-160,000 older adults are hospitalized and **6,000-10,000** die in the U.S.

https://www.cdc.gov/rsv/research/index.html#ref04. Accessed Oct 31, 2023.
https://www.cdc.gov/rsv/high-risk/older-adults.html. Accessed Oct 31, 2023.
https://www.niaid.nih.gov/diseases-conditions/respiratory-syncytial-virus-rsv. Accessed Oct 31, 2023.

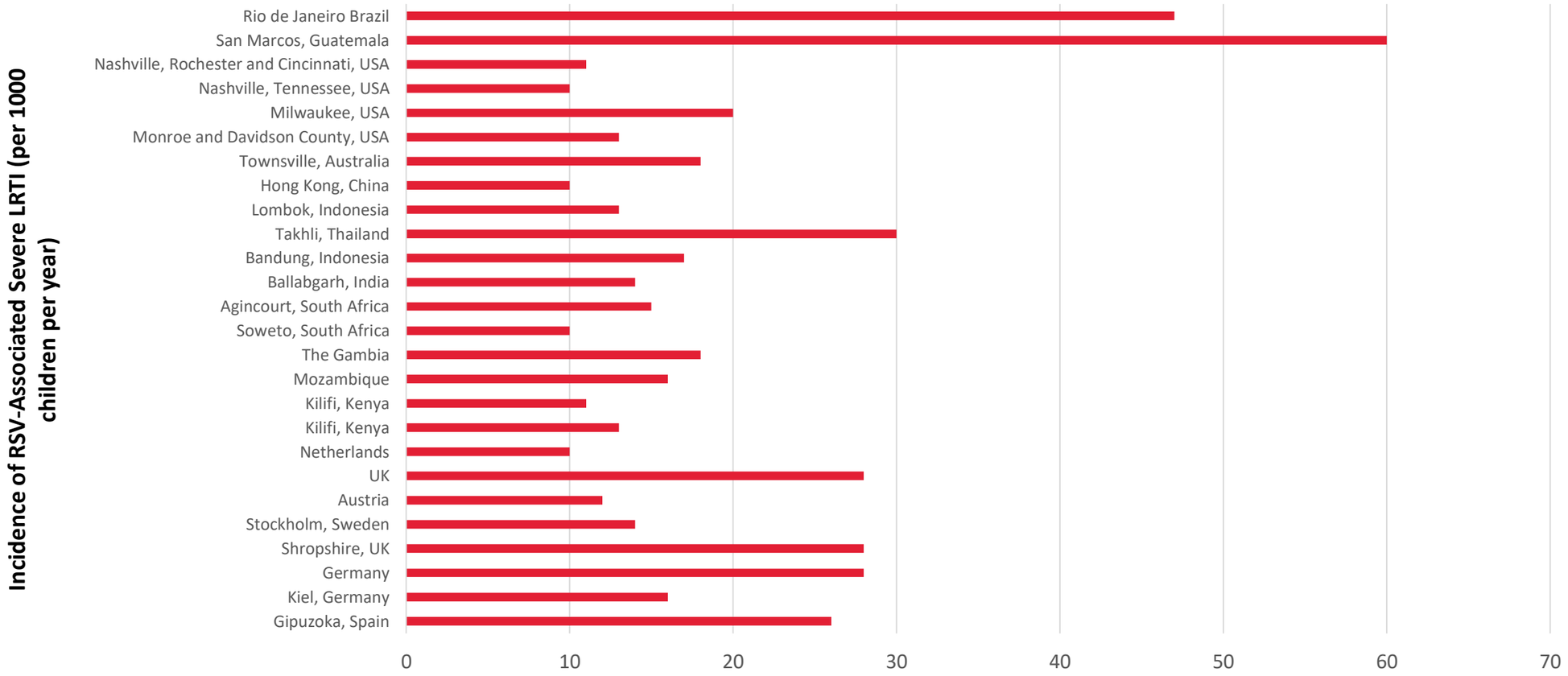
RSV is seasonal in most of the U.S.

- RSV seasonality is well documented but has changed due to the COVID-19 pandemic.
- There was no RSV season in 2020-2021.
- Florida and other tropic or subtropic climates may have cases year-round.



Hamid S, et al. MMWR Morb Mortal Wkly Rep. 2023;72:355–361.

RSV is a global disease



Shi T, et al. Lancet. 2017;390(10098):946-958.

There are four priority groups for RSV prevention

1. Newborns and infants
2. High risk children
   - Underlying cardiopulmonary disease
   - Down syndrome
   - Congenital abnormalities
   - Neuromuscular disease
   - Immune compromising conditions
3. Pregnant women
4. Adults 60 years and older

Jain H, et al. Respiratory Syncytial Virus Infection in Children. [Updated 2023 Jun 20]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK459215/
https://www.cdc.gov/respiratory-viruses/whats-new/vaccination-pregnant-people.html. Accessed October 31, 2023.
https://www.cdc.gov/rsv/high-risk/older-adults.html. Accessed October 31, 2023.

Infant risks and prevention

RSV infection remains the leading cause of infant hospitalization

RSV is a seasonal virus causing upper respiratory tract infections, which in 25-40% of young children progress to lower respiratory tract infections (LRTIs).

In industrialized countries

- 2-4% of children under a year of age are hospitalized for RSV-associated LRTIs each year.
- 100,000 hospitalizations annual in the U.S.

Each year, it is estimated globally

- 3.4 million young children developed RSV-associated severe respiratory infection necessitating hospital admission.
- 66,000–253,000 children younger than 5 years die.
- 99% of deaths occur in developing countries.
- Re-infections occur throughout life.

Chatterjee A, et al. Infect Dis Ther. 2021;10(Suppl 1):5-16.
Lee CYF, et al. Cureus. 2023;15(9):e45012.
Hosken N, et al. Vaccine. 2017;35(23):3082-3088.

Globally, do children need an RSV vaccine?

Annually:

- 33.8 million new episodes of acute LRTI in children under five
- 3.4 million hospital admissions
- 253,000 deaths

Globally, the lack of supportive care contributes to morbidity and mortality.

Accurate morbidity and mortality rate is difficult to assess in many countries due to infrequent use of specific diagnostics.

Under-reporting also occurs due to lack of medical care.

Chatterjee A, et al. Infect Dis Ther. 2021;10(Suppl 1):5-16.
Lee CYF, et al. Cureus. 2023;15(9):e45012.
Hosken N, et al. Vaccine. 2017;35(23):3082-3088.

RSV-related illnesses account for substantial numbers of infant hospitalizations in the U.S.

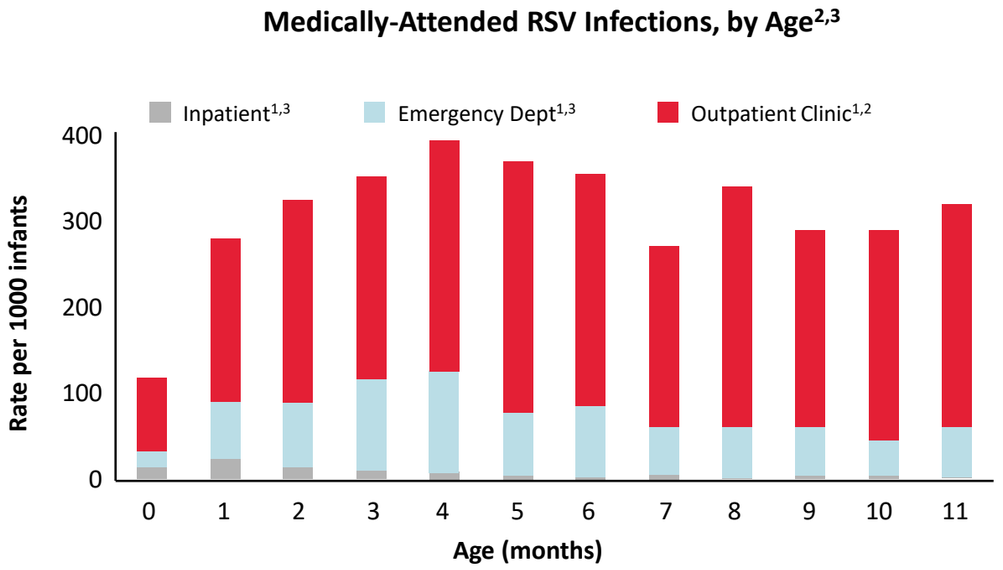
Acute bronchiolitis to RSV diagnosis accounted for 9.6% of total infant hospitalizations (2009—2015) and 9.3% of total infant hospitalizations (2015—2019).

Leading Cause of Hospitalizations by Year						
	Leading Primary Diagnosis			Most Frequent Diagnosis in Any Position		
Diagnosis (ICD—9 or 10 code)	**Rank**	**Weighted Frequency (N)**	**% of Total Infant Hospitalizations (95% CI)**	**Rank**	**Weighted Frequency (N)**	**% of Total Infant Hospitalizations (95% CI)**
Acute bronchiolitis due to RSV (466.11)	1	206,265	9.6 (9.4—9 9)	1	249,251	11.6 (11.3-11.9)
Unspecified fetal and neonatal jaundice (774.6)	2	131,126	6.1 (5.7—6.4)	3	224,337	10.4 (10.1-10.7)
Acute bronchiolitis due to other infectious organisms (466.19)	3	127,150	6.1 (5.8-6.3)	5	170,454	(7.7-8.2)
Pneumonia, organism unspecified (486)	4	64,680	3.4 (3.2—3.6)	*	*	*
Other specified conditions originating in the perinatal period (779.89)	5	53,044	2.4 (2.3-2.7)	6	147,596	6.9 (6.6-7.1)
*Not in the top 10 primary diagnosis or most frequent diagnosis.						

Mova N, et al. 2021. Medicaid Infants Have the Highest Respiratory Syncytial Virus (RSV) Hospitalization Burden and Rates Among United States (US) Infants Aged <1 year: An Analysis of the 2011 - 2018 National (Nationwide)Inpatient Sample (NIS). Poster presented at American Academy of Pediatrics 2021 Annual Conference.

Medically-attended RSV infection is a burden throughout the first year of life

- CDC-developed a model of RSV burden in a single birth cohort to estimate direct effects of immunization candidates:[1]
  - Disease burden estimates (lab-confirmed RSV) from NVSN surveillance from 2002-2009
- Approximately 590,000 infants (1 in 7 births) acquire LRTI requiring medical attention.[1]
- Outpatient + ED burden is 17 times that of inpatient.[1]

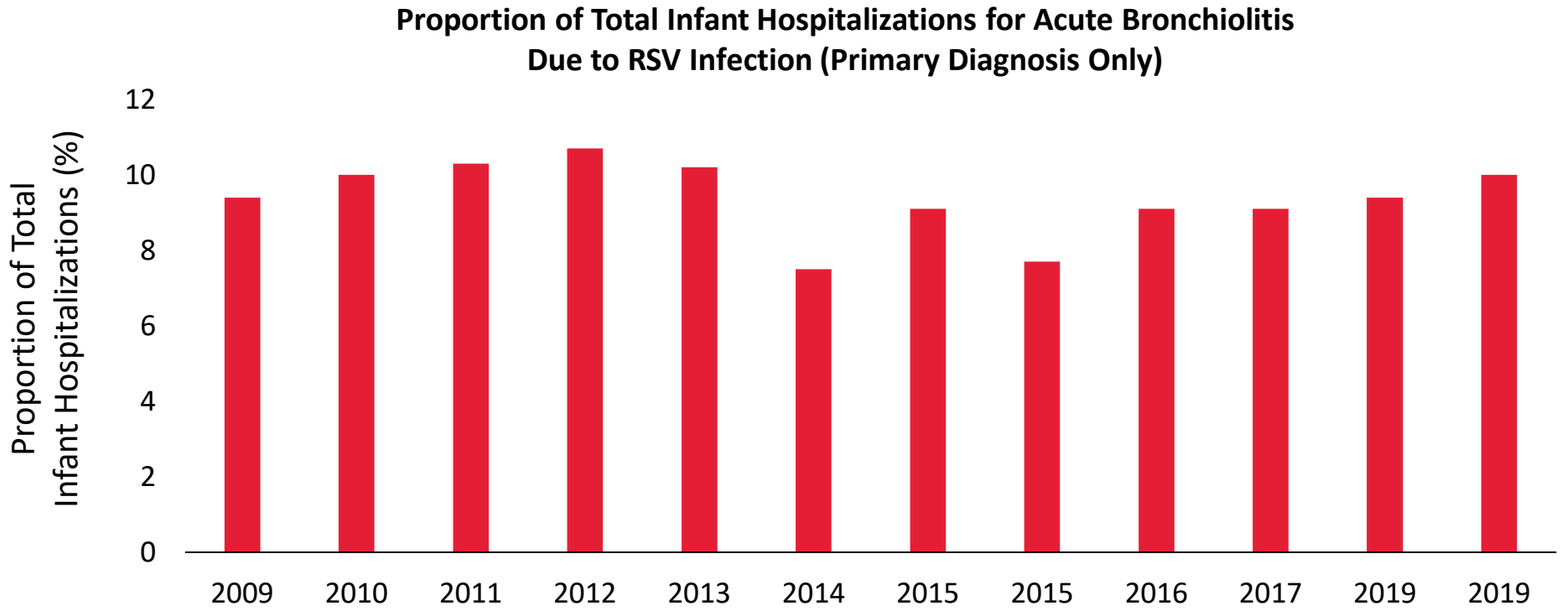


Data source: NVSN 2000-2005 (inpatient)[2] and 2004-2009 (outpatient and ED)[3]

RSV causes significant burden of disease throughout the first year of life.[1-3]

1. Rainish G, et al. *Vaccine*. 2020;38(2):251-257.
2. Hall CB, et al. *Pediatrics*. 2013;132(2):e341-348.
3. Lively JY, et al. *J Pediatr Infect Dis Soc*. 219;8(3):284-286.

RSV is the leading cause of hospitalization in U.S. infants



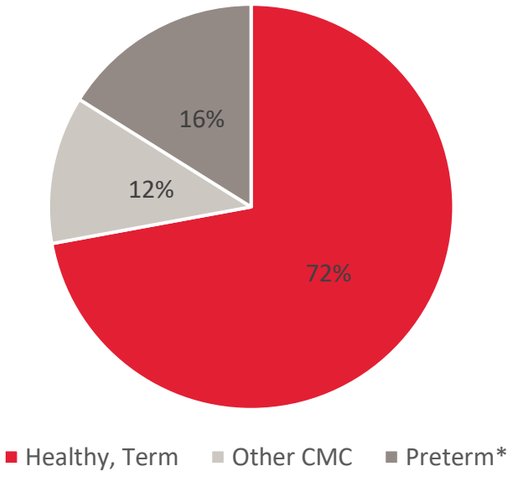
Acute bronchiolitis due to RSV was the leading cause of infant hospitalization and represented a median of 9.4% (range 7.5-10.7%) of total infant hospitalizations each year.

Mova N, et al. 2021. Medicaid Infants Have the Highest Respiratory Syncytial Virus (RSV) Hospitalization Burden and Rates Among United States (US) Infants Aged <1 year: An Analysis of the 2011 - 2018 National (Nationwide)Inpatient Sample (NIS). Poster presented at American Academy of Pediatrics 2021 Annual Conference.

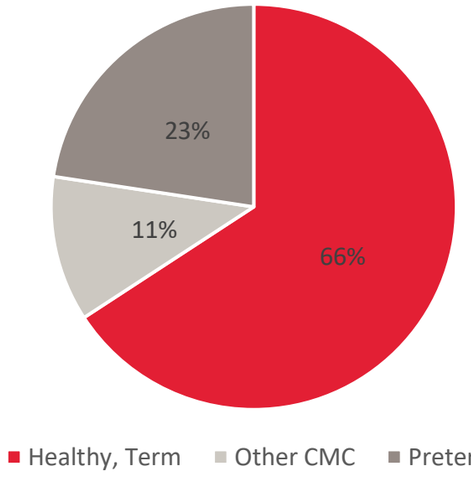
Most infant hospitalizations, ICU admissions, and ventilation episodes due to RSV are in healthy, term infants

26% of hospitalized healthy term infants were admitted to the ICU[1]

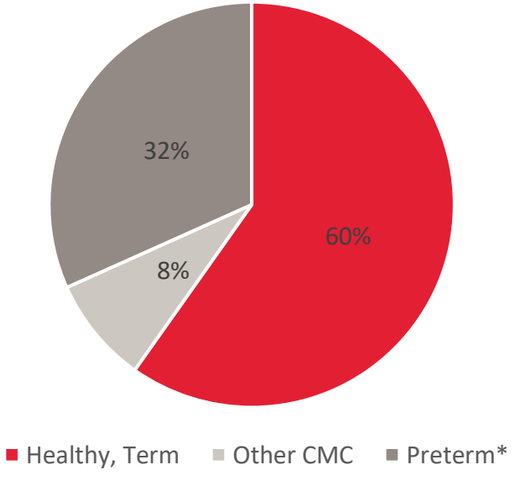
22% of ICU-admitted healthy term infants required mechanical ventilation[1]



Hospital Admissions (N = 1180)[1]



ICU Admissions (N = 336)[1]



Mechanical Ventilation (MV; N = 82)[1]

Infant: age < 12 months; preterm: born at < 37 weeks gestational age; Term, born at 37+ weeks gestational age; CMC: chronic medical condition 9.6% of the 2014 birth cohort were born preterm[2]

1. Arriola CS, et al. *J Pediatric Infect Dis Soc*. 2019;9(5):587-595.
2. Hamilton BE, et al. *Births: Final Data for 2014. National Vital Statistics Reports*. 2015;64(12).

Which infants are at risk for severe RSV infection?

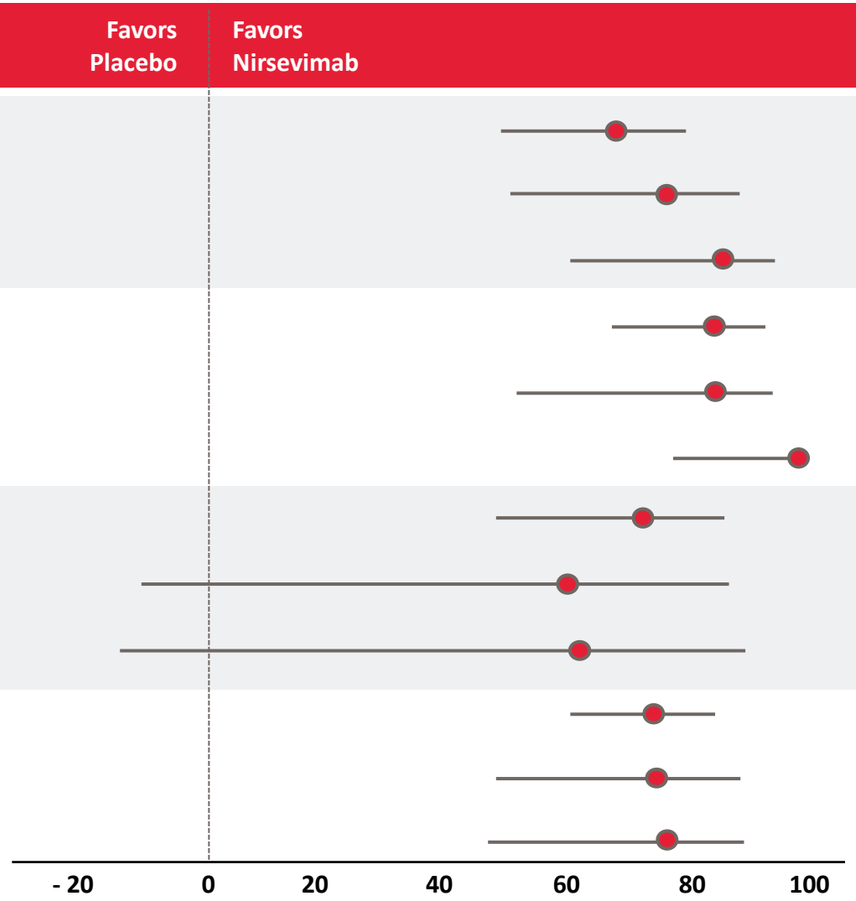
All infants are at risk for severe RSV infection.

Effective prevention strategies targeting all children less than 1 year of age have the potential to completely change the landscape of seasonal RSV epidemics.

Nirsevimab
RSV immunoprophylaxis for all infants

Consistent efficacy across populations and disease severity

Population/Study	Endpoint	Efficacy % (95% CI)
Preterm infants (≥ 29 to < 35 wGA) Trial 03	MA RSV LRTI	70.1 (52.3, 81.2)
	MA RSV LRTI with hospitalization	78.4 (51.9, 90.3)
	MA RSV LRTI (very severe)	87.5 (62.9, 95.8)
Trial 03 (proposed dose)	MA RSV LRTI	86.2 (68.0, 94.0)
	MA RSV LRTI with hospitalization	86.5 (53.5, 96.1)
	MA RSV LRTI (very severe)	100 (79.7, NE)
Term and late preterm infants (≥ 35 wGA) Trial 04 (primary cohort)	MA RSV LRTI	74.5 (49.6, 87.1)
	MA RSV LRTI with hospitalization	62.1 (-8.6, 86.8)
	MA RSV LRTI (very severe)	64.2 (-12.1, 88.6)
Trial 04 (all subjects)	MA RSV LRTI	76.4 (62.3, 85.2)
	MA RSV LRTI with hospitalization	76.8 (49.4, 89.4)
	MA RSV LRTI (very severe)	78.6 (48.8, 91.0)



1. Simões EAF, et al. *Lancet Child Adolesc Health*. 2023;7(3):180-189.
2. Muller WJ, et al. *N Engl J Med*. 2023;388(16):1533-1534.
3. Griffin MP, et al *N Engl J Med*. 2020;383(5):415-425. [published correction: *N Engl J Med*. 2020;383(7):698].

Case 1: Infant

- 5-week-old boy born preterm by vaginal delivery at 32 weeks
- Discharged 9 days ago and has been doing well
- Scheduled well-child check in January
- Mother says he has developed moderate nasal congestion and clear nasal discharge two days ago
- No issues with breastfeeding
- Mother and sibling (5 years old) have congestion, discharge, and dry cough one week ago but no fever

Physical exam

Infant is sleeping comfortably with no signs of distress.

- Temperature: 36.8°C
- Pulse: 120
- Respiratory rate: 42 breaths per minute
- Symptoms: nasal congestion with clear rhinorrhea
- Cardiac exam: normal
- Lung auscultation: right side crackles

The remainder of the exam is unremarkable.

Further exam notes regular stretches of periodic breathing with no breaths for 10-12 seconds.

A point-of-care nasal swab confirms RSV LRTI.

Due to periodic breathing, hospitalization is arranged.

At the hospital

Infant’s condition initially remains the same.

- Pulse oximetry shows 93% saturation without supplemental oxygen
- Occasional dips to 85% during periodic breathing episodes
- Low flow supplemental oxygen is provided
- Chest radiograph: right lung infiltrate
- Temperature: 38.2°C

Labs:

- WBC: 62,000 cells/mL
- Lymphocytes: 92%
- Neutrophils: 6%
- Monocytes: 2%

Multiplex PCR Respiratory Panel:

- **RSV**
- ***Bordetella pertussis***

As a result of multiplex testing, droplet precautions are added, and household contacts are treated for pertussis and infant remains hospitalized for monitoring.

Infant case

Take home points

- Signs and symptoms of common respiratory tract infections overlap.
- Diagnostic testing is needed to confirm clinical diagnoses especially when results may impact treatment and/or infection control practices.
- Multiplex PCR-based testing often reveals the presence of more than 1 pathogen, especially among young children where ~25% of all samples reveal the presence of 2 or more pathogens.
- Multiplex respiratory panels include several pathogens for which treatment is available.
  - Influenza viruses, SARS-CoV-2, Bordetella pertussis, B. parapertussis, Mycoplasma pneumoniae, Chlamydophila pneumoniae.
- Best infection control practices differ by respiratory pathogen.
  - For example, RSV infection requires contact precautions, while *B. pertussis* infection requires droplet precautions.

Adult RSV and vaccinations

Older adults have more severe RSV

In most adults, RSV causes mild cold-like symptoms that last less than 5 days.

- Cough, runny nose, sore throat, headache, decreased appetite, and fever

In older adults, RSV can cause more severe disease such as pneumonia, or can worsen respiratory diseases, including asthma or chronic obstructive pulmonary disease (COPD).

Linder KA, Malani PN. *JAMA.* 2023;330(12):1200.

Adults over 60 are at increased risk for RSV complications

11%

of outpatients over 60 with acute respiratory illness in winter have RSV

33%

of older adults with RSV may need to be hospitalized

15%

ICU admission rate for RSV in patients over 60

≥8%

hospital mortality rate from RSV in older adults

https://health.clevelandclinic.org/rsv-in-older-adults/. Accessed October 1, 2023.

RSV in older adults and adults with chronic medical conditions can be severe

Healthy adults with RSV

- Mild symptoms consistent with upper respiratory tract infection
- Variable symptom duration

Adults at risk for RSV LRTI

- Older adults, especially age ≥ 65 years
- Adults with chronic lung or heart disease
- Adults with weakened immune system

Centers for Disease Control and Prevention. November 2023. https://www.cdc.gov/rsv/clinical/index.html. Accessed November 10, 2023.

Chronic conditions can impact the severity of RSV

Chronic conditions with highest risk for severe RSV
Lung disease
Cardiovascular disease
Diabetes
Neurologic conditions
Kidney disorders
Liver disorders
Hematologic disorders
Immune disorders

Underlying factors that increase severe RSV risk
Frailty
Advanced age
Residence in a nursing home or long-term care facility

Healthcare providers may conclude that other conditions or underlying risk factors are also a risk for severe respiratory disease.

Centers for Disease Control and Prevention. November 2023. https://www.cdc.gov/rsv/clinical/index.html. Accessed November 10, 2023.

RSV can exacerbate multiple chronic conditions

RSV infection may exacerbate underlying cardiopulmonary diseases

- Asthma
- Chronic obstructive pulmonary disease
- Congestive heart failure

Centers for Disease Control and Prevention. November 2023. https://www.cdc.gov/rsv/clinical/index.html. Accessed November 10, 2023.

Comorbidities increase risk of hospitalization among older adults who develop RSV

Associated Risk Condition	Odds Ratio (95% CI)	P Value
Osteoarthritis	0.72 (0.51-1.02)	0.062
High cholesterol	0.75 (0.55-1.03)	0.074
Asthma	0.79 (0.50-1.24)	0.303
Coronary artery disease	1.16 (0.82-1.65)	0.411
Stroke	2.00 (1.02-3.96)	0.045
Congestive heart failure	2.06 (1.40-3.02)	<0.001
Chronic obstructive pulmonary disease	2.12 (1.49-3.02)	<0.001
Solid organ transplant	2.52 (0.88-7.22)	0.085
Stem cell transplant	2.53 (0.21-29.70)	0.461
Chronic kidney disease	4.37 (2.74-6.98)	<0.001
Hematologic malignancy	5.17 (2.02-13.20)	0.001

RSV is a strong predictor of hospitalization for stroke, congestive heart failure, COPD, kidney disease, and malignancies.

Wyffels V, et al. *Adv Ther*. 2020;37:1203-1217.

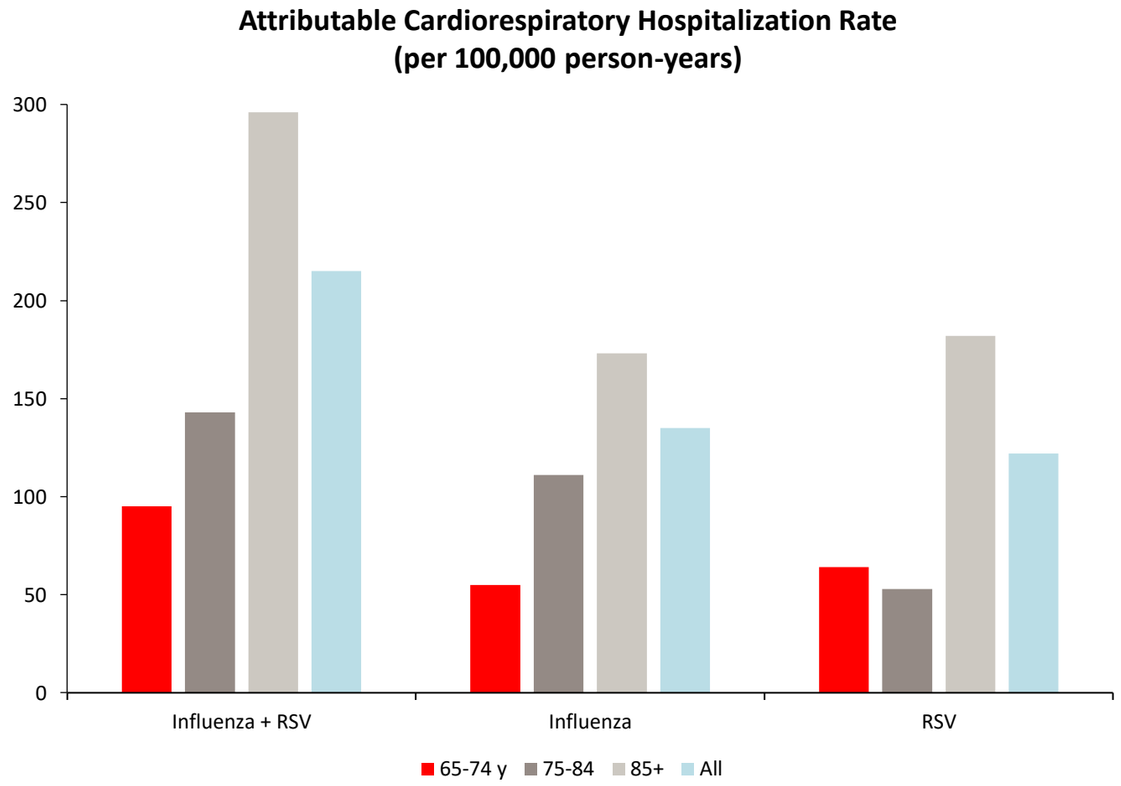
RSV is an important cause of cardiorespiratory hospitalization

Retrospective analysis for 6 respiratory seasons (2011-2017)

- Long-stay (≥100 d) residents of long-term care facilities age ≥65 years

RSV contributes to cardiorespiratory causes of hospitalization.

Increases correlate with increased age.



Bosco E, et al. *JAMA Netw Open*. 2021;4(6):e2111806.

RSV outcomes are more severe than COVID-19 or influenza in patients over 60

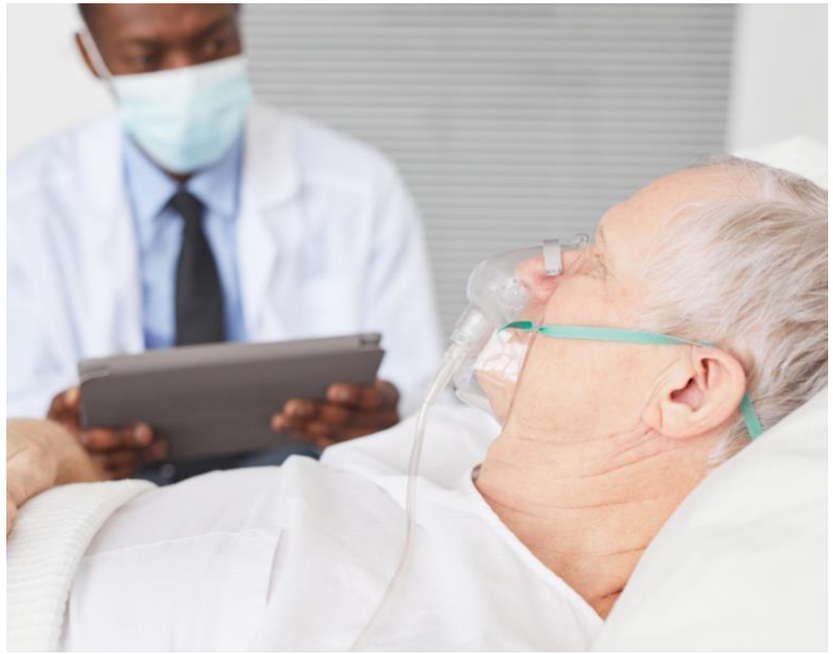
In-hospital outcomes	No./Total no. (%)			RSV vs. COVID-19 aOR (95% CI)	P-value	RSV vs. influenza aOR (95% CI)	P-value
	RSV N = 304	COVID-19 N = 4734	Influenza N = 746				
Standard flow oxygen therapy	157/197 (79.7)	2,169/3,726 (58.2)	390/593 (65.8)	2.97 (2.07–4.27)	<0.001	2.07 (1.37–3.11)	<0.001
HFNC or NIV	59/256 (23.0)	495/4,223 (11.7)	94/687 (13.7)	2.25 (1.65–3.07)	<0.001	1.99 (1.36–2.90)	<0.001
ICU admission	74/304 (24.3)	819/4,734 (17.3)	125/746 (16.8)	1.49 (1.13–1.97)	0.005	1.55 (1.11–2.19)	0.01
IMV or death	41/304 (13.5)	481/4,734 (10.2)	52/746 (7.0)	1.39 (0.98–1.96)	0.07	2.08 (1.33–3.26)	0.001

Abbreviations:
aOR = adjusted odds ratio; HFNC = high-flow nasal cannula; ICU = intensive care unit;
IMV = invasive mechanical ventilation; NIV = noninvasive ventilation; RSV = respiratory syncytial virus

Surie D, et al. *MMWR Morb Mortal Wkly Rep.* 2023;72:1083–1088.

Current RSV testing paradigms miss many patients

- Adults shed RSV viral particles for a short period of time.
- Rapid antigen tests for RSV in adults' may be less effective due to reduced viral shedding.
- Polymerase chain reaction (PCR) tests are more reliable for detecting RSV in adults.
  - Correct 93% of the time
- All testing for RSV is underutilized in the U.S.
- Only **4.3%** of U.S. hospitals test for RSV in people aged 65 or older who are admitted with lower respiratory tract infections.



Nuwer R. *Nature.* 2023;621:S58-59.

Adult vaccines

The US Food and Drug Administration (FDA) recently approved two new RSV vaccines.
Both vaccines are moderately-to-highly effective in preventing severe RSV infections in adults aged 60+ years.

RSVpreF (Abrysvo, Pfizer)

- Reduced LRTI with 3+ lower respiratory signs and symptoms by 88.9% during the first RSV season and by 78.6% during a partial second RSV season (compared to placebo).
- Statistically significant efficacy was demonstrated in subgroups including those aged 70 years and older, and those with and without at least one chronic medical condition.

RSVPreF3 (Arexvy, GSK)

- Reduced symptomatic RSV lower respiratory tract disease (LRTD) by 82.6% during the first RSV season and by 56.1% during the second RSV season.
- Statistically significant efficacy was demonstrated in subgroups including those aged 70 years and older, those with and without at least one chronic medical condition, those classified as fit, and those classified as pre-frail.

https://www.cdc.gov/vaccines/vpd/rsv/hcp/older-adults.html. Accessed October 1, 2023.
Linder KA, Malani PN. *JAMA.* 2023;330(12):1200.

Case 2: Long term care

- 74-year-old woman in a resident long-term care facility for 5 months
- Presents to physician on call with shortness of breath, congestion, and cough for two days that is getting worse
- Physical exam shows no fever or cardiovascular findings
- Physician notes some wheezing on auscultation
- COVID-19 rapid antigen test is negative
- Influenza rapid antigen test is negative
- Patient is prescribed antibiotics and given supplemental oxygen

Hospitalization needed for increasing symptom severity

- Patient develops worsening symptoms over the next 48 hours and is hospitalized with fever and decreasing oxygen saturation.
- Lung sounds have worsened, and patient is diagnosed with pneumonia.
- A COVID-19 PCR test is negative.
- A sample is sent for a multi-pathogen respiratory panel to identify the causative etiology of the pneumonia.

Multiplex PCR Respiratory Panel:

- COVID-19 – negative
- Influenza A – negative
- Influenza B – negative
- **RSV – positive**

Patient is admitted to ICU for respiratory distress and monitored.

As a result of multiplex testing, RSV was identified as a causative pathogen.
The patient was admitted to the ICU for monitoring and improved with supportive care.

Respiratory symptom overlap, point-of-care and multiplex testing

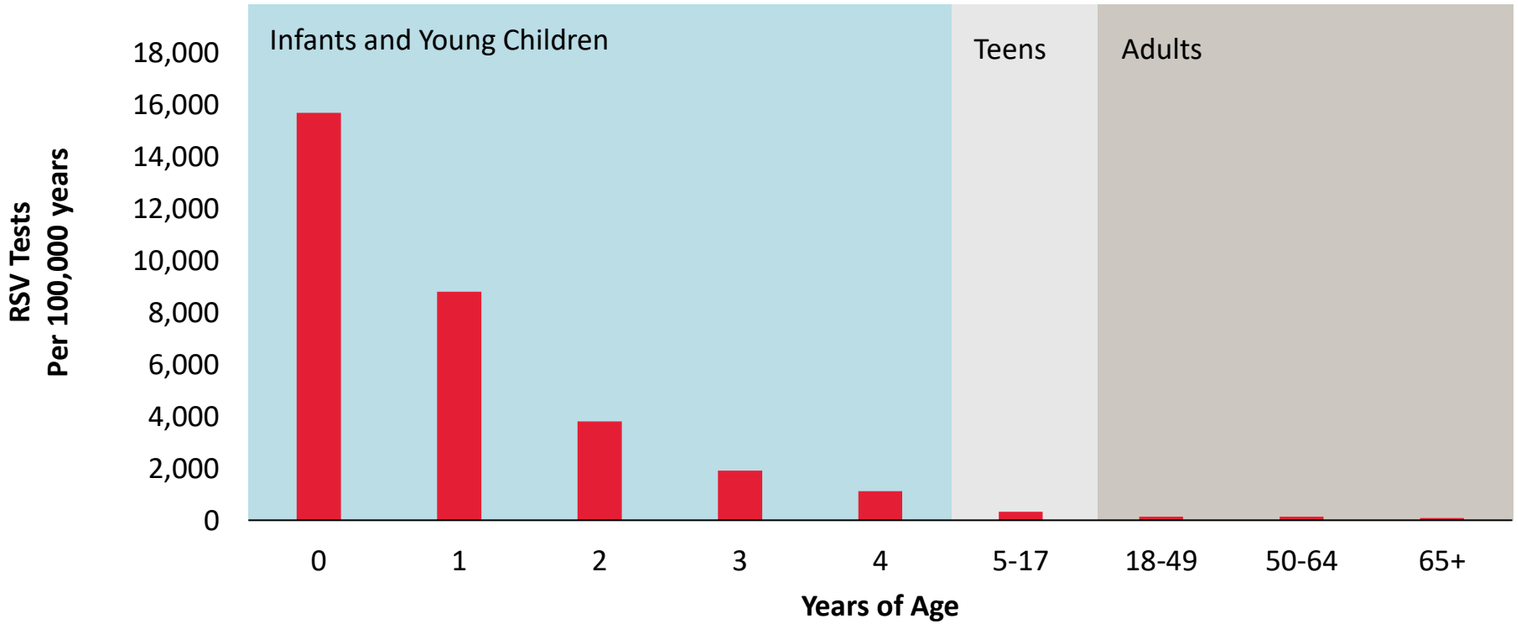
Common respiratory viruses have high levels of symptom overlap

Symptoms	Cold	Flu	COVID-19	RSV
Cough	+++	+++	+++	+++
Headache	+++	+++	+++	+++
Sneezing	+++	+++	+++	+++
Runny nose	+++	+++	+++	+++
Congestion	+++	+++	+++	+++
Aches	++	+++	++	+
Difficultly breathing/Wheezing	+	+	+++	+++
Fatigue	++	+++	+++	+
Fever	+	+++	++	++
Loss of taste or smell	+	+	++	+
Sore throat	+++	++	+++	+

Overlapping symptoms create a need for sensitive and specific point-of-care multiplex tests.

https://www.nfid.org/resource/how-to-tell-the-difference-between-flu-rsv-covid-19-and-the-common-cold/. October 1, 2023.

Pediatric vs. adult RSV testing



Children are tested for RSV more often than adults.

Nuwer R. *Nature.* 2023;621:S58-59.
Tran PT, et al. *BMC Infect Dis*. 2022 Aug 8;22(1):681.

Point-of-care rapid antigen-based tests may be more useful in pediatric patients

Systematic review and meta-analysis of RSV rapid antigen-based tests show an overall sensitivity around 80%.

- Pooled sensitivity of 80% (95% CI, 76–83)
- Pooled specificity of 97% (95% CI, 96–98)

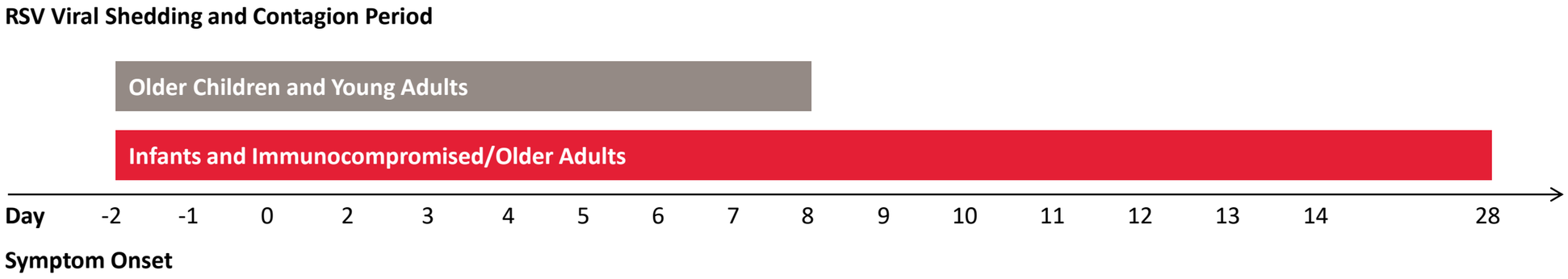
Sensitivity of RSV rapid antigen tests is increased in pediatric patients compared to adults.

- Pediatric patients: 81% (95% CI 78–84)
- Adults: 29% (95% CI 11–48)

Bernstein D, et al. *J Appl Lab Med.* 2023;8(2):353–371.

RSV viral shedding can impact efficacy of rapid antigen tests

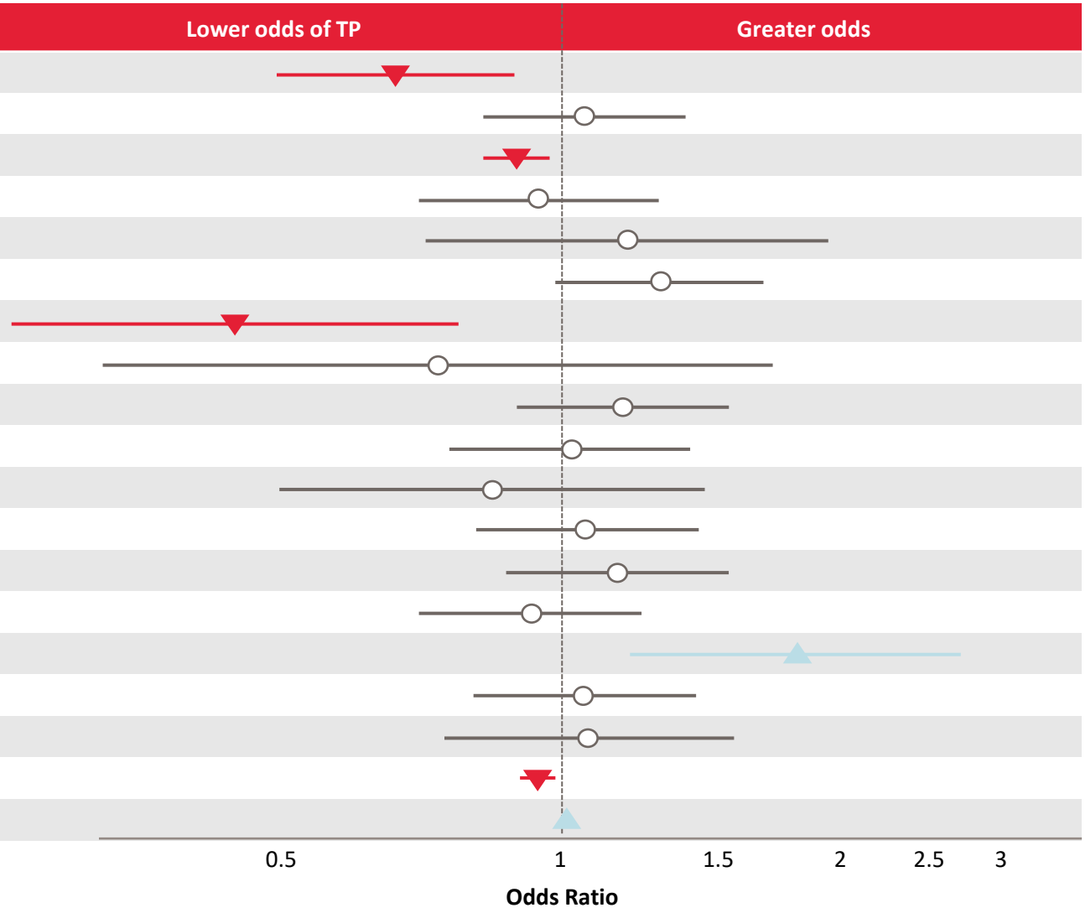
- Viral shedding lasts longer in infants and older adults, up to 28 days.
- Rapid antigen test sensitivity is highest in infants and young children but may not be as sensitive for older children and young adults due to lower viral loads in respiratory specimens.
- The CDC recommends PCR testing for older children and adults.



Centers for Disease Control and Prevention. November 2023. https://www.cdc.gov/rsv/clinical/index.html. Accessed November 10, 2023.

Symptoms and age may impact sensitivity of rapid tests for respiratory infections

	OR	95% CI	P-value
No ILI	0.65	0.48 to 0.88	0.006
Sex: Male	1.06	0.81 to 1.38	0.681
Days from onset	0.89	0.82 to 0.97	0.006
Severity: Mild	0.94	0.69 to 1.29	0.714
Severity: Severe	1.18	0.70 to 1.98	0.531
Unvaccinated	1.29	0.99 to 1.68	0.064
RVP: Co-detection	0.43	0.24 to 0.76	0.004
Season: Early	0.73	0.31 to 1.73	0.473
Season: Late	1.17	0.89 to 1.53	0.272
Symptom: Chills	1.03	0.76 to 1.39	0.861
Symptom: Cough	0.84	0.48 to 1.45	0.522
Symptom: Sore Throat	1.06	0.81 to 1.39	0.674
Symptom: Malaise	1.15	0.86 to 1.54	0.339
Symptom: Myalgia	0.92	0.69 to 1.24	0.595
Symptom: Runny Nose	1.83	1.19 to 2.80	0.006
Symptom: Headache	1.05	0.80 to 1.39	0.711
Symptom: Nasal Congestion	1.07	0.73 to 1.55	0.739
Linear age	0.94	0.91 to 0.97	< 0.001
Quadratic age	1.01	1.00 to 1.02	0.01



Bell C, et al. *PLoS One*.2022;17(5):e0268279

Molecular rapid tests (≤ 30 minutes) improve sensitivity and specificity for RSV regardless of age or setting

Method	Antigen	Molecular
Subrecords, n (%)	61 (69.3)	27 (30.7)
Overall		
Sensitivity, %	25.7–100	66.7–100
Specificity, %	80.3–100	94.3–100
Age		
<18 years		
Sensitivity, %	25.7–97.6	84.3–100
Specificity, %	80.3–100	94.3–100
Mixed age		
Sensitivity, %	57.5–100	77.8–100
Specificity, %	91.8–100	94.7–100
Setting		
Inpatient		
Sensitivity, %	25.7–95.2	98.1–100
Specificity, %	80.3–100	94.3–99.4
Emergency department/outpatient		
Sensitivity, %	67.8–97.6	93–100
Specificity, %	97.6–99.6	96–100

Bernstein D, et al. *J Appl Lab Med.* 2023;8(2):353–371.

Molecular multiplex testing is more sensitive and specific than rapid antigen testing for RSV

Testing for multiple respiratory pathogens in one molecular platform could address symptom overlap while improving on rapid antigen testing in certain age groups.

Test	Performance (95% CI)
Influenza A	
PCR	Sensitivity: 100% (92.7–100%)
	Specificity: 90.6% (86.3–93.6%)
Rapid Antigen	Sensitivity: 69.4% (55.5–80.5%)
	Specificity: 99.6% (97.7–99.9%)
Influenza B	
PCR	Sensitivity: 100% (61.0–100%)
	Specificity: 98.3% (96.0–99.3%)
Rapid Antigen	Sensitivity: 66.7% (30.0–90.3%)
	Specificity: 100% (98.7–100%)
RSV	
PCR	Sensitivity: 100% (61.0–100%)
	Specificity: 99.3% (97.5–99.8%)
Rapid Antigen	Sensitivity: 83.3% (43.6–97%)
	Specificity: 100% (98.7–100%)

Bernstein D, et al. *J Appl Lab Med.* 2023;8(2):353–371.

Rapid multiplex testing for respiratory viruses improves care

Utilizing rapid multiplex testing for respiratory viruses reduces time to result and length of stay for hospitalized patients.

Reduction in turnaround time

–24.22 hours

(95% CI –28.70 to –19.74 hours)

Reduction in length of stay

–0.82 days

(95% CI –1.52 to –0.11 days)

Clark TW, et al. *J Infect*. 2023;86(5):462-475.

Impact on patients, providers and society

RSV cost burden is high in the U.S.

RSV cost burden is carried by infants and patients over 65.
Most costs are related to hospitalizations.

Age	RSV Hospitalization Costs
Infants and children	$709.6 million
18-49	$164.2 million
50-64	$290.2 million
≥65	$810.9 million

Total U.S. costs of infants, children, and adults with RSV could total **~$3 billion per year.**

Bowser DM, et al. *J Infect Dis*. 2022;226(Suppl 2):S225–S235.
Grace M, et al. *J Med Econ*. 2023;26(1):742-759.
Schaffner W. *Infect Dis Clin Pract.* 2023;31(1):e1210.

Economics and finances of prevention: Is it worth the price tag?

- In June of 2023, CDC's Advisory Committee on Immunization Practices (ACIP) voted to recommend RSV vaccination in adults over 60.
- Adult RSV vaccines currently on the market could cost as much as $300 per dose.

ACIP found that adult RSV vaccines could be cost effective with current estimates of prevalence and cost burden.

ACIP Model of Cost-Effectiveness: Adult RSV Vaccines

If 20% of adults 65 and over were vaccinated, in two years the U.S. would avert:

- 220,000 outpatient visits
- 26,000 emergency department visits
- 22,000 inpatient stays
- 1,100 deaths

Cost ~$100,000-$150,000 per QALY

Hutton D. https://ihpi.umich.edu/news/expert-qa-exploring-cost-effectiveness-rsv-vaccines-older-adults. Accessed November 1, 2023.
Appleby J. https://kffhealthnews.org/news/article/timing-cost-vaccines-insurance-flu-covid-rsv/. Accessed November 1, 2023.

Economics and finances of prevention: Is it worth the price tag?

There are two new RSV interventions for newborns.

- Monoclonal antibody infant injection
- Maternal vaccine to transfer antibodies in utero

Both are anticipated to provide protection for less than a year.

Infant RSV preventatives are expensive and do not provide full protection but protect during the most critical period.

Cost-effectiveness depends on correct estimates of incidence.

ACIP Model of Cost-Effectiveness: Infant RSV Prevention

Monoclonal antibody

- ~ $157,000 per QALY

Maternal vaccine

- ~ $214,000 per QALY

QALY framework may not be an effective measure for pediatric vaccinations given the younger patient age and amount of quality adjusted life per lifespan.

Hutton D. https://ihpi.umich.edu/news/expert-qa-exploring-cost-effectiveness-rsv-vaccines-older-adults. Accessed November 1, 2023.
Amdahl J, et al. Infect Dis Ther. 2021;10:1-13.

Incidence is likely underestimated. Multiplex testing can help.

- Relatively few symptomatic patients undergo diagnostic testing for RSV.
- RSV may not be considered a possible etiology of respiratory symptoms, particularly in adults.
- Thus, the true incidence of RSV infection is very likely underestimated.

- Accurate, rapid, cost-effective tests may lead to more widespread testing for RSV.
- Multiplex assays may play a critical role in RSV diagnosis and differentiation respiratory symptom overlap.
- Ability to test and diagnose RSV will be particularly important once RSV-specific treatments become available.

Schaffner W. Infect Dis Clin Pract. 2023;31(1):e1210.

National Foundation for Infectious Diseases

RSV call to action

Increase RSV awareness and education

- Increased awareness is essential to improving the diagnosis and treatment of RSV.
- Offer expanded health care professional education.
- Broaden public understanding of the burden of RSV.

Strengthen RSV public health surveillance and related policies

- Establish robust RSV surveillance system driven by leadership and investments at the federal level.
- Expand RSV diagnostics for use in children and older adults with respiratory illness—tests should be quick, convenient, accurate, and affordable.
- Rebuild public health capacity lost due to COVID-19.

Increase support for RSV research and innovation

- Prepare regulatory frameworks for future innovations.
- Identify funding sources and programs for preventive interventions and establish pathways to improve access to new interventions.
- Establish a cost-effectiveness evidence base.
- Identify and implement strategies to manage insurance coverage gaps
- Pursue broad-based public health recommendations for evidence-based interventions.

https://www.nfid.org/resource/call-to-action-reducing-the-burden-of-rsv-across-the-lifespan/. Accessed November 1, 2023.
Schaffner W. *Infect Dis Clin Pract.* 2023;31(1):e1210.

Summary

- Infants and children are the most prevalent age group affected by RSV.
- Adult RSV can be severe, particular in those over 65, but lack of awareness may affect testing and vaccination rates.
- Large overlap in symptoms leads to delayed testing or misdiagnosis.
- New vaccines and preventive measures are here but there are still a lack of treatments.
- Multiplex testing may improve accuracy and rates of testing in infants and adults, particularly those who are not vaccinated.

Thank you

Jonathan L. Temte, MD, PhD