Pediatric Fall Respiratory Refresher Course

Virtual Webinar

October 15, 2025

12:30-3pm PT

Agenda

12:30 **Welcome, Logistics**
Vicki L. Sakata, MD – Senior Medical Advisor, NWHRN
Bernardo Lactaoen – Coalition Program Administrative and Volunteer Coordinator, NWHRN

Case Presentation: Preparing for Pediatric Respiratory Season
Vicki L. Sakata, MD

12:40 **Part 1: Approach to the wheezing, coughing, febrile infant/child**
Russell Migita, MD, Clinical Director, Emergency Service, Seattle Children's Hospital

Case Update

1:00 **Part 2: Pediatric Asthma Update**
Stephen R. Reeves, MD, PhD, Principal Investigator, Center for Respiratory Biology and Therapeutics, Seattle Children's Hospital

SME Panel: Vicki L. Sakata, MD, Moderator
Pulmonology: Stephen Reeves, MD
ED: Russ Migita, MD
RT: Janell Robison, RT
RN: Maria Ignacio, RN; Tami Best-Brandt RN, MSN
Critical Care: Derk Mueller, MD; Mary King, MD, MPH
Hospitalist: Sean Lawler, MD; Jennifer Taylor, MD

2:00 **Part 3: Nirsevimab, Clesrovimab and RSV Vaccine Update**
- Elyse Bevers, MPH, Program Manager, Non-Healthcare Congregate Settings Program, WA DOH
- Julia C. Bennett, CDC Epidemic Intelligence Service (EIS) Officer, WA DOH
- Jeaux Alexander Rinedahl, RN, PhD, Clinical, QA, and Schools Section Manager, Office of Immunization, WA DOH

2:45 **Part 4: WA State Pediatric Surge Planning, Resources and JIT Training**
Vicki L. Sakata, MD – Sr. Med. Adv. NWHRN

3:00 **Wrap-up and Adjourn**

Welcome, Introductions and Logistics

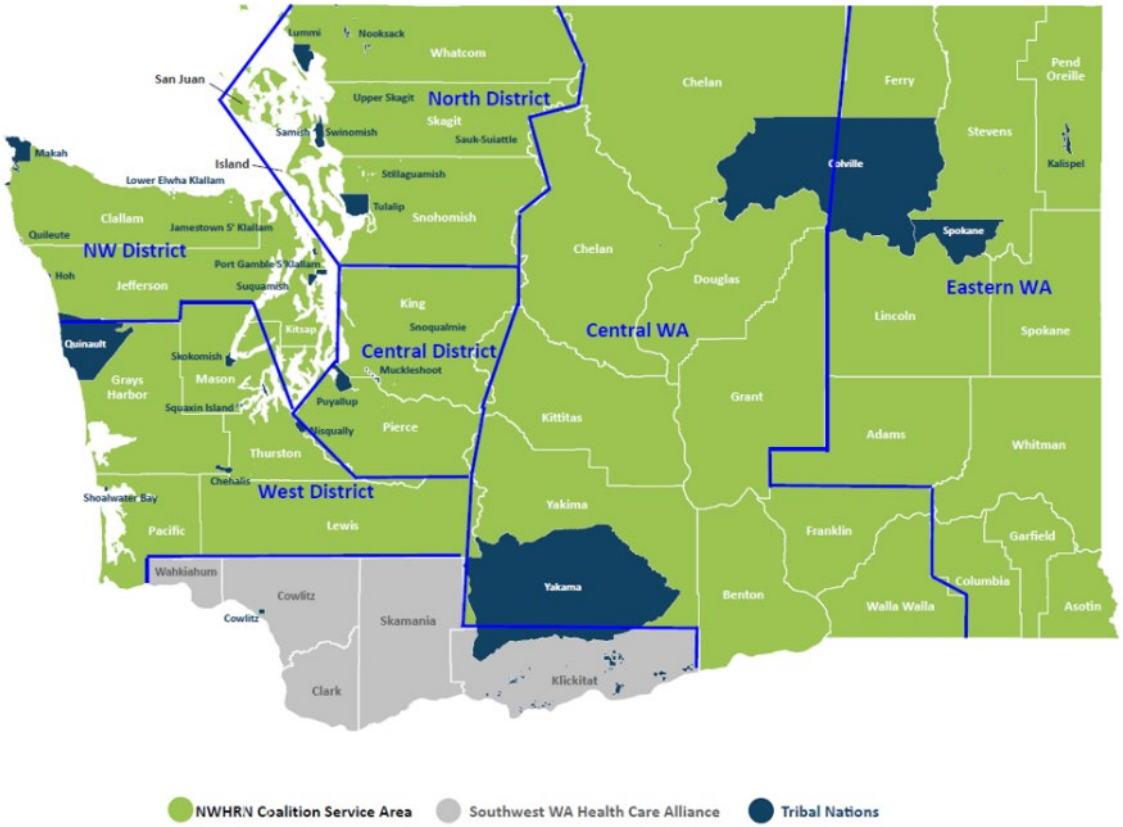
Vicki L. Sakata, MD, FAAEM, FAAP
Professor, Department of Pediatrics, University of Washington
Sr. Medical Advisor
Northwest Healthcare Response Network

Bernardo Lactaoen
Coalition Program Administrative and Volunteer Coordinator
Northwest Healthcare Response Network

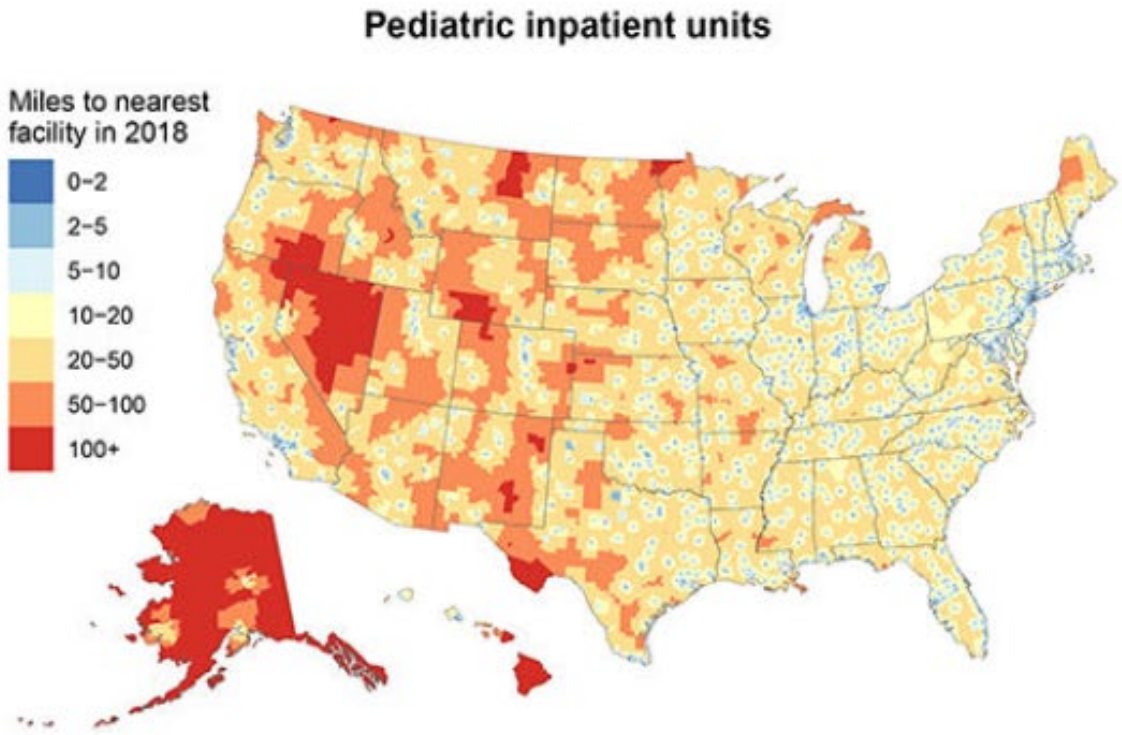
About the Northwest Healthcare Response Network

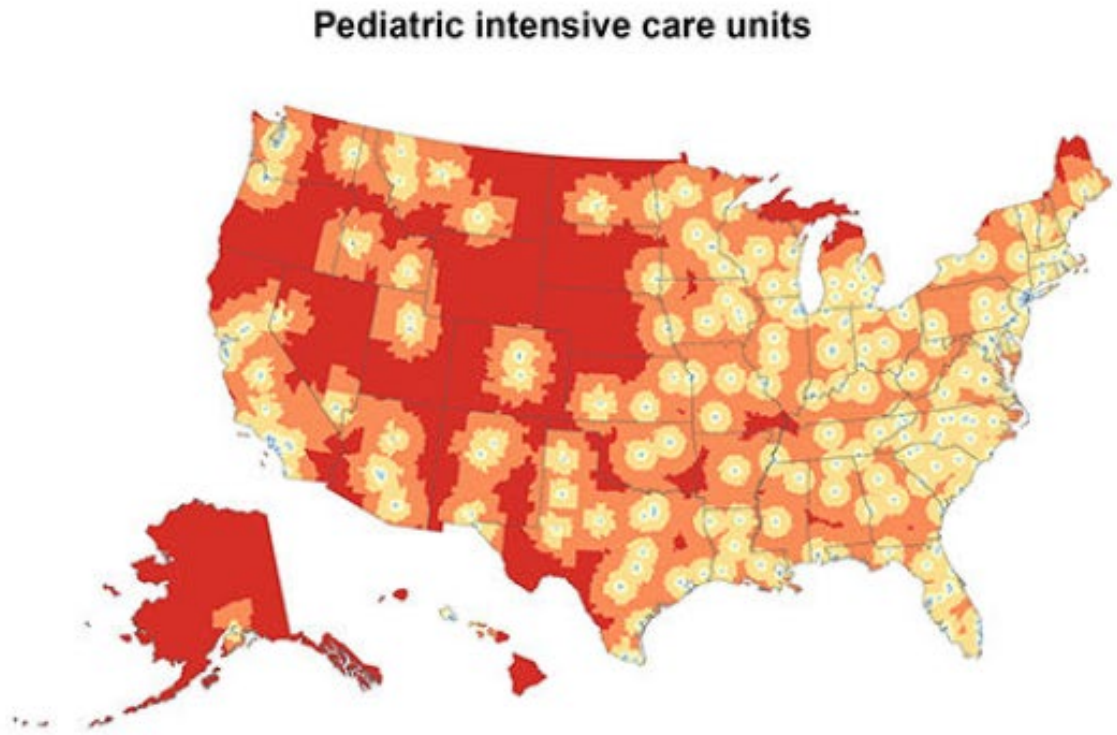
Mission: We lead cross-sector, solution-oriented coordination to build healthcare ecosystem resilience in order to face emergencies, disasters, disease outbreaks, and other disruptive events.

Vision: We envision a future with a resilient healthcare ecosystem that, through collective effort, provides effective and equitable care to all.



US Pediatric Inpatient Availability





Cushing AM, Bucholz EM, Chien AT, Rauch DA, Michelson KA. Availability of Pediatric Inpatient Services in the United States. Pediatrics. 2021 Jul;148(1):e2020041723. doi: 10.1542/peds.2020-041723. Epub 2021 Jun 14. PMID: 34127553; PMCID: PMC8642812.

Table 1.

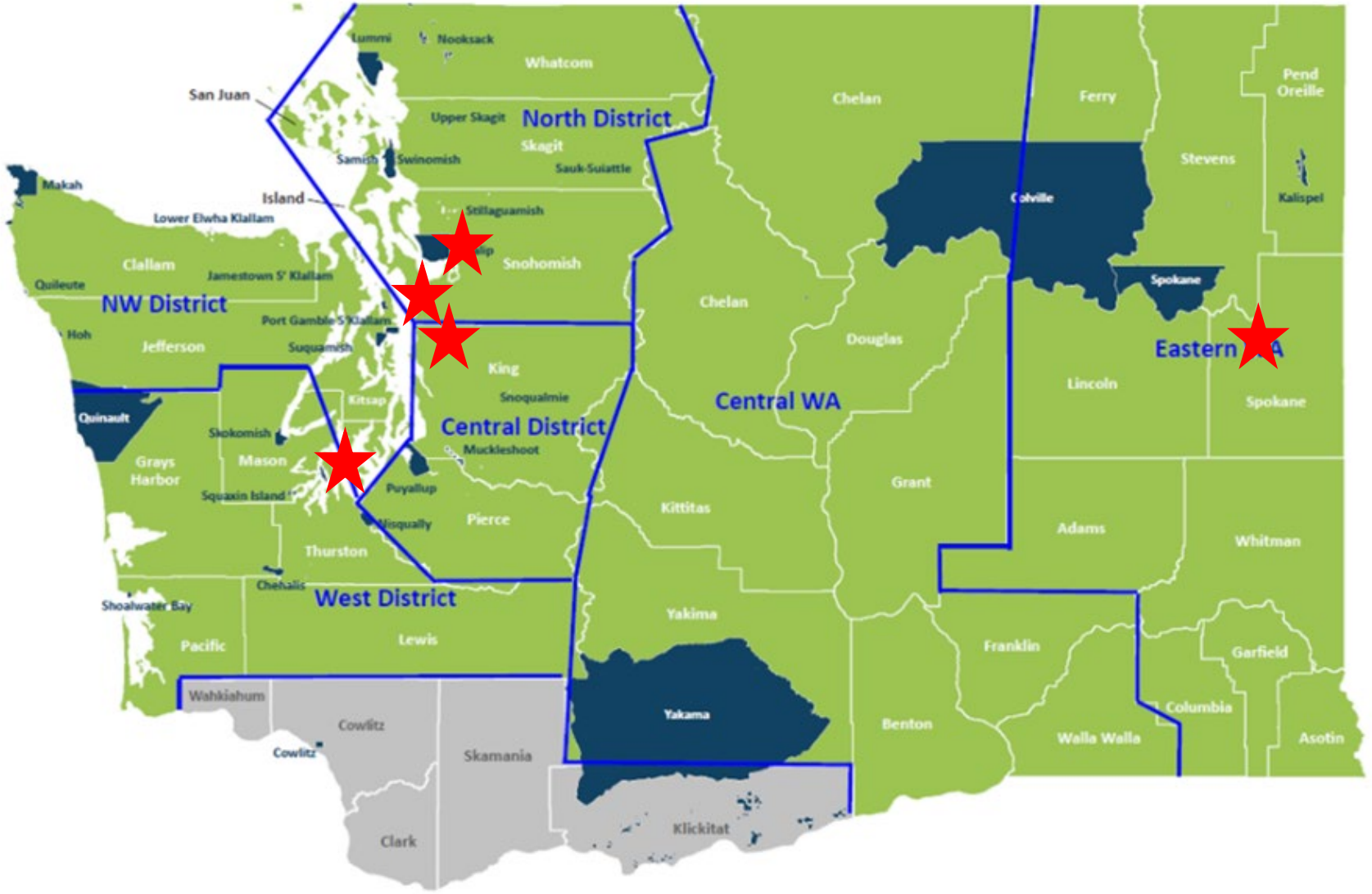
Trends in pediatric inpatient unit and intensive care unit counts, with trends in pediatric inpatient and intensive care beds.

Year	Analyzed hospitals	Hospitals with pediatric units (%)	Change in pediatric units[a]	Hospitals with PICUs (%)	Change in PICUs[a]	Pediatric beds	Change in pediatric beds[a]	Total PICU beds	Change in PICU beds[a]
2008	4585	1753 (38.2)	0%	358 (7.8)	0%	31171	0%	4646	0%
2009	4581	1733 (37.8)	−1.1%	352 (7.7)	−1.7%	31043	−0.4%	4640	−0.1%
2010	4571	1708 (37.4)	−2.6%	356 (7.8)	−0.6%	31156	0%	4823	3.8%
2011	4564	1691 (37.1)	−3.5%	357 (7.8)	−0.3%	30759	−1.3%	4840	4.2%
2012	4551	1650 (36.3)	−5.9%	357 (7.8)	−0.3%	30269	−2.9%	4858	4.6%
2013	4538	1619 (35.7)	−7.6%	354 (7.8)	−1.1%	29953	−3.9%	4879	5.0%
2014	4507	1575 (34.9)	−10.2%	352 (7.8)	−1.7%	29213	−6.3%	5007	7.8%
2015	4483	1541 (34.4)	−12.1%	351 (7.8)	−2.0%	28757	−7.7%	5015	7.9%
2016	4477	1508 (33.7)	−14.0%	360 (8.0)	0.6%	28388	−8.9%	5062	9.0%
2017	4461	1455 (32.6)	−17.0%	360 (8.1)	0.6%	27773	−10.9%	5249	13.0%
2018	4421	1418 (32.1)	−19.1%	349 (7.9)	−2.5%	27496	−11.8%	5388	16.0%

[a]change from baseline year of 2008

US Census Quick Facts: Children < 18 yo = ~73.1 million (2020)

Cushing AM, Bucholz EM, Chien AT, Rauch DA, Michelson KA. Availability of Pediatric Inpatient Services in the United States. Pediatrics. 2021 Jul;148(1):e2020041723. doi: 10.1542/peds.2020-041723. Epub 2021 Jun 14. PMID: 34127553; PMCID: PMC8642812.



Peds Beds:

1.9 million kids
3.0 peds beds/10,000 kids

National avg:
3.26 peds beds/10,000 kids

Initial Evaluation

Russ Migita, MD
Professor, Department of Pediatrics, University of Washington
Clinical Director, Emergency Services
Seattle Children's Hospital

Case Presentation

A Tale of Three Noisy Breathers

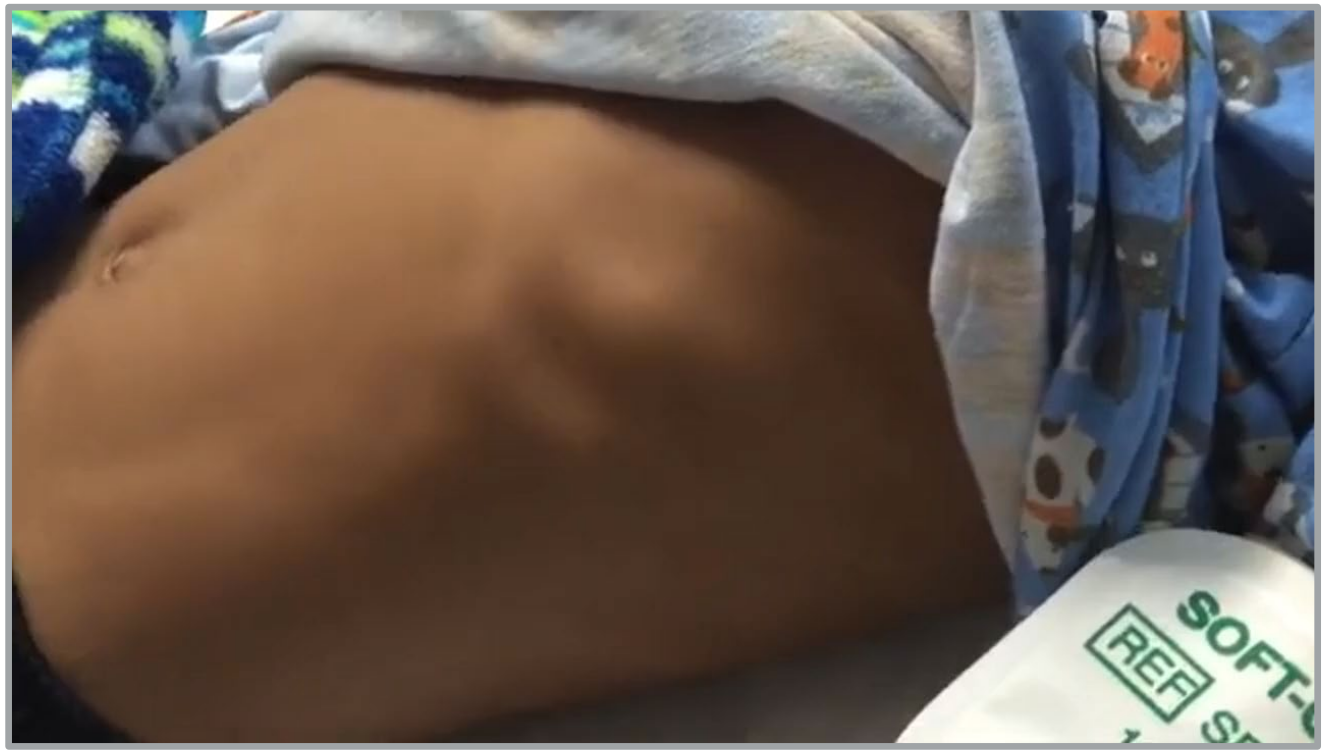
ED: Room 1

- 8 month old, 38 week, healthy, no previous wheezing, presents with < 24 hours of cough and noisy breathing
- Delayed immunization schedule, no Nirsevimab
- Robust 11 kg 90th % HR 140 RR 40, Fever 102; 02 sat 98%
- PE: moderate cough, moderate retractions, drinking from a bottle, smiling
- Nasal congestion, diffuse rhonchi, diffuse expiratory wheeze

Video link

ED: Room 2

- 3 year old toddler, 3 days URI, 1 day of increased WOB
- Routine immunizations UTD, including flu
- No respiratory history, and benign neonatal course
- PE: 15kg, HR 172, RR 50, Temp 99F, O2 sat 91% RA
- Holding himself upright, obvious distress, very poor air entry bilaterally, faint intermittent scattered wheezes, marked supraclavicular retractions



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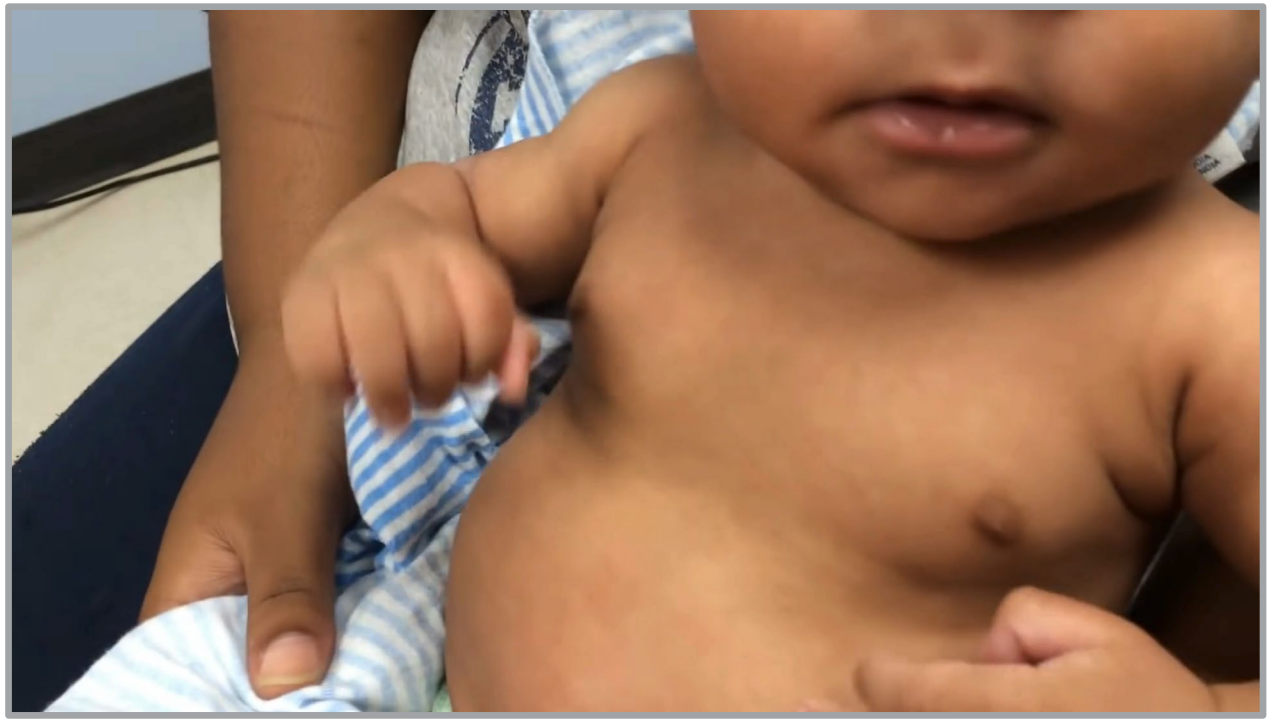
ED - Room 3

- 15 mo old, 2 days URI, woke from sleep tonight with difficulty breathing that the parents describe as “wheezing”
- Parents called 911, child improved upon EMS arrival, referred to your ED
- Routine immunizations UTD, including flu and Hib
- No prior episodes of respiratory distress requiring medical care
- PE: 15kg, HR 115, RR 20, Temp 99F, O2 sat 99% RA
- Calm, intermittent audibly noisy breathing



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A Brief Word on Croup

- Dexamethasone PO 0.6 mg/kg helps even relatively asymptomatic children
- Limit racemic epinephrine to patients with persistent audible stridor AND distress
- Differential: bacterial tracheitis, epiglottitis, foreign body aspiration
- Most kids don’t need admission

Approach to the young child in respiratory distress

- Retractions
  - Subcostal
  - Intercostal
  - Suprasternal/Supraclavicular
- See-saw breathing
- Head bobbing
- Nasal flaring
- Mental status changes

What is the cause of the distress?

Recognizing Respiratory Problems Flowchart

Clinical signs		Upper airway obstruction	Lower airway obstruction	Lung tissue disease	Disordered control of breathing
Airway	Patency	Airway open and maintainable/not maintainable			
Breathing	Respiratory rate/effort	Increased			Variable
	Breath sounds	Stridor (typically inspiratory) Barking cough Hoarseness	Wheezing (typically expiratory) Prolonged expiratory phase	Grunting Crackles Decreased breath sounds	Normal
	Air movement	Decreased			Variable

All that Wheezes Does NOT Need Albuterol

- Bronchiolitis is a clinical diagnosis
- RSV is NOT synonymous with bronchiolitis
- Caused by many viruses: RSV, hMPV, Parainfluenza, Seasonal coronavirus, SARS-CoV-2, rhinovirus, influenza, human bocavirus
- For first time wheezers less than 2 years of age with a clinical picture consistent with bronchiolitis, you can treat it as bronchiolitis

Testing

- NOT Routinely Recommended
- Chest x-rays
- Viral testing
- CBC or blood cultures (after 3 weeks of age)

Treatment

- NOT Routinely Recommended
- Albuterol and/or ipratropium
- Steroids
- Racemic epinephrine
- Antibiotics
- Chest physiotherapy
- Hypertonic nebulized saline

Recommended Treatment

- Suctioning
- Hydration
- Fever and comfort control (acetaminophen and/or ibuprofen)
- Reassessment

Disposition Decision

- Children who need supportive care
  - Persistently hypoxemic
  - Unable to orally hydrate on their own
  - Subjectively working hard enough that you don’t feel comfortable sending them home

Back to ED Room 2

- 3 year old toddler, 3 days URI, 1 day of increased WOB
- Routine immunizations UTD, including flu
- No respiratory history, and benign neonatal course
- PE: 15kg, HR 172, RR 50, Temp 99F, O2 sat 91% RA
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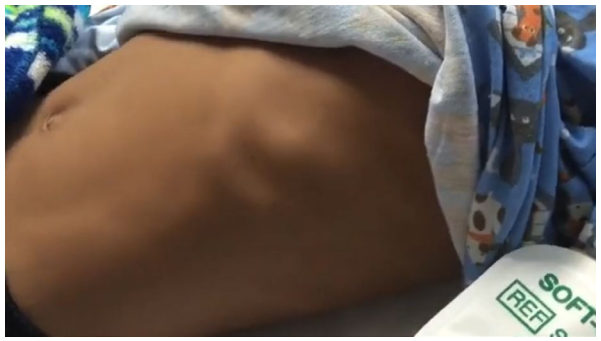


Who Do You Treat For Asthma?

- Patients with recurrent wheezing
- Children younger than 2 years of age who are first time wheezers, but do not have other auscultory findings consistent with bronchiolitis
- If stridor and wheeze, you probably need to treat stridor first

Pediatric Asthma

Stephen R. Reeves, MD, PhD
Attending Physician Division of Pulmonary and Sleep Medicine
Principle Investigator, Center for Respiratory Biology and Therapeutics

Asthma – *A Pulmonologist's Perspective*

- **Asthma** is a chronic inflammatory airway disease characterized by **reversible airflow obstruction**, airway **hyperresponsiveness**, and bronchial **inflammation**, leading to symptoms of wheezing, cough, shortness of breath, and chest tightness. It is triggered by various stimuli, including allergens, infections, and exercise, and can range from intermittent to severe persistent in severity.

Asthma Epidemiology

- One of the top non-communicable diseases worldwide
  - Estimated to affect >**339 million** people worldwide[1]
  - Over 80% of asthma-related deaths occur in low-and lower-middle income countries.
- The **most common** chronic disease of childhood.
  - Prevalence is about **14%** worldwide, and **~7-8%** in the USA
  - Affects **~5 million** American Children[2]
  - Wide variance across geographic and socioeconomic lines

1.) Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet. 2020;396(10258):1204-22

2.) 2021 National Health Interview Survey (NHIS) Data

The Burden Asthma

- High cost of care inpatient/outpatient
  - Estimated total cost in the US **> $80 Billion** annually
  - **1.5 million** ED visits annually in the US
  - **~500,000** asthma-related hospitalizations/year
  - US has the highest rates of hospitalizations
- Huge morbidity burden in children
  - **~3 million** physician visits per year
  - **>160,000** hospitalizations per year
  - **~14 million** school absence days per year

https://www.cdc.gov/asthma/most_recent_national_asthma_data.htm

Health Disparities in Asthma

- Asthma prevalence is higher for minority groups in the U.S.
  - American Indian/AK Native NH = 9.2%
  - Asian NH = 3.3%
  - Black NH = 11.6%
  - Hispanic = 5.9%
  - Multiple NH = 7.4%
  - White NH = 5.5%
- Asthma prevalence is higher in lower SES
  - Below 100% of the poverty threshold = 10.4%
  - 100% to less than 250% of the poverty threshold = 8.2%
  - 250% to less than 450% of the poverty threshold = 7.1%
  - 450% of poverty threshold or higher = 6.8%

https://www.cdc.gov/asthma/most_recent_national_asthma_data.htm

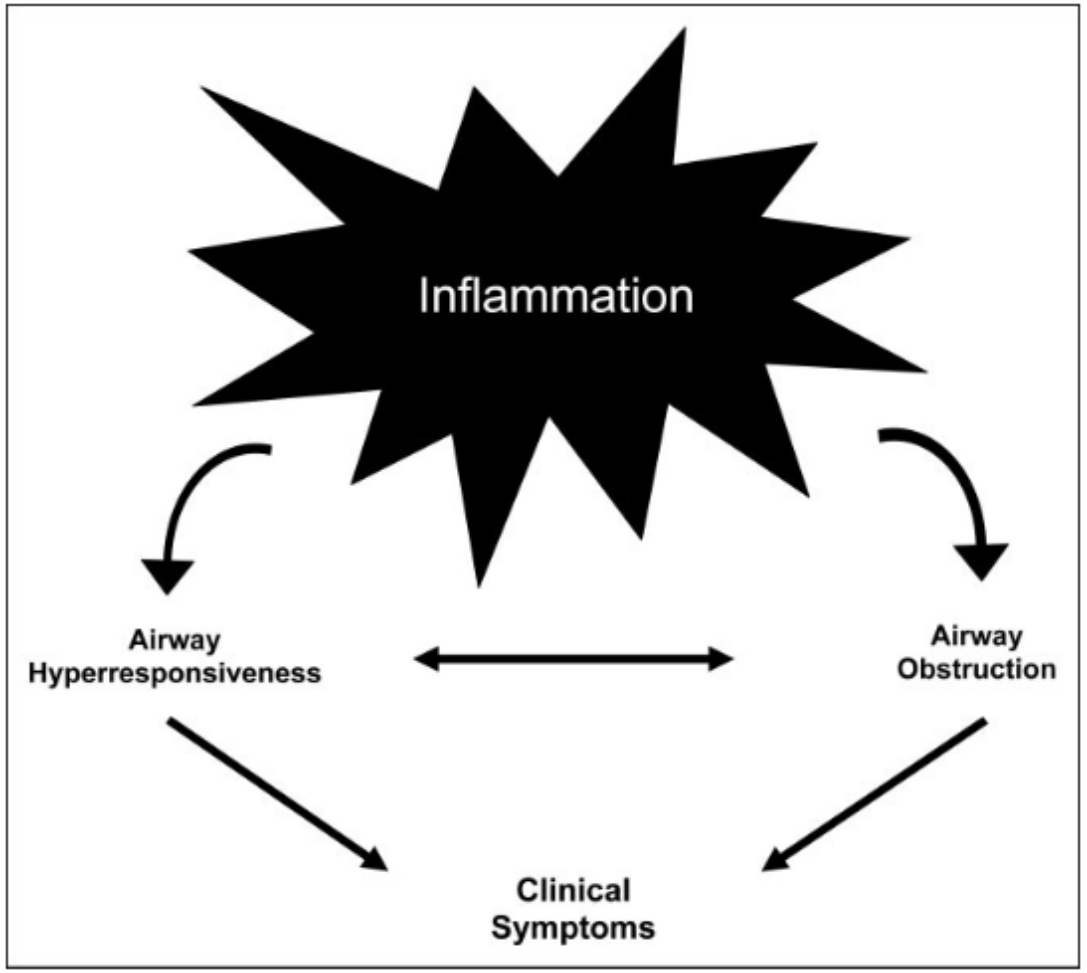
Identifying High-Risk Patients in the ER

- **Excessive SABA (Albuterol) use** is the greatest risk factor for ICU admission (up to 8-fold greater)
- A **history** of a prior **asthma attack** is the strongest predictor for future attacks. Previous hospitalization for asthma within the last year is strongly associated with ICU admission risk
- Prescriptions for **high doses of ICS** or **oral corticosteroids (OCS)** in the previous year are associated with increased risk of ICU admission

What is asthma?

Asthma Pathophysiology

- Heterogeneous disease, usually characterized by **chronic airway inflammation**
- Defined by **history** of respiratory symptoms (wheeze, shortness of breath, chest tightness, cough) that vary over time and intensity



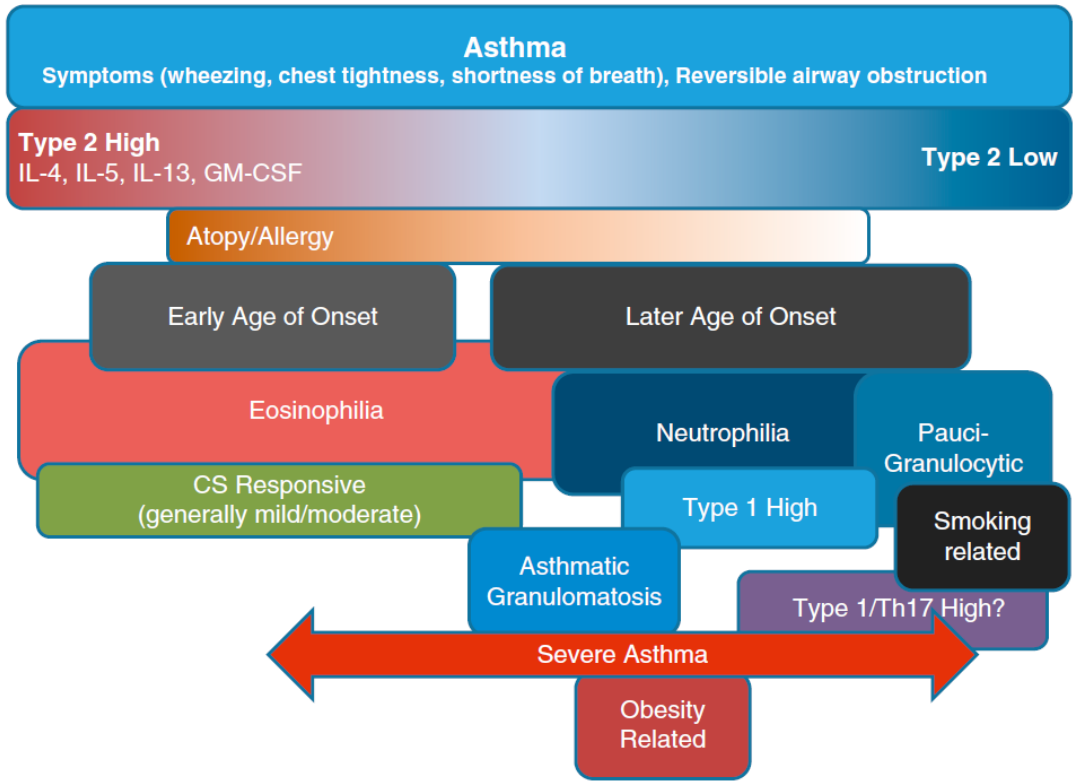
Hill VL, Runge Wood P. Asthma Epidemiology, Pathophysiology, and Initial Evaluation. Pediatrics in Review 2009; 30(9): 331-336.

Physical Exam – Bronchiolitis vs Asthma

	Bronchiolitis	Asthma
Anatomy of Obstruction	Lower Airway: Bronchioles	Lower Airway: Bronchi and Bronchioles
Primary Pathology	Inflammation, Edema, & Mucus Plugging	**Bronchoconstriction**, Inflammation, & Mucus Plugging
Work of Breathing	Effort on Both Phases (Inspiration and Expiration)	Marked **Effort on Exhalation** (Prolonged Expiratory Phase)
Location of Retractions	Intercostal, Subcostal, & Nasal Flaring	Intercostal, Suprasternal, **Abdominal push**
Clinical Hallmark	Tachypnea, Wheezing, and prominent Retractions	**Prolonged Expiration**, Wheezing, and Accessory Muscle Use
Response to Albuterol	Generally Poor	**Generally Good** and Rapid

Asthma Phenotypes

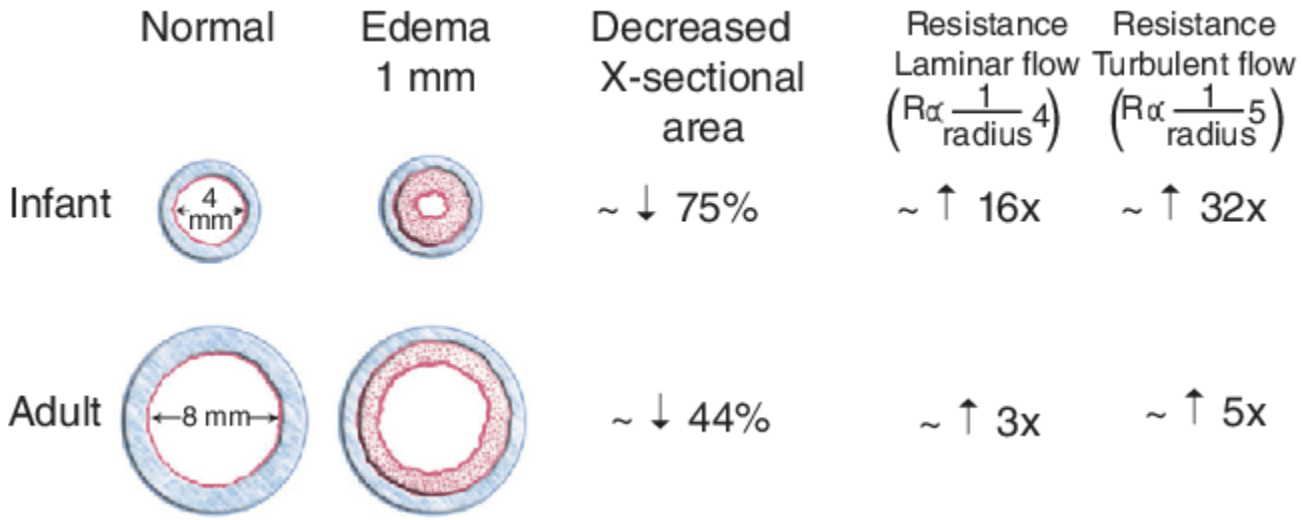
- It's not so simple:
- **Multiple** asthma **phenotypes/endotypes** (wheeze, cough, allergic/non-allergic)
- **Multiple triggers** for symptoms (viruses, allergens, tobacco smoke, etc.)
- Currently there is **no cure** (symptomatic relief and control of exacerbations are mainstay of therapy)
- How do we choose **effective therapies**?



(Gauthier et al, *AJRCCM* 2015)

Pediatric Airway Anatomy

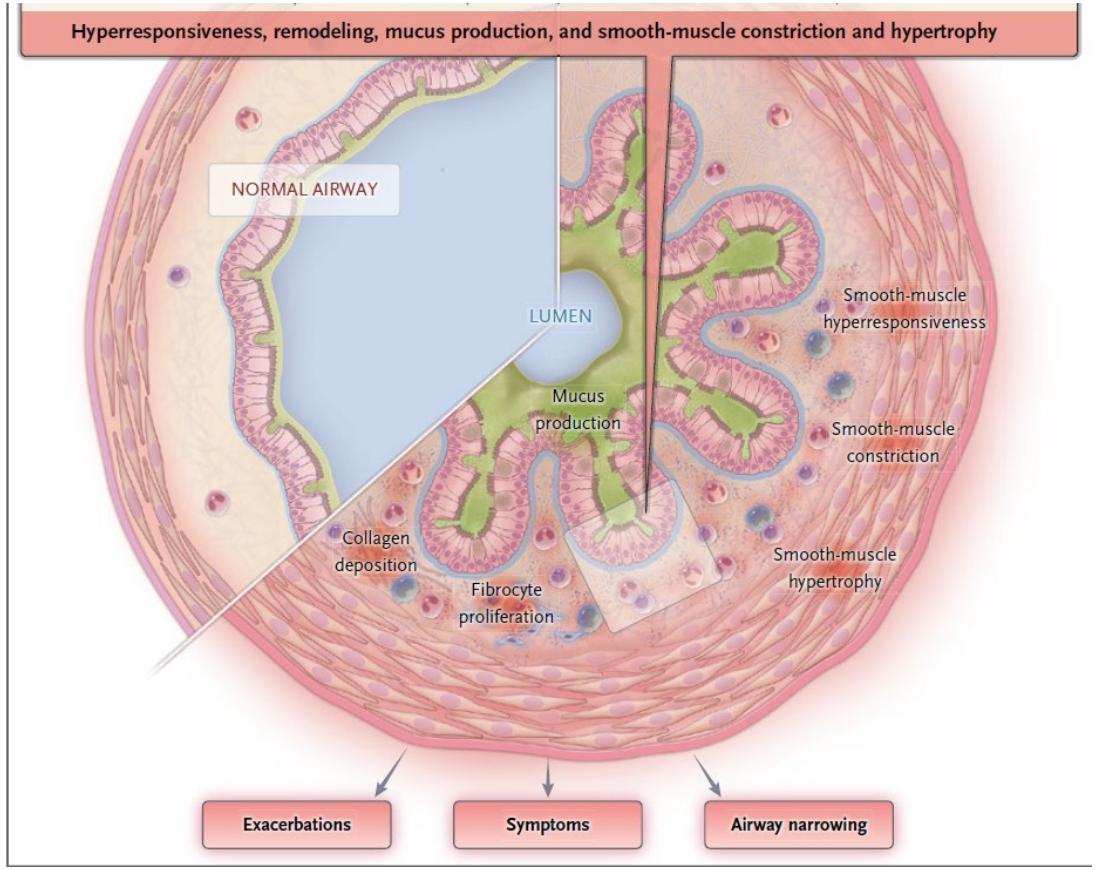
- Smaller airway diameter → higher resistance
- Increased smooth muscle mass relative to lumen size
- More obstruction from mucus production & airway hyperreactivity
- Immature immune system & greater viral susceptibility



(Marchese & Langhan, *Pediatr Emerg Med Pract.* 2017)

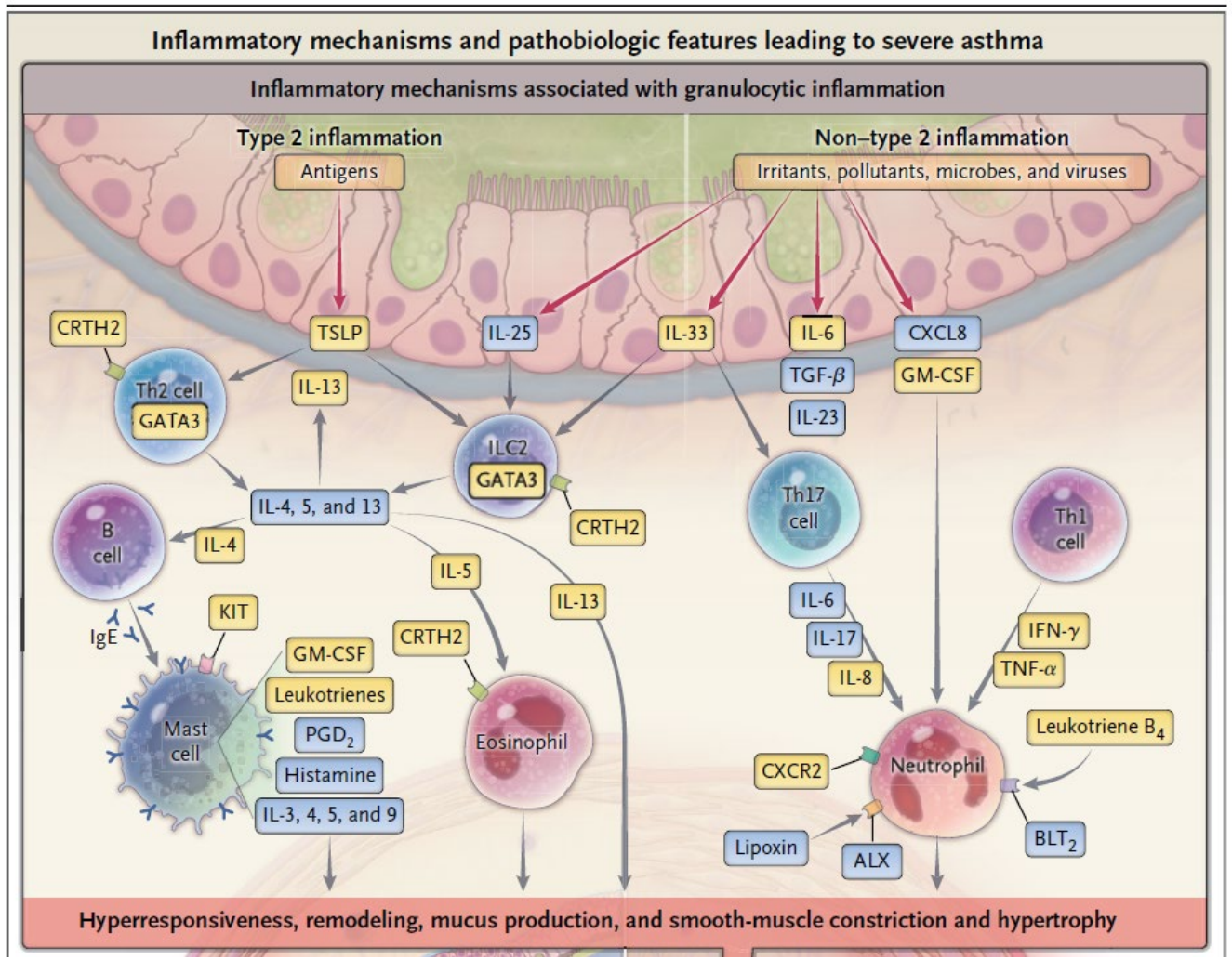
Asthma Pathogenesis

- Smooth muscle hypertrophy
  - Bronchoconstriction
- Inflammation
  - Luminal compression
- Goblet cell hyperplasia
  - Increased mucus
- Epithelial injury
  - Impaired mucus clearance
  - Epithelial signaling
- Chronic Wound Repair
  - ECM Changes
  - Airway remodeling



(Israel *et al. NEJM* 2017)

Inflammatory signaling



(Israel *et al. NEJM* 2017)

Mechanisms of Asthma Therapies

Medication Type	Mechanism of Action	Primary Role in Asthma Therapy	Examples
Bronchodilators	Relax airway smooth muscle via β2-agonist or anticholinergic pathways	Provide rapid symptom relief and airway relaxation	SABA (albuterol), LABA (formoterol), LAMA (tiotropium)
Anti-Inflammatory Medications	Suppress airway inflammation by targeting immune cells & cytokines	Reduce airway obstruction, hyperresponsiveness, & prevent exacerbations	ICS (budesonide), Leukotriene modifiers (montelukast), Biologics (omalizumab, dupilumab)

Enteral Steroids

Prednisone / Prednisolone

- Usually ~5-day treatment course (advantage to extend/taper)
- Shorter half-life (12-36hrs)
- 1-2mg/kg/day (max 60mg/day)

Dexamethasone

- 1-2 doses
- Longer half life (36-54hrs)
- 0.6 mg/kg (Max 16 mg)

Bottom line: multiple studies have demonstrated equivalence

Bronchodilators – Short Acting

- **Short-Acting Beta-Agonists (SABAs) - *Albuterol***
  - MOA: Bind to β2-adrenergic receptors → increase cAMP → smooth muscle relaxation
  - Role: Rescue therapy for acute symptoms
  - Data: Overuse linked to increased exacerbations & mortality (GINA, 2024)
- **Short-Acting Muscarinic Antagonists (SAMAs) - *Atrovent* (Ipratropium)**
  - MOA: Blocks muscarinic receptors (M3) on airway smooth muscle → reduces vagal tone → bronchodilation.
  - Role: Add-on therapy in the ED for moderate-to-severe asthma exacerbations, often given with a SABA.
  - Data: Reduces hospital admissions when added to SABA in the acute setting, particularly in severe exacerbations (Rodrigo & Castro-Rodriguez, Pediatrics. 2005).

Bronchodilators – Long Acting

- **Long-Acting Beta-Agonists (LABAs)**
  - MOA: Same as SABAs but longer duration (~12-24 hours)
  - Role: Used in combination with ICS for moderate-to-severe asthma
  - Data: LABA monotherapy increases asthma-related death risk, but ICS+LABA reduces exacerbations (Spahn et al., *Ann Allergy Asthma Immunol*. 2018)
- **Long-Acting Muscarinic Antagonists (LAMAs)**
  - MOA: Block M3 receptors, reducing vagal tone & bronchoconstriction
  - Role: Add-on therapy for severe asthma not controlled with ICS/LABA
  - Data: Tiotropium reduces exacerbations & improves lung function (Kerstjens et al., *NEJM.* 2012)

Anti-Inflammatory Medications

- **Inhaled Corticosteroids (ICS)**
  - MOA: Suppress airway inflammation by reducing cytokines, eosinophils, and mucus production
  - Role: First-line controller therapy for persistent asthma
  - Data: ICS use reduces hospitalizations & deaths (GINA, 2024)
- **Leukotriene Receptor Antagonists (LTRAs)**
  - MOA: Block leukotriene receptors, preventing airway constriction & inflammation
  - Role: Alternative controller therapy for mild asthma or aspirin-exacerbated asthma
  - Data: Less effective than ICS but useful for patients with allergic asthma (Chauhan et al., *Cochrane Review.* 2014)
- **Biologics (Monoclonal Antibodies)**
  - MOA: Target IgE, IL-5, IL-4/IL-13 pathways to reduce inflammation
  - Role: Used for severe asthma with specific endotypes
  - Data: Omalizumab, dupilumab, and mepolizumab reduce steroid use & exacerbations (Akenroye et al., *JACI* 2023)

Stepwise Approach to Asthma Management

- **What Are GINA & NHLBI Guidelines?**
  - GINA: Global asthma guidelines updated annually, with a **strong focus on ICS-Formoterol as preferred reliever**
  - NHLBI (EPR-4): U.S.-based guidelines with a structured stepwise approach to therapy
- **Stepwise Approach Overview**
  - Treatment intensity increases based on symptom severity and control
  - Mild, Moderate, Severe classifications guide therapy adjustments
  - Emphasis on inhaled corticosteroids (ICS) early in therapy
- **Key Differences Between GINA & NHLBI**
  - GINA: ICS-Formoterol preferred across all steps
  - NHLBI: ICS-SABA still a first line option
  - Role of biomarkers (FeNO, eosinophils) in personalizing treatment

GINA 2024 – Children 6–11 years

Personalized asthma management:
Assess, Adjust, Review

Confirmation of diagnosis if necessary
Symptom control & modifiable risk factors (see Box 2-2)
Comorbidities
Inhaler technique & adherence
Child and parent/caregiver preferences and goals

Symptoms
Exacerbations
Side-effects
Lung function
Comorbidities
Child and parent/ caregiver satisfaction

Treatment of modifiable risk factors & comorbidities
Non-pharmacological strategies
Asthma medications including ICS
Education & skills training

Asthma medication options:
Adjust treatment up and down for individual child's needs

	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
PREFERRED CONTROLLER to prevent exacerbations and control symptoms	Low dose ICS taken whenever SABA taken*	Daily low dose inhaled corticosteroid (ICS) (see table of ICS dose ranges for children)	Low dose ICS-LABA, OR medium dose ICS, OR very low dose ICS-formoterol maintenance and reliever therapy (MART)	Refer for expert advice, OR medium dose ICS-LABA, OR low dose ICS-formoterol maintenance and reliever therapy (MART)	Refer for phenotypic assessment ± higher dose ICS-LABA or add-on therapy, e.g. anti-IgE, anti-IL4Rα, anti-IL5
Other controller options (limited indications, or less evidence for efficacy or safety)		*Daily leukotriene receptor antagonist (LTRA†), or low dose ICS taken whenever SABA taken**	*Low dose ICS + LTRA†*	*Add tiotropium or add LTRA†*	*As last resort, consider add-on low dose OCS, but consider side-effects*
RELIEVER	As-needed SABA (or ICS-formoterol reliever* in MART in Steps 3 and 4)				

*Anti-inflammatory reliever; †advise about risk of neuropsychiatric adverse effects

AGES 5–11 YEARS: STEPWISE APPROACH FOR MANAGEMENT OF ASTHMA

	Intermittent Asthma	Management of Persistent Asthma in Individuals Ages 5–11 Years				
Treatment	**STEP 1**	**STEP 2**	**STEP 3**	**STEP 4**	**STEP 5**	**STEP 6**
Preferred	PRN SABA	Daily low-dose ICS and PRN SABA	Daily and PRN combination low-dose ICS-formoterol▲	Daily and PRN combination medium-dose ICS-formoterol▲	Daily high-dose ICS-LABA and PRN SABA	Daily high-dose ICS-LABA + oral systemic corticosteroid and PRN SABA
Alternative		Daily LTRA,* or Cromolyn,* or Nedocromil,* or Theophylline,* and PRN SABA	Daily medium-dose ICS and PRN SABA or Daily low-dose ICS-LABA, or daily low-dose ICS + LTRA,* or daily low-dose ICS +Theophylline,* and PRN SABA	Daily medium-dose ICS-LABA and PRN SABA or Daily medium-dose ICS + LTRA* or daily medium-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* or daily high-dose ICS + Theophylline,* and PRN SABA	Daily high-dose ICS + LTRA* + oral systemic corticosteroid or daily high-dose ICS + Theophylline* + oral systemic corticosteroid, and PRN SABA
		Steps 2–4: Conditionally recommend the use of subcutaneous immunotherapy as an adjunct treatment to standard pharmacotherapy in individuals ≥ 5 years of age whose asthma is controlled at the initiation, build up, and maintenance phases of immunotherapy▲			Consider Omalizumab**▲	

Assess Control

- First check adherence, inhaler technique, environmental factors,▲ and comorbid conditions.
- **Step up** if needed; reassess in 2–6 weeks
- **Step down** if possible (if asthma is well controlled for at least 3 consecutive months)

Consult with asthma specialist if Step 4 or higher is required. Consider consultation at Step 3.

Control assessment is a key element of asthma care. This involves both impairment and risk. Use of objective measures, self-reported control, and health care utilization are complementary and should be employed on an ongoing basis, depending on the individual's clinical situation.

Single Maintenance and Reliever Therapy (SMART) with ICS/Formoterol

- **What is SMART?**
  - Combines maintenance and reliever therapy using a single inhaler containing ICS and formoterol (a fast-acting LABA).
  - Allows patients to use the same inhaler for both daily control and relief of acute symptoms.
- **Efficacy of SMART:**
  - Reduced Exacerbations: Significant reduction in severe asthma exacerbations with SMART compared to traditional therapies. *A meta-analysis reported a 32% reduced exacerbation risk with SMART compared to the same dose of ICS-LABA maintenance therapy plus SABA.*[1]
  - Lower Steroid Use: MART is associated with a reduced corticosteroid requirement, leading to fewer side effects.[2]
- **Safety Profile:**
  - SMART has been shown to have a favorable safety profile, with studies indicating a lower risk of adverse events compared to higher-dose ICS-LABA therapies.[3]
- **Clinical Implications:**
  - Simplifies asthma management.
  - Dosage is driven by symptoms in real time.
  - Improves patient adherence and outcomes.

1) Beasley et al., *JAMA Netw Open.* 2022; 2) Kim et al., *JACI: In Practice.* 2022; 3) Beasley et al., *Eur Respir J.* 2024

Inhalers in Children

- MDI with a spacer delivered beta agonist therapy equal to or better than a nebulizer for pediatric patients aged 2 or older.[1]
- In general, inhaler technique is poor
  - Extensive evidence that in person teaching improves technique
  - Valve holding chambers improve drug delivery of MDI/HFA
- Special considerations for DPI
  - Recommended age varies by brand, in general 10yr+
  - Must be able to generate sufficient PIF (>15L/min)
  - Can't use with mask or holding chamber
- RediHalers, Respimat, etc.
  - Breath actuated devices
  - Designed to use without a spacer
  - May be more challenging for kids to coordinate

1) Cates CJ, Welsh EJ, Rowe BH. Holding chambers (spacers) versus nebulizers for beta-agonist treatment of acute asthma. Cochrane Database Syst Rev. 2013

Asthma Inhalers and Climate Change

- Metered-Dose Inhalers (MDIs) rely on hydrofluoroalkane (HFA) propellants, which are potent greenhouse gases
  - The use of a single MDI can generate carbon emissions equivalent to driving a gasoline-powered car 100 to 200 km
- In the US, the currently available ICS + fast-acting β-agonist combinations are exclusively MDIs
- Young children, may require MDIs (e.g., due to lower inspiratory flow required or technical difficulties with DPIs)

Escalating Respiratory Support in Pediatric Asthma

	Mechanism & Goal	Indication for Use	Key Clinical Consideration
High-Flow Nasal Cannula (HFNC)	Reduces dead space, modest PEEP. **Goal: Decrease WOB**	Mild to Moderate distress **unresponsive to initial therapy** or increased O_2 needs	Limited pressure to overcome severe spasm/air trapping
Non-Invasive Positive Pressure Ventilation (NIPPV)	Delivers titrated IPAP/EPAP. **Goal: Reduce air-trapping & WOB**	**Severe Exacerbation** pCO_2 elevation (Impending Failure); High WOB	Patient **must be fully conscious**. BiPAP often preferred. High risk of aspiration if vomiting occurs
Endotracheal Intubation (ETT)	Full mechanical ventilation and airway control. **Goal: Deliver full support**	**Frank Respiratory Failure**	**Highest Risk.** High airway pressures (barotrauma) and hemodynamic instability are major concerns

When to refer to a subspecialist?

- Uncontrolled asthma despite appropriate treatment
  - Frequent exacerbations requiring steroids (>2 courses/year) or hospital admissions
- Concern for an alternative or additional diagnosis (e.g., “Asthma-plus” conditions)
- Atypical symptoms or unusual presentation (e.g., chronic cough, recurrent pneumonia, poor response to therapy)
- Need for advanced diagnostic testing (e.g., pulmonary function tests, bronchoscopy, imaging)
- Persistent gaps in patient or caregiver understanding requiring specialized education
- Family requests further evaluation or confirmation of the diagnosis
- History of life-threatening exacerbations (e.g., ICU admissions, intubation)

Panel Discussion

Moderator: Vicki L. Sakata, MD, NWHRN

RSV Epidemiology, Vaccine Update and RSV mABs

Elyse Bevers, MPH, Program Manager, Non-Healthcare Congregate Settings Program, WA DOH

Julia C. Bennett, CDC Epidemic Intelligence Service (EIS) Officer, WA DOH

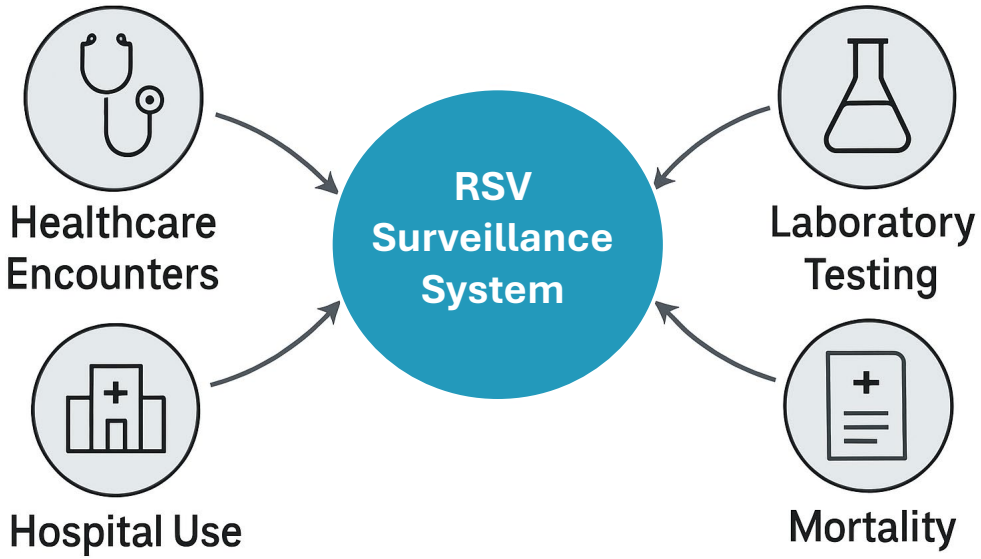
Jeaux Alexander Rinedahl, RN, PhD, Clinical, QA, and Schools Section Manager, Office of Immunization, WA DOH

RSV EPIDEMIOLOGY

Elyse Bevers, MPH
Office of Communicable Disease Epidemiology
Washington State Department of Health

RSV Cases Are Not Reportable in WA

Washington State monitors RSV activity and impact using multiple state and national data systems



CDC Burden Estimates 2024-2025, US

3.6M-6.5M

RSV Outpatient Visits

190,000 - 350,000

RSV Hospitalizations

10,000 - 23,000

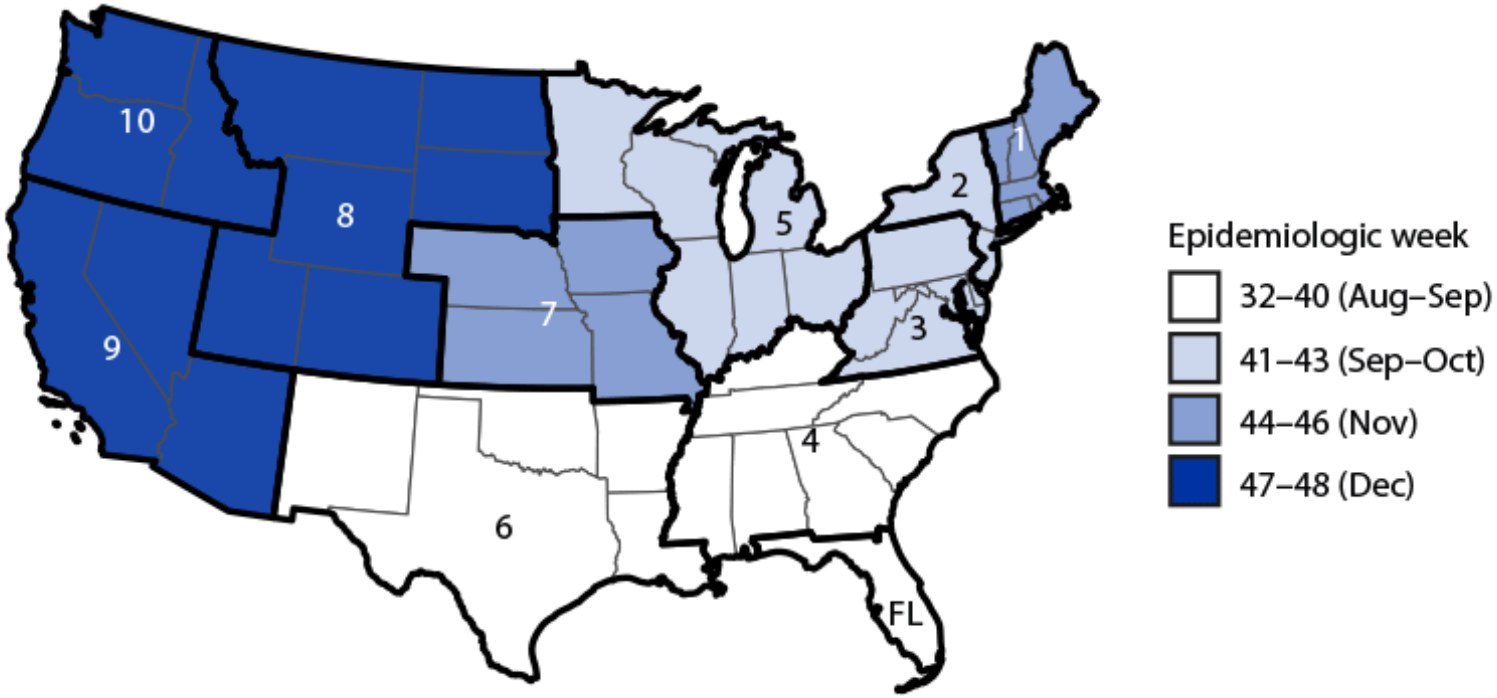
RSV Deaths

October 1, 2024 through May 3, 2025

Source: CDC Preliminary Estimates of RSV Burden for 2024-2025
www.cdc.gov/rsv/php/surveillance/burden-estimates.html

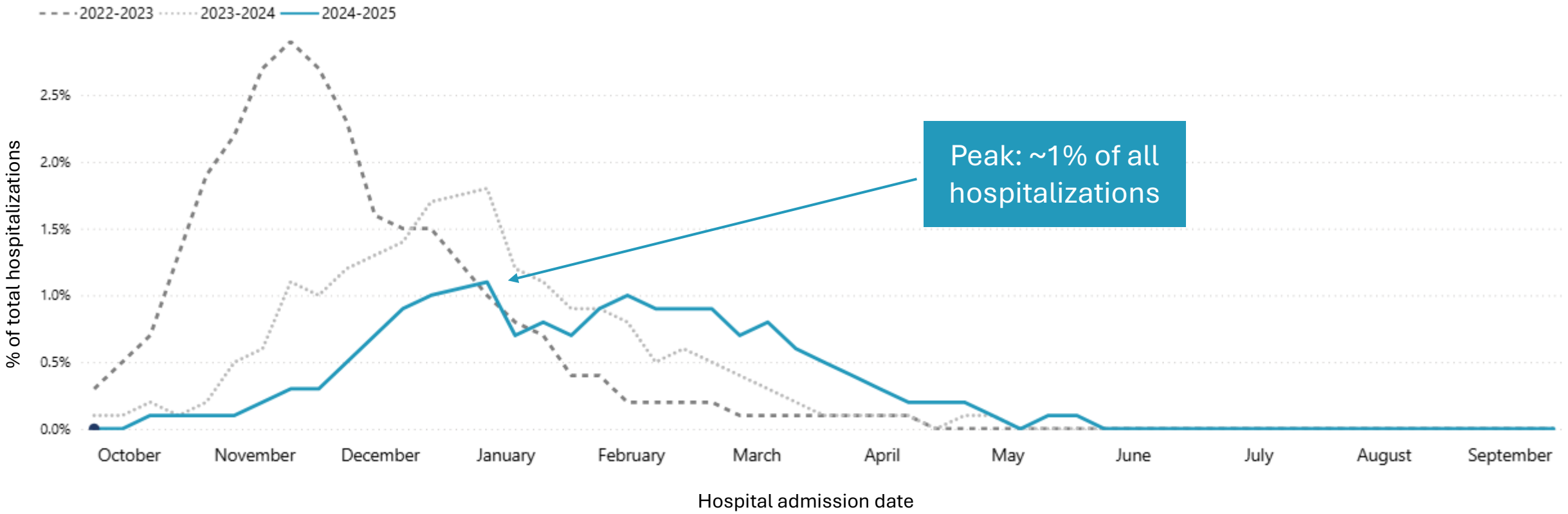
RSV Activity Begins Earlier in the Southeast and Florida and Later in the Northwest

RSV Epidemic Onset in US by HHS Region and Florida, 2017-2020



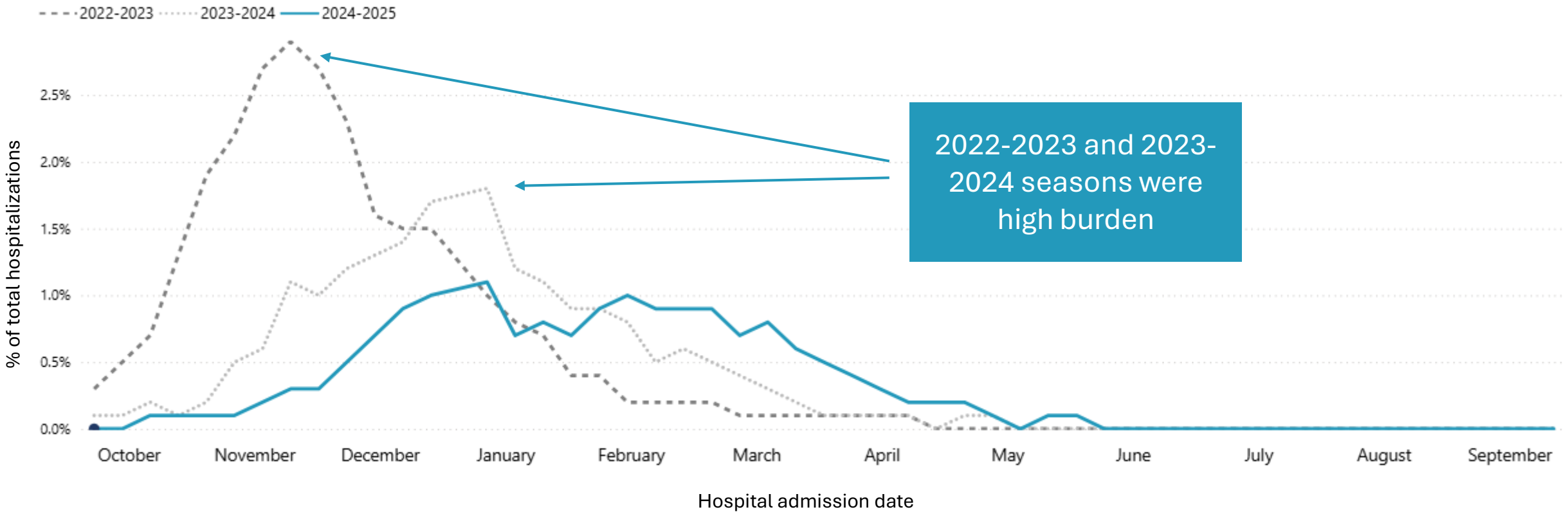
www.cdc.gov/mmwr/volumes/72/wr/mm7214a1.htm

Hospitalizations Associated with RSV, WA



Data Source: WA DOH Rapid Information Health Network (RHINO)

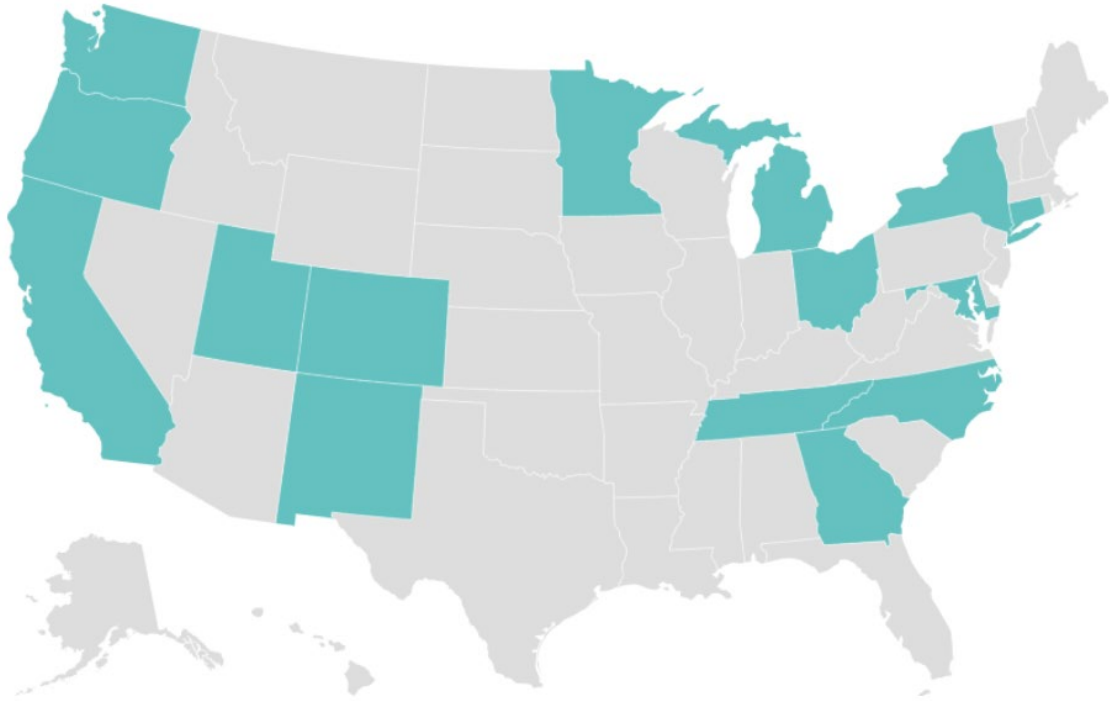
Hospitalizations Associated with RSV, WA

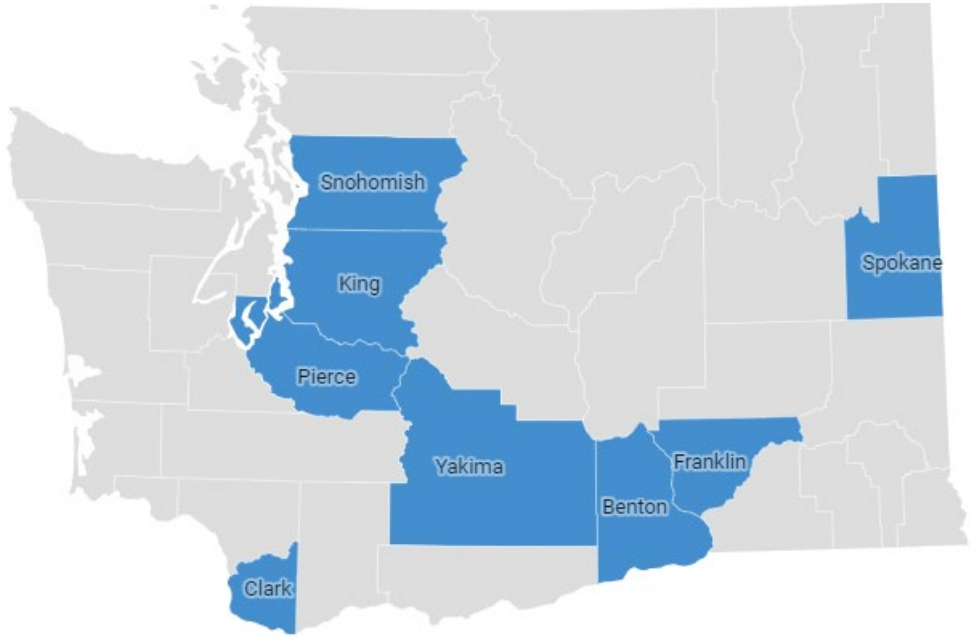


Data Source: WA DOH Rapid Information Health Network (RHINO)

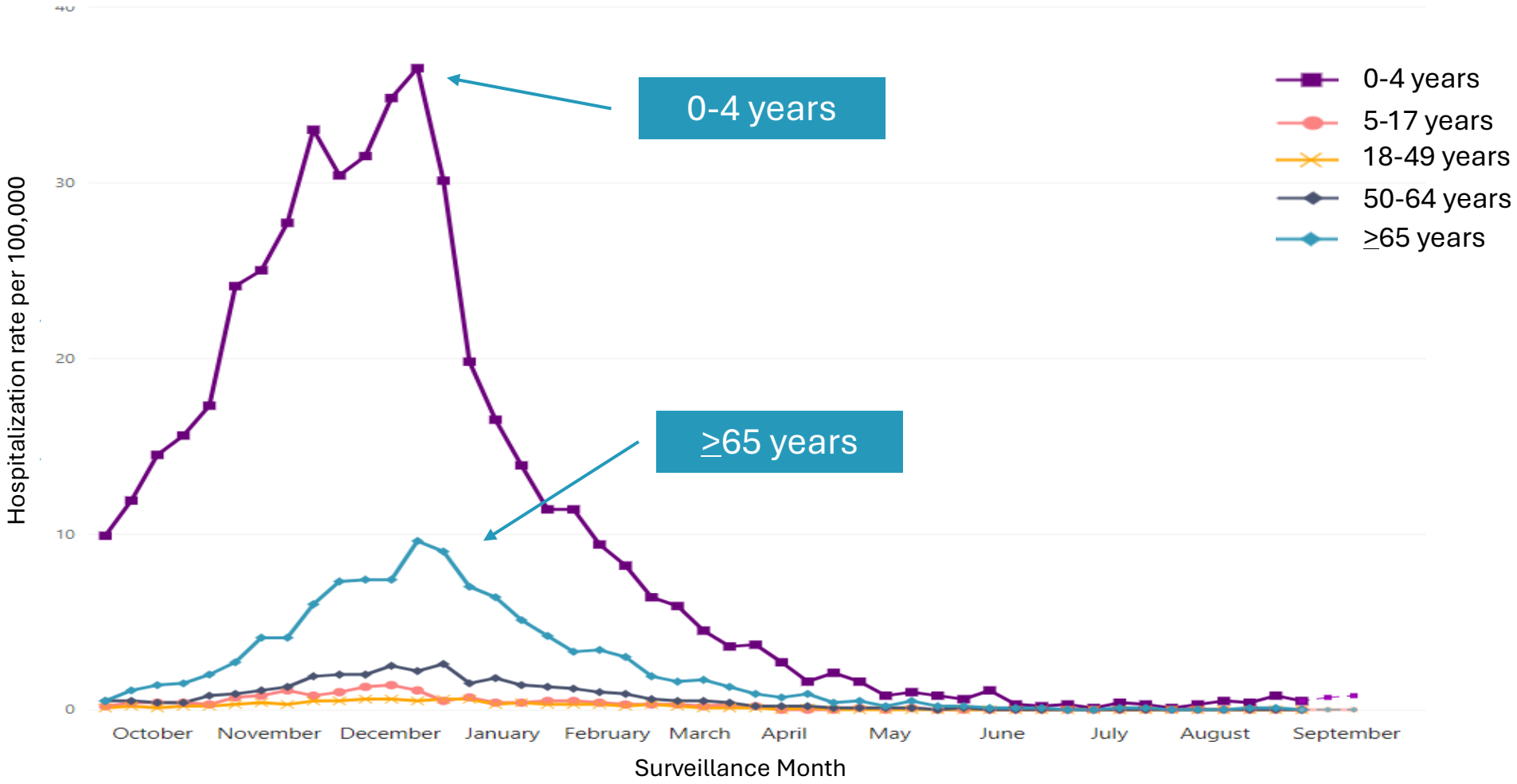
Respiratory Virus Hospitalization Surveillance Network (RESP-NET)

- RESP-NET monitors laboratory-confirmed hospitalizations associated with RSV, influenza, and COVID-19 among children and adults.



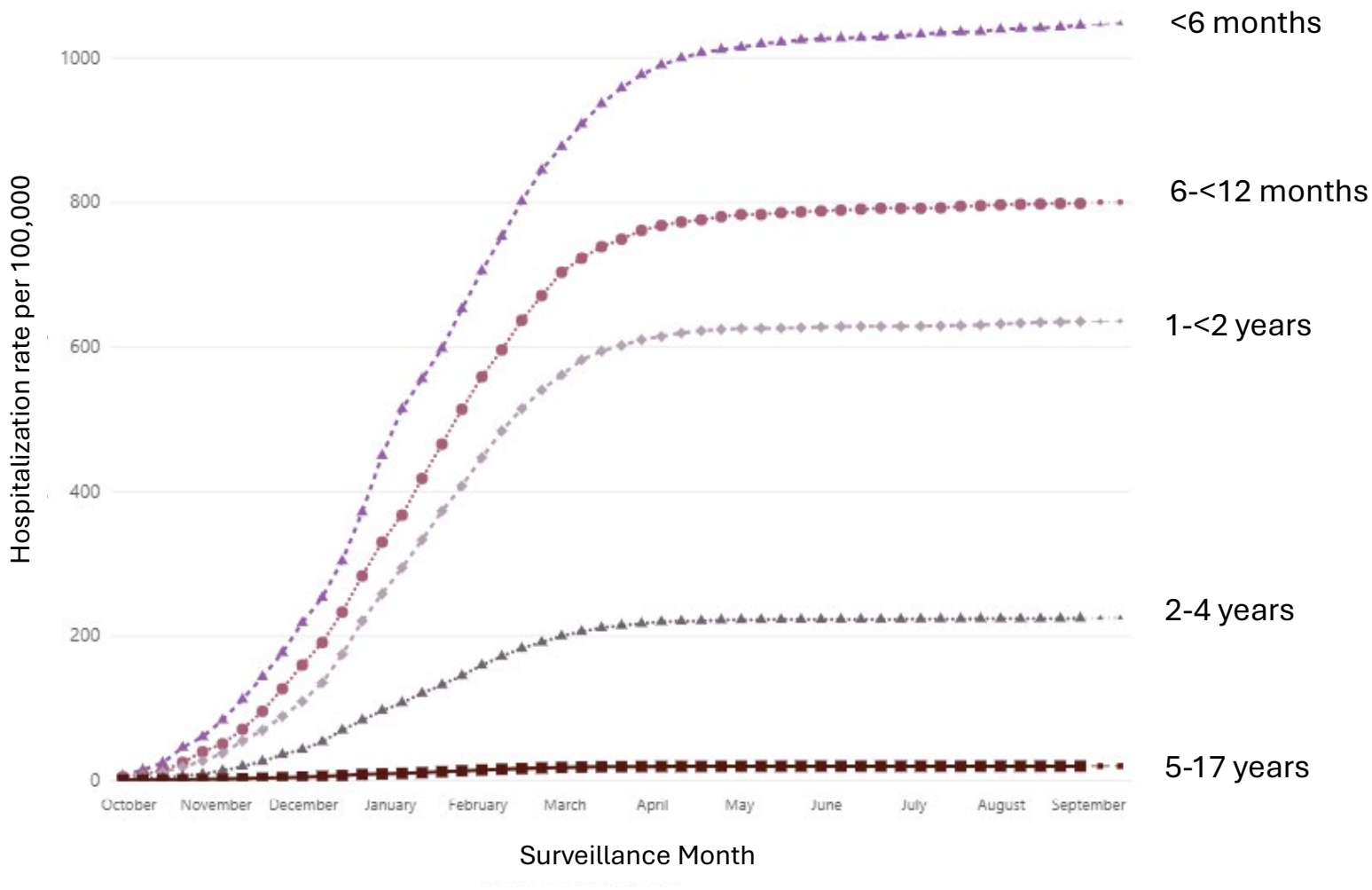


Weekly RSV-Associated Hospitalizations by Age Group, 2024-2025, US



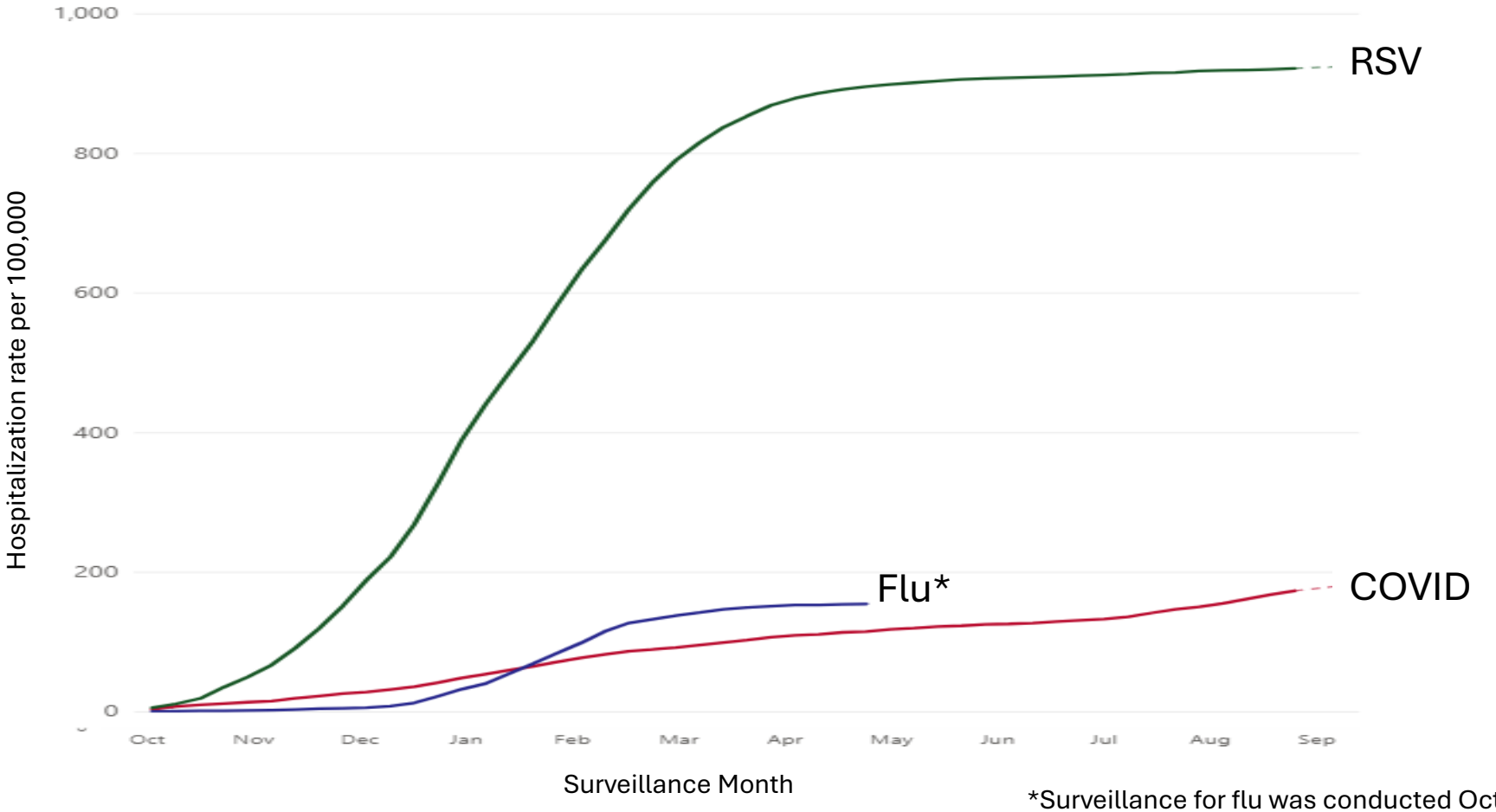
Data Source: Respiratory Virus Hospitalization Surveillance Network (RESP NET)

Cumulative RSV-Associated Hospitalizations, 0-17 Years Old, 2024-2025, US



Data Source: Respiratory Virus Hospitalization Surveillance Network (RESP NET)

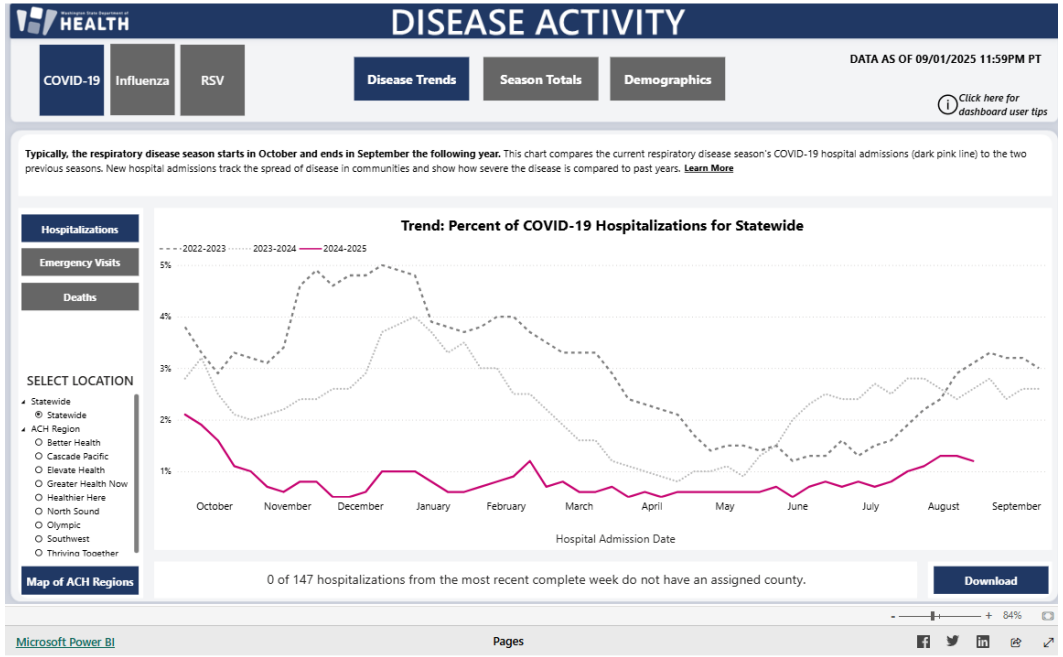
Cumulative Respiratory Virus-Associated Hospitalizations, <1 Year, 2024-2025



*Surveillance for flu was conducted Oct –April

Data Source: Respiratory Virus Hospitalization Surveillance Network (RESP NET)

Visit WA DOH Respiratory Illness Data Dashboard



- Hospitalizations
- Emergency department visits
- Deaths
- Vaccinations
- Hospital use
- Wastewater

Located on WA DOH's website

Washington State Department of HEALTH

RSV IMMINUZATION IMPACT IN WASHINGTON INFANTS

Julia C. Bennett, PhD

CDC Epidemic Intelligence Service (EIS) Officer, assigned to WA DOH

Disclaimer

This analysis used unpublished state data and results are considered preliminary.

2023: a pivotal year for RSV prevention

August 3, 2023:

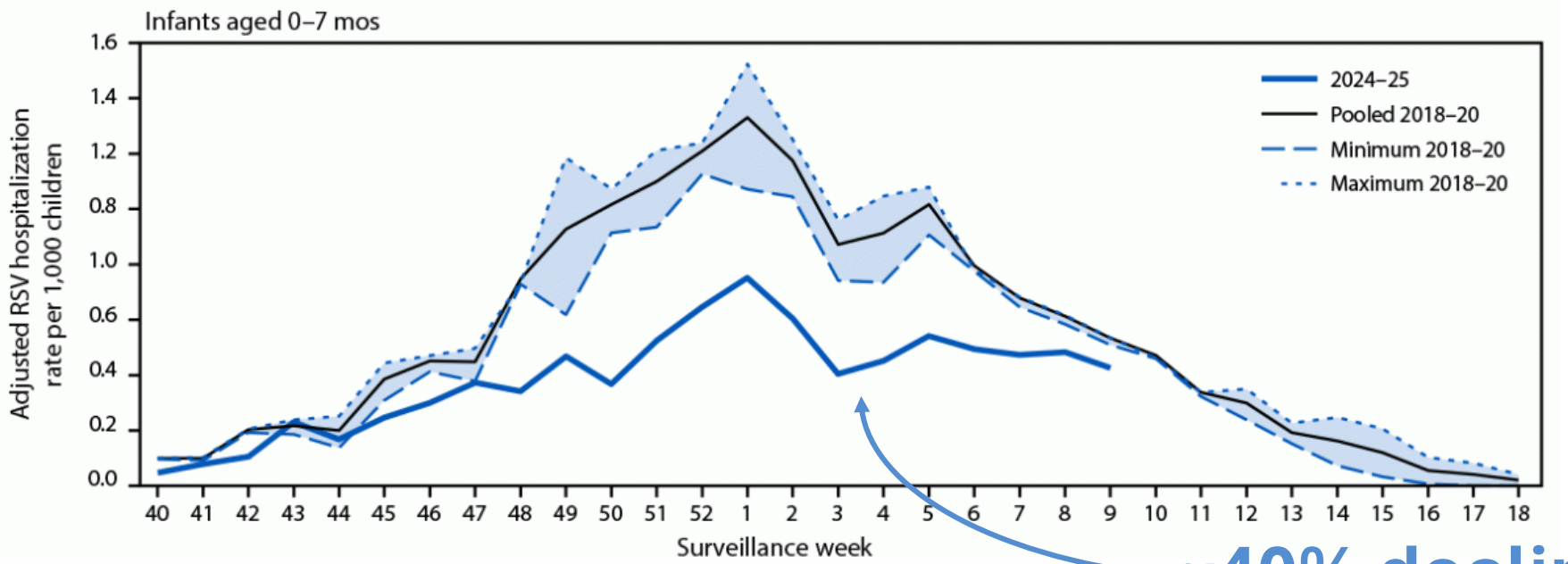
September 22, 2023:

Post-licensure effectiveness

Antenatal RSVPreF vaccine against RSV-associated hospitalization in infants

1. 77% (Argentina)
2. 72% (UK)

Post-licensure impact



~40% decline in US RSV-associated hospitalization rate in 2024–25

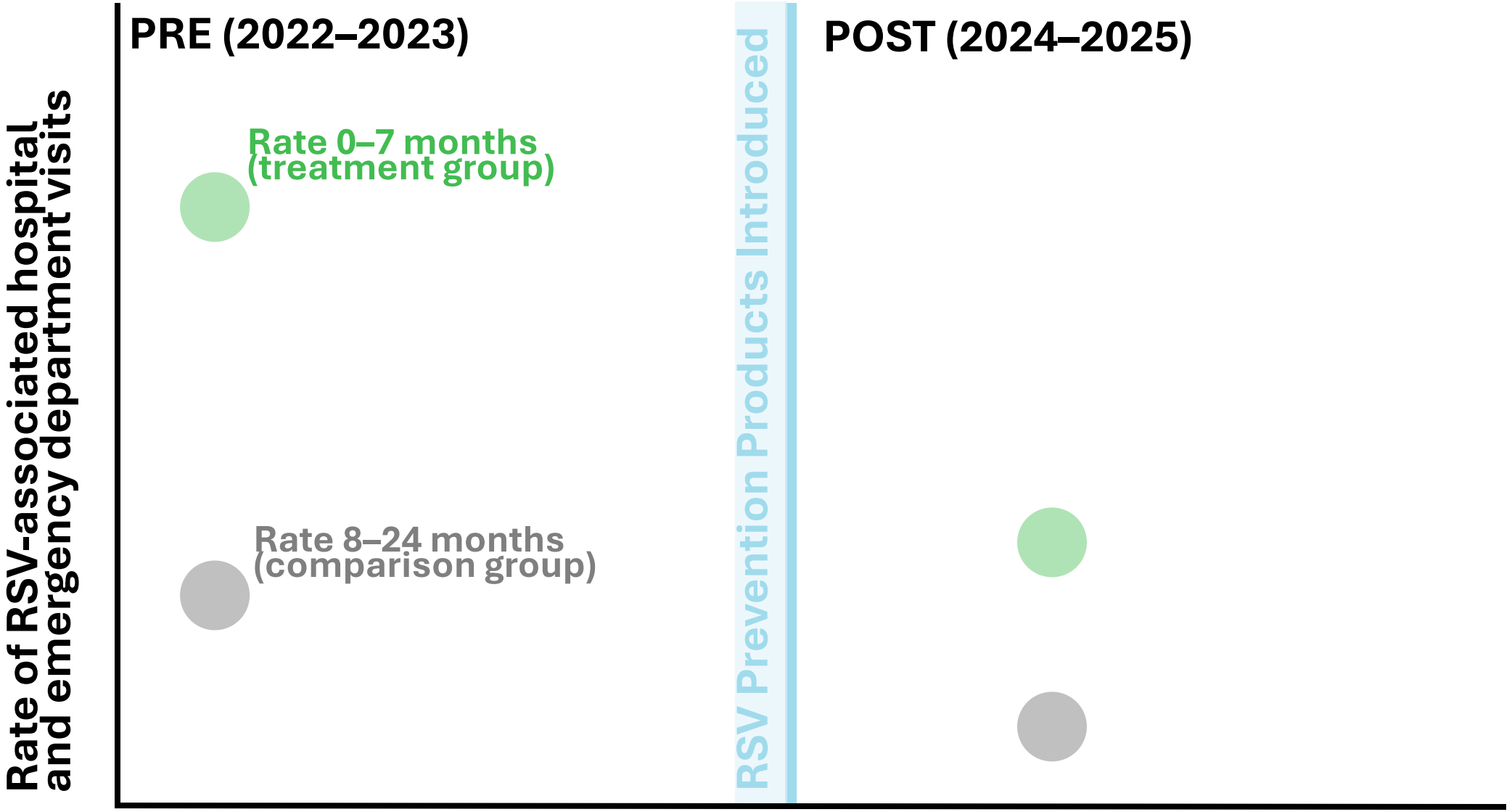
Syndromic surveillance data used to estimate impact across Washington state

Data inclusion criteria:

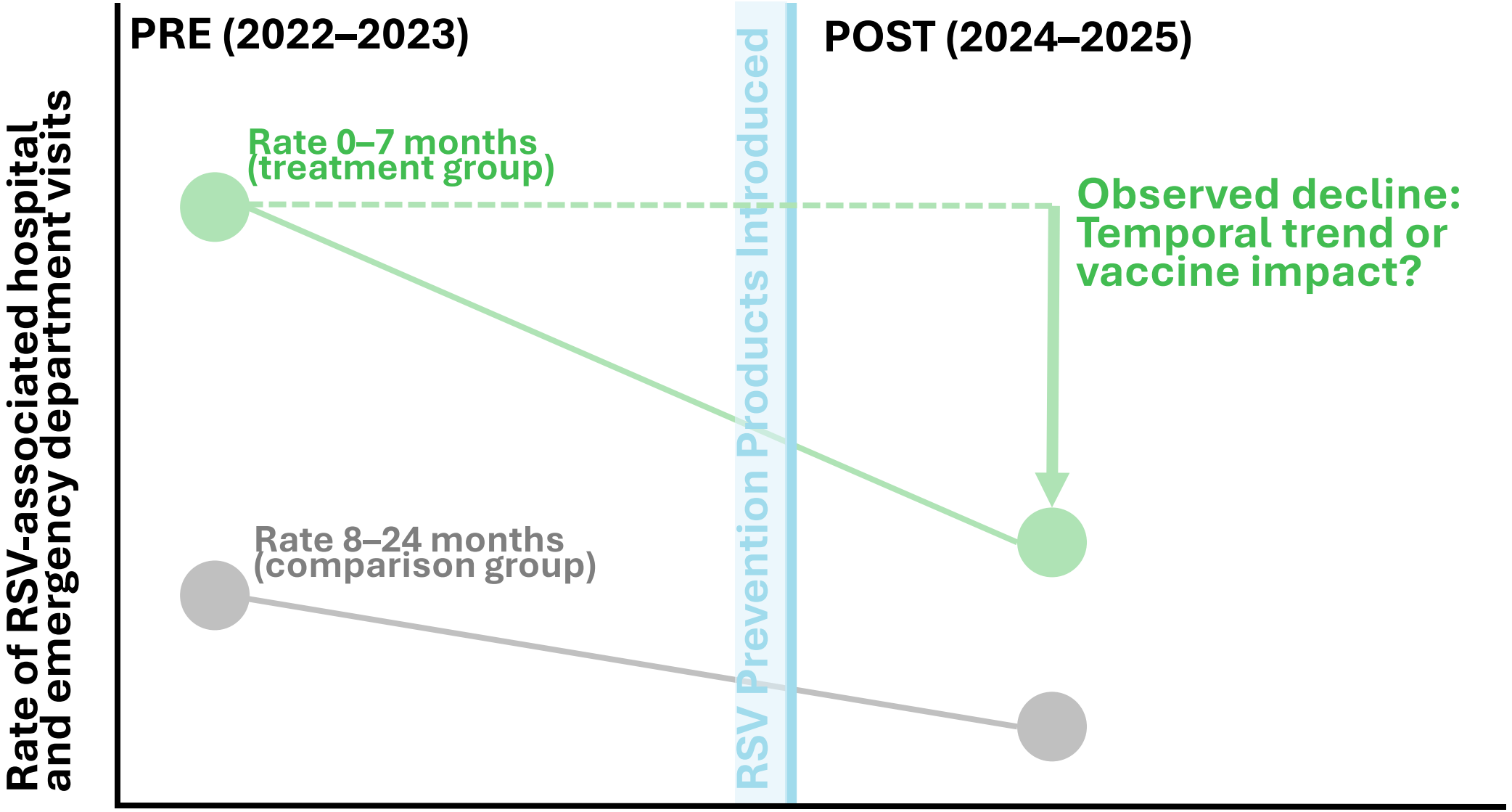
- hospitalizations or ED visits among children ≤24 months old
- from July 2022 to June 2025
- with RSV diagnosis code

1. Acute bronchiolitis due to RSV (J21.0)
2. RSV as the cause of diseases classified elsewhere (B97.4)
3. RSV pneumonia (J12.1)
4. Acute bronchitis due to RSV (J20.5)

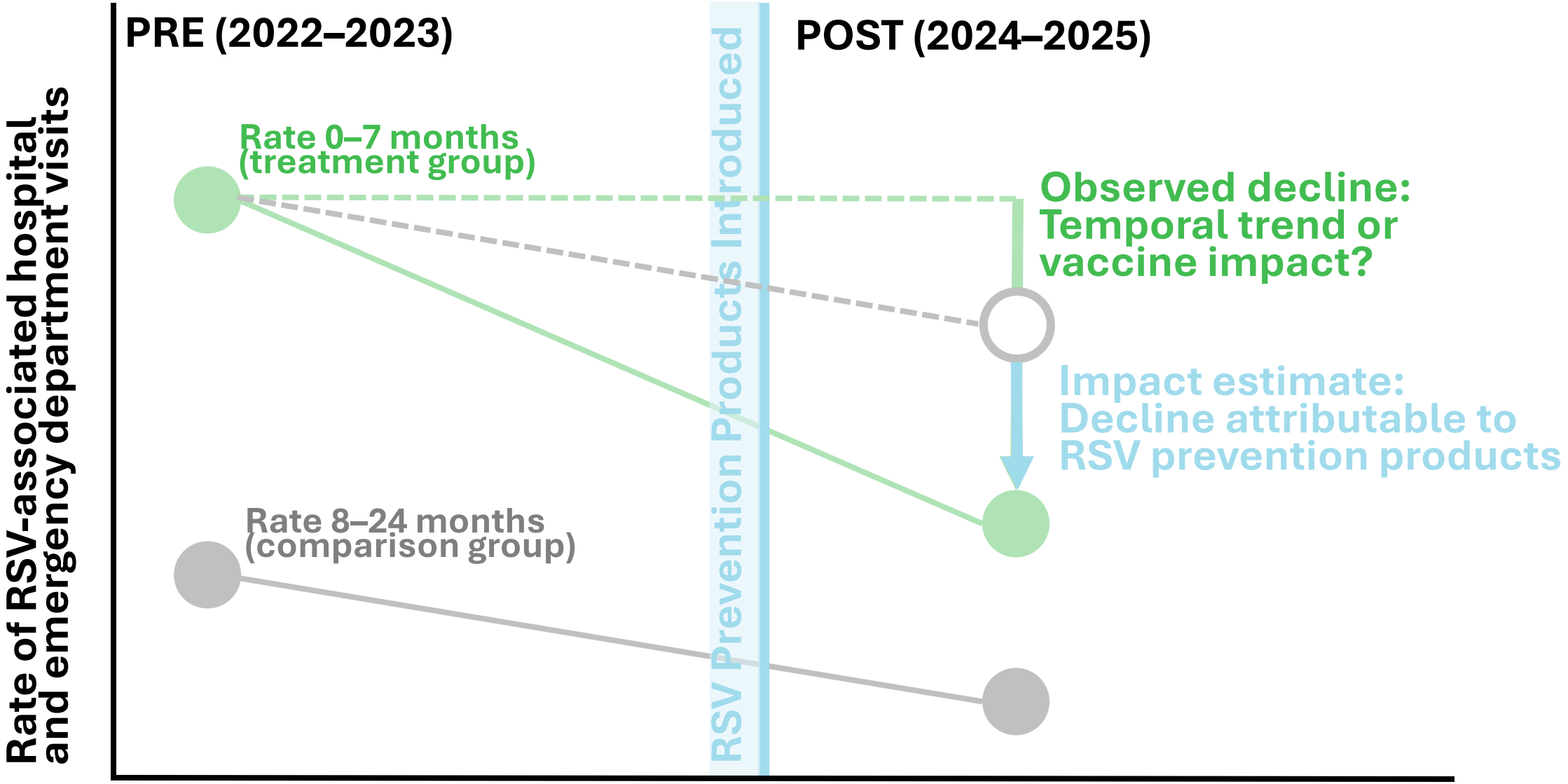
Difference-in-differences study design



Difference-in-differences study design

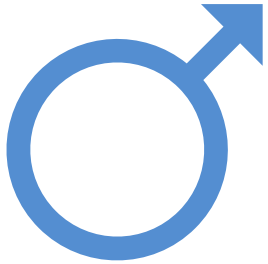


Difference-in-differences study design



July 2022 to June 2025:

16,775 RSV-associated hospitalizations & ED visits among children aged ≤24 months

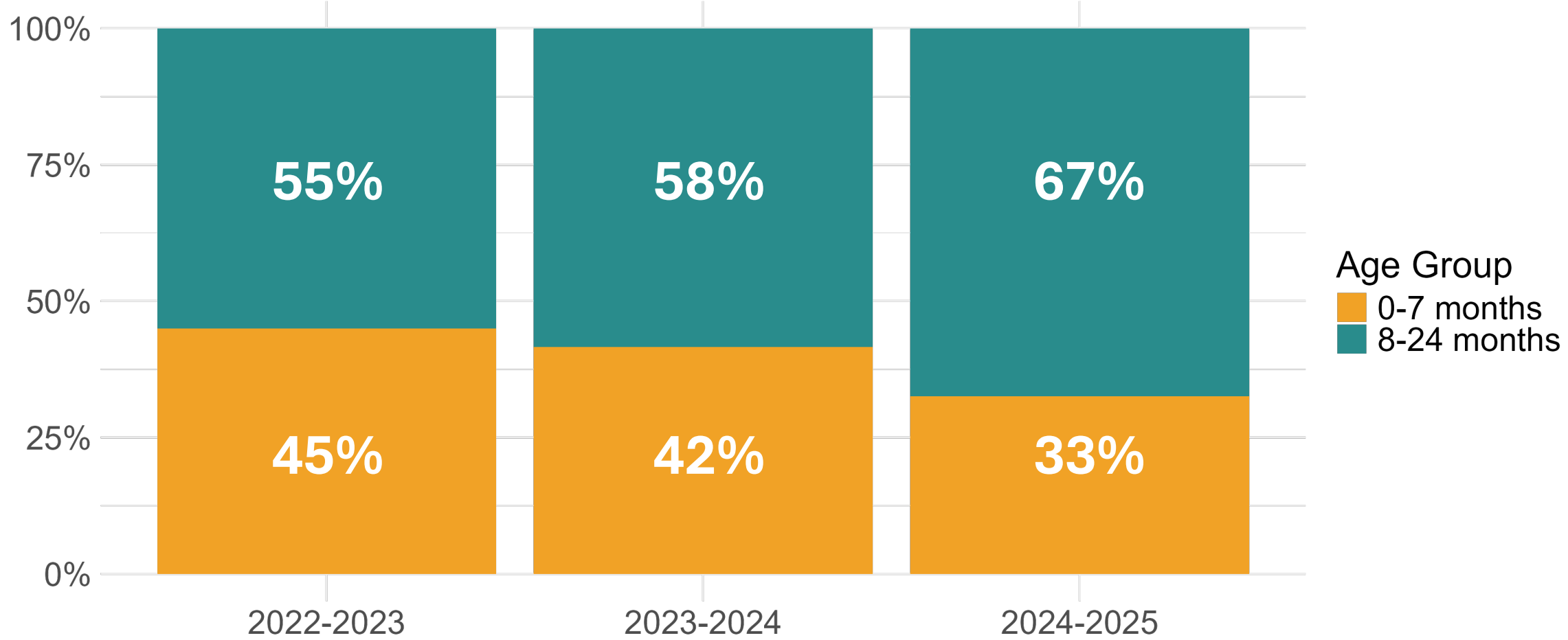


55% male sex

81% ED only
15% admitted from ED
4% directly admitted

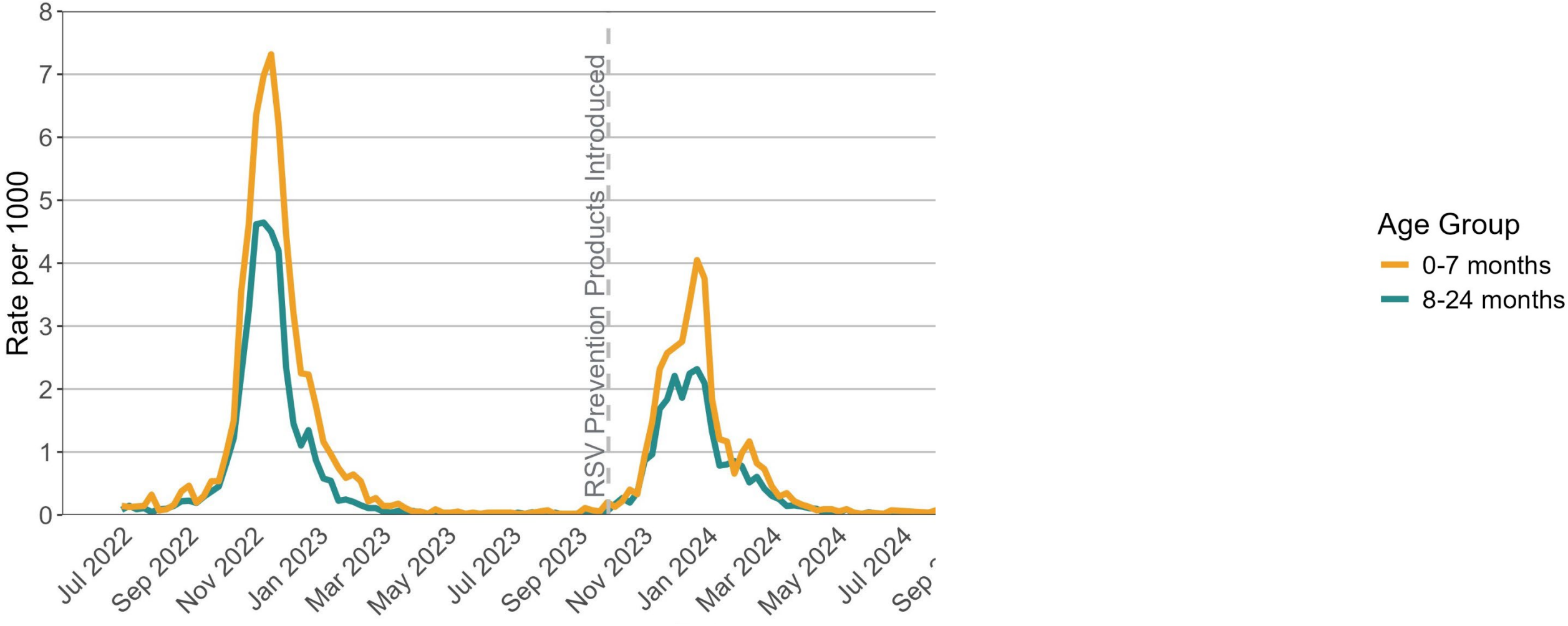
Median age increased with immunization

Median age: 9 months 10 months 12 months

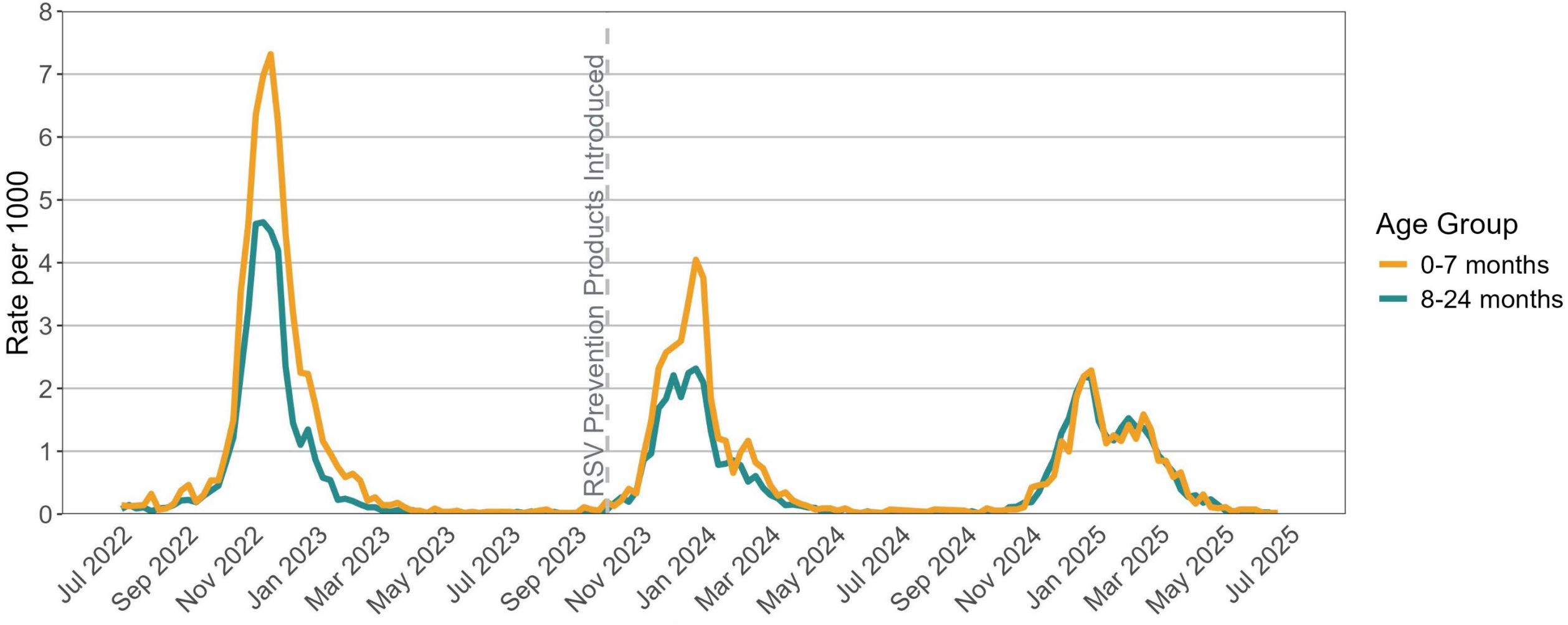


Pre-immunization, rate of RSV-associated ED visits & hospitalizations HIGHER in younger infants

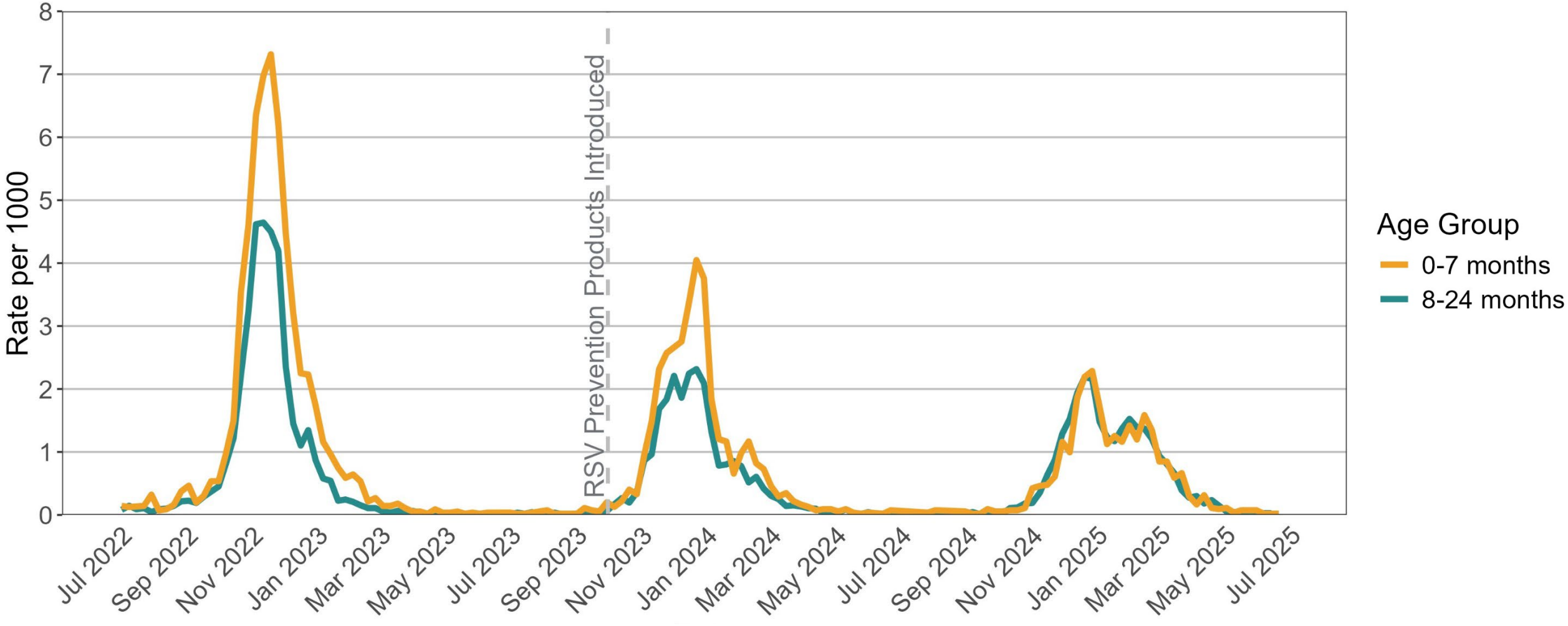
No significant population-level decline attributable to RSV immunization in 23–24 (1st year of use)



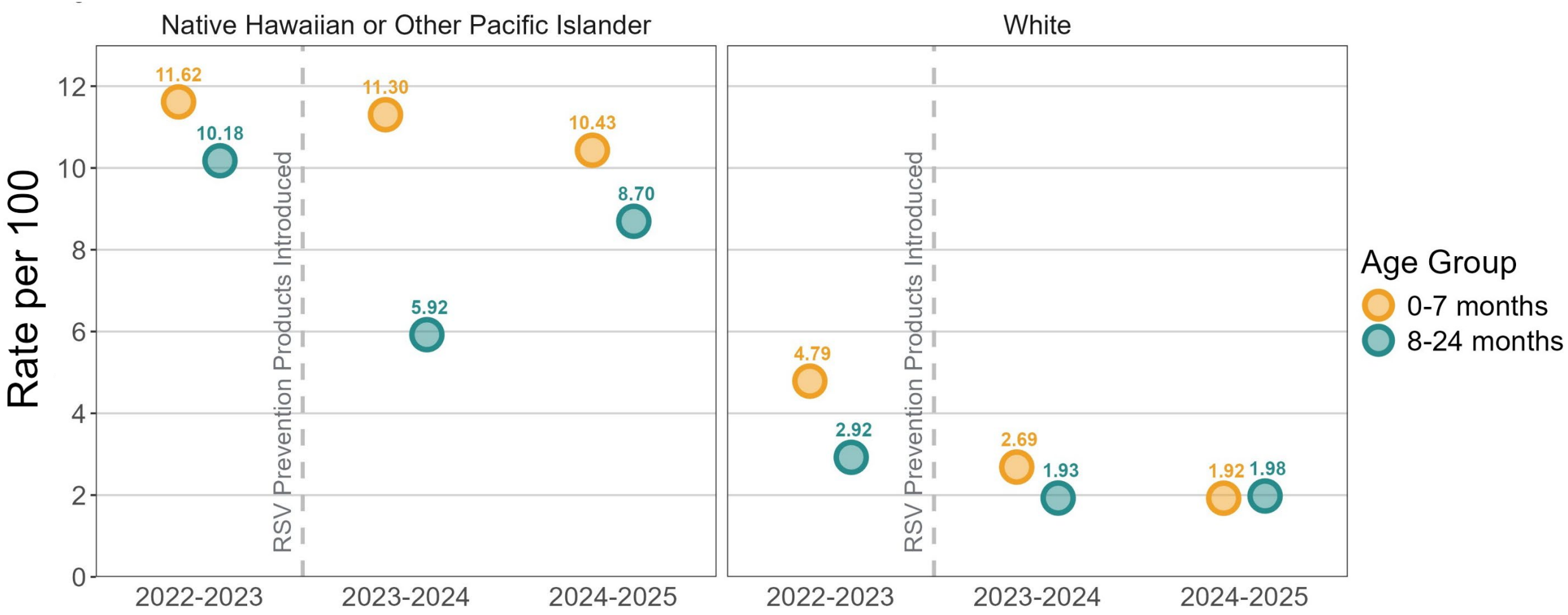
Rates similar in both age groups in 24–25 (2nd year)



43% population-level decline among children 0–7 months attributable to RSV prevention products



NHPI children have a persistently high burden of disease in the first & second years of life



Infant nirsevimab & antenatal RSVpreF vaccine associated with reduced burden of severe RSV disease in Washington infants

ACKNOWLEDGMENTS

Washington Department of Health

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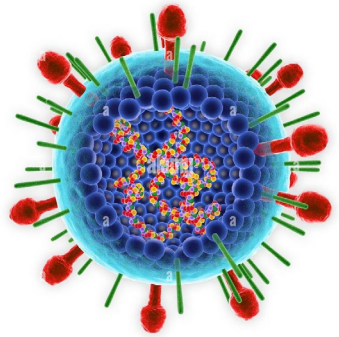
Janet Englund

Centers for Disease Control and Prevention

Emily Jentes
Anna Blackstone

Washington State Department of HEALTH

2025-26 RESPIRATORY SEASON RSV IMMUNIZATION RECOMMENDATIONS



Immunization Against RSV

Products Available to Immunize Adults Against RSV

Arexvy® (GlaxoSmithKline)

Abrysvo® (Pfizer)

mResvia® (Moderna)

Recommendation for RSV Vaccination in Adults

Administer 1 dose of vaccine to:

- All adults 75 years of age and older
- Adults aged 50-74 years of age who are at increased risk of severe RSV.

Current recommendations are that RSV vaccines are a one-time dose, a second does is not recommended.

RSV vaccine can be given at the same time along with other adult vaccines.

RSV Vaccine Guidance for Adults | RSV | CDC

Products to Protect Infants From RSV

- Maternal immunization – *Abrysvo*®
- Monoclonal antibody – nirsevimab (*Beyfortus*®) and clesrovimab (ENFLONSIA®)
  - Confer long-lasting protection from RSV, with protection expected to last at least 5 months (about the length of a typical RSV season).

Only One Product is Licensed & Approved for Vaccination in Pregnancy

Abrysvo®, Pfizer

Recommendation: RSV Vaccination in Pregnancy

RSV Vaccine Guidance for Pregnant Women | RSV | CDC

- Administer 1 dose of Abrysvo®
  - during weeks 32 through 36 weeks of pregnancy
  - during the months of October through March

- If an infant requires protection against severe RSV outside of the recommended seasonal administration for maternal RSV vaccination, healthcare providers should administer nirsevimab or clesrovimab.
- Persons who received RSV vaccine in a prior pregnancy should NOT receive any additional doses.
- RSV vaccine may be co-administered with Tdap, influenza, COVID-19 vaccines in pregnancy.

Recommendation for RSV Immunization in Infants

- Administer 1 dose of nirsevimab or clesrovimab to all infants under the age of 8 months
  - during the months of October through March.
  - if the birthing parent received RSV vaccine less than 14 days prior to delivery.
- Nirsevimab or clesrovimab should be given if the birthing parent's RSV vaccine status is unknown.
- Simultaneous administration with age-appropriate vaccines is recommended.

RSV Immunization Guidance for Infants and Young Children | RSV | CDC

Recommendation: RSV Immunization for Infants

Health care providers may choose to give nirsevimab or clesrovimab before the start of RSV season if they feel that the child may not return for a visit when RSV immunization would be recommended (e.g., give RSV immunization to infant who presented for care in September who has not yet received a dose of RSV immunization and may be unlikely to return for a visit in October or November)

RSV Immunization Guidance for Infants and Young Children | RSV | CDC

Synagis (palivizumab)

Palivizumab is no longer routinely recommended for use and will be discontinued as of December 31, 2025. Clesrovimab is recommended as an additional RSV immunization to nirsevimab for infants in their first RSV season.

This is because niservimab and clesrovimab provide a more comprehensive approach to RSV Prevention.

RSV Immunization for Older Infants who have not yet received an RSV Vaccine

Administer 1 dose of **nirsevimab*** to 'at-risk' infants **between the ages of 8 - 19 months** with:

- Chronic Lung Disease of prematurity
- Severe immunocompromise
- Severe Cystic Fibrosis
- American Indian or Alaskan Natives

As early in the season as possible during the months October - March

*Clesrovimab is not licensed for infants between the ages of 8 - 19 months.

RSV Immunization Guidance for Infants and Young Children | RSV | CDC

RSV Immunization for Infants - FAQs

Should a baby who is 8 months in October but presents to the clinic in November at 8 months of age receive a monoclonal antibody?

No, they should not receive a monoclonal antibody. CDC recommends RSV immunization only for infants younger than 8 months of age.

Can a baby born towards the end of March and did not receive RSV immunization get immunized in October?

Yes, they can receive 1 dose of RSV immunization in October if they are <8 months of age entering their second RSV season IF they did NOT receive RSV immunization and the birthing parent did not receive RSV vaccine during pregnancy.

RSV Immunization for Infants - FAQs

If a patient was born last March and received RSV immunization and will be less than 8 months of age in October, can they receive another dose of RSV immunization? What about if the pregnant parent received Abrysvo more than 14 days prior to their birth last March?

No. In both scenarios, the infant is not eligible to receive RSV immunization since it is their second RSV season. Only children who meet high-risk criteria should receive RSV immunization in their second RSV season.

Resources

- RSV Immunization Frequently Asked Questions AAP
- RSV (Respiratory Syncytial Virus) Immunizations | CDC

For clinical questions, please send an email to immunenurses@doh.wa.gov

Questions?

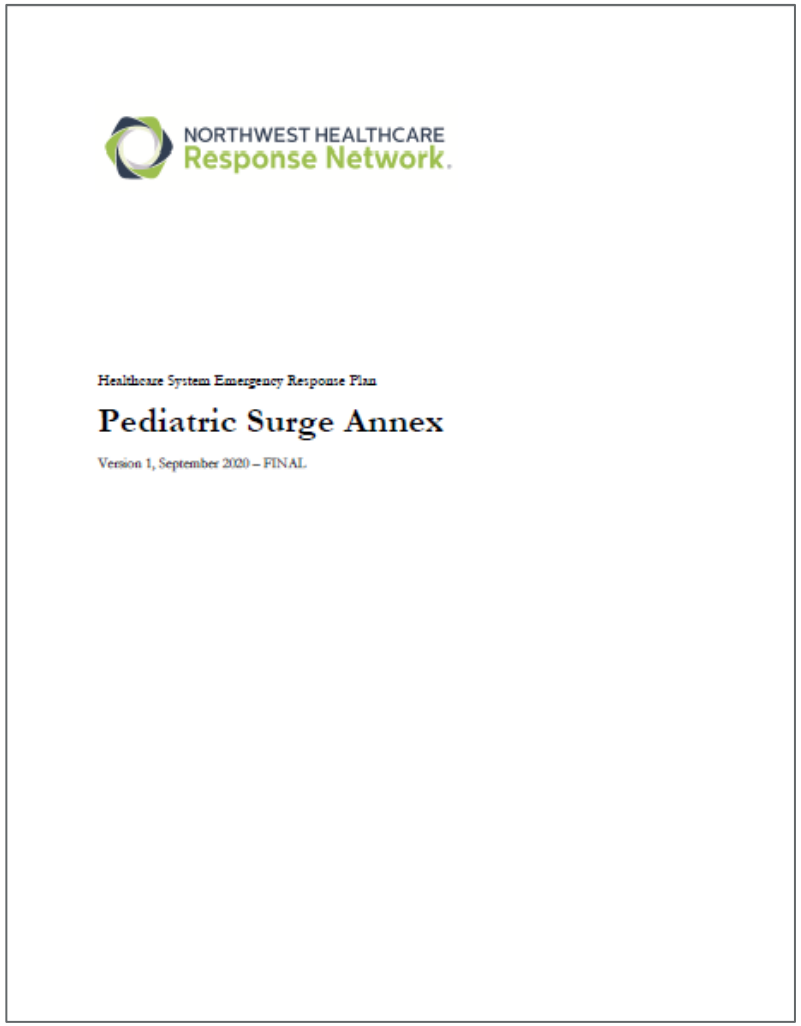
Washington State Department of HEALTH

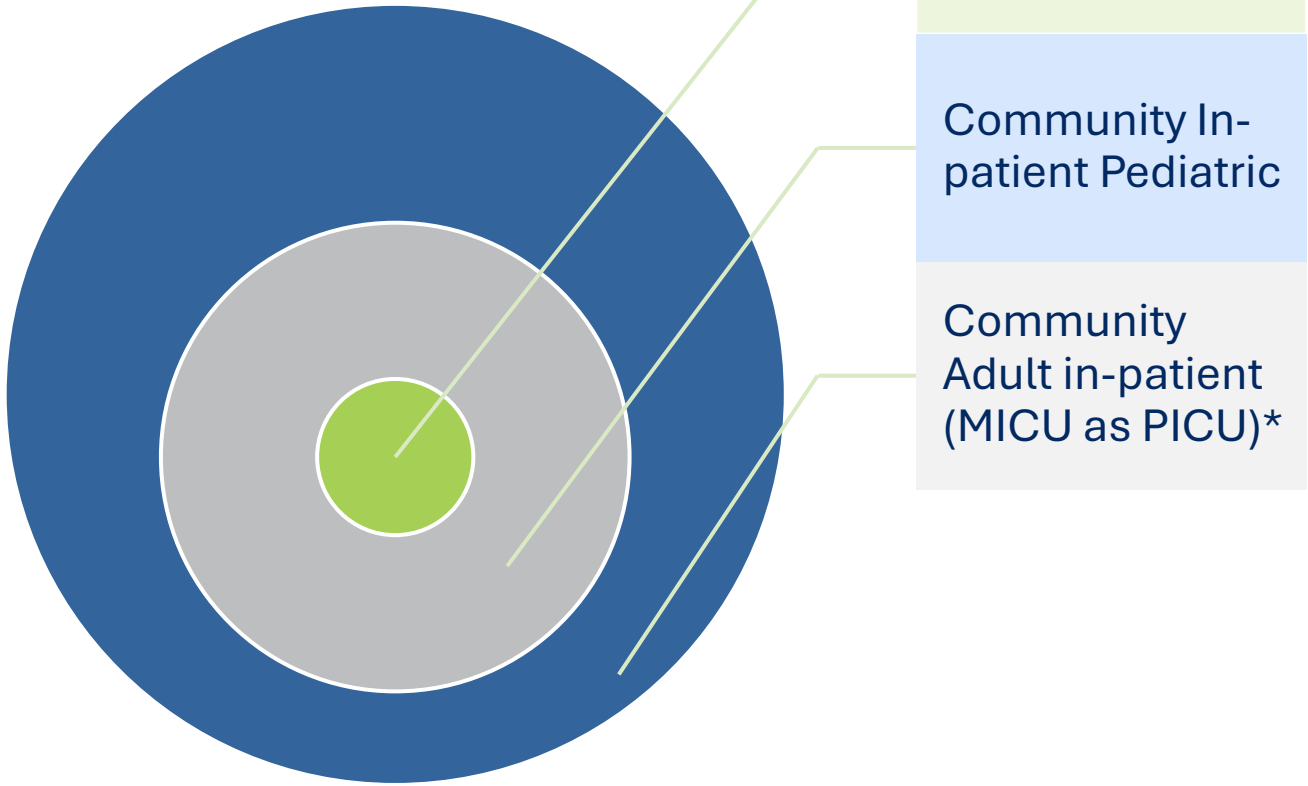
To request this document in another format, call 1-800-525-0127. Deaf or hard of hearing customers, please call 711 (Washington Relay) or email civil.rights@doh.wa.gov.

WA Pediatric Surge Planning, Resources, and JIT Training

Vicki L. Sakata, MD, NWHRN

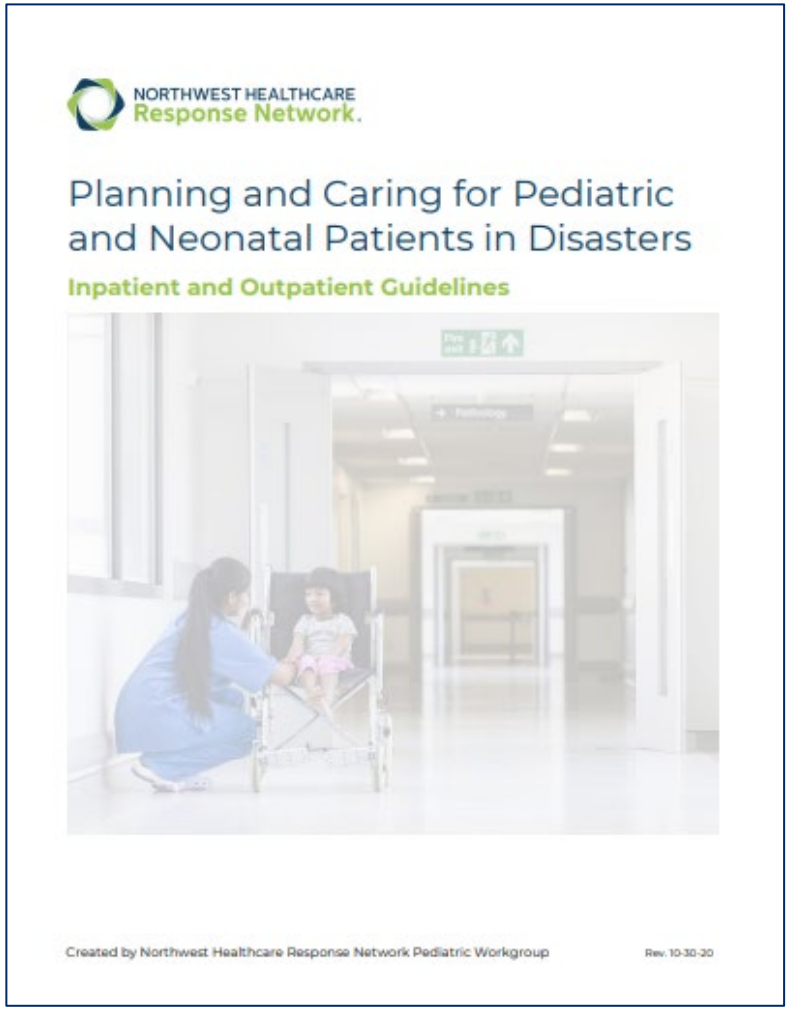
NWHRN Pediatric Surge Annex and Toolkit

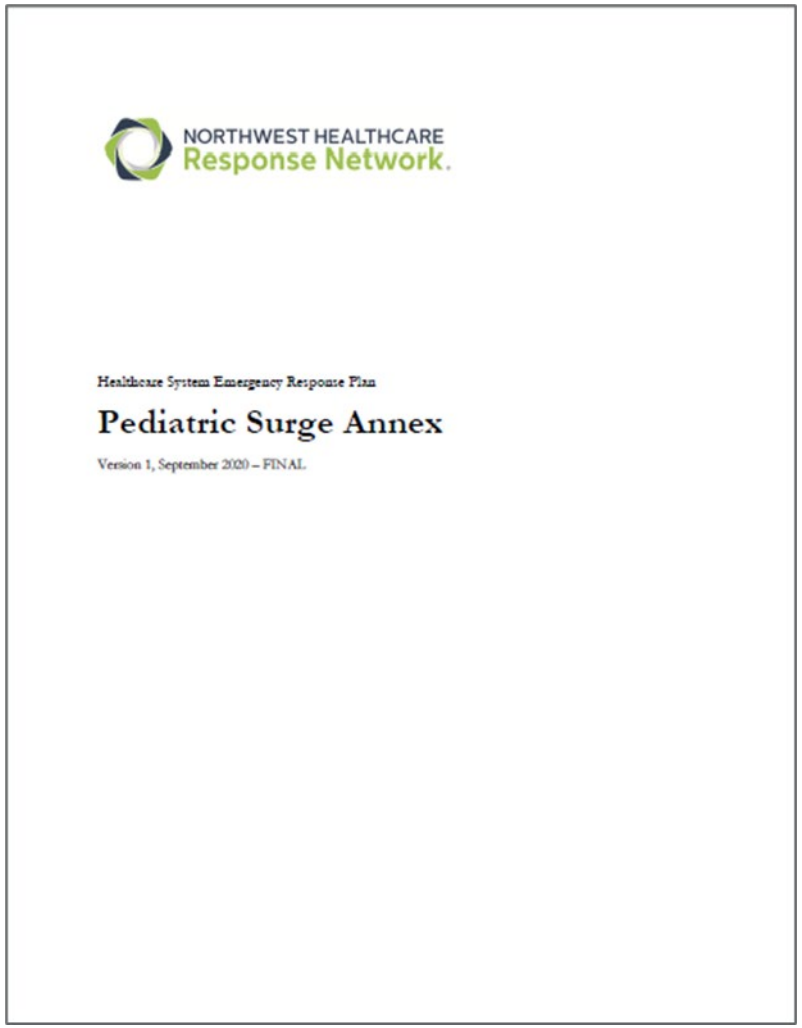




https://nwhrn.org/pediatric-surge-annex-clinical-toolkit/

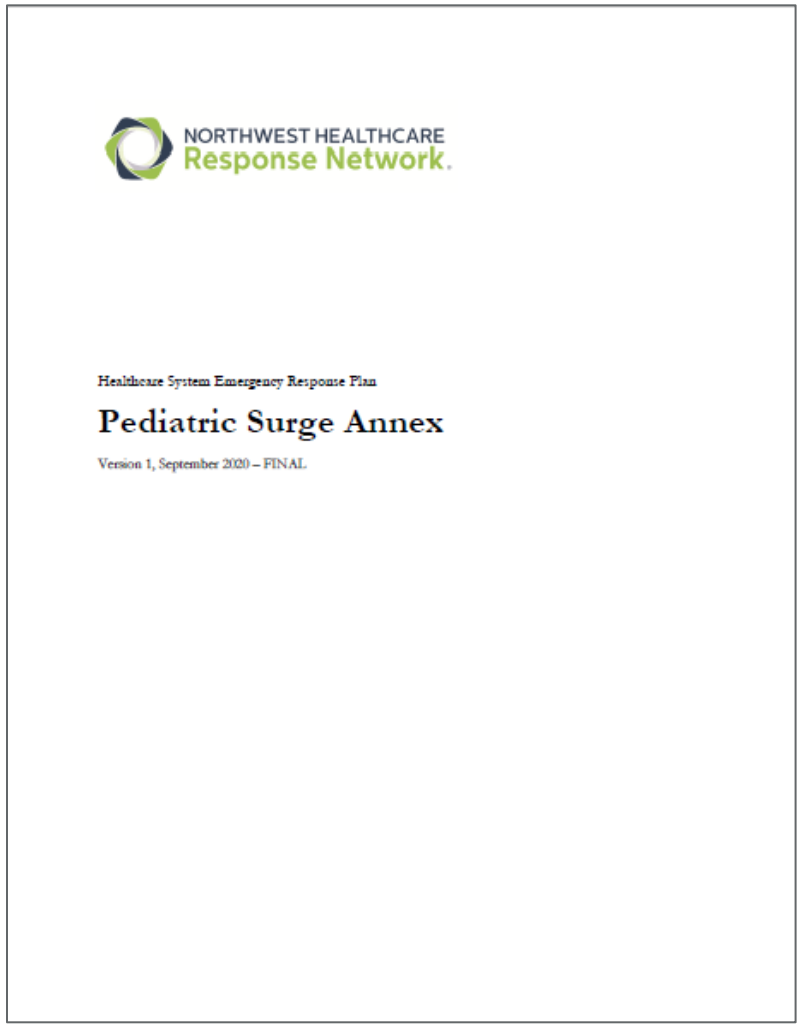
NWHRN Pediatric Surge Annex and Toolkit

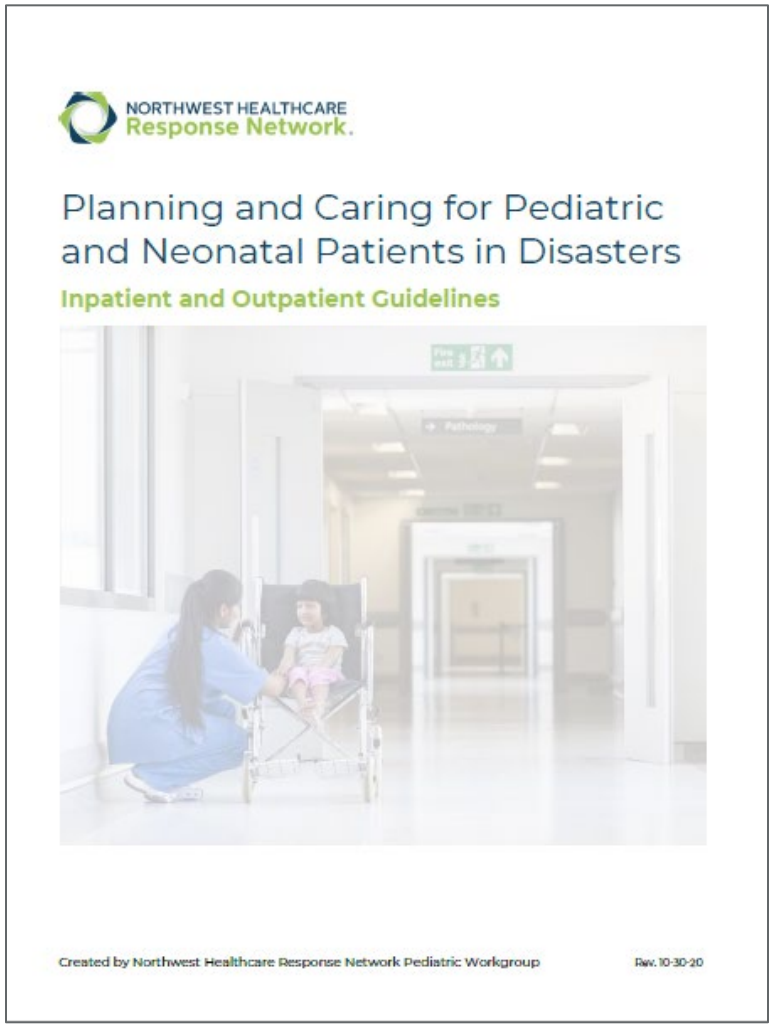




https://nwhrn.org/wp-content/uploads/2025/08/NWHRN-Pediatric-Toolkit-Guidelines-103020.pdf

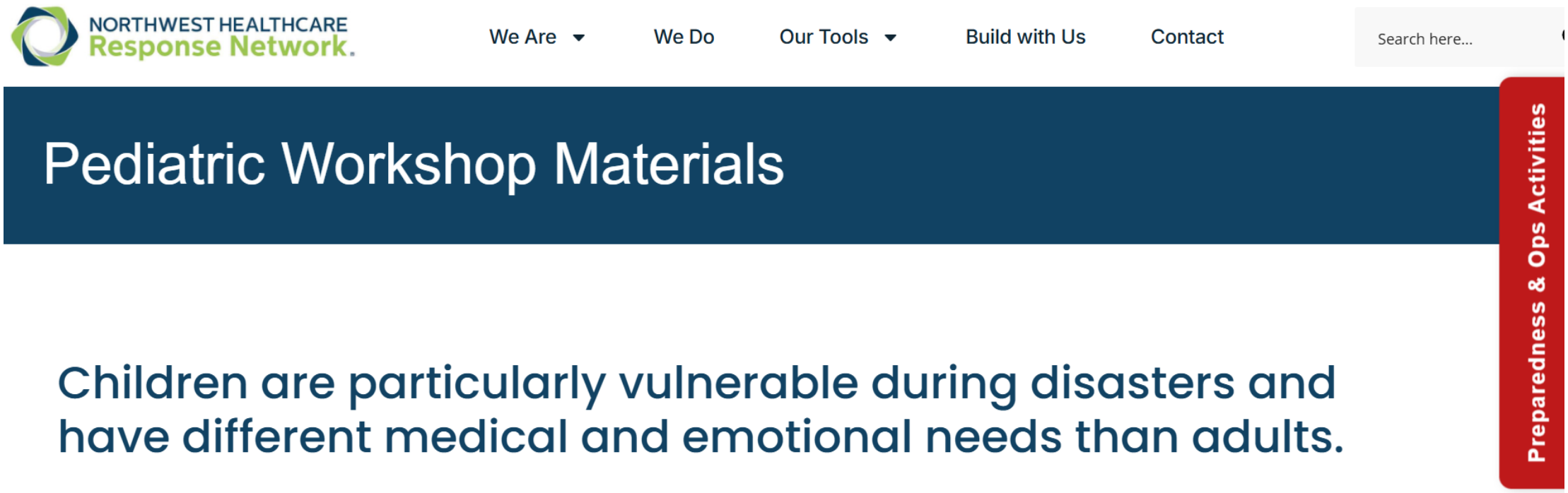
NWHRN Pediatric Surge Annex and Toolkit





https://nwhrn.org/pediatric-surge-annex-clinical-toolkit/

JIT and Pediatric Resources:

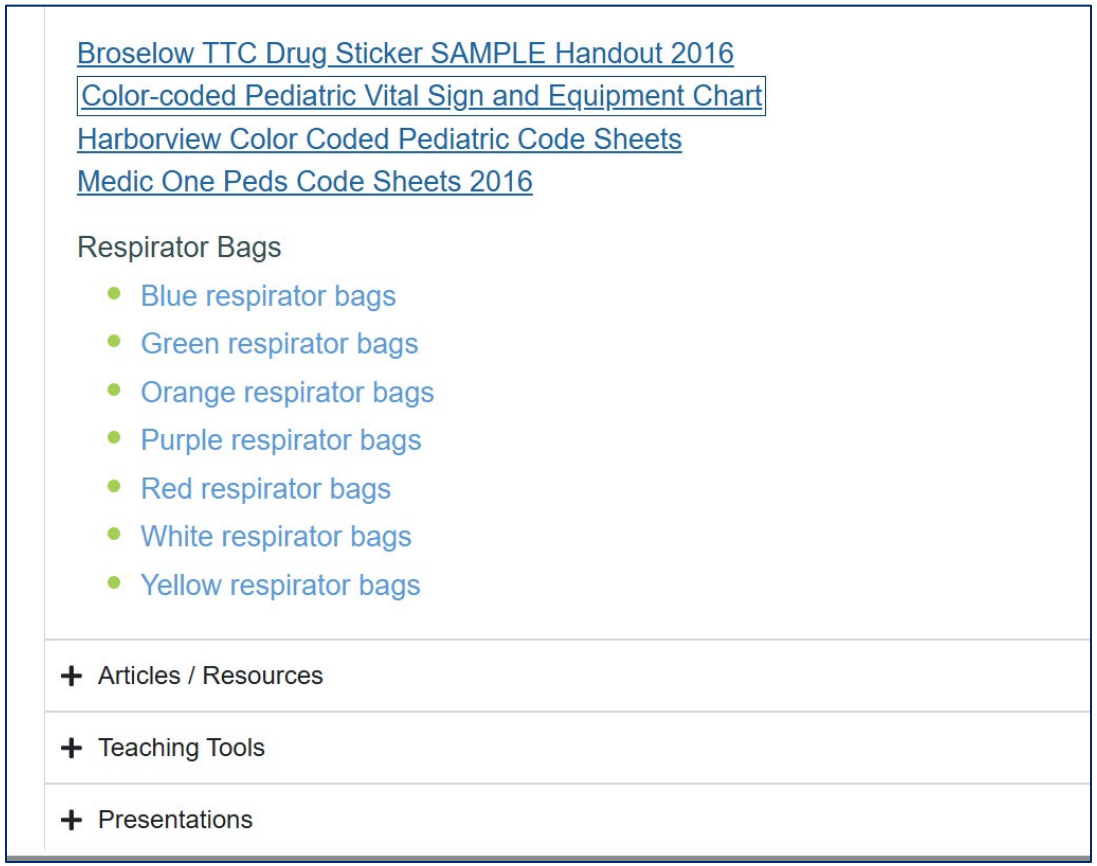


https://nwhrn.org/pediatric-workshop/

Pediatric Resources

NWHRN

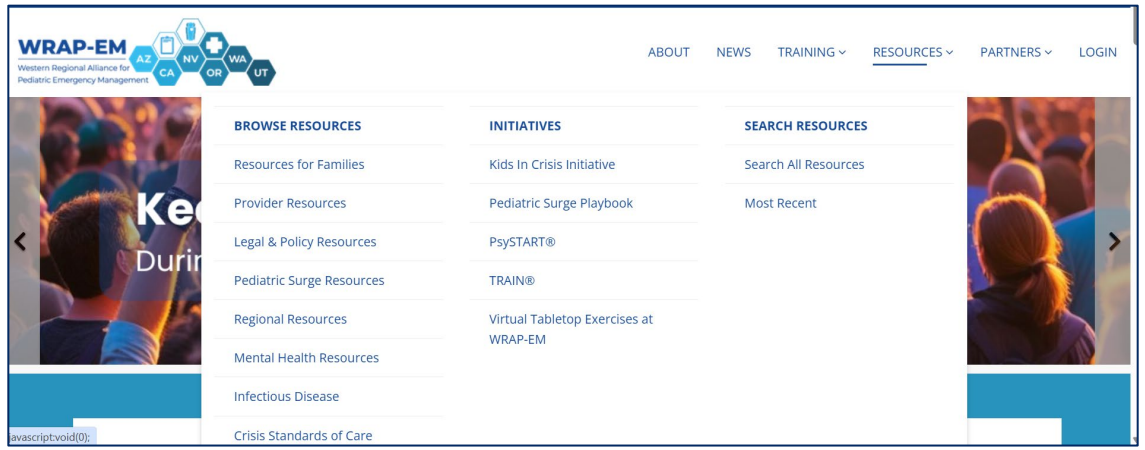
https://nwhrn.org/pediatric-workshop/

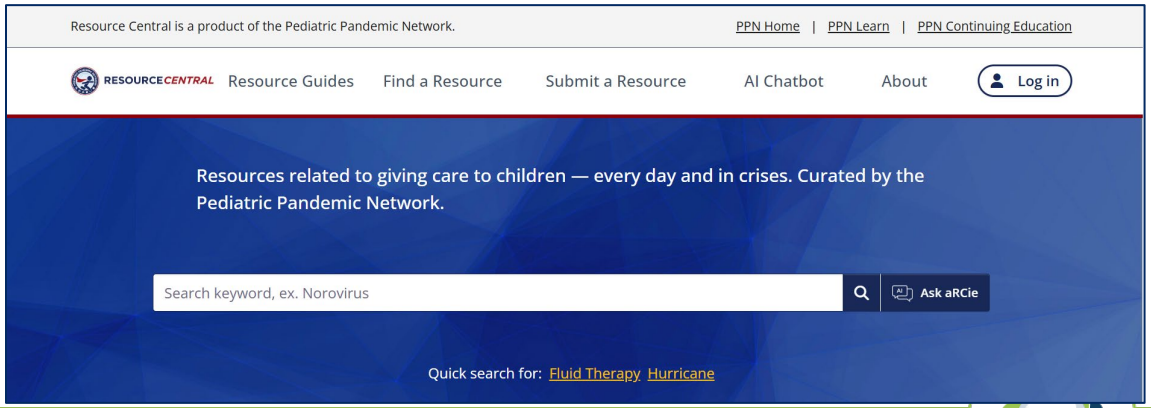


WRAP-EM and PPN

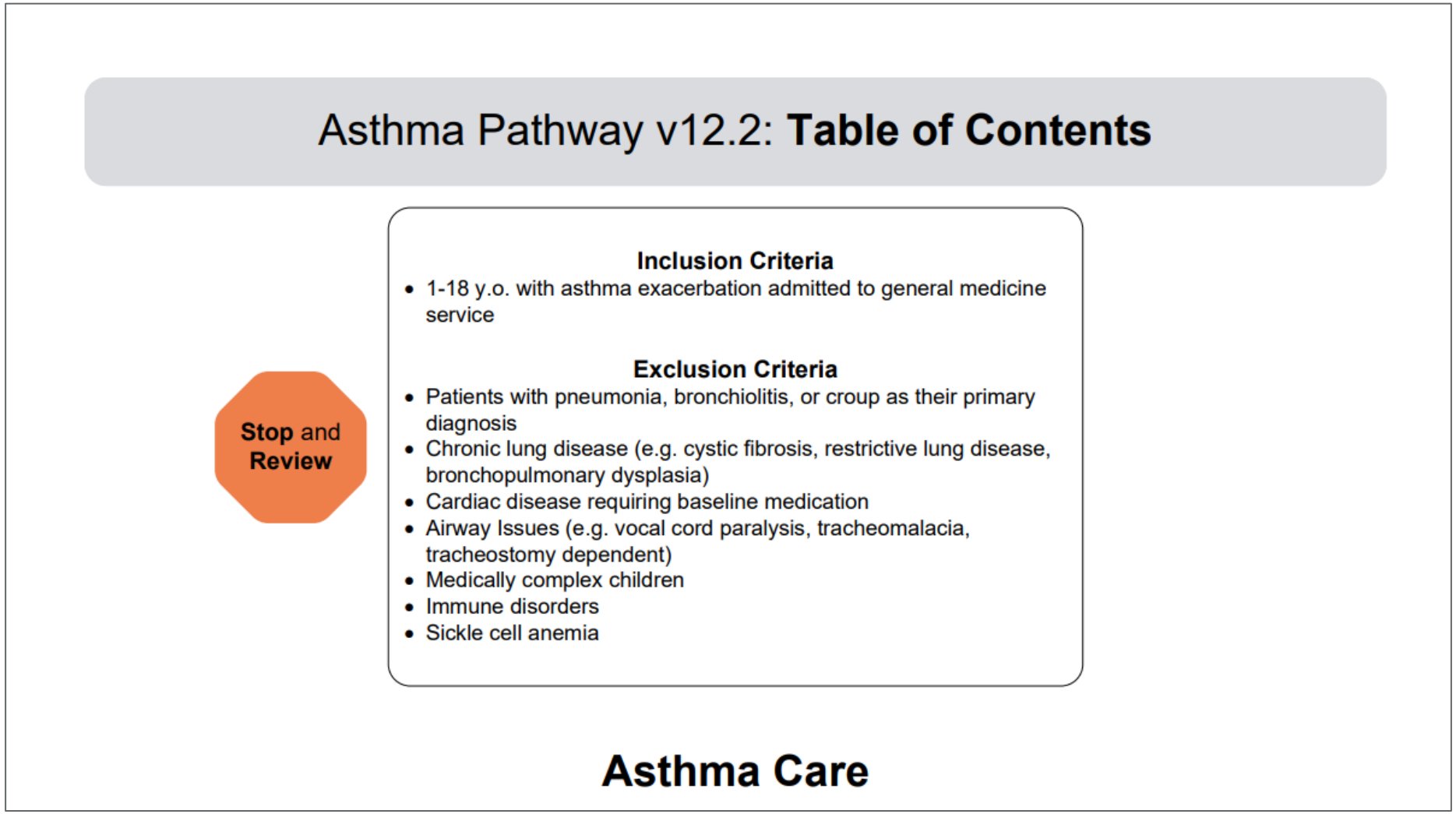
https://resources.pedspandemicnetwork.org/

https://wrap-em.org/





Seattle Children's Clinical Pathways



https://www.seattlechildrens.org/healthcare-professionals/community-providers/pathways/

Pediatric Fall Respiratory Refresher Course

Virtual Webinar

October 15, 2025

12:30-3pm PT

Thank you!

clinical@nwhrn.org