United States Public Health Approach to RSV Surveillance

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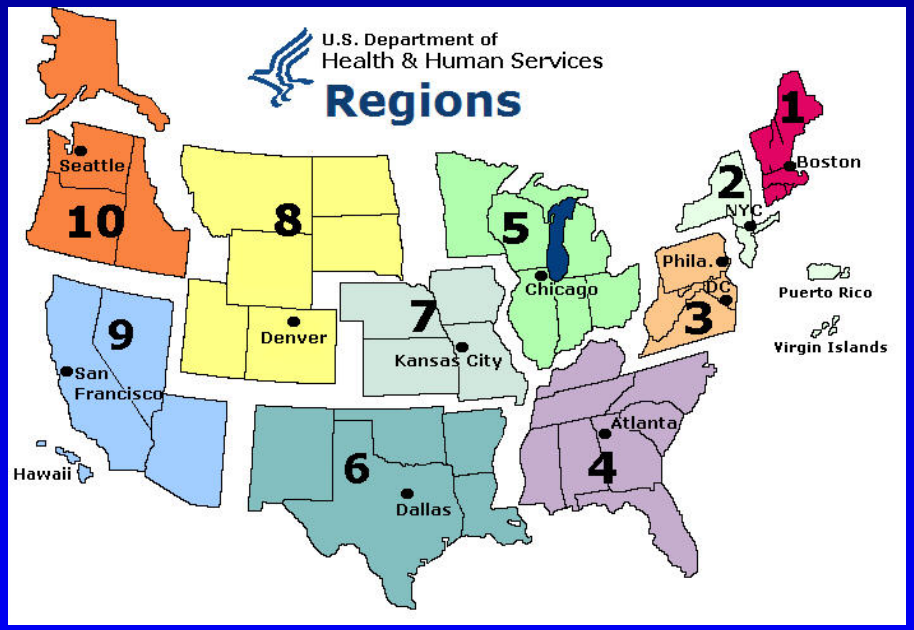
United States RSV Program Goals

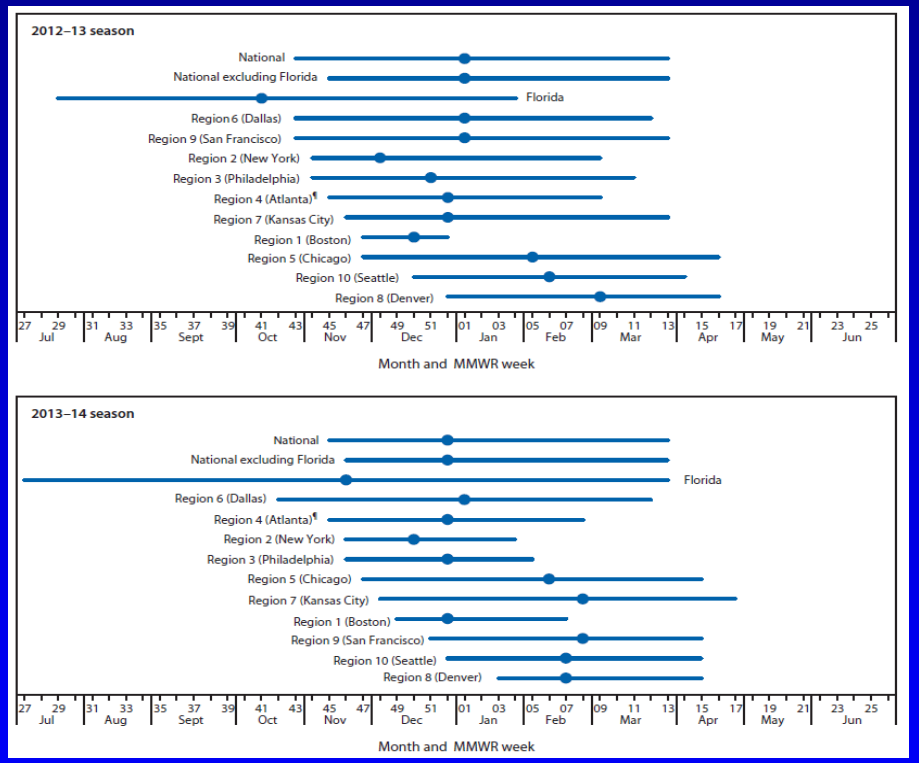
- To fill evidence gaps important for future implementation of RSV vaccine and immunoprophylaxis products
- To identify areas where CDC may be able to contribute optimally
- To optimize the value of epidemiologic platforms by integrating laboratory investigations

National Respiratory and Enteric Virus Surveillance System (NREVSS)

- Passive laboratory-based surveillance system
  - Developed in the early 1980s
- Data sources: participating laboratories
  - Private, public, and academic hospitals
  - State and local public health departments
  - Reference labs
- Weekly reporting of # tests and # positives
  - Percent positive used to describe circulation
  - Moving toward integration of patient level data- ELR
  - Automated public health messaging

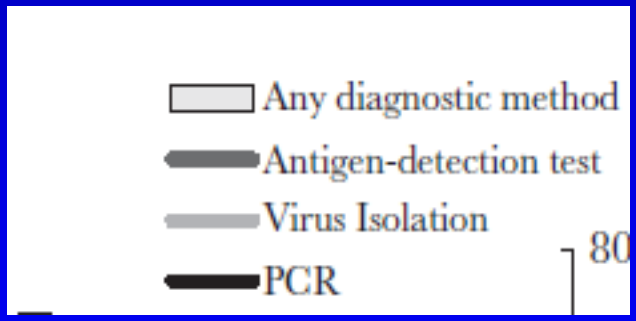
RSV season duration and peak by US HHS Regions and in Florida: NREVSS (2012-2014)

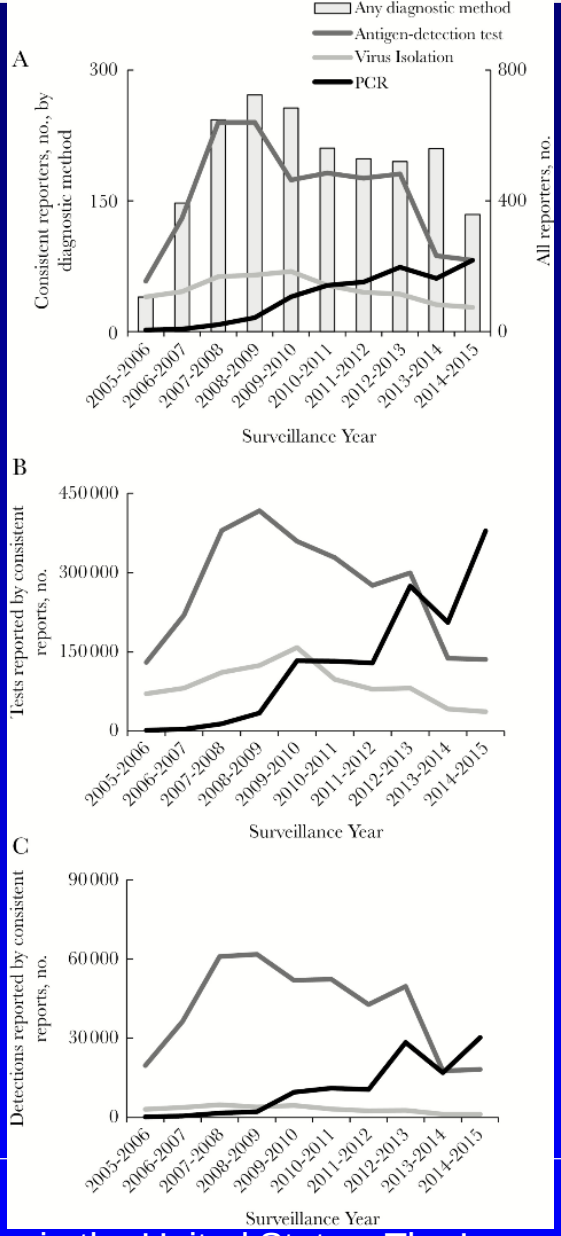




Haynes et al. MMWR (2014)
Note: seasonality is based on antigen testing

Reporting of RSV Diagnostic Data by NREVSS Laboratories That Consistently Report: July 2005- June 2015

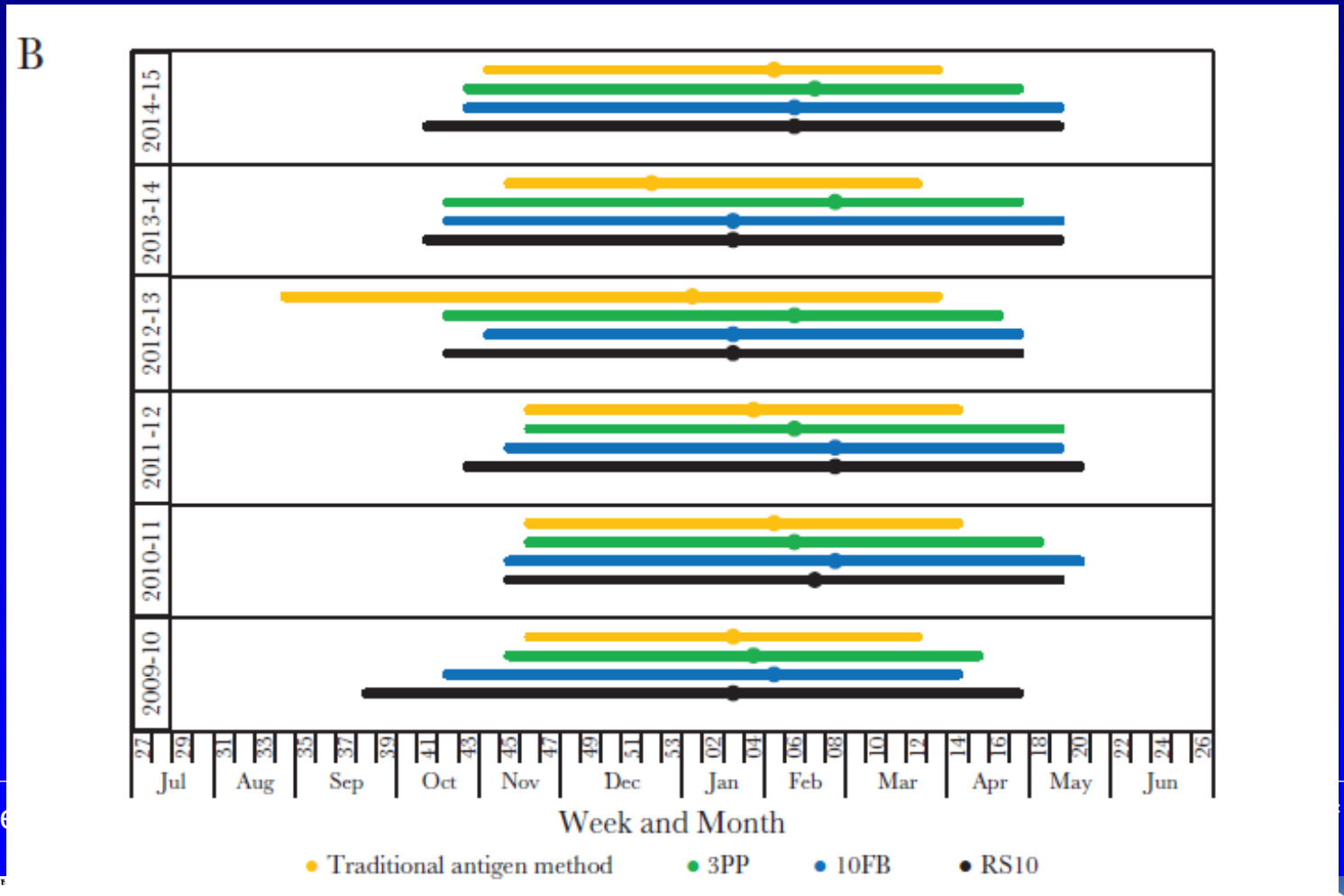




From: Determining the Seasonality of Respiratory Syncytial Virus in the United States: The Impact of Increa cular Testing

J Infec 216(3):345-355. doi:10.1093/infdis/jix275

Comparison of RSV Seasons by 4 Methods: Antigen, 3PP, 10 FB, Retrospective Slope



From: Dete
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J Infec shed by Oxford University Press for the Infectious Diseases Society of America 2017. This work is written by (a) US nt employee(s) and is in the public domain in the US.

RSV Surveillance in Pediatric Populations in the United States

Platform (Years)	Population and setting	Design	Enrollment	Specimen and laboratory techniques
NVSN (2015-2021)	▪ <5 years at 7 sites (<18 years at some sites) ▪ Inpatients and ED	▪ Active case finding ▪ Prospective ▪ Population-based ▪ All respiratory viruses	▪ Broad ARI symptoms ▪ Controls	▪ Flocked mid-turbinate and OP (tracheal/BAL) ▪ Molecular testing
PREVAIL (2016-2018)	▪ Mother-infant pairs followed for up to 2 years	▪ Longitudinal cohort of 240 pairs	▪ Pregnant women ≥18 years of age, ≥34 weeks GA ▪ Live birth	▪ Baseline maternal blood ▪ Cord blood, placenta ▪ Milk samples ▪ Infant blood at 2,4,6,12,18 and 24 months ▪ Weekly nasal swabs ▪ Nasal swabs if ill (household)

Abbreviations: NVSN=New Vaccine Surveillance Network; PREVAIL=Pediatric Respiratory and Enteric Virus Acquisition and Immunogenesis Longitudinal Cohort; ED= Emergency Department; ARI=acute respiratory infections; BAL=bronchoalveolar lavage

NVSN: Objectives

- Determine **inpatient and ED, population-based burden** of respiratory and enteric viruses in children <5 years
-
- Characterize **clinical and epidemiologic factors of children** with medically-attended acute respiratory infections
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- Assess **influenza vaccine effectiveness** among hospitalized children aged <18 years

PREVAIL

Years/Site	2016-2018/Cincinnati
Design/Size	Longitudinal cohort of 240 mother-infant pairs
Population/Age	Maternal enrollment in late pregnancy and infant follow-up to 2 years of age
Eligibility	• Pregnant woman ≥34 weeks GA • Mother ≥18 years of age • Singleton birth • No plans to move outside Cincinnati area within 2 years
Exclusions	• Fetal/infant death before maternal discharge • Major congenital anomalies • Mother delivers before baseline maternal blood draw

RSV Surveillance in Adult Populations in the US

Platform (Years)	Population (catchment) and setting	Design	Enrollment	Specimen and laboratory techniques
HAIVEN (2016-2018)	▪ ≥18 years at 4 sites (4.3 million) ▪ Inpatients	▪ Prospective ▪ Population-based, ▪ Active case finding	▪ Broad ARI symptoms and diagnoses	▪ Flocked mid-turbinate and OP ▪ Molecular testing
Emerging Infections Program (2014-2018)	▪ ≥18 years at 7 sites (13.2 million) ▪ Inpatients	▪ Population-based ▪ Laboratory-based	▪ Clinician-directed testing	▪ Discretion of clinician and laboratory
Veterans Affairs (2016-2018)	▪ ≥18 years at 1-2 sites ▪ Inpatients	▪ Prospective ▪ Population-based ▪ Active case finding ▪ All respiratory viruses	▪ Broad ARI symptoms and diagnoses ▪ Controls	▪ Flocked mid-turbinate and OP ▪ Molecular testing

Abbreviations: HAIVEN= Hospitalized Adult Influenza Vaccine Effectiveness Network: ARI-Acute respiratory infection

HAIVEN RSV Surveillance: Objectives

- Estimate **population-based, age-specific incidence** of RSV-associated hospitalizations among adults ≥18 years
- Describe the **clinical and epidemiologic characteristics** of adults hospitalized with RSV
- Describe the **outcomes** of adults hospitalized with RSV

FluSurv-NET: Objectives

- Estimate **age-specific RSV hospitalization rates** among adults
- Describe **characteristics of adults ≥ 18 years** hospitalized with laboratory-confirmed RSV.
- Estimate proportion of **severe RSV-associated outcomes**
- Assess **risk factors for RSV-associated complications** among hospitalized adults ≥ 18 years.

VA Surveillance: Objectives

- Determine the **population-based**, **inpatient burden of respiratory viruses** as causes of ARI among adults in the VA population, particularly **respiratory syncytial virus (RSV)**

- Characterize the **clinical and epidemiologic factors of adults** with ARI that require hospitalization

RSV Surveillance in Special Populations in the United States

Platform (Years)	Population and setting	Design	Enrollment	Specimen and laboratory techniques
Alaska Natives (2016-2018)	▪ ≥18 years from the YK Delta ▪ Inpatients	▪ Prospective ▪ Population-based ▪ Active case finding	Broad symptoms and diagnoses	▪ Flocked nasopharyngeal swab ▪ Molecular testing
Chronic care facilities—children (2016-2017)	▪ ≤21 years in 3 facilities ▪ Residents and healthcare workers	▪ Prospective ▪ Active case finding ▪ All respiratory viruses	Acute respiratory illness	▪ Flocked mid-turbinate and OP ▪ Serum in subset ▪ Molecular testing

Optimization of Current Strategies

- Evaluation of platform surveillance systems
- Opportunities to understand correlates of immunity within surveillance platforms
- RSV sequencing collaborations within surveillance platforms
- Lessons learned for development of post-vaccine (or immunoprophylaxis product) implementation regarding vaccine effectiveness

Acknowledgements: Collaborators

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  - Seattle Children's Hospital, Seattle, WA
  - Texas Children's Hospital, Houston, TX
  - University of Pittsburgh, Pittsburgh, PA
  - University of Rochester Medical Center, Rochester, NY
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  - VA Greater Los Angeles Healthcare System. Los Angeles, CA
- **Influenza Hospitalization Surveillance Network (FluSurv-NET)**
  - California Emerging Infections Program (EIP)
  - Georgia EIP
  - Michigan Department of Health and Human Services
  - Minnesota EIP
  - New York EIP
  - Oregon EIP
  - Tennessee EIP
- **Study of Influenza and other Respiratory Viral Infections in Pediatric Care Centers**
  - Columbia University Medical Center, New York, NY
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