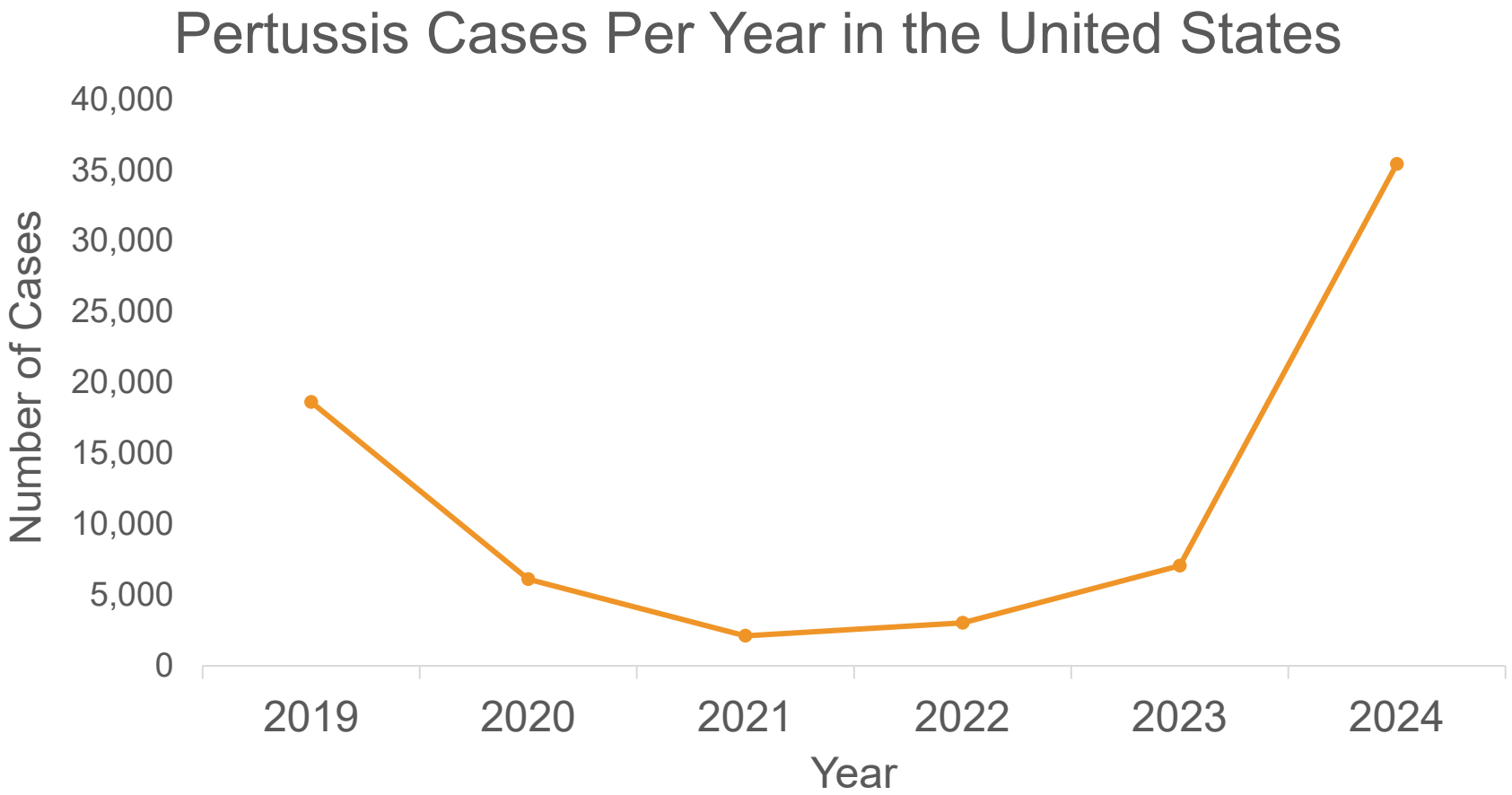
Reemergence of Pertussis

Reemergence of pertussis post-COVID 19



National Notifiable Diseases Surveillance System, 1990–2024. Division of Health Informatics and Surveillance , Center for Surveillance, Epidemiology, and Laboratory Services, Office of Public Health Scientific Services, Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Atlanta, GA 30329.

Chart Constructed using CDC Notifiable Infectious Disease Data Tables 2019 - 2024

Pertussis: Clinical Diagnostic Testing

Culture vs. Molecular vs. Serology- which to choose?

Polling Question

Which method is considered the “gold standard” for pertussis testing?

A. Direct Fluorescent Antibody (DFA)

B. Culture

C. Molecular

D. Serology

B. pertussis culture

- Culture is still considered the gold standard
  - While sensitivity is lower specificity is extremely high
  - Can allow for further characterizations for epidemiological use
- Optimal sampes are nasopharyngeal swab or aspirate (aspirate superior but hard to collect)
  - Collect within first two weeks of symptom onset
- Bordet-Gengou and Regan-Lowe are media of choice for culture
  - If transport is required Regan-Lowe or Stainer-Scholte broth are recommended to preserve viability
- Identification via MALDI-ToF and other phenotypic testing methods

Molecular *B. pertussis* assays

- More widely used methodology for the detection of pertussis.
- Same sample source can be utilized as culture (if molecular testing only performed swabs can be submitted dry)
  - Collect within 3 to 4 weeks from symptom onset
- Assays can vary in molecular targets utilized
  - Many multiplex/syndromic molecular assays are signal target
    - *ptxP* (pertussis toxin promoter gene) only

Molecular *B. pertussis* assays- points of consideration

- Inadequate specimen collection:
  - Nasopharyngeal collections best (aspirations superior to swab)
  - Throat and anterior nasal are poor specimen sources
- Timing of collection:
  - Collection of specimen after antibiotic use significantly impacts sensitivity
- Assay target(s):
  - Single target for *ptxP* vs. multi-target assay (IS*481* & *ptxP*)
  - *ptxP* is a single copy gene which limits sensitivity while IS*481* is multi-copy in *B. pertussis*

Pertussis serology testing

- Not suitable for use under routine testing scenarios
  - Recent vaccination, previous infections, and cross reactivity can occur
- Most helpful for diagnosis of late-stage infections within the 2-8 (up to 12) week after onset of symptom window
- There are a variety of assays available with varying performance

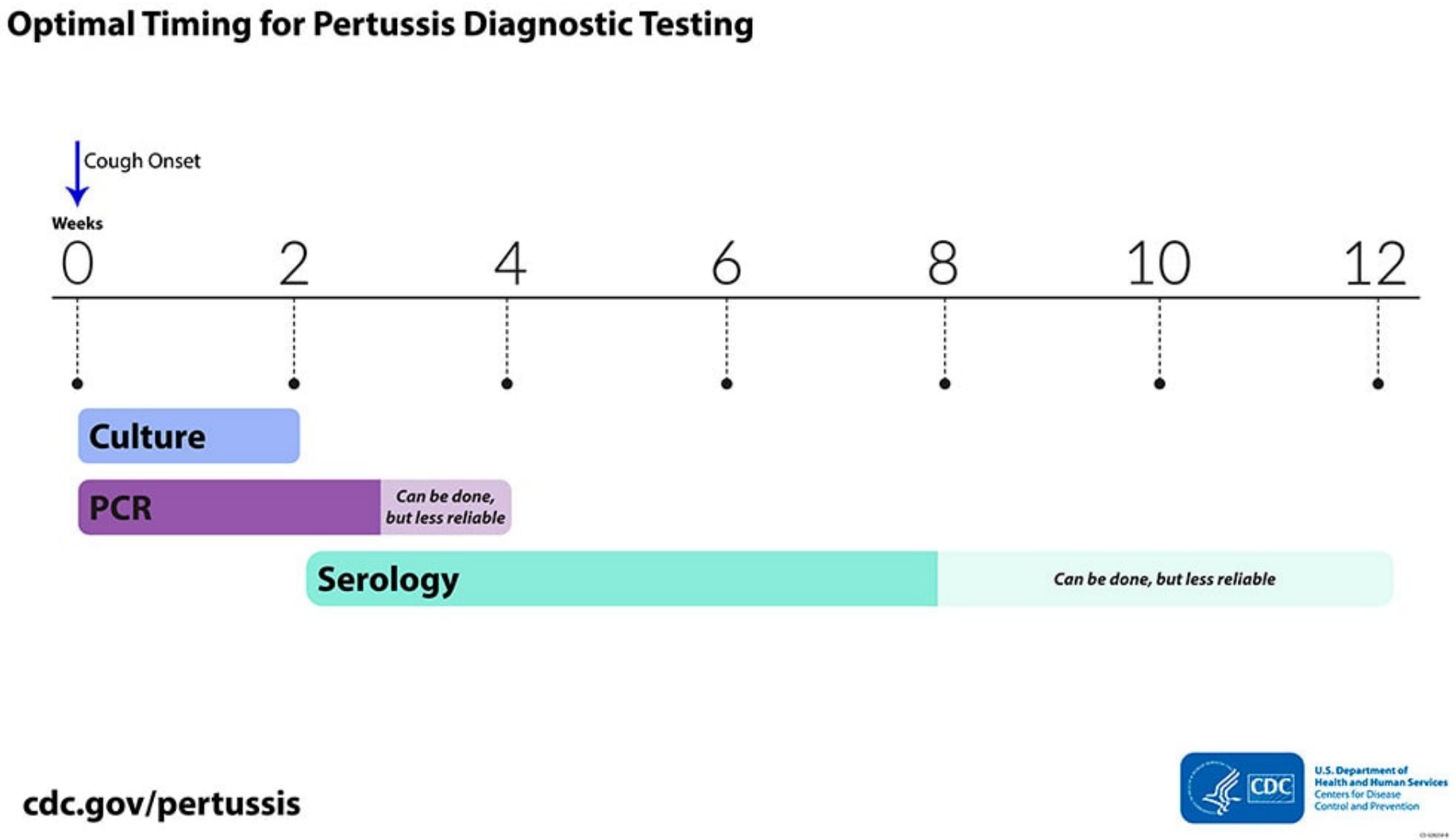
Testing Pros and Cons

- Culture:
  - Pros: 100% specific with isolation allowing for further characterization
  - Cons: poor sensitivity, requires specialty media, highly dependent on collection timing (for vaccinated patients, collection may need to occur within a few days of symptom onset)

- Molecular:
  - Pros: higher sensitivity, longer window for collection, more rapid results
  - Cons: specificity issues due to cross contamination or cross reactivity with other species, repeat testing same day using different molecular platforms presents billing challenges

- Serology:
  - Pros: aids in diagnosis of older vaccinated patients
  - Cons: assay performance widely varies, poor differentiation to *B. parapertussis* & a

The importance of timing



Polling Question

Molecular assays using the single *ptxP* target for the detection of *B. pertussis* provide better assay sensitivity.

A. True

B. False

B. pertussis surveillance initiatives

- *B. pertusiss* is a nationally notifiable disease
- Ongoing surveillance via the Emerging Infections Program (EIP) Network from 7 states (CO, CT, GA, MN, NM, NY, and OR)
- EIP collect additional data than what is required for disease notification
- EIP collect isolates for *B. pertussis* and other species for further characterization by CDC

Pertussis: Case Study

Pertussis Case Study

- An elevated number of pertussis cases were observed between November 2008 to September 2009
- The elevated cases were only observed in 3 counties
  - Submitting clinics mainly served patient populations from the same counties
- Testing was performed at a large national level reference laboratory
- Many cases reported prior vaccination and aytipcal symptoms
- Control measures and epidemiological followup was performed but no decline in cases were observed

Pertussis Case Study

- Two distinct epi curves were observed one during winter (Nov. 2008 to April of 2009) and one during summer (May 2009 to September 2009).

- Beginning in April of 2009 higher PCR Ct values were observed.
  - The majority of PCR + samples were observed during this time and concentrated from one clinic.

- Laboratory contamination was ruled out
  - PCR positivity spike only limited to outbreak counties

Pediatrics. 2012 Feb;129(2):e424-30. doi: 10.1542/peds.2011-1710. Epub 2012 Jan 16.

Pertussis Pseudo-outbreak linked to specimens contaminated by Bordetella pertussis DNA From clinic surfaces

Sema Mandal [1], Kathleen M Tatti, Denise Woods-Stout, Pamela K Cassiday, Amanda E Faulkner, Matthew M Griffith, Michael L Jackson, Lucia C Pawloski, Bari Wagner, Meghan Barnes, Amanda C Cohn, Ken A Gershman, Nancy E Messonnier, Thomas A Clark, Maria-Lucia C Tondella, Stacey W Martin

Affiliations + expand

PMID: 22250029 DOI: 10.1542/peds.2011-1710

Highly Pathogenic Avian Influenza

Overview of Influenza Viruses & Emergence of H5

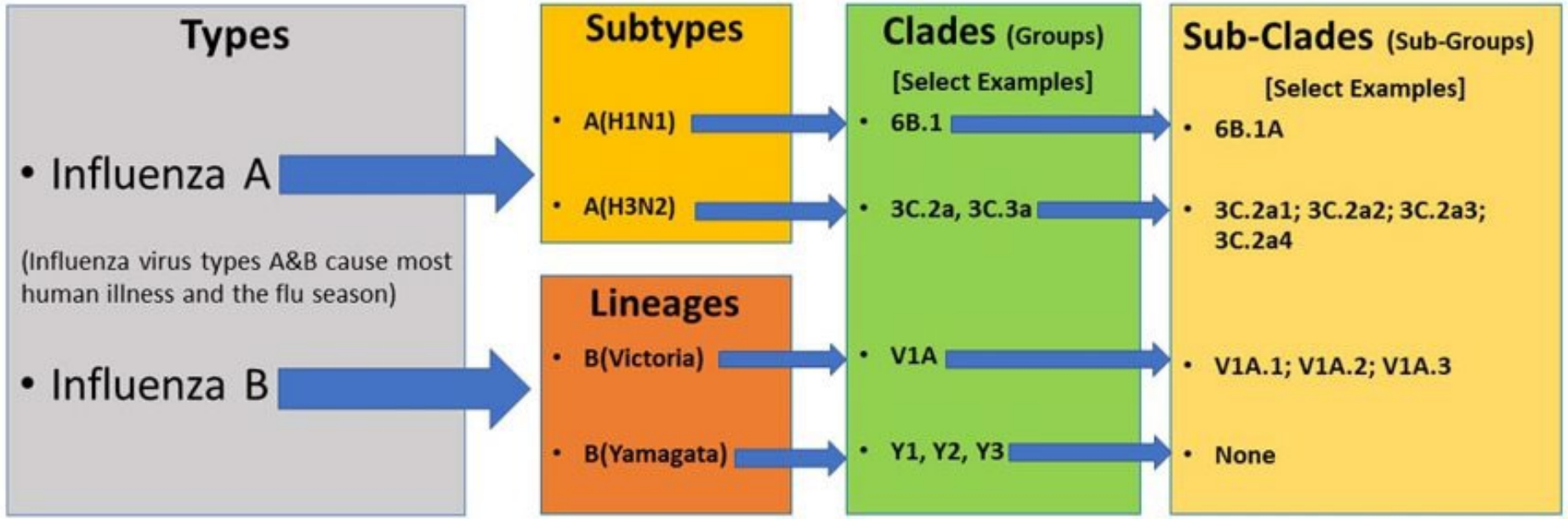
Polling Question

Which influenza type has lineage nomenclature?

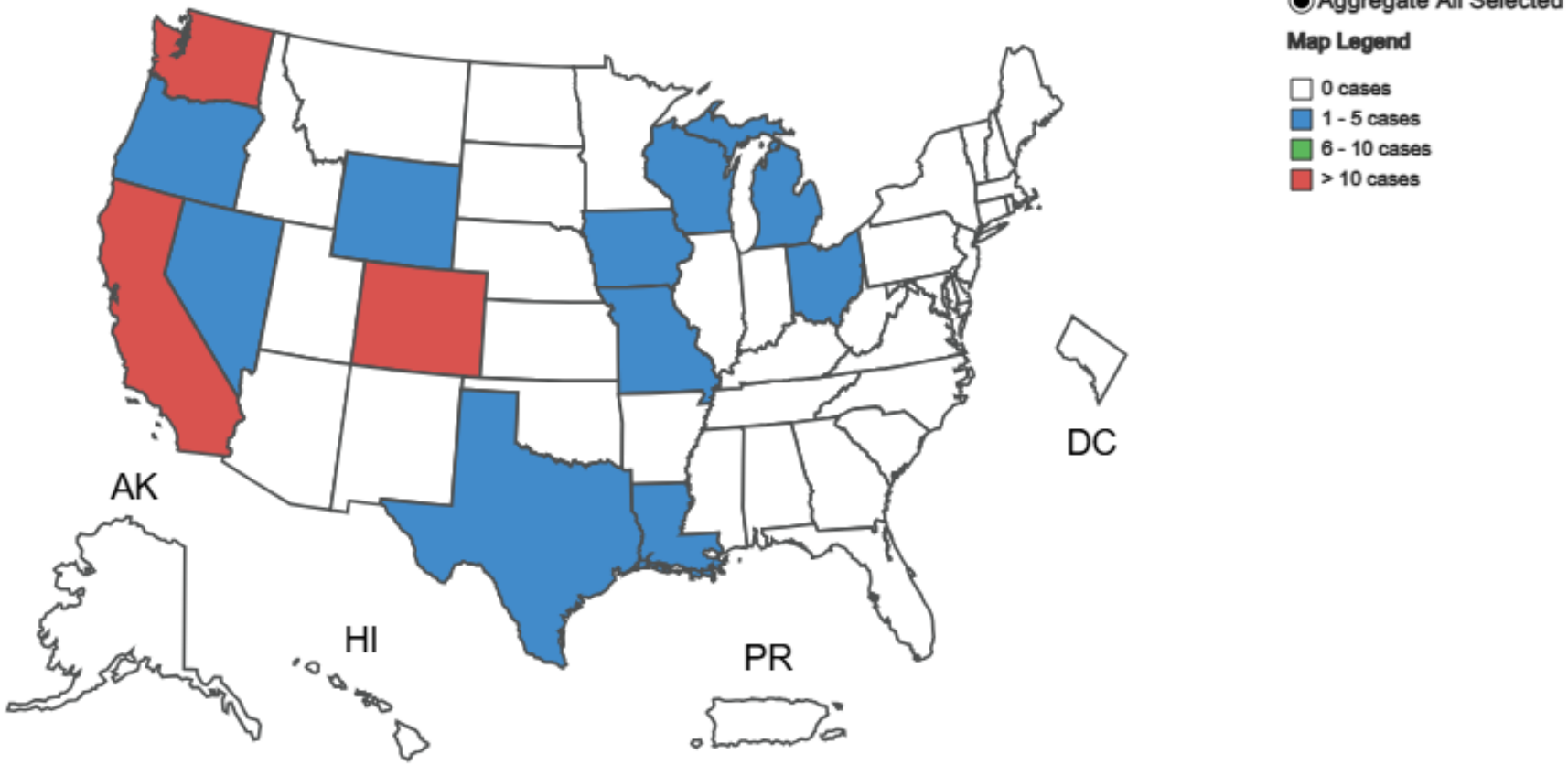
A. Influenza type A

B. Influenza type B

Human Seasonal Influenza Viruses



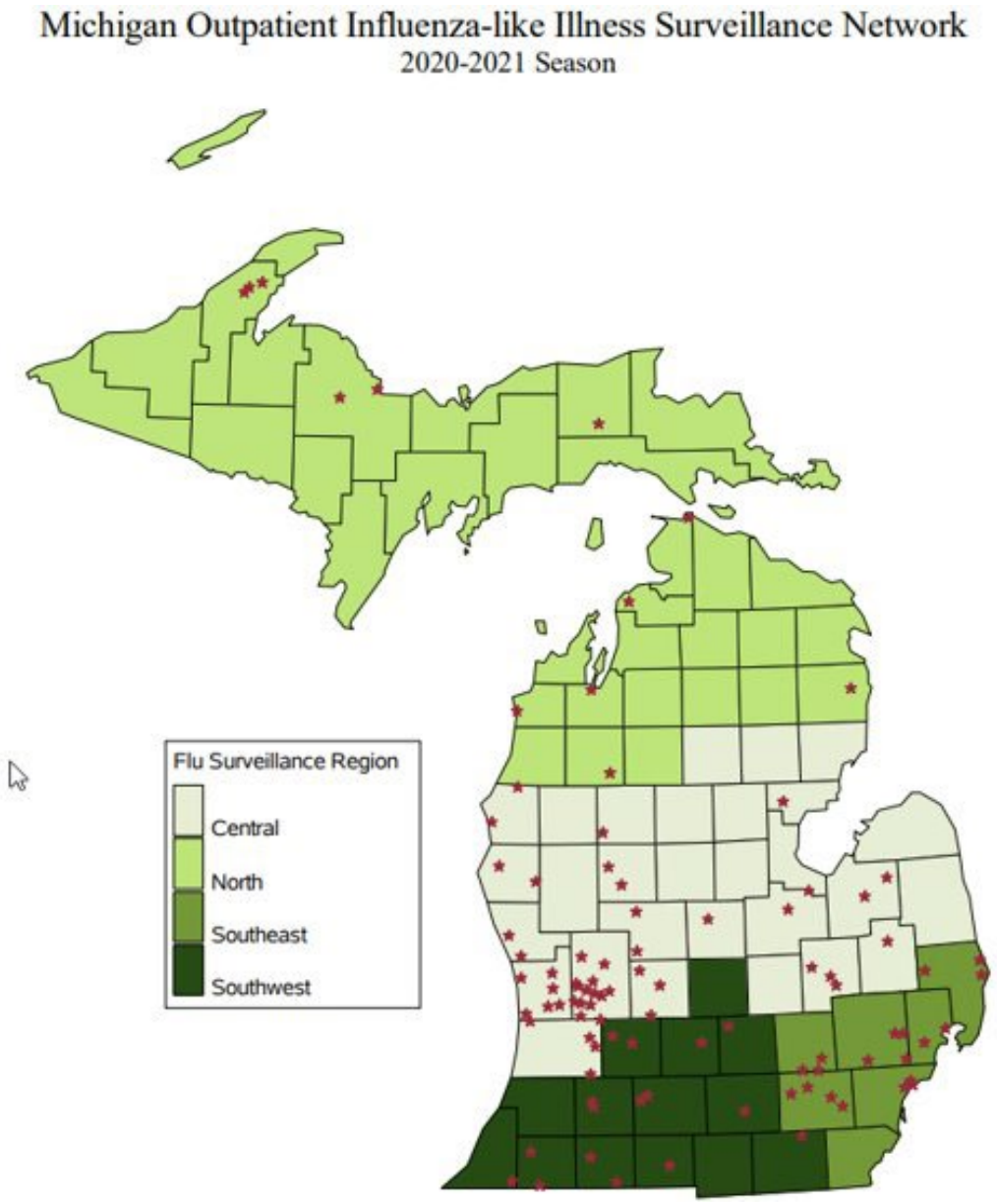
2022-Current HPAI Cases



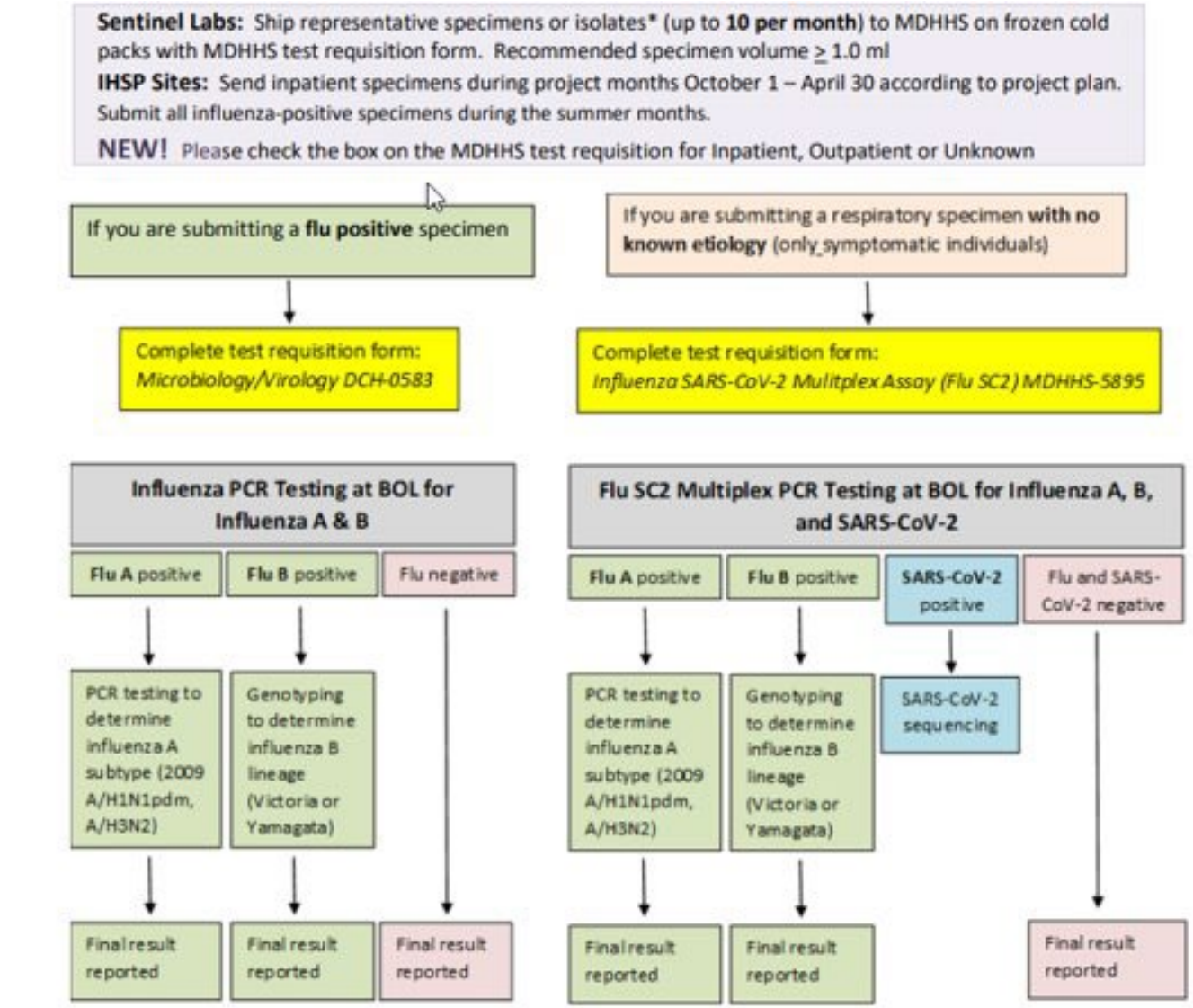
Novel Influenza A Virus Infections (cdc.gov) accessed 03/14/2025

Importance of Collaboration

Routine Flu Surveillance Systems : Michigan Example



Routine Flu Surveillance Systems : Michigan Example



Suspect avian or novel influenza cases should be reported immediately to the MDHHS Division of Communicable Disease at the numbers listed above; testing is arranged at that time.

Flu Surveillance Systems and HPAI

01/16/2025 CDC Issues Alert for Accelerated Subtyping of Influenza A in Hospitalized Patients

ABOUT

- Level: Laboratory Advisory
- Audience: Clinical Laboratory Professionals

FLUVIEW interactive

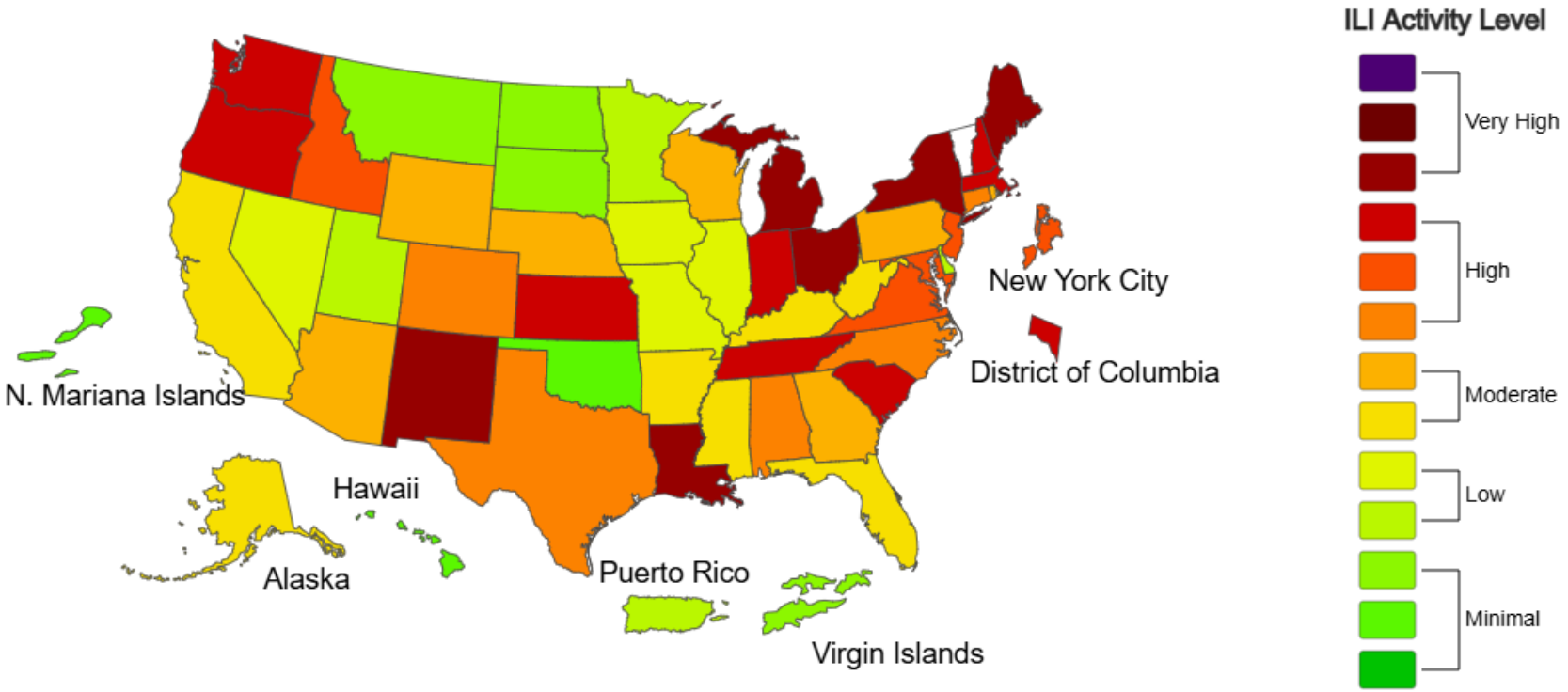
CDC U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

A Weekly Influenza Surveillance Report Prepared by the Influenza Division

Outpatient Respiratory Illness Activity Map Determined by Data Reported to ILINet

This system monitors visits for respiratory illness that includes fever plus a cough or sore throat, also referred to as ILI, not laboratory confirmed influenza and may capture patient visits due to other respiratory pathogens that cause similar symptoms.

2024-25 Influenza Season Week 10 ending Mar 08, 2025



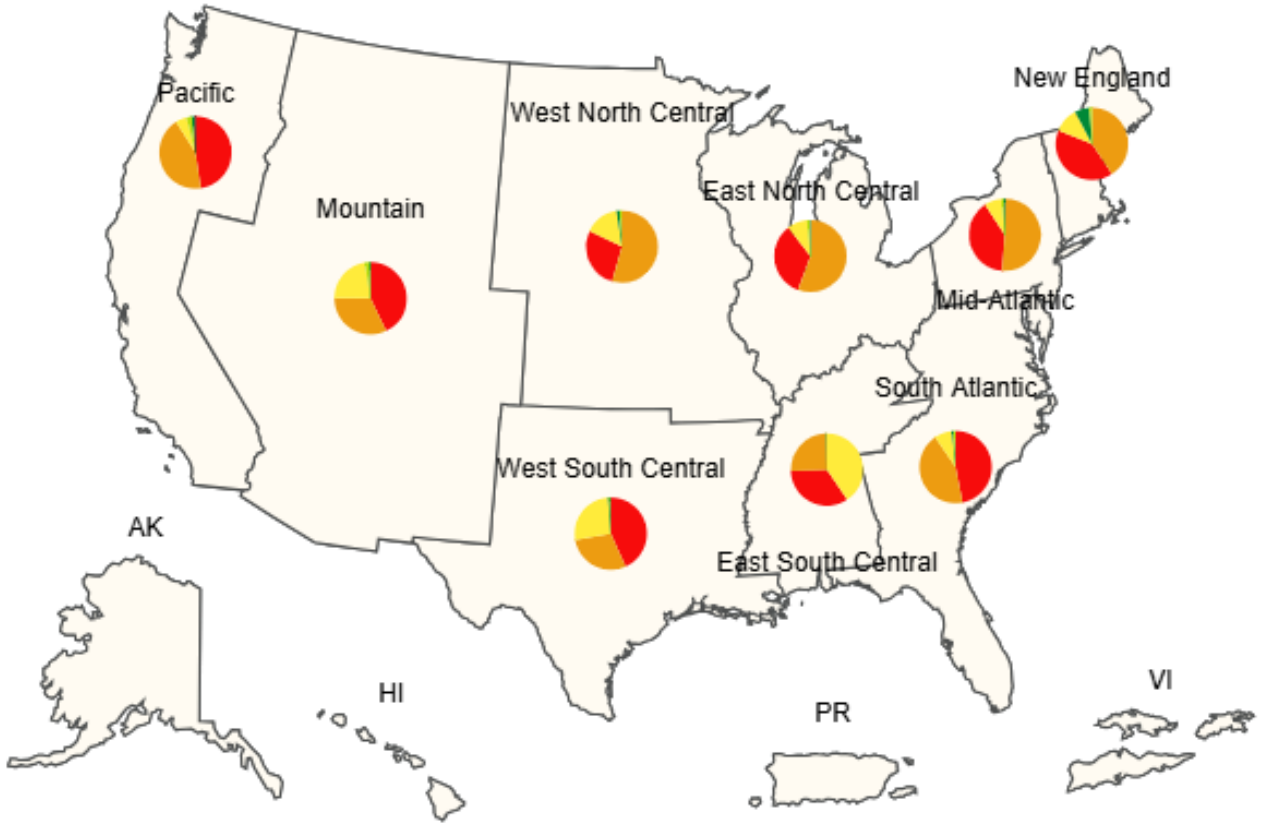
https://gis.cdc.gov/grasp/fluview/main.html accessed 03/14/2025

FLUVIEW interactive

CDC U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

Influenza Positive Tests Reported to CDC by Public Health Laboratories and ILI Activity, by Census Division, 2024-25 Season, week ending Mar 08, 2025

Reported by: U.S. WHO/NREVSS Collaborating Laboratories and ILINet



◉ Cumulative
○ Most Recent 3 weeks

Pie Chart Legend

(Pie chart includes data from most recent 3 weeks of season)

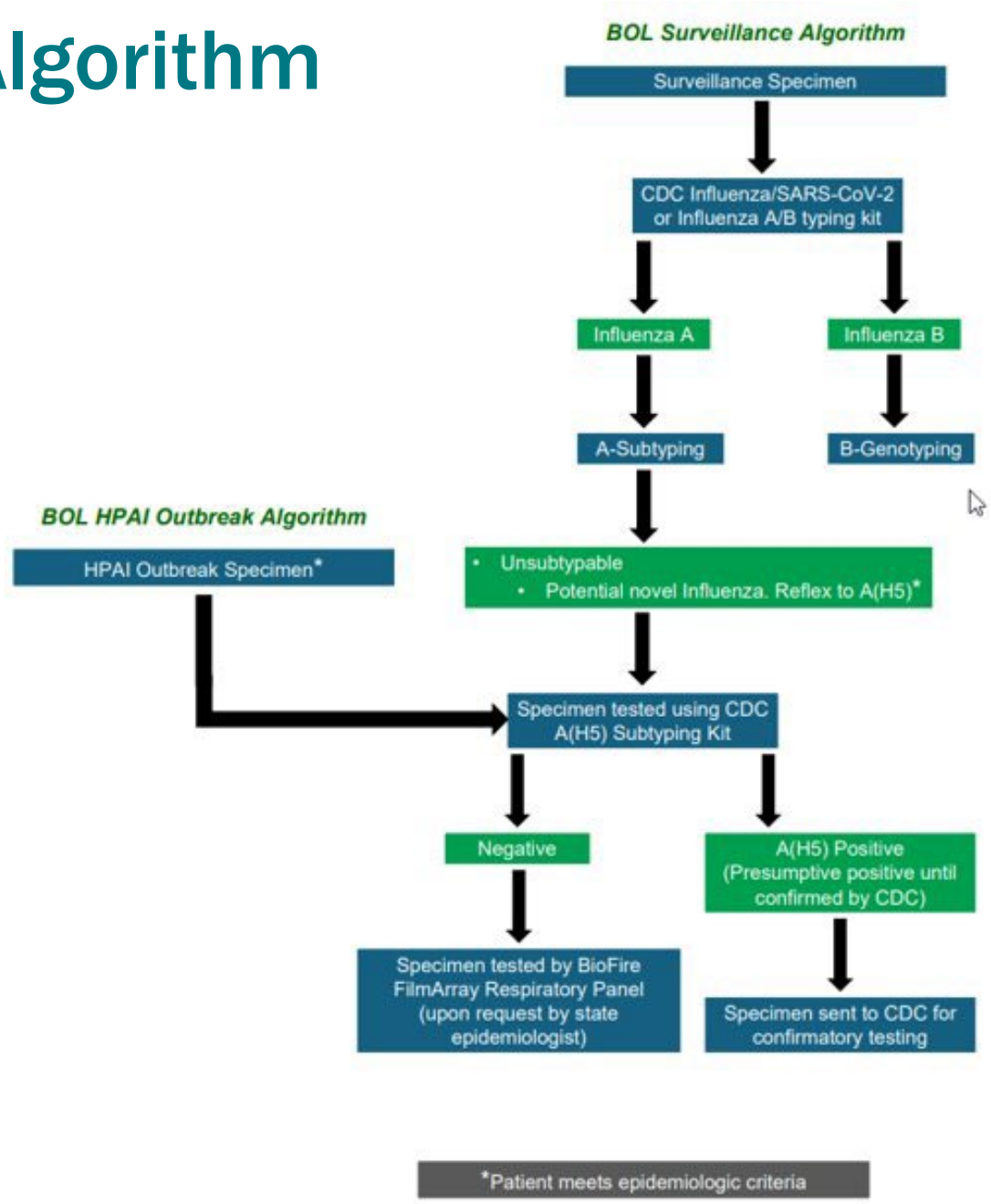
- A (H1) - 0
- A (Unable to Subtype) - 0
- A (H3) - 3602
- A (H1N1)pdm09 - 3634
- A (Subtyping not Performed) - 1010
- B (Lineage Unspecified) - 579
- H3N2v - 0
- B (Victoria Lineage) - 107
- B (Yamagata Lineage) - 0
- A (H5) - 0
- No Data/Small Data Sample

Map Legend

- ILI Elevated
- ILI Normal
- No Data

National, Regional, and State Level Outpatient Illness and Viral Surveillance accessed 03/14/2025

Michigan Algorithm



Limited resources for Subtyping

IRR™
International Reagent Resource

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Quick Links » IRR Frequently Asked Questions (FAQs)

IRR Frequently Asked Questions (FAQs)

After logging in, visit our Knowledge Base - which provides additional knowledge about IRR and reagents through questions and answers.

What can your assay detect?

- Read IFU and reach out to assay manufacturers to see whether your assay can detect H5N1.
- Public Health and Commerical Laboratories are available for H5 testing
- Notify immediately your public health jurisdiction if there is a highrisk patient.
  - In instances of highrisk patient testing, best to send specimen to clinical laboratory rather than to perform point of care testing
  - Communicate to the laboratory if specimen is being sent so this is prioritized for testing
  - Nationally notifiable disease

Polling Question

A limited number of laboratories can perform conjunctival specimen testing for HPAI?

A. True

B. False

Resources

Laboratory Testing of Highly Pathogenic Avian Influenza A(H5N1)

FAQ For Clinical Laboratories: Developed Jointly by ASM and APHL

Authors: Logan Patterson,[1] Scott Cunningham,[2] Elizabeth Palavecino,[3] Elizabeth M. Marlowe,[4] Diana Riner,[5] Kelly Wroblewski,[6] Paige M.K. Larkin,[7] Allen Bateman[8]

Questions?

Kimberly McCullor, PhD MSc
Microbiology Section Manager
Michigan Dept. of Health and Human Services
Bureau of Laboratories

Amy L. Leber, Ph.D., D(ABMM)
Senior Director, Clinical Laboratories
Director, Clinical Microbiology and Immunoserology
Department of Laboratory Medicine
Nationwide Children's Hospital