



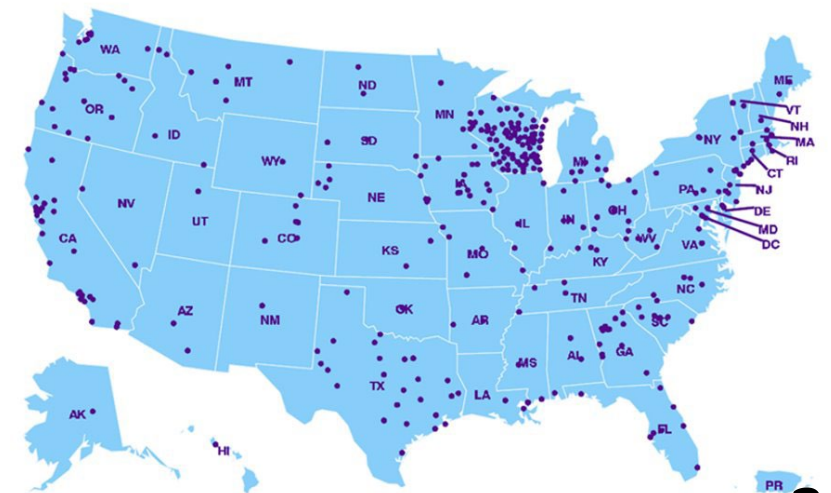
Respiratory Syncytial Virus (RSV) Epidemiology in Children

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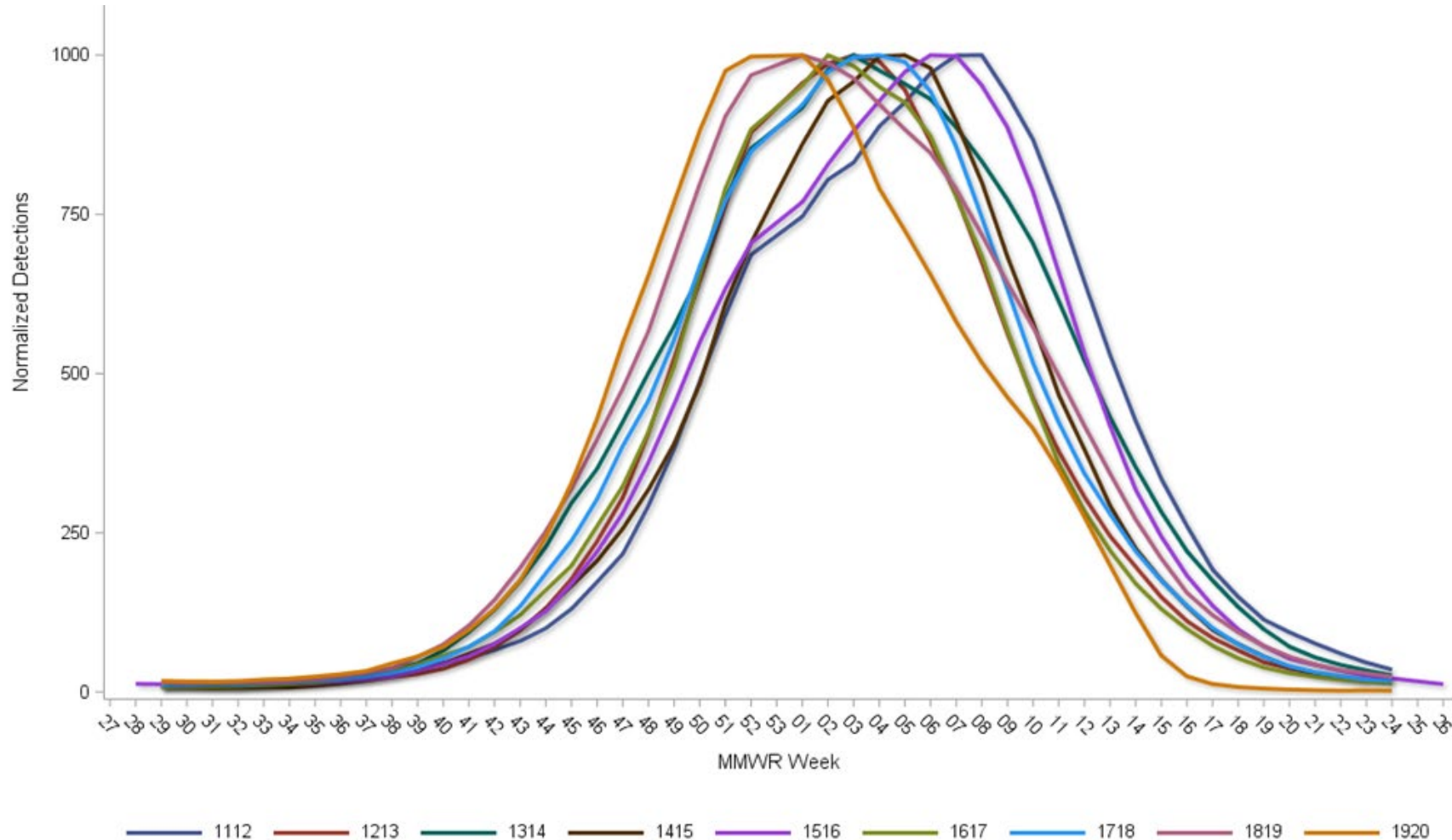
RSV Seasonality in the U.S.

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

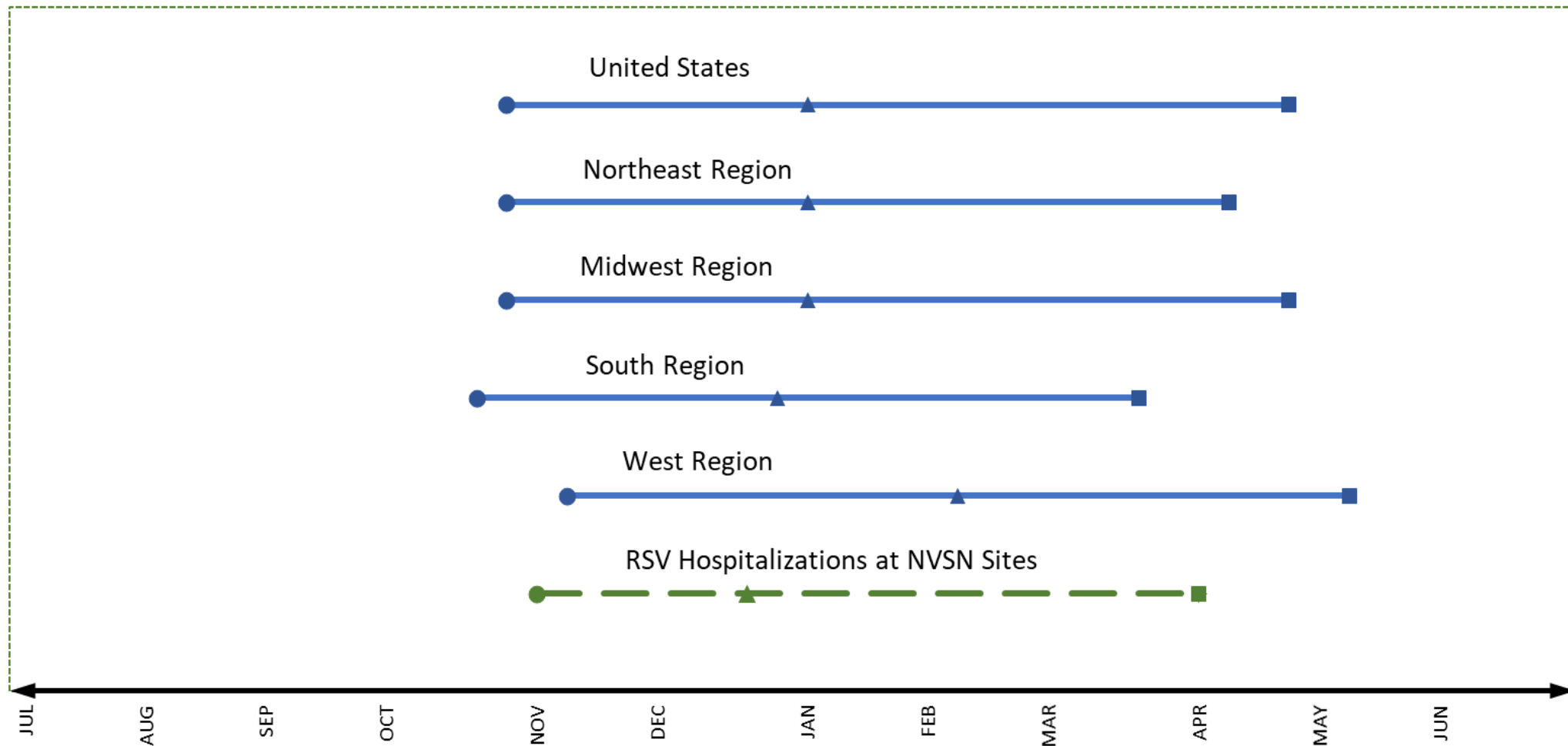
- Passive, laboratory-based surveillance
 - Commercial, hospital, and state/local public health laboratories
 - ~300 laboratories report RSV results
 - Weekly reporting of total tests performed and RSV positive tests
- All test types (majority PCR assays)
- Testing is clinician-directed
- All ages



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

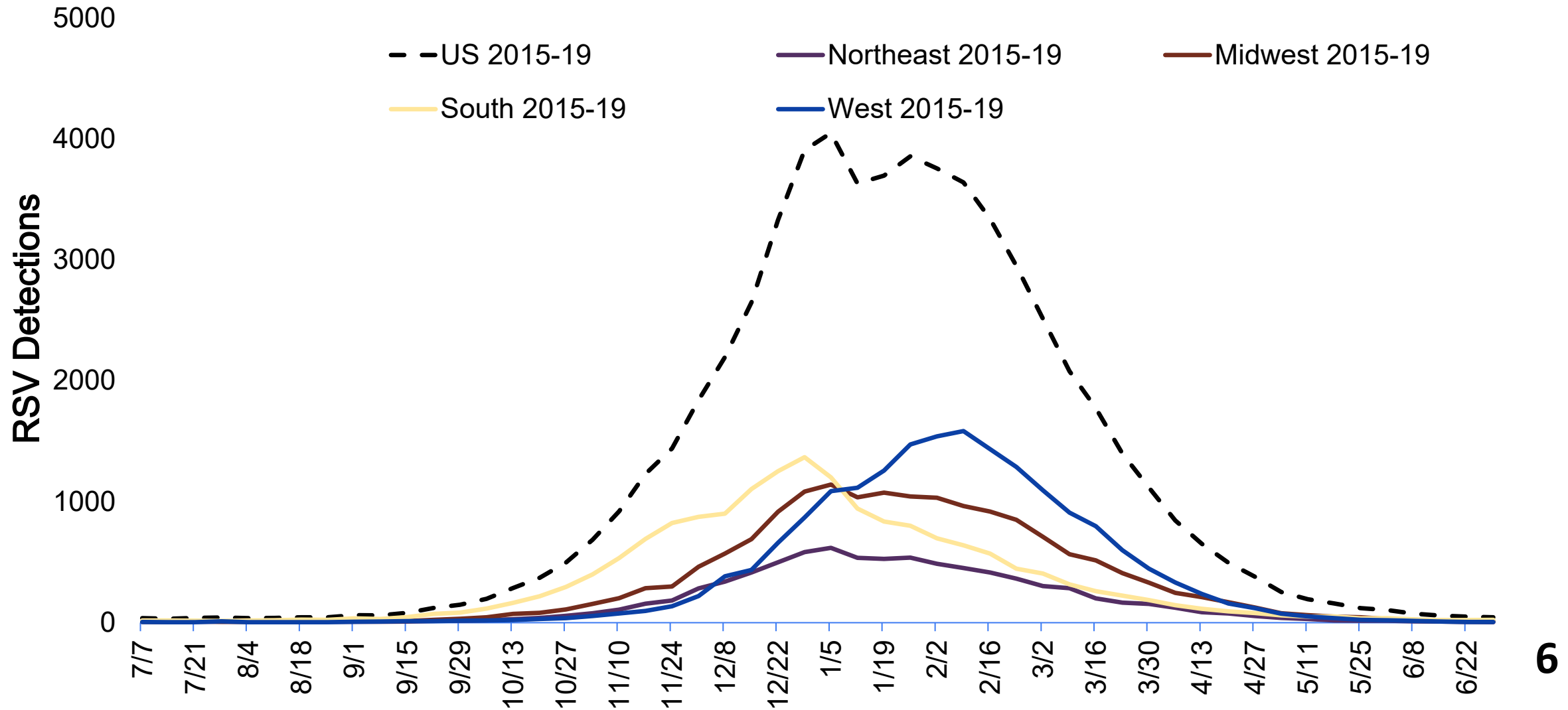


Geographic differences in RSV seasonality in the U.S.

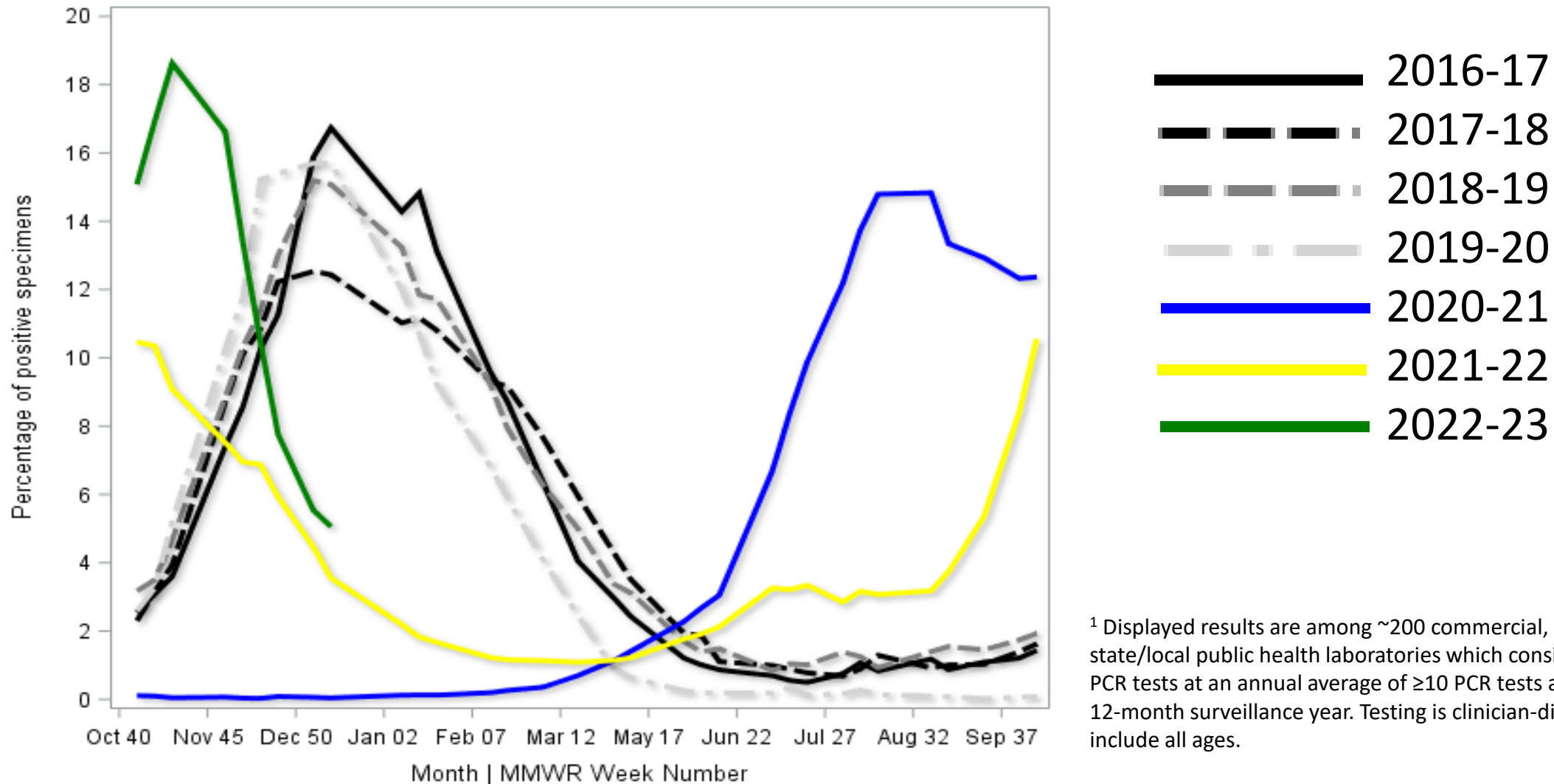


Median RSV season onset (circle), peak (triangle), and end (square) by census region from **NREVSS** and pediatric hospitalizations from 7 sites in the **New Vaccine Surveillance Network (NVSN)**, July 2017 – June 2020

Peak RSV transmission during December – February, average weekly detections from NREVSS 2015-2019



Changes in seasonality of RSV transmission following SARS-CoV2 introduction— NREVSS¹, 2016–2023



¹ Displayed results are among ~200 commercial, hospital, and state/local public health laboratories which consistently report RSV PCR tests at an annual average of ≥ 10 PCR tests and ≥ 30 weeks of the 12-month surveillance year. Testing is clinician-directed and results include all ages.

The burden of RSV in U.S. children

RSV is the leading cause of hospitalization in U.S. 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
 - Average cost of hospitalization in infant <29 weeks ~4x higher than for term infant³
- 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

¹Glezen et al, Arch Dis Child, 1986; ²Hall et al, Pediatrics, 2013; ³McLaurin et al, J Perinatol, 2016; ⁴Langley & Anderson, PIDJ, 2011

Each year in U.S. children aged less than 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

10

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 hospitalization rates vary by year, study design, and assumptions

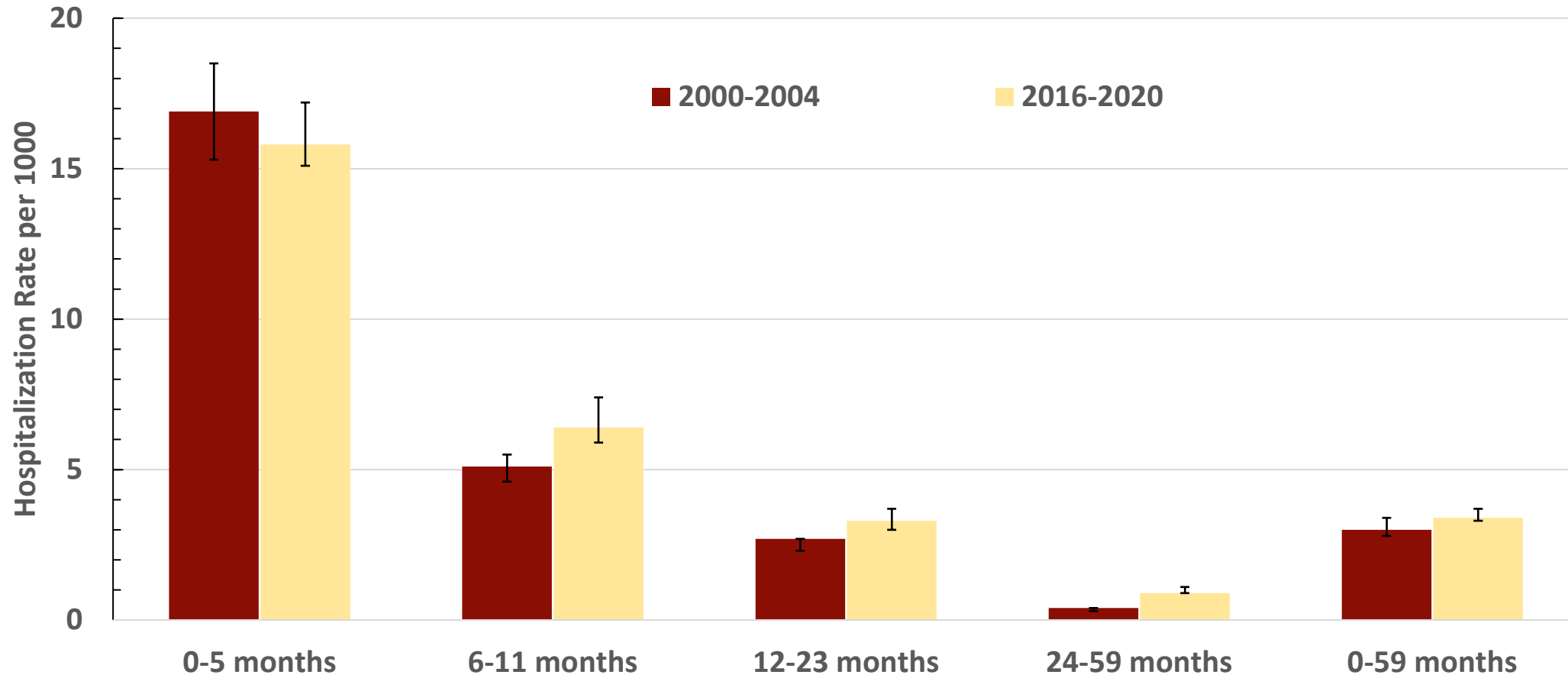
- An industry-sponsored systematic review estimated median annual hospitalization rate of 25.6 per 1000 in infants aged 0-5 months (25 studies)
 - Included 4 studies with a single year of hospital data, 5 with 2 years
 - Rates were imputed, not directly reported from all but 9 studies
 - Median estimates varied considerably based upon methods
 - Lowest (15.8) from active surveillance
 - Highest (31.2) from modeling studies
 - Clear outliers were not excluded
- For cost-effectiveness analyses, CDC will use estimates from active surveillance in primary analyses, others will inform sensitivity analyses

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



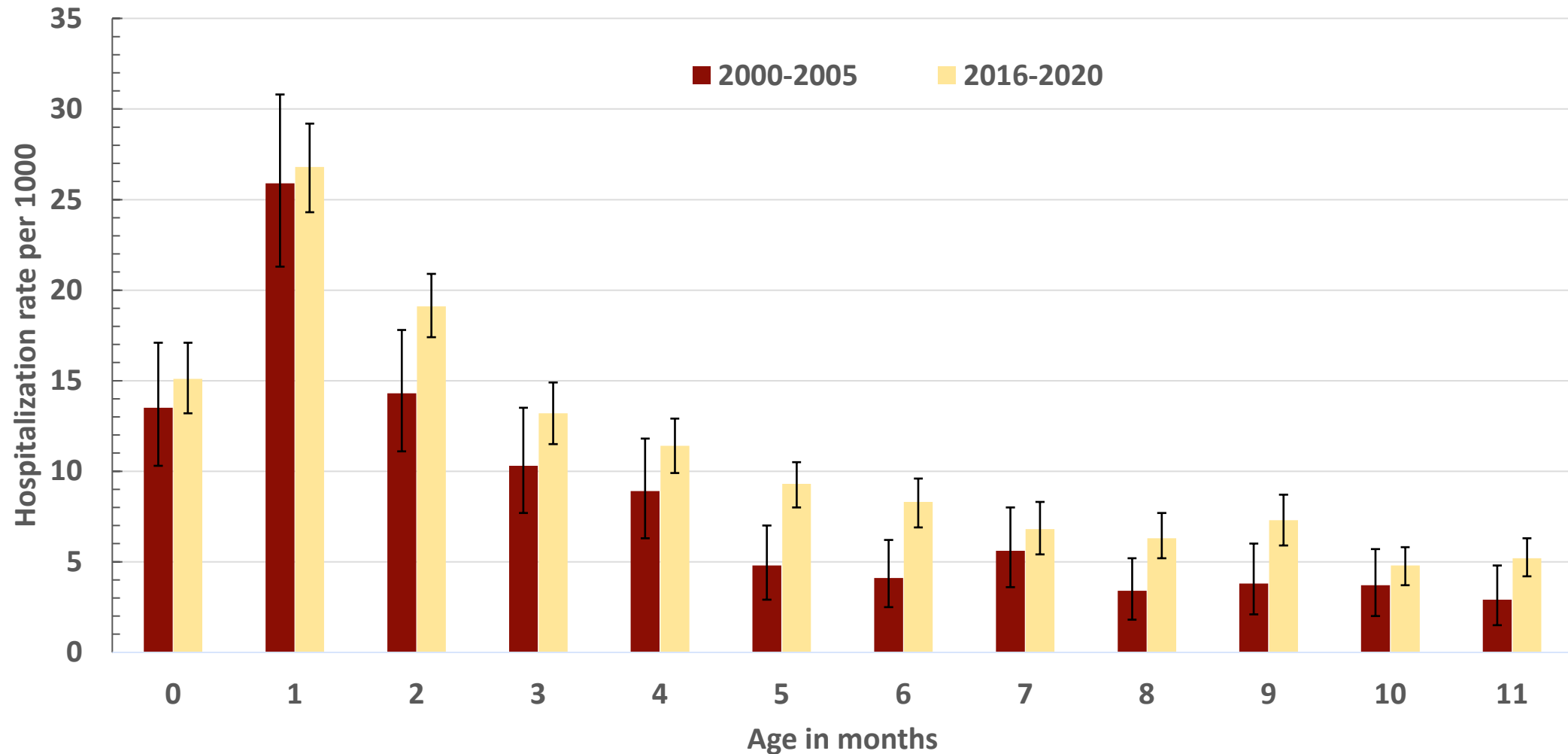
2000-2004: Adapted from Hall et al, NEJM 2009; 2016-2020: CDC unpublished data

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



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

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 US 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

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 hospitalization are in healthy, term infants
- Currently licensed prevention product targets only 2-3% of US infants
- RSV prevention candidates are in late stages of development

Acknowledgements

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Thank you

For more information, contact CDC
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TTY: 1-888-232-6348 www.cdc.gov

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