



COVID CONVERSATIONS

Respiratory Syncytial Virus
(RSV)

American
Academy of
Pediatrics
CALIFORNIA
Approved by California

Welcome to tonight's Conversation

- All lines are muted during program
- Question-and-Answer box can be utilized to communicate with the moderators
- Webinar will be recorded and posted to the California Immunization Coalition website (<https://www.immunizeca.org/>) as well as the CIC YouTube page (<https://www.youtube.com/channel/UClkZ1SZQNQLcpmNpeQpDAg>)

Thank you



American
Academy of
Pediatrics
CALIFORNIA
Incorporated in California

Today's Hosts and Moderators



Dr. Pia Pannaraj

- Associate Professor of Pediatrics, Molecular Microbiology and Immunology, Keck School of Medicine, University Southern California
- Director, Pediatric Immunization Advancement Laboratory, Division of Infectious Diseases, Children's Hospital Los Angeles
- Co-Chair, Emerging Issues Committee, California Immunization Coalition



Dr. Eric Ball

- Primary Care Pediatrician, CHOC Primary Care Network
- Vice Chair, American Academy of Pediatrics, California
- Co-Chair, Emerging Issues Committee, California Immunization Coalition

Today's Speaker

Angela Campbell, MD, MPH

Medical Officer, FAAP, FPIDS, FIDSA

National Center for Immunization and
Respiratory Diseases (NCIRD)
Centers for Disease Control and Prevention
(CDC)



Emerging Conversations: Respiratory Syncytial Virus (RSV) Surge and Prevention Strategies

Coming Soon

Angela Campbell, MD, MPH, FAAP, FPIDS, FIDSA

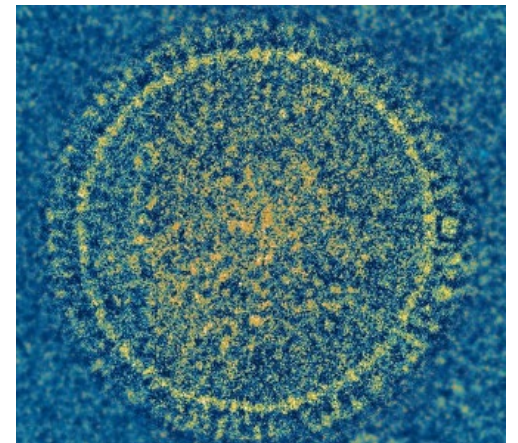
Team Lead, Severe Illness and Multisystem Inflammatory Syndrome Team

Epidemiology Branch, COVID and Other Respiratory Viruses Division

(proposed)

California Immunization Coalition and American Academy of Pediatrics – California Chapter

November 15, 2022



The burden of RSV in U.S. children

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

- RSV can infect the small airways and lungs, particularly in infants
- Most (68%) infants are infected in the first year of life and nearly all (97%) by age 2¹
- Premature infants born at <30 weeks gestation had hospitalization rates ~3x higher than term infants²
 - Preterm infants have higher rates of ICU admission, mechanical ventilation³
- 79% of children hospitalized with RSV aged <2 years had no underlying medical conditions²
- 2-3% of all infants will be hospitalized for RSV^{2,4}



Image: Goncalves et al. Critical Care Research and Practice 2012

Each year in U.S. children <5 years, RSV is associated with...

100-300^{1,2}
deaths

58,000-80,000^{3,4}
hospitalizations

~520,000³
emergency department visits

~1,500,000³
outpatient visits

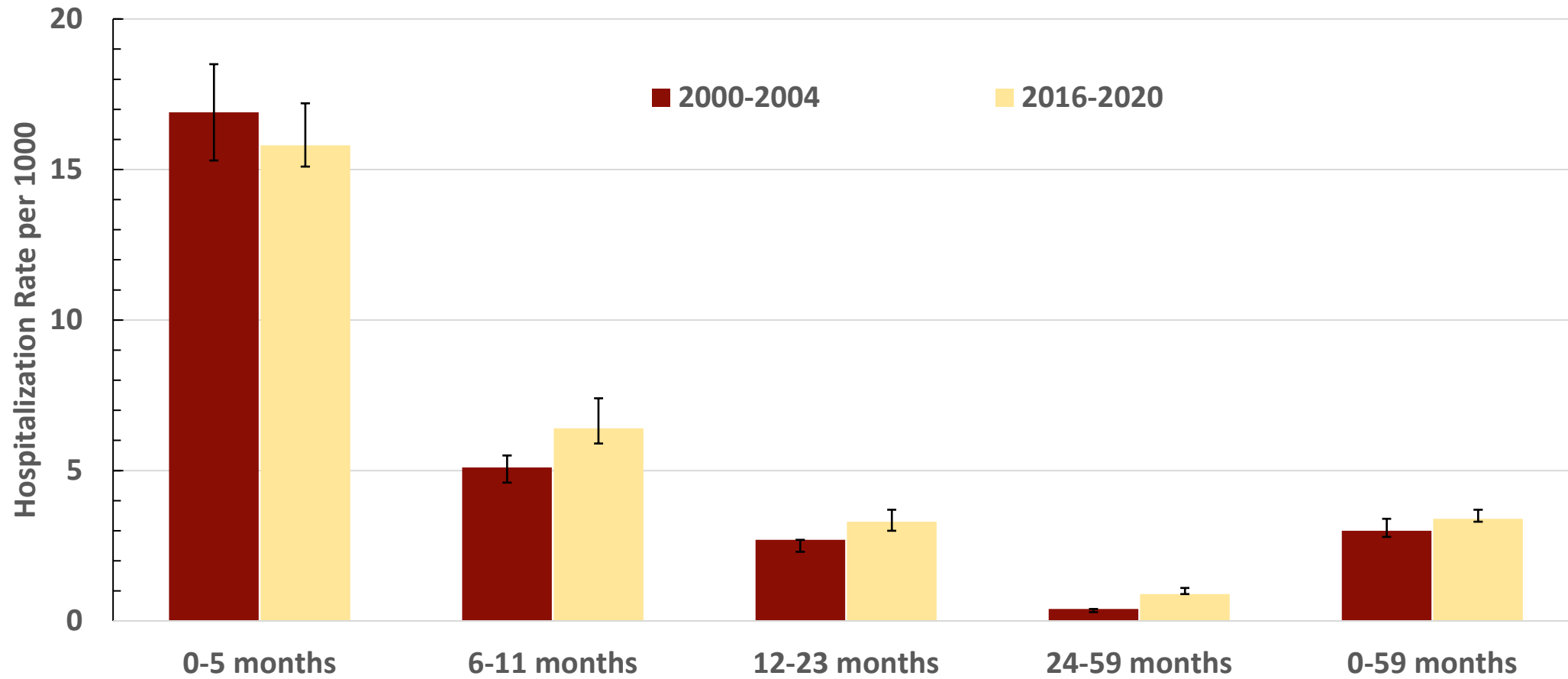
¹Thompson et al, JAMA, 2003; ²Hansen et al, JAMA Network Open, 2022; ³Hall et al, NEJM, 2009; ⁴McLaughlin et al, J Infect Dis, 2022
(*estimate 80,000 hospitalizations in infants <1y)

RSV-associated disease burden estimates from the New Vaccine Surveillance Network (NVSN)



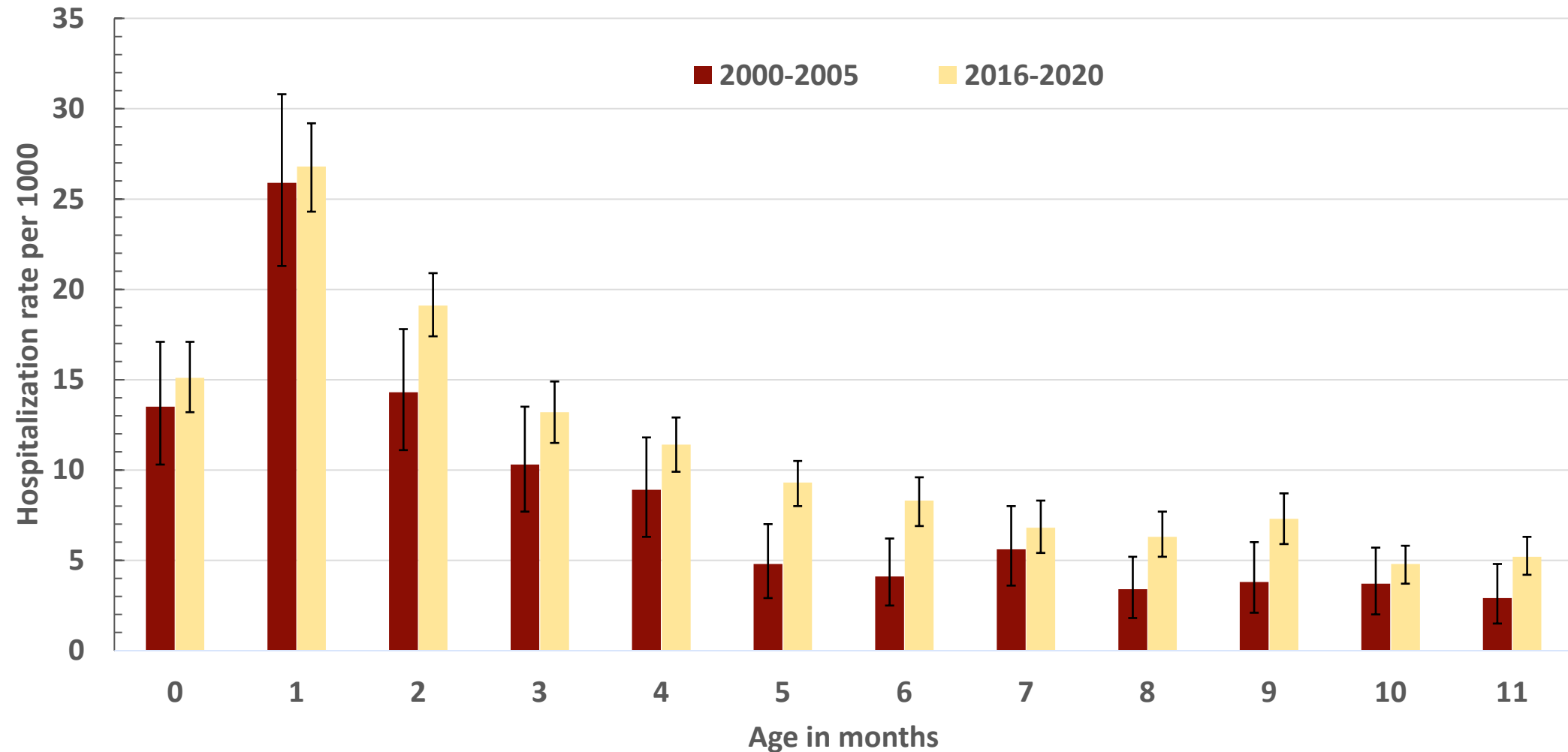
- Year-round acute respiratory illness (ARI) surveillance at 3 sites during 2000-2009
- Expanded to 7 sites during 2016-2021
- Prospective surveillance in inpatient, ED, outpatient clinics
- PCR testing for multiple respiratory viruses, including RSV
- Population denominators and market share used to estimate disease burden

RSV-associated hospitalization rates are highest in children aged 0 -5 months and decrease with increasing age, NVSN



2000-2004: Adapted from Hall et al, NEJM 2009; 2016-2020: CDC unpublished data

RSV-associated hospitalization rates in children aged 0-11 months, NVSN



2000-2005: Adapted from Hall et al, Pediatrics 2013; 2016-2020: CDC unpublished data

NVSN estimates of emergency and outpatient visits during 2002 -2004, 2004-2009

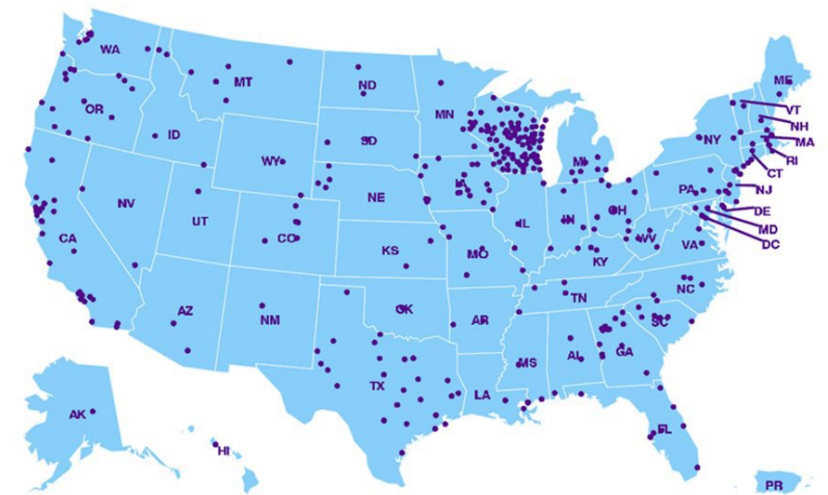
- Emergency department
 - Highest rates in infants (55/57 per 1000) among 0-5/6-11 months¹
 - Highest rate in infants aged 0-5 months (75 per 1000)²
- Outpatient pediatric clinics
 - Highest rates in infants aged 6-11 months (177 per 1000)¹
 - Highest rates in infants aged 6-11 months (246 per 1000)²

¹Hall et al, NEJM, 2009; ²Lively et al, J Ped Infect Dis Soc, 2019

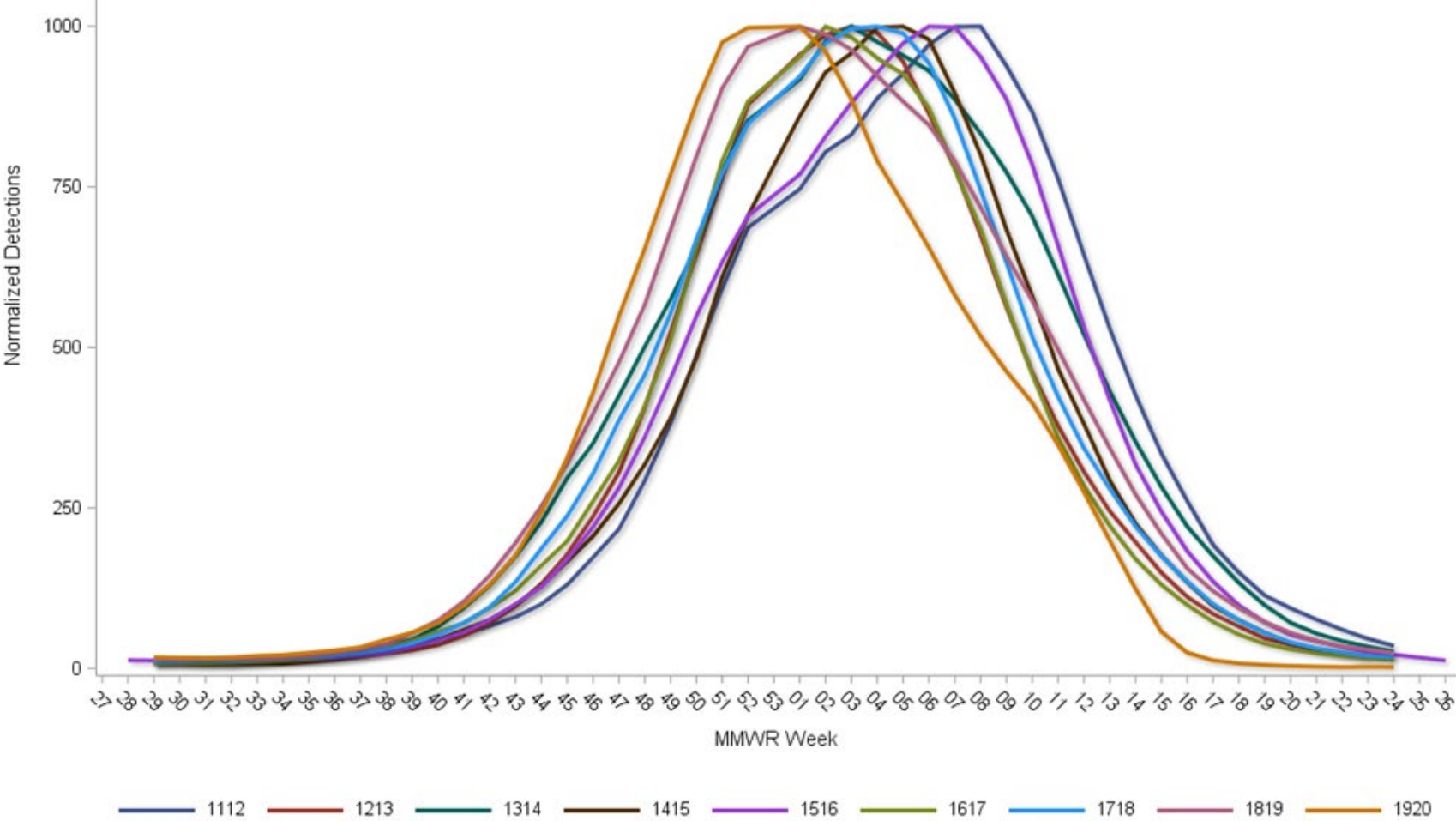
RSV Seasonality in the United States

National Respiratory and Enteric Virus Surveillance System (NREVSS) for monitoring RSV seasonality

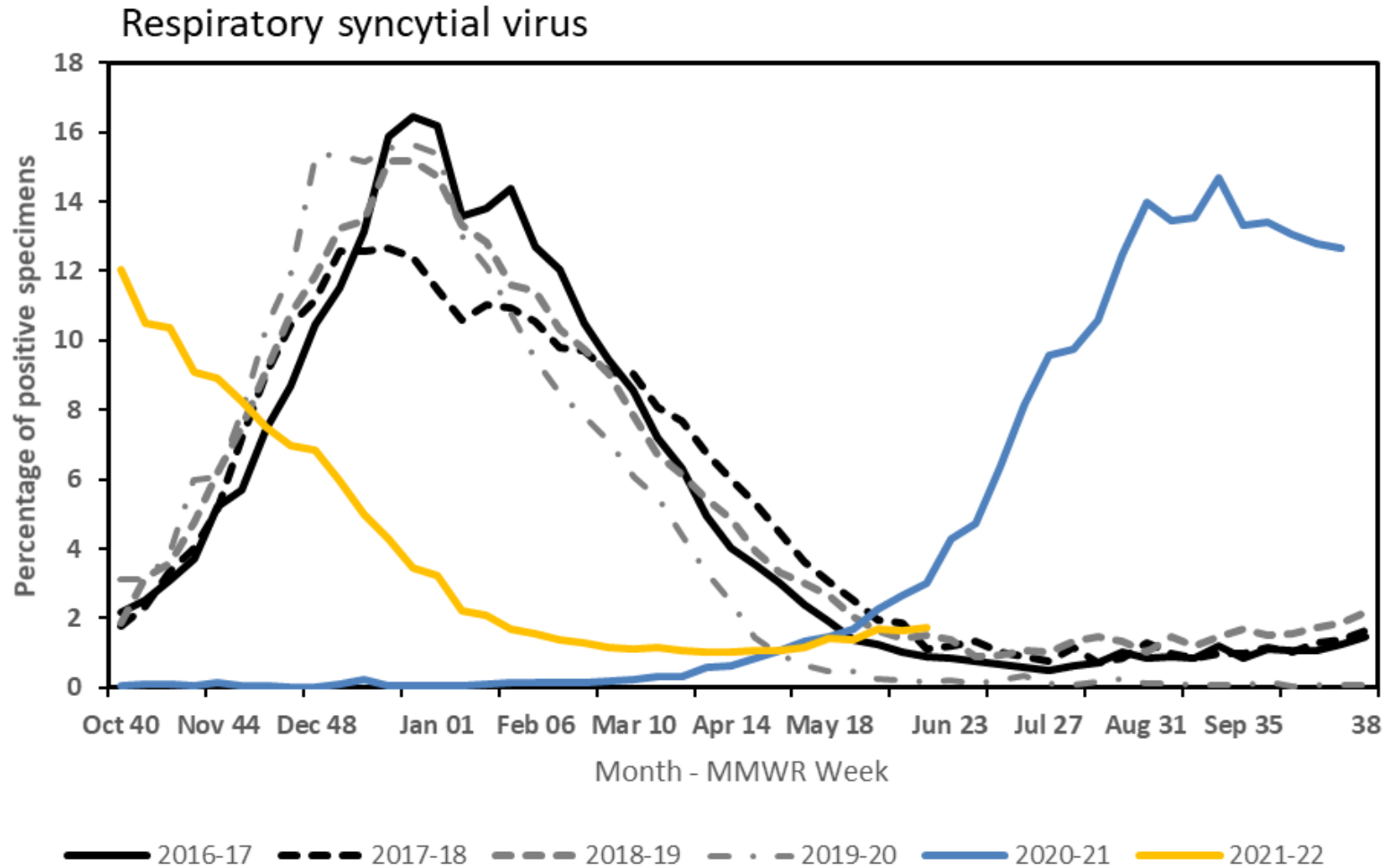
- **Passive, laboratory-based surveillance**
 - Commercial, hospital, and state/local public health laboratories
 - ~300 laboratories report RSV results
 - Weekly reporting of total tests performed and RSV positive tests
- **All test types (majority PCR assays)**
- **Testing is clinician-directed**
- **All ages**



During 2011 – 2020, RSV circulation was highly seasonal in the U.S. with predictable peak activity during December – February annually

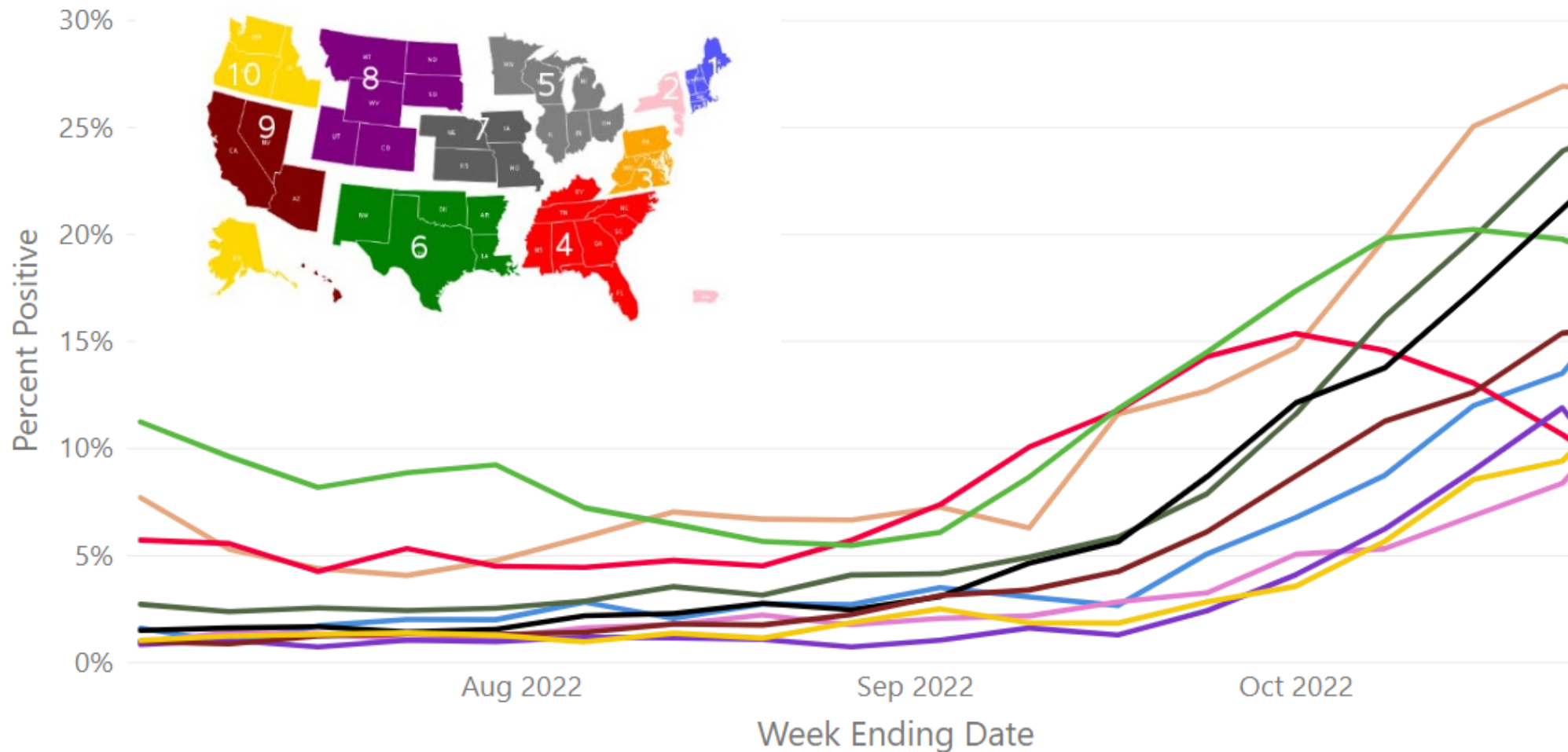


Following over 1 year of limited RSV circulation, the U.S. experienced an intraseasonal RSV wave that peaked in early August 2021



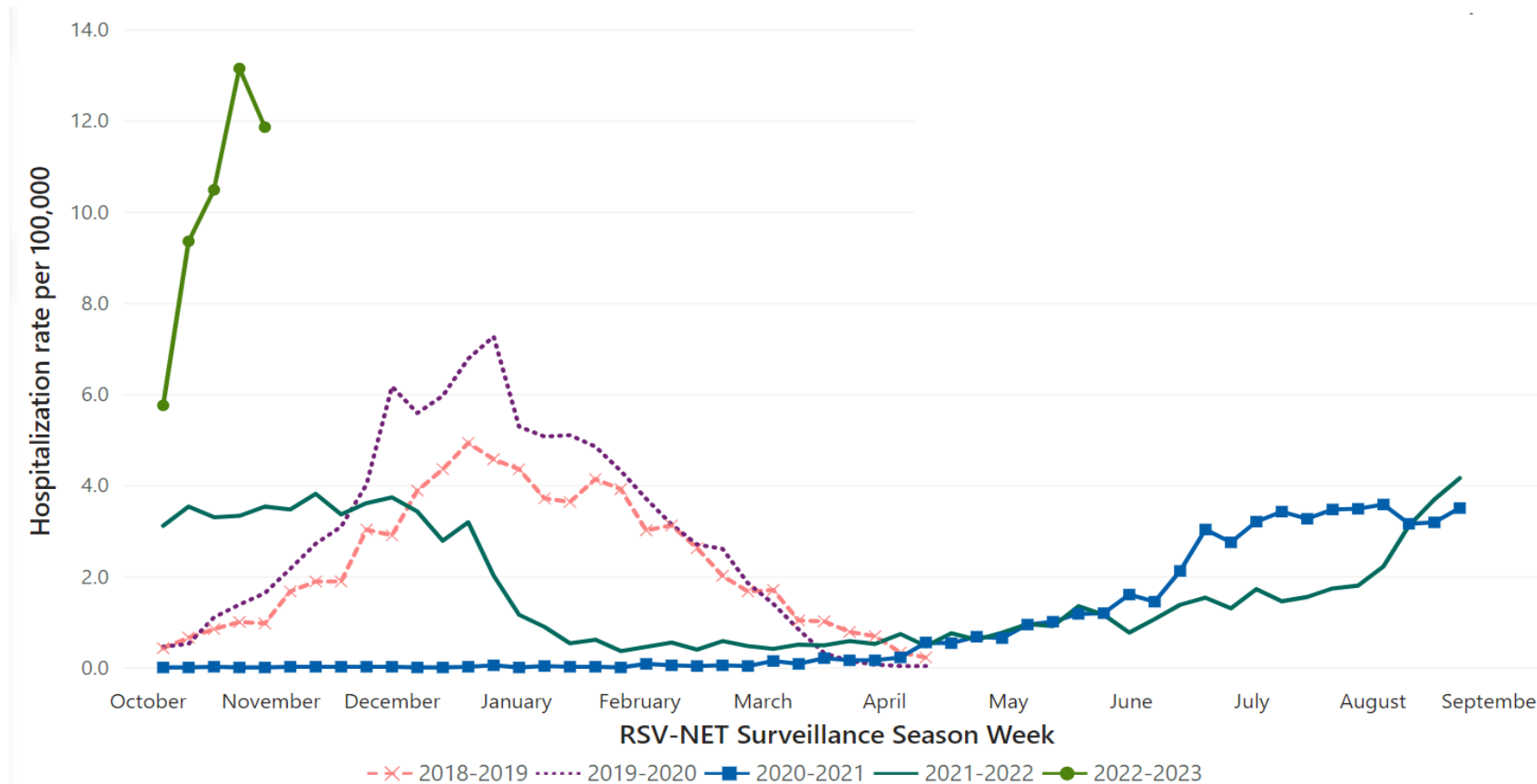
RhSV weekly percent positive by HHS Region - National Respiratory and Enteric Virus Surveillance System (NREVSS), March 2020 to October 29, 2022 (updated 11/7/22)

HHS 1 2 3 4 5 6 7 8 9 10



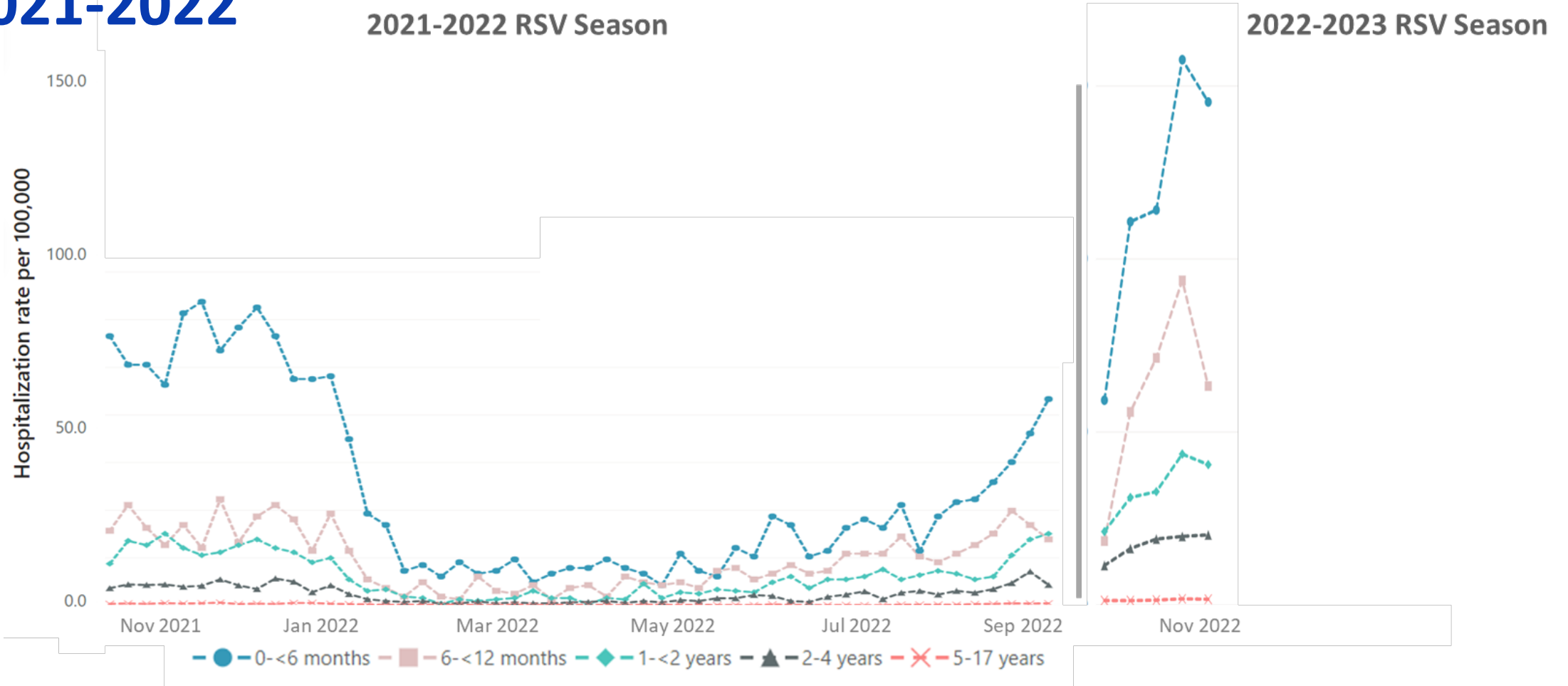
Weekly Rates of RSV-Associated Hospitalizations among Children Ages <18 years by Surveillance Season – RSV-NET, 2018-2022

RSV-NET Interactive Dashboard



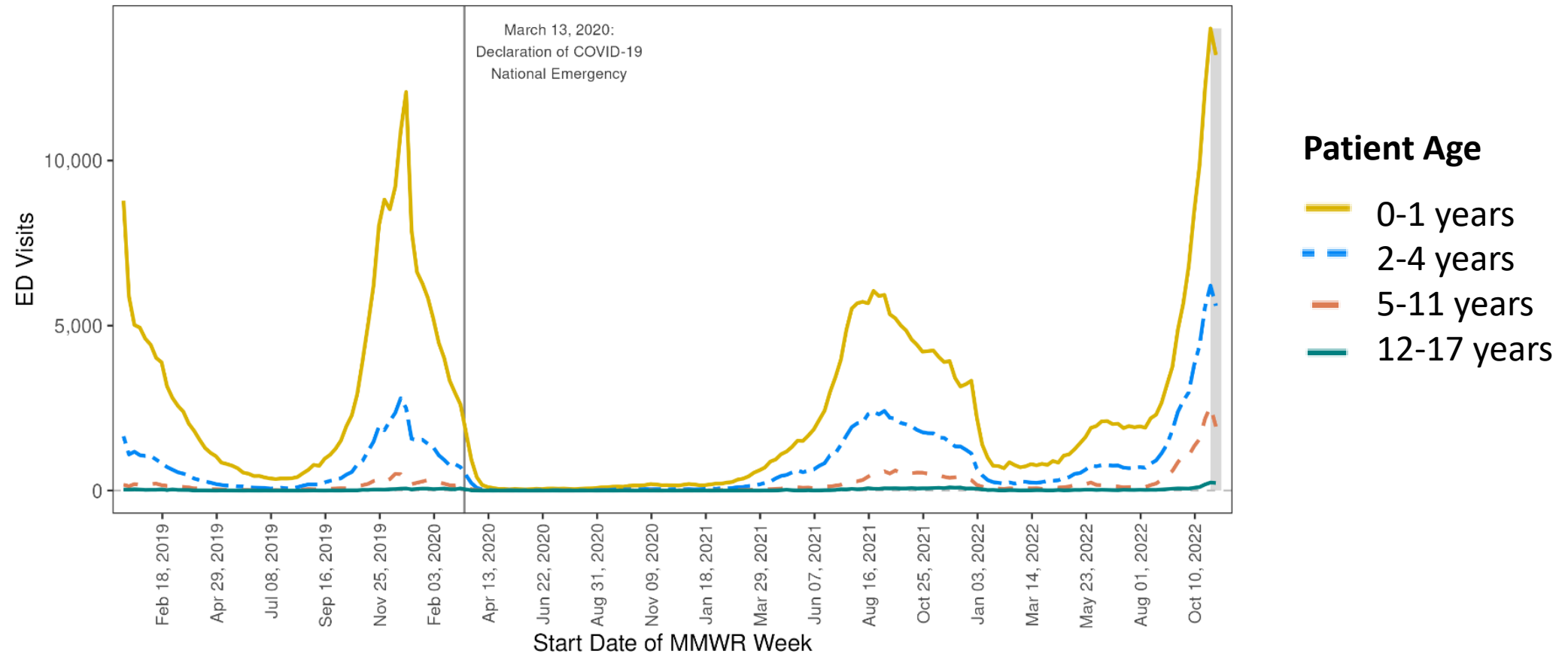
Date are subject to reporting lag. Rates presented likely underestimate actual rates of RSV hospitalization as cases are defined as those with a positive test, and not all patients might be tested for RSV. Rates are unadjusted and do not account for changing testing practices over time. Data for May and June 2022 are incomplete.

Weekly Rates of RSV-Associated Hospitalizations among Children Ages <18 years by Age Group – RSV-NET, 2021-2022



Data are subject to reporting lag. Rates presented likely underestimate actual rates of RSV hospitalization as cases are defined as those with a positive test, and not all patients might be tested for RSV. Rates are unadjusted and do not account for changing testing practices over time. Data for May and June 2022 are incomplete.

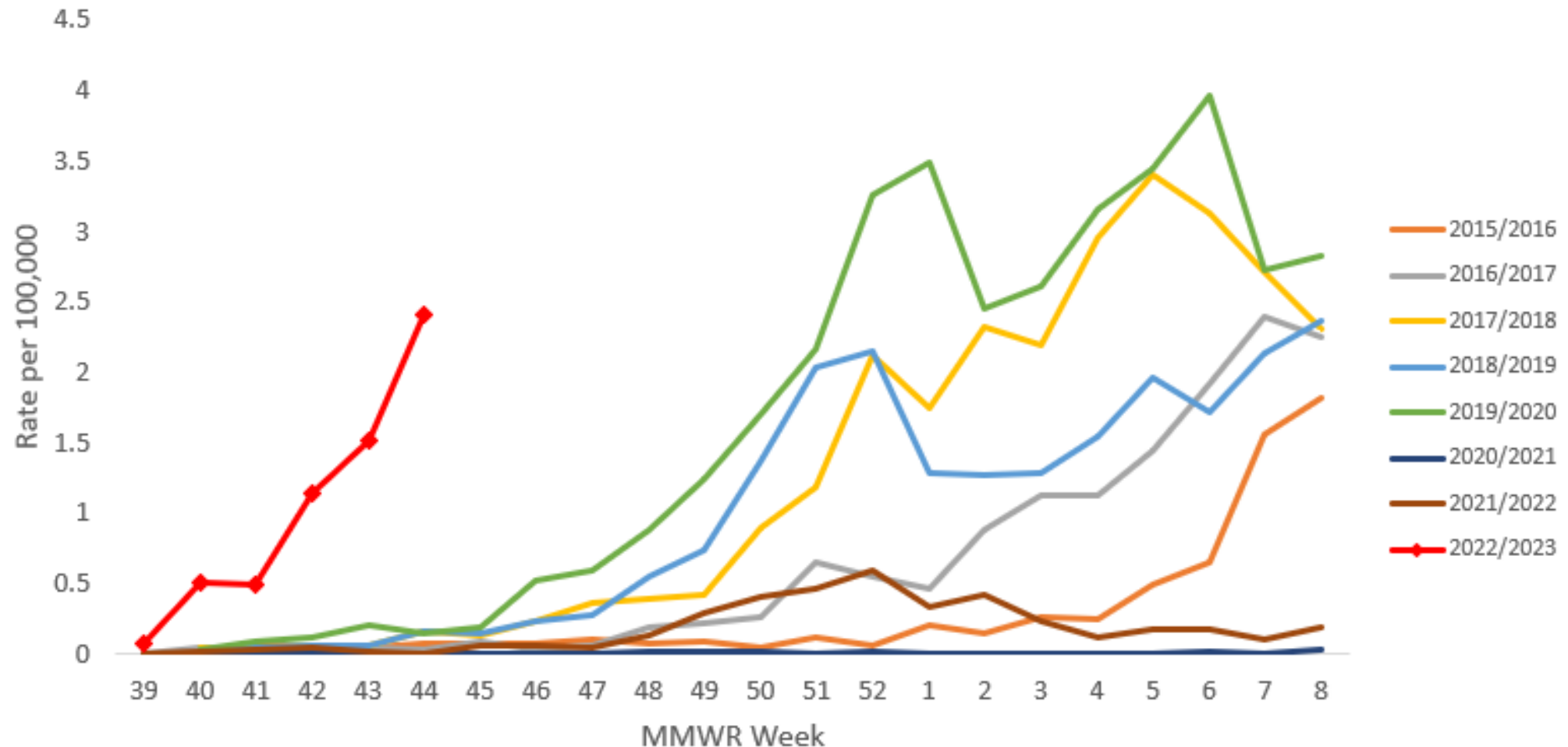
Weekly U.S. Emergency Department Visits with Diagnosed RSV and RSV-like Illness*, Ages 0-1, 2-4, 5-11, and 12-17 Years, Dec 30, 2018, to Nov 12, 2022, National Syndromic Surveillance Program



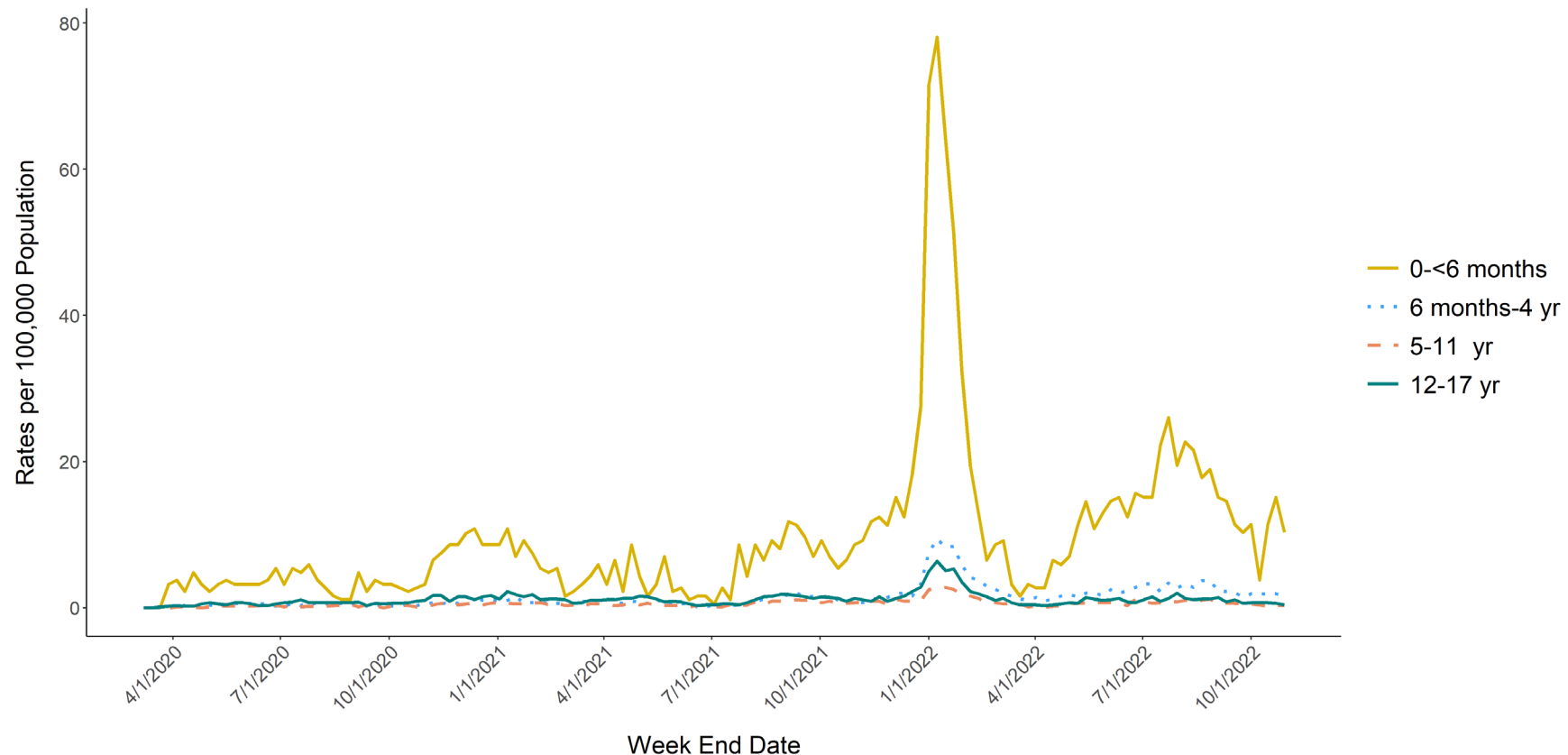
+The most recent week of data may be incomplete

*CDC Respiratory Syncytial Virus v1 definition includes visits with RSV, bronchiolitis, or syncytial virus in the chief complaint and visits with diagnosed RSV. Counts limited to the subset of NSSP facilities with consistent reporting to NSSP and with high quality diagnosis codes throughout the time period.

Weekly Rates of Influenza-Associated Hospitalization in Children <18 years by Surveillance Season – FluSurv-NET, 2014-2022



Laboratory-Confirmed Pediatric COVID-19-Associated Hospitalization – COVID-NET, March 2020, to October 29, 2022



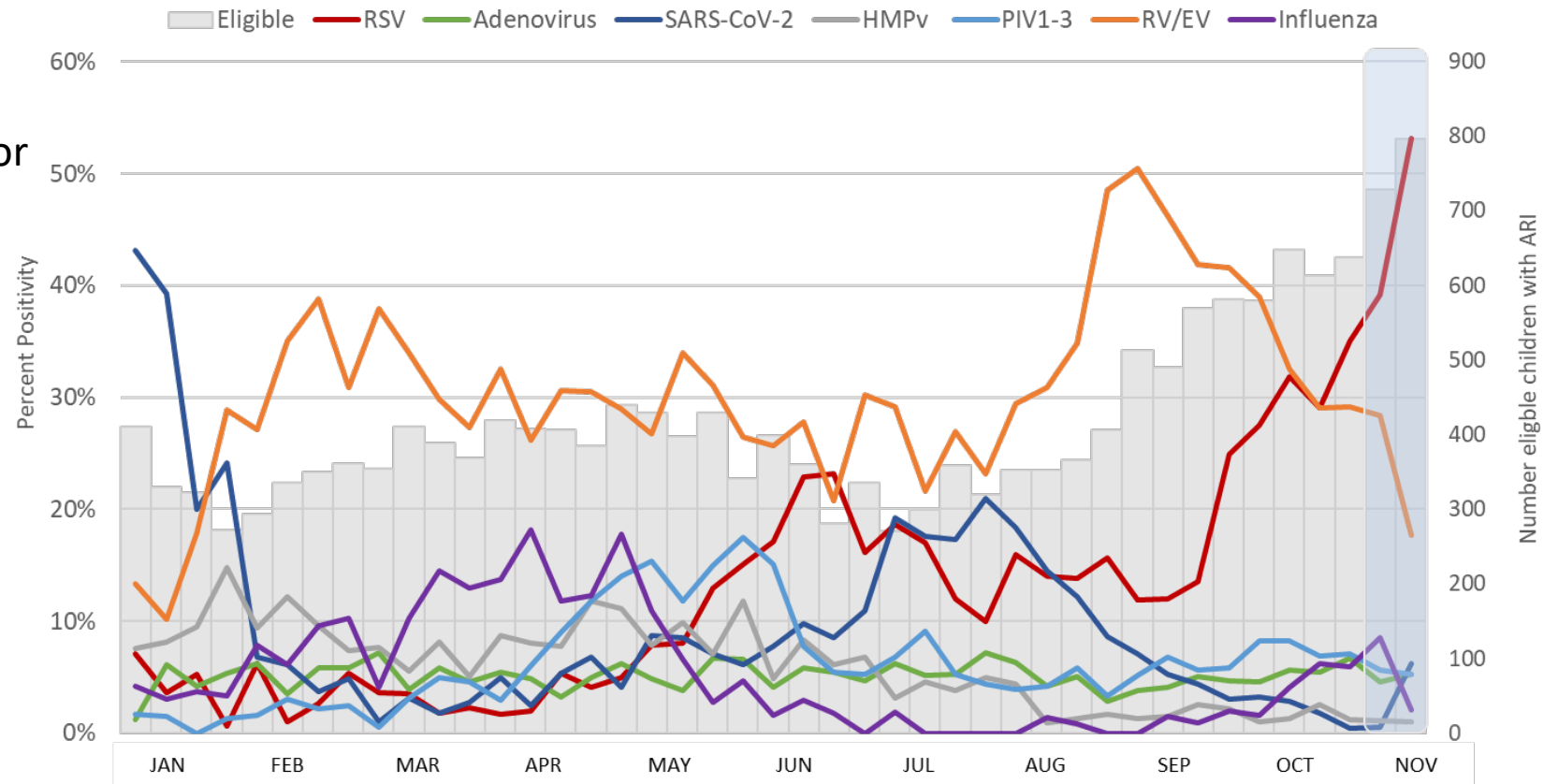
*Starting the week of May 29, 2022, Iowa data are removed from weekly rate calculations.

Source: COVID-NET hospitalization data through October 29, 2022; <https://covid.cdc.gov/covid-data-tracker/#covidnet-hospitalization-network>

The Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization Surveillance Network (COVID-NET) conducts population-based surveillance for laboratory-confirmed COVID-19-associated hospitalizations in children (persons younger than 18 years) and adults. The current network covers nearly 100 counties in the 10 Emerging Infections Program states (CA, CO, CT, GA, MD, MN, NM, NY, OR, and TN) and four additional states through the Influenza Hospitalization Project (IA, MI, OH, and UT). The network represents approximately 10% of US population (~32 million people). Cases are identified by reviewing hospitals, laboratory, and admissions databases and infection control logs for patients hospitalized with COVID-19. Laboratory confirmation is dependent on clinician-ordered SARS-CoV-2 testing. Therefore, the unadjusted rates provided are likely to be underestimates as COVID-19-associated hospitalizations can be missed due to test availability and provider or facility testing practices. COVID-NET hospitalization data are preliminary and subject to change as more data become available. In particular, case counts and rates for recent hospital admissions are subject to lag. As data are received each week, prior case counts and rates are updated accordingly. All incidence rates are unadjusted.

Weekly test positivity for ED/Inpatient Children in the New Vaccine Surveillance Network, January to November 10, 2022

- Network of 7 pediatric medical centers
- Year-round active surveillance for acute respiratory infection
- All participants tested for multiple respiratory viruses by PCR
- >10,000 children enrolled annually



Pediatric Respiratory Disease Surveillance Summary

- We continue to see a national increase in pediatric respiratory illness, and nationally we remain at winter peak levels.
- For RSV, some HHS regions (Regions 3, 4, 6, and 9) are seeing decreased test positivity and may have peaked.
- Early increases in seasonal influenza have been reported in most regions of the US, with the highest levels of activity in the Southcentral and Southeast regions of the country.
- Public health response
 - Prevention focus on vaccines for influenza, COVID-19
 - Diagnostics, important to determine etiology, guide therapy

Increased Respiratory Virus Activity, Especially Among Children, Early in the 2022-2023 Fall and Winter

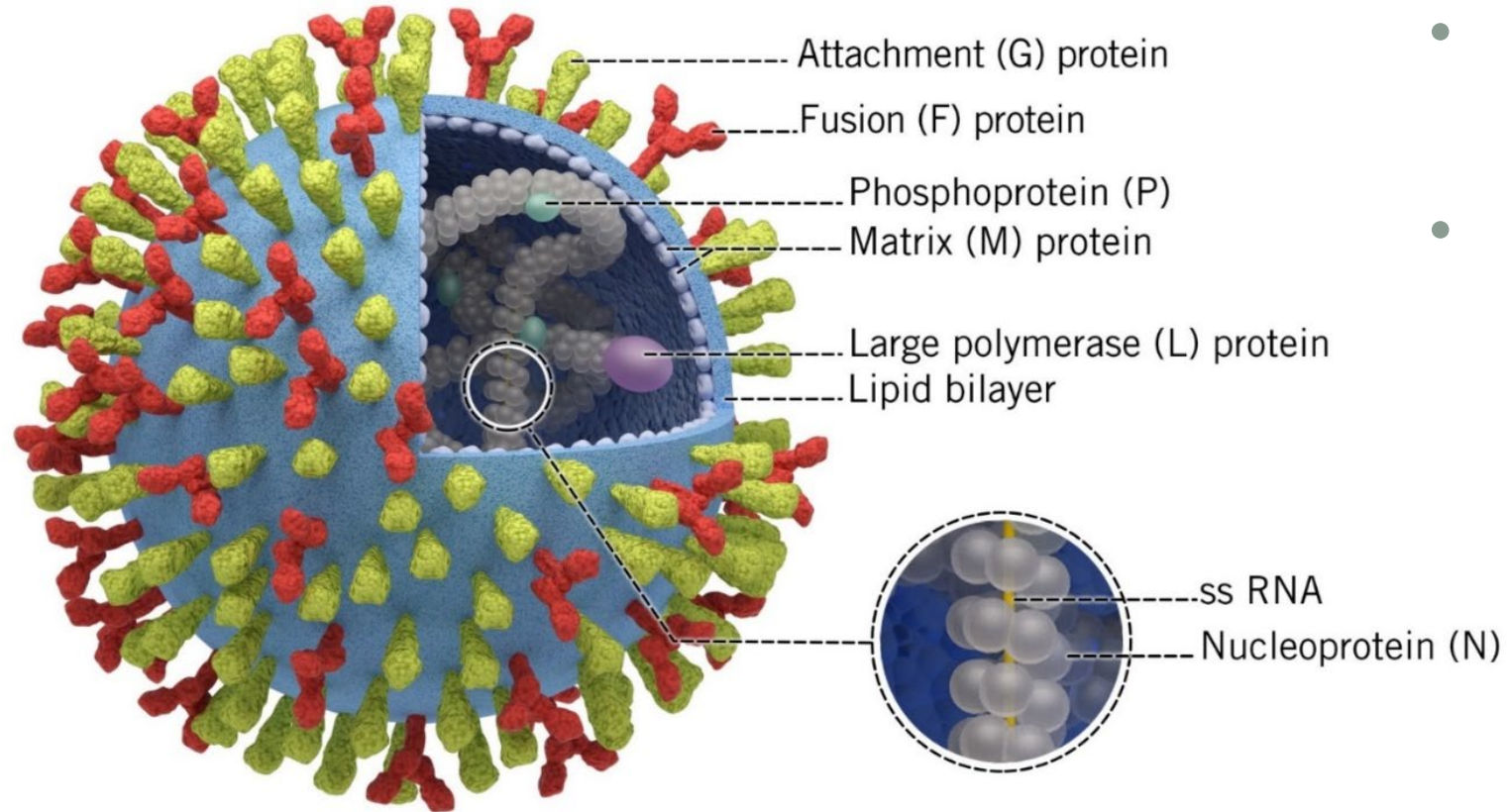
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Distributed via the CDC Health Alert Network
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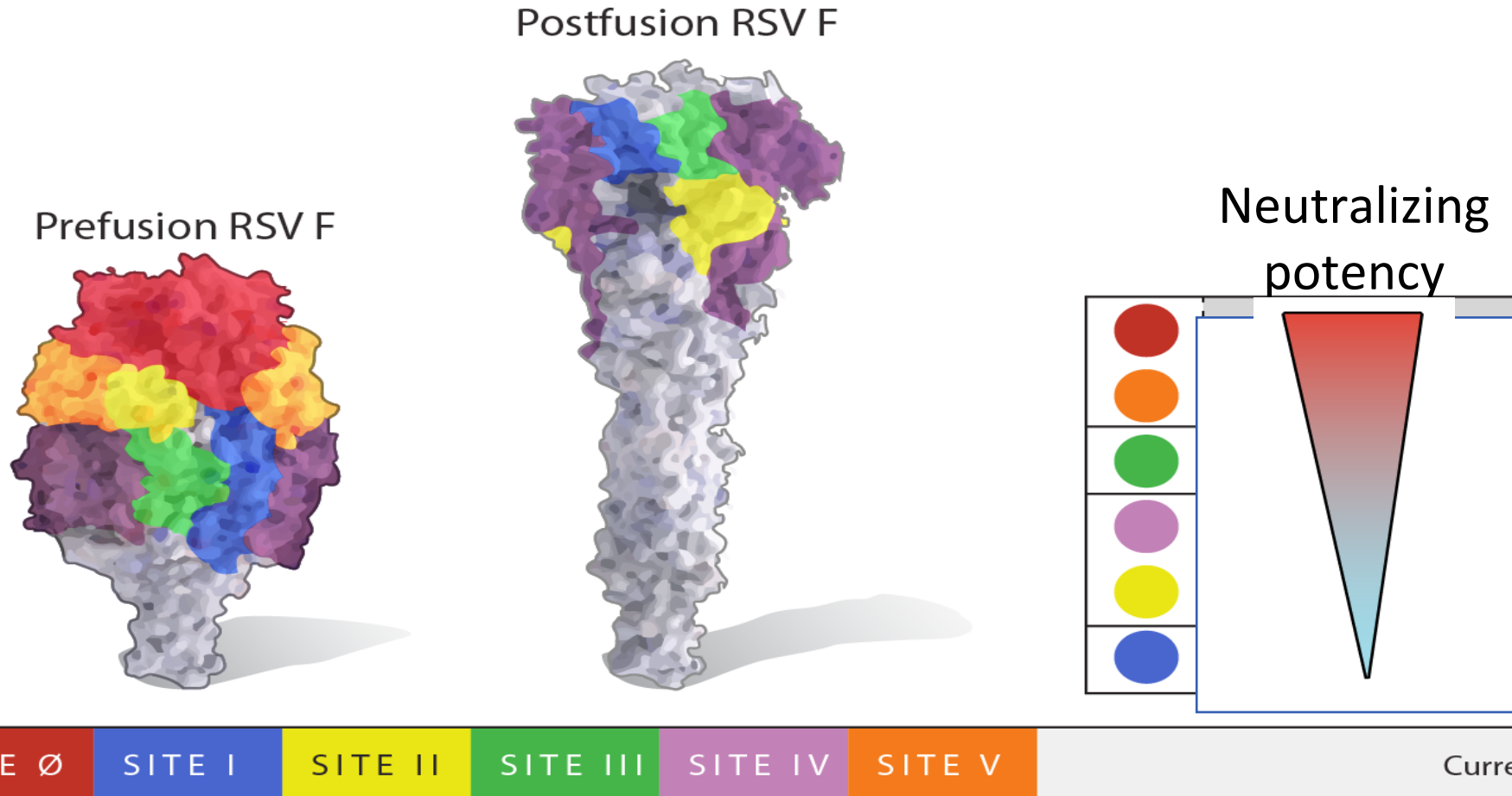
Prevention

RSV – Virion structure



- Targets for neutralizing antibodies
- Products target F alone or have both F and G

The fusion (F) protein exists in two or more structural forms, which bind different antibodies



Five general categories of RSV preventatives in clinical trials

Vaccine product types

1. Live attenuated/chimeric
2. Protein-based
 - Inactivated
 - Particle
 - Subunit
3. Nucleic acid
4. Recombinant vectors

Immunoprophylaxis

5. Monoclonal antibodies

Prevention - Palivizumab (Synagis ®).

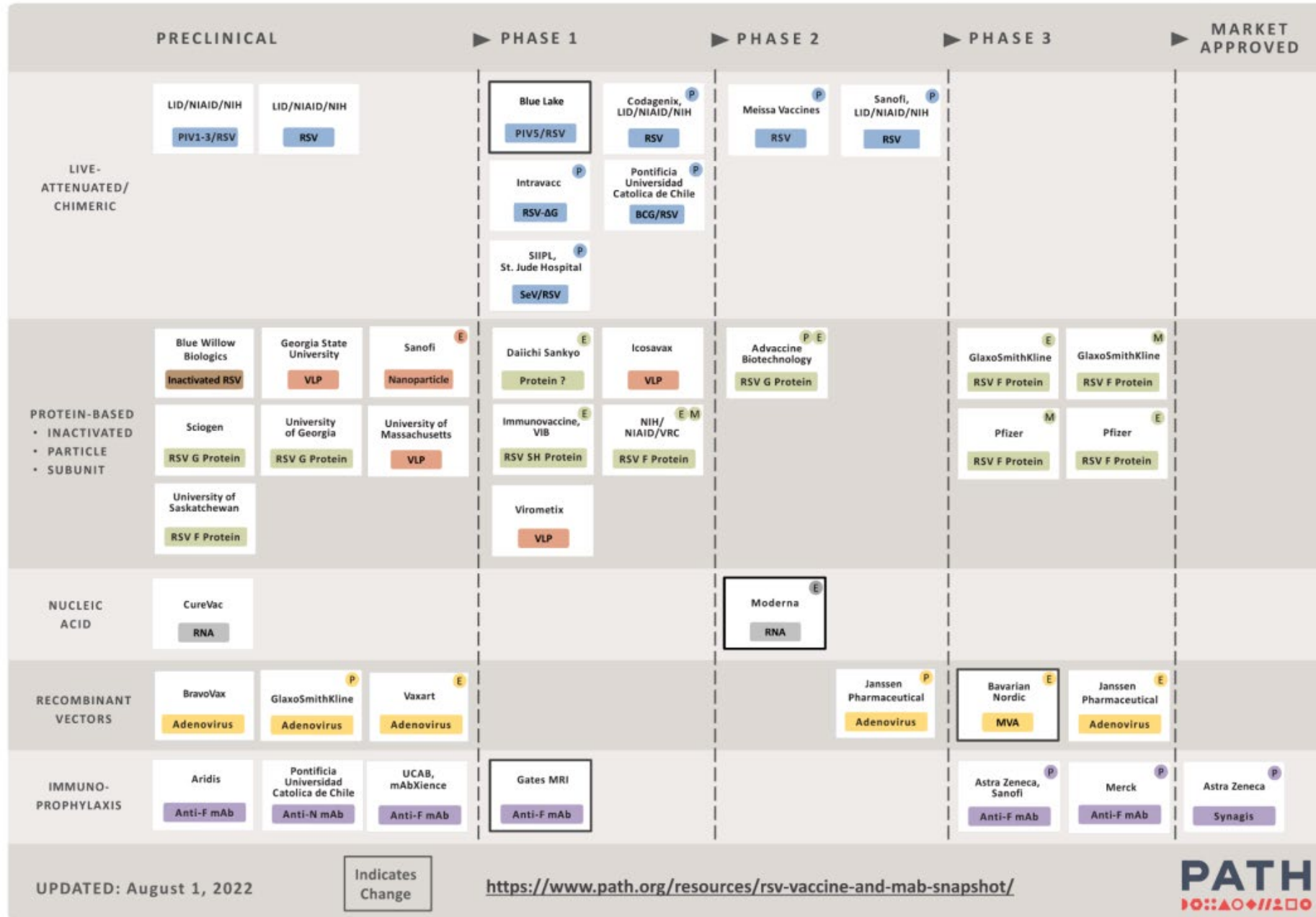
- Humanized monoclonal IgG directed against F glycoprotein
- Monthly administration due to short half-life (28 days)
- Efficacy against RSV-associated hospitalization in:
 - Preterm infants and infants with chronic lung disease (CLD) (55%)¹,
 - Infants with congenital heart disease (CHD) (45%)²
- AAP recommends³ use in:
 - Infants <29 weeks gestation during first year of life
 - Preterm infants with CLD
 - Infants with hemodynamically significant CHD
 - Infants with profound immunocompromise
 - 5% of U.S. infants eligible, ~2% receive one or more doses⁴

¹IMpact-RSV Study group, Pediatrics, 1998; ²Feltes et al, Pediatrics, 2003; ³American Academy of Pediatrics, Red Book, 2021;

⁴Ambrose et al, Human Vaccines Immuno, 2014

RSV Vaccine and mAb Snapshot

TARGET INDICATION: P=PEDIATRIC M=MATERNAL E=ELDERLY



Live attenuated/ chimeric

Inactivated

Particle

Subunit

RNA

Vectored

Monoclonal Ab

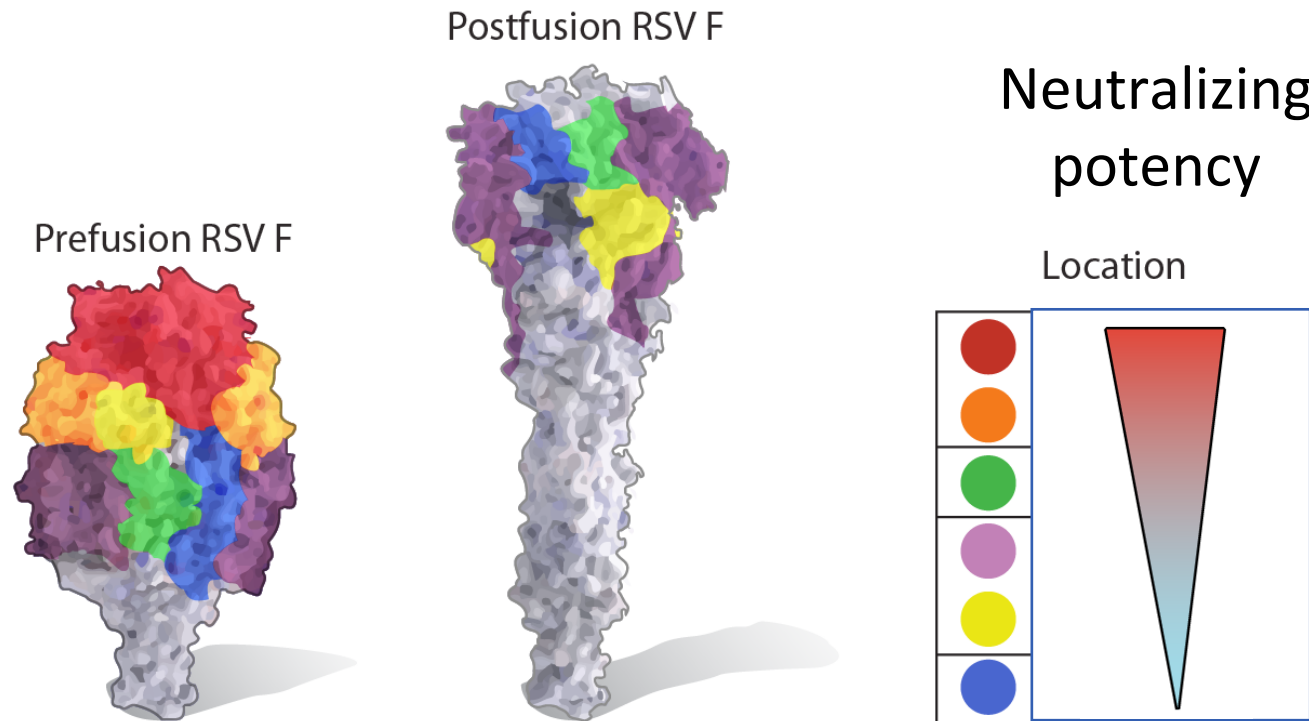
UPDATED: August 1, 2022

Indicates Change

<https://www.path.org/resources/rsv-vaccine-and-mab-snapshot/>



Monoclonal antibody prophylactic products target different antigenic regions (sites)



Palivizumab (Synagis): site II

Nirsevimab: site 0

SITE 0 SITE I SITE II SITE III SITE IV SITE V

Current Opinion in Virology

Conclusions

- Pre-pandemic RSV seasonality is well defined with limited geographic variability in most of the U.S.
- RSV is the most common cause of hospitalization in U.S. infants
 - Highest hospitalization rates in first months of life
 - Risk declines with increasing age in early childhood
- Prematurity and other chronic diseases increase risk of RSV-associated hospitalization but most hospitalizations are in healthy, term infants
- Currently licensed prevention product targets only 5% of U.S. infants
- RSV prevention candidates are in late stages of development

Resources

- [HAN Archive - 00479 | Health Alert Network \(HAN\) \(cdc.gov\) \(respiratory virus HAN\)](#)
- [Symptoms and Care of RSV \(Respiratory Syncytial Virus\) | CDC](#)
- [RSV \(Respiratory Syncytial Virus\) | CDC \(main RSV page\)](#)
- [Influenza \(Flu\) | CDC \(main flu page\)](#)
- [The National Respiratory and Enteric Virus Surveillance System \(NREVSS\)](#)
- [RSV-NET: RSV hospitalizations](#)
- [FluSurv-NET: COVID-19 hospitalizations](#)
- [COVID-NET: COVID-19 hospitalizations](#)

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- Meredith McMorro
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Thank you

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

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

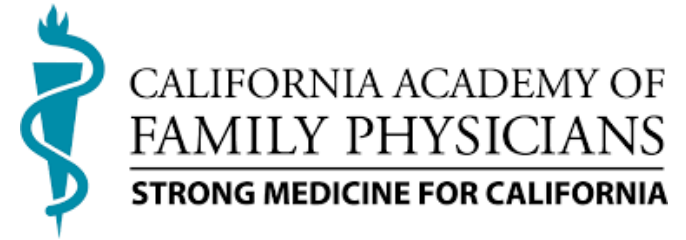


Thank you for protecting California!



Vaccination is the most effective way to prevent influenza & COVID





Stay tuned for future Conversations

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your support
and your
participation!

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on our YouTube channel

<https://www.youtube.com/channel/UCklkZ1SZQNQLcpmNpeQpDAg>

www.ImmunizeCA.org/Covid-19-Updates