SARS-CoV-2, Influenza, and other Respiratory Viruses Update - 2022

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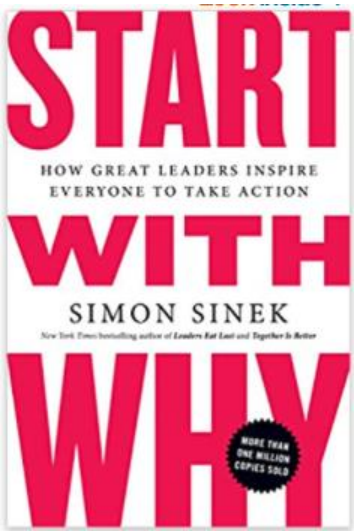
5 October 2022

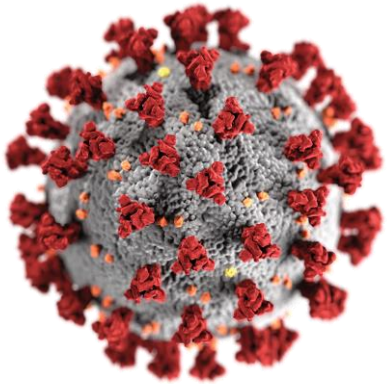
Outline

- Purpose of respiratory virus surveillance
- Review of the 2021-2022 respiratory virus season
  - SARS-CoV-2, influenza, and other respiratory viruses
- SARS-CoV-2 and influenza vaccine updates
- Infections of note for 2022-23
  - Avian influenza
  - Rhino/Enteroviruses and Enterovirus D68
- Respiratory virus surveillance strategy for 2022-2023
  - Data submission guidelines
  - Specimen submission guidelines

Why Perform Surveillance?

- Depends on the pathogen
- Respiratory viruses
  - Situational awareness of what is circulating, to inform clinical decision-making and public health response
- SARS-CoV-2:
  - Number of cases, hospitalizations, deaths
  - Geographic distribution
  - Age/gender distribution
  - Genomic surveillance
    - Track virus lineages/variants
    - Inform monoclonal antibody use
    - Inform vaccine strain selection





SARS-CoV-2 Surveillance

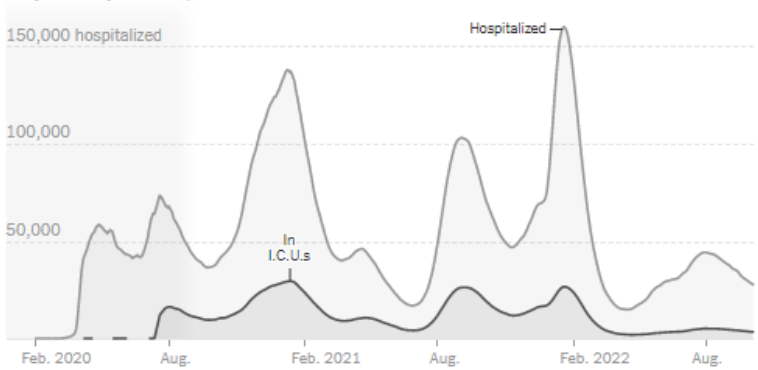
U.S. trends

All time | Last 90 days

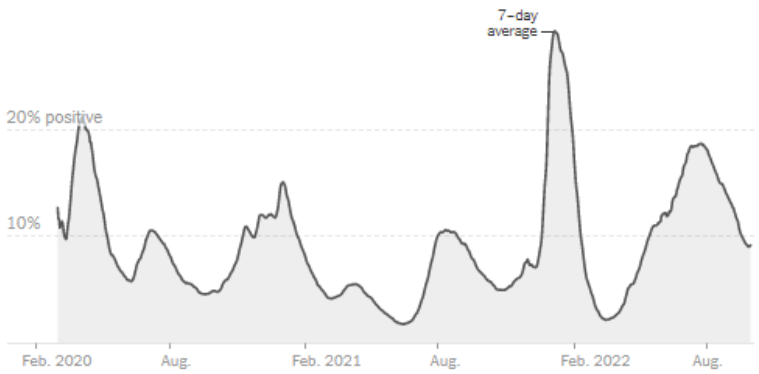
New reported cases by day

Covid patients in hospitals and I.C.U.s

Early data may be incomplete.

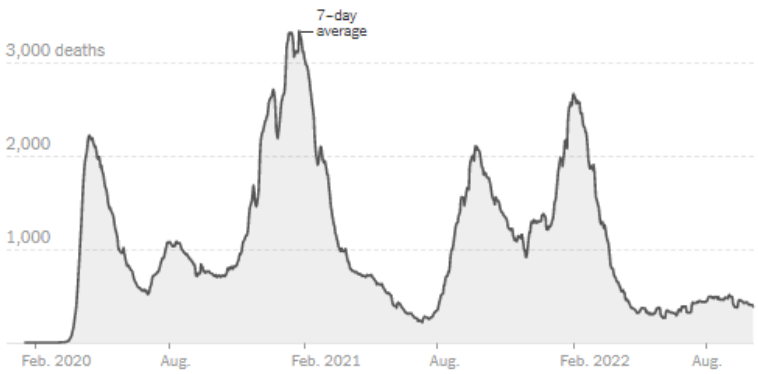


Test positivity rate



About this data

New reported deaths by day



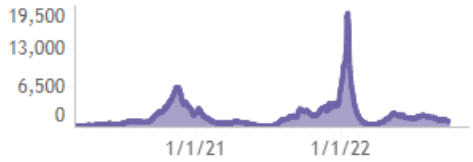
https://www.nytimes.com/interactive/2021/us/covid-cases.html

SARS-CoV-2 Surveillance

Testing Updated: 9/30/22

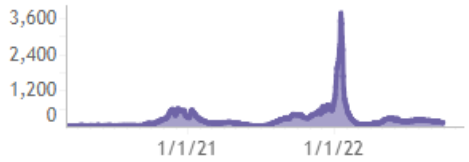
New Confirmed Cases
(7-day average)

841



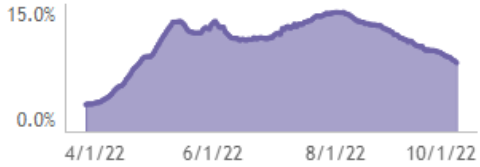
New Probable Cases
(7-day average)

122



Percent Positive by Test
(7-day average)

8.8%



Deaths Updated: 9/30/22

Total Confirmed Deaths

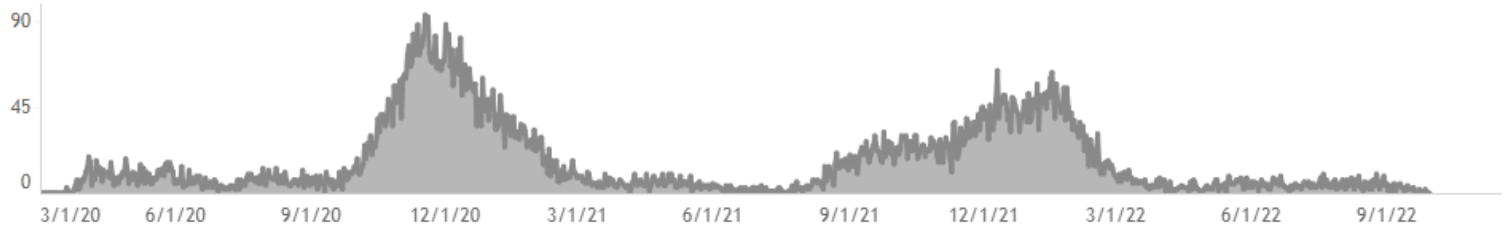
13,499

Total Probable Deaths

1,764

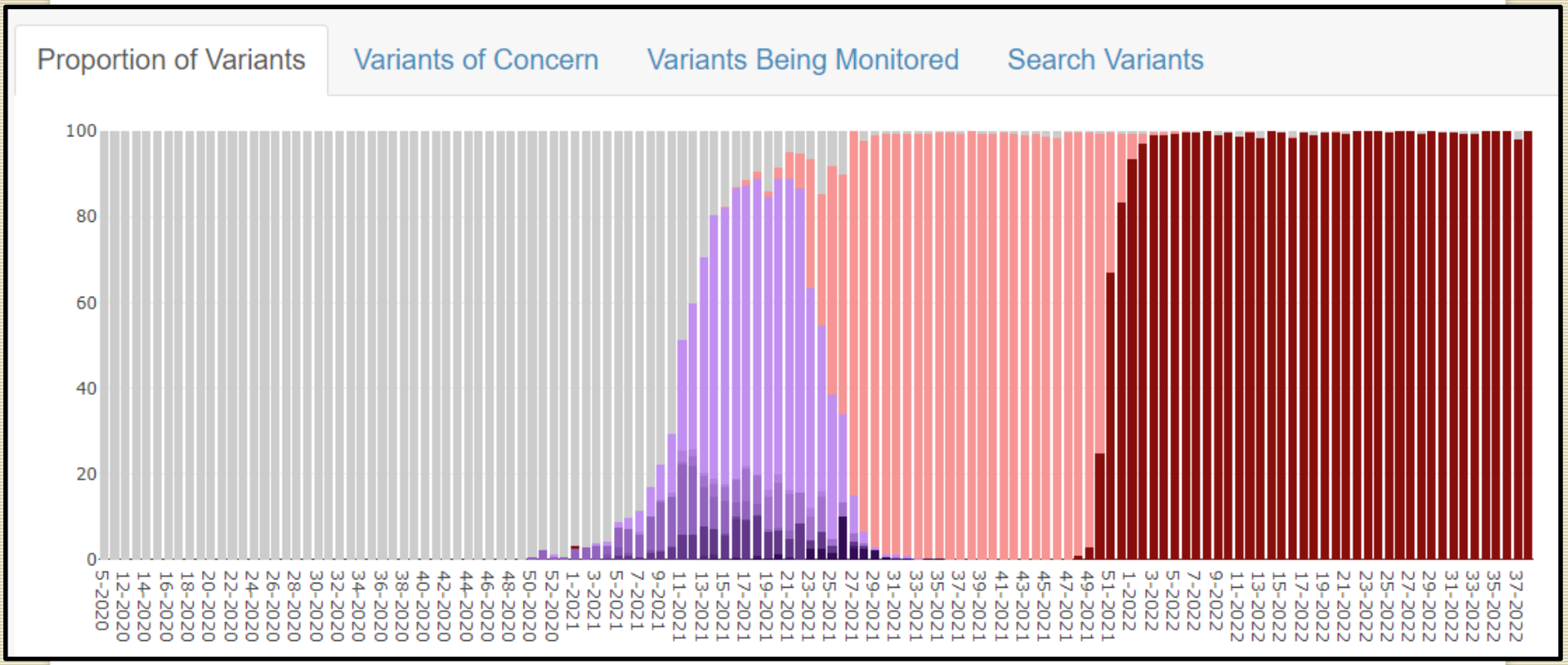
New Deaths Reported
(7-day average)

3



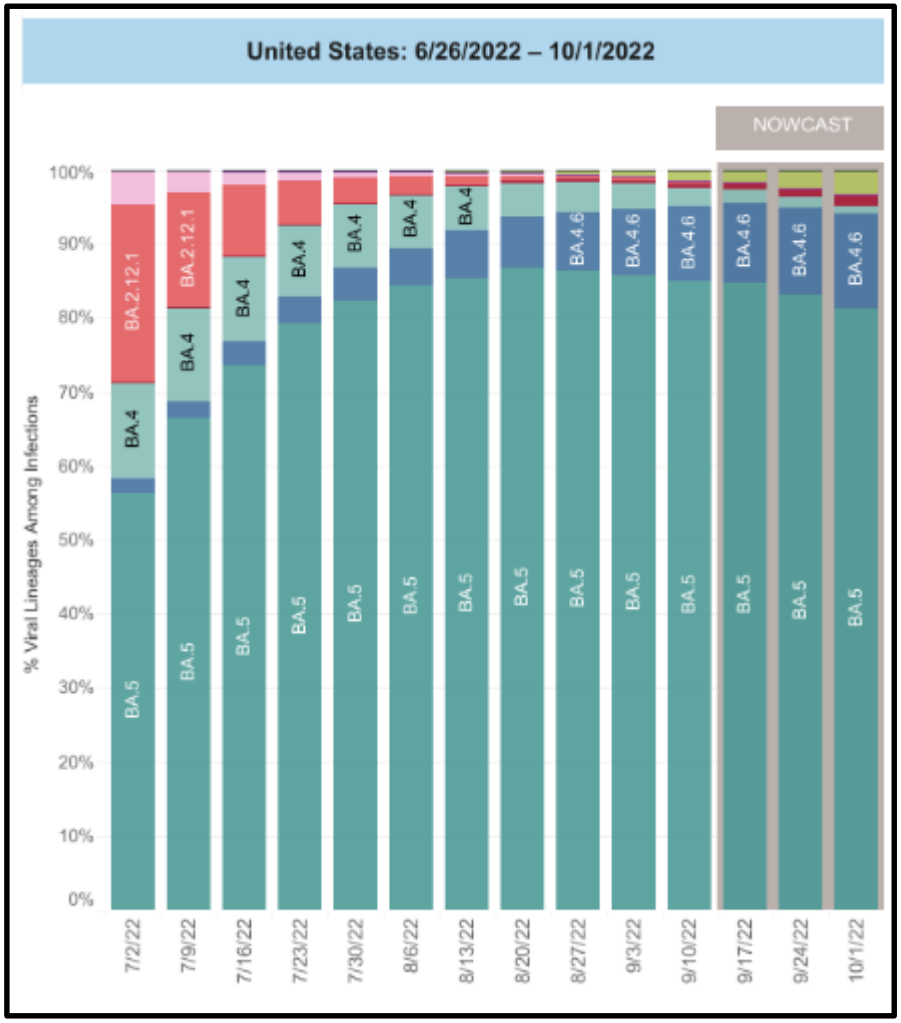
https://www.dhs.wisconsin.gov/covid-19/data.htm

SARS-CoV-2 Genomic Surveillance



https://dataportal.slh.wisc.edu/sc2dashboard

SARS-CoV-2 Genomic Surveillance



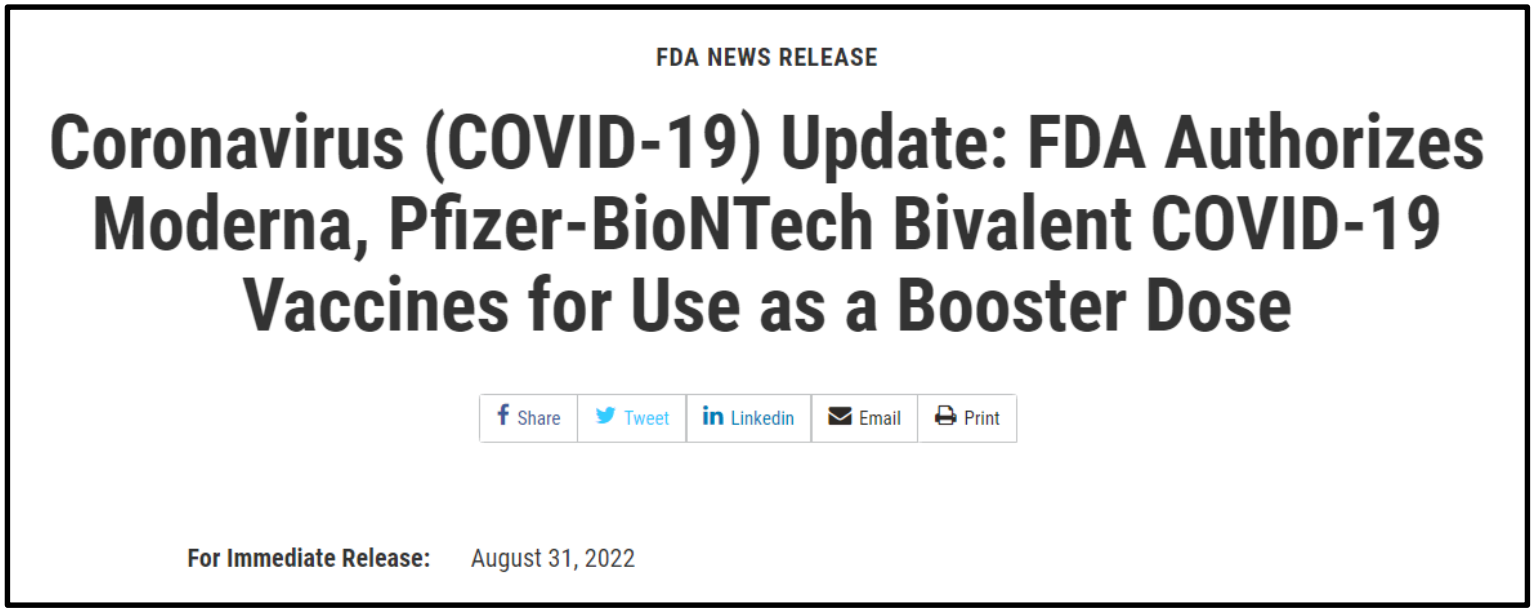
https://covid.cdc.gov/covid-data-tracker/#variant-proportions

SARS-CoV-2 Genomic Surveillance

- Thank you for sending up to 5 SARS-CoV-2 positives per week for sequencing!

- 4 other labs in Wisconsin also sequencing
  - City of Milwaukee Health Department Laboratory
  - Marshfield Clinic Research Institute
  - UW-Madison AIDS Vaccine Research Laboratory
  - Medical College of Wisconsin

SARS-CoV-2 Vaccines



FDA NEWS RELEASE

Coronavirus (COVID-19) Update: FDA Authorizes Moderna, Pfizer-BioNTech Bivalent COVID-19 Vaccines for Use as a Booster Dose

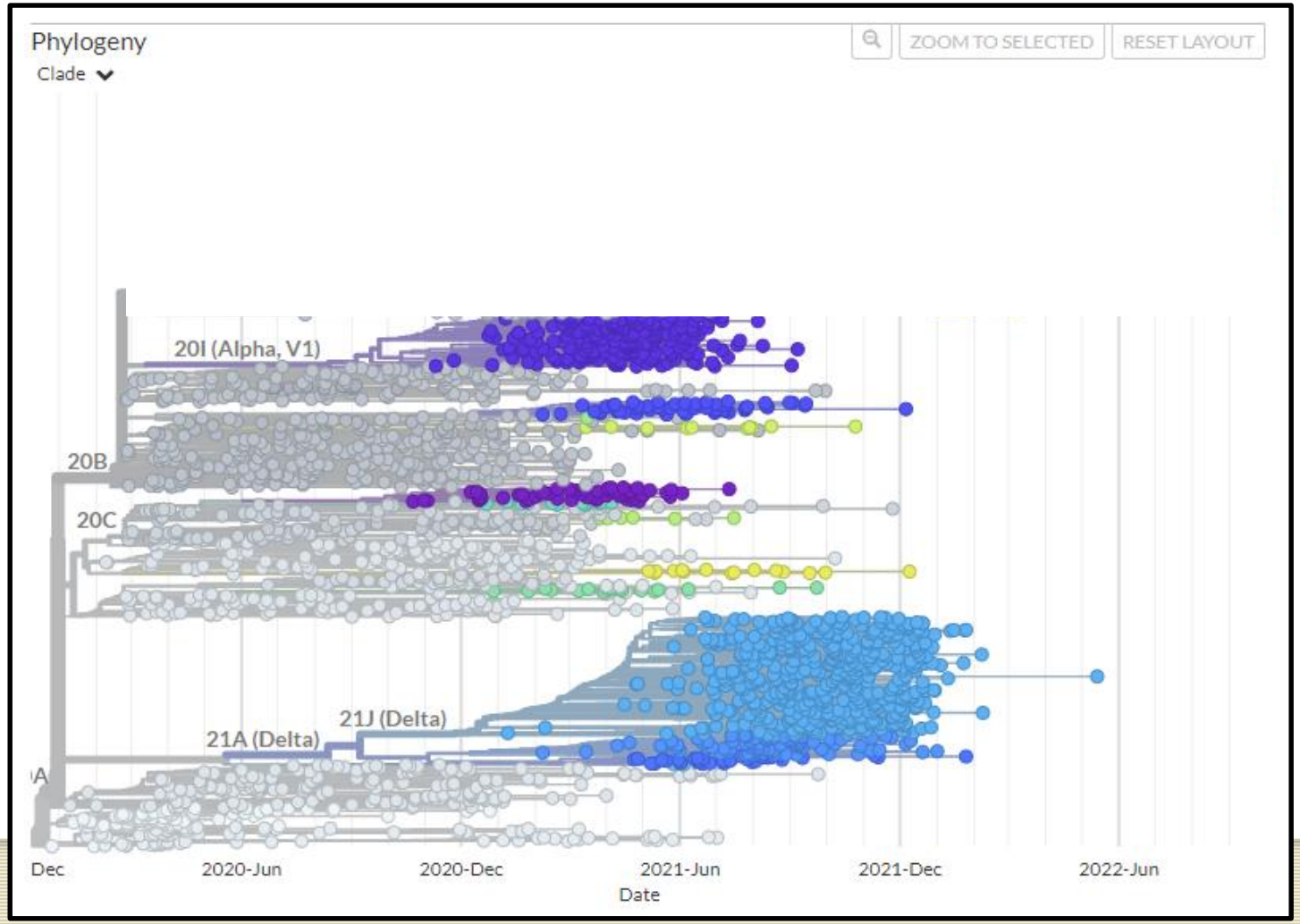
Share Tweet Linkedin Email Print

For Immediate Release: August 31, 2022

- Two strains ("bivalent")
  - Original SARS-CoV-2 strain
  - Omicron strain (BA.4/BA.5)
- Boost the level of immune response
- Broaden the immune response repertoire

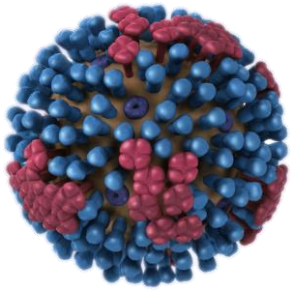
SARS-CoV-2 Vaccines

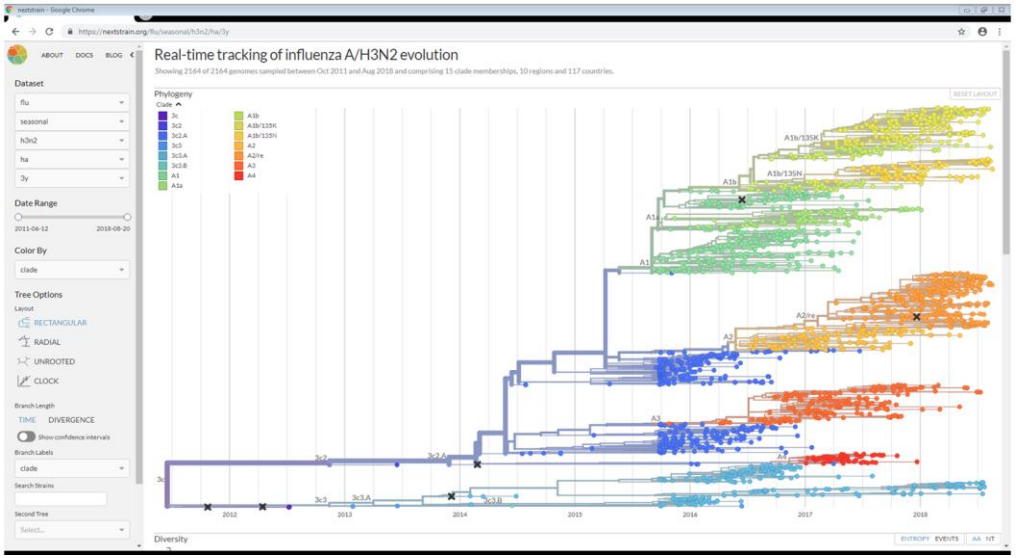
- Why include the original strain again?



Why Perform Surveillance?

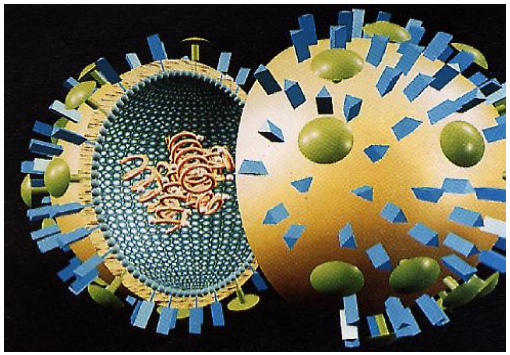
- Influenza
  - Track circulating strains to estimate vaccine match
  - Detect antiviral resistance
  - Isolate viruses for inclusion into future vaccines
  - Detect novel influenza viruses with pandemic potential



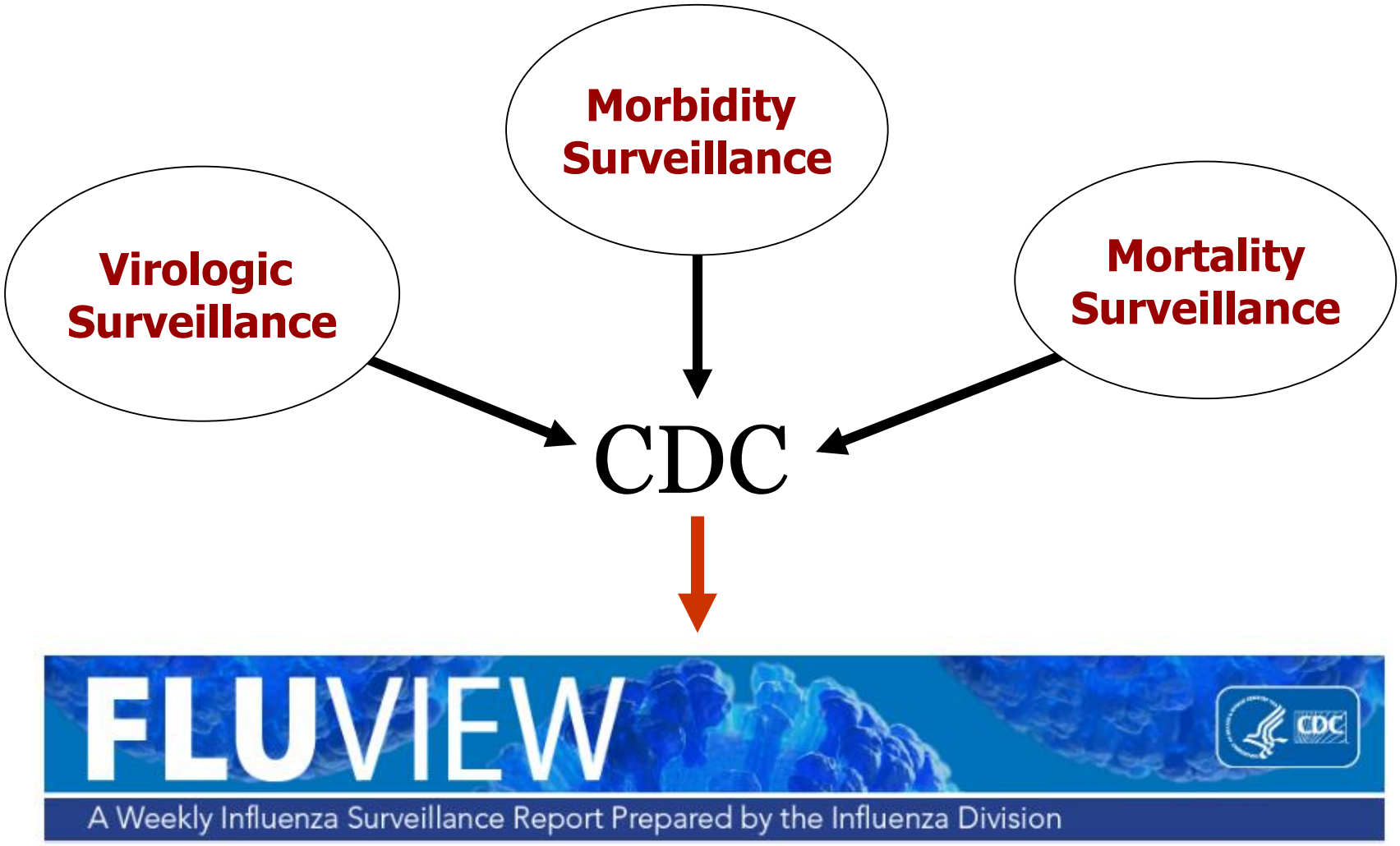


Influenza virus: Changeability is its hallmark

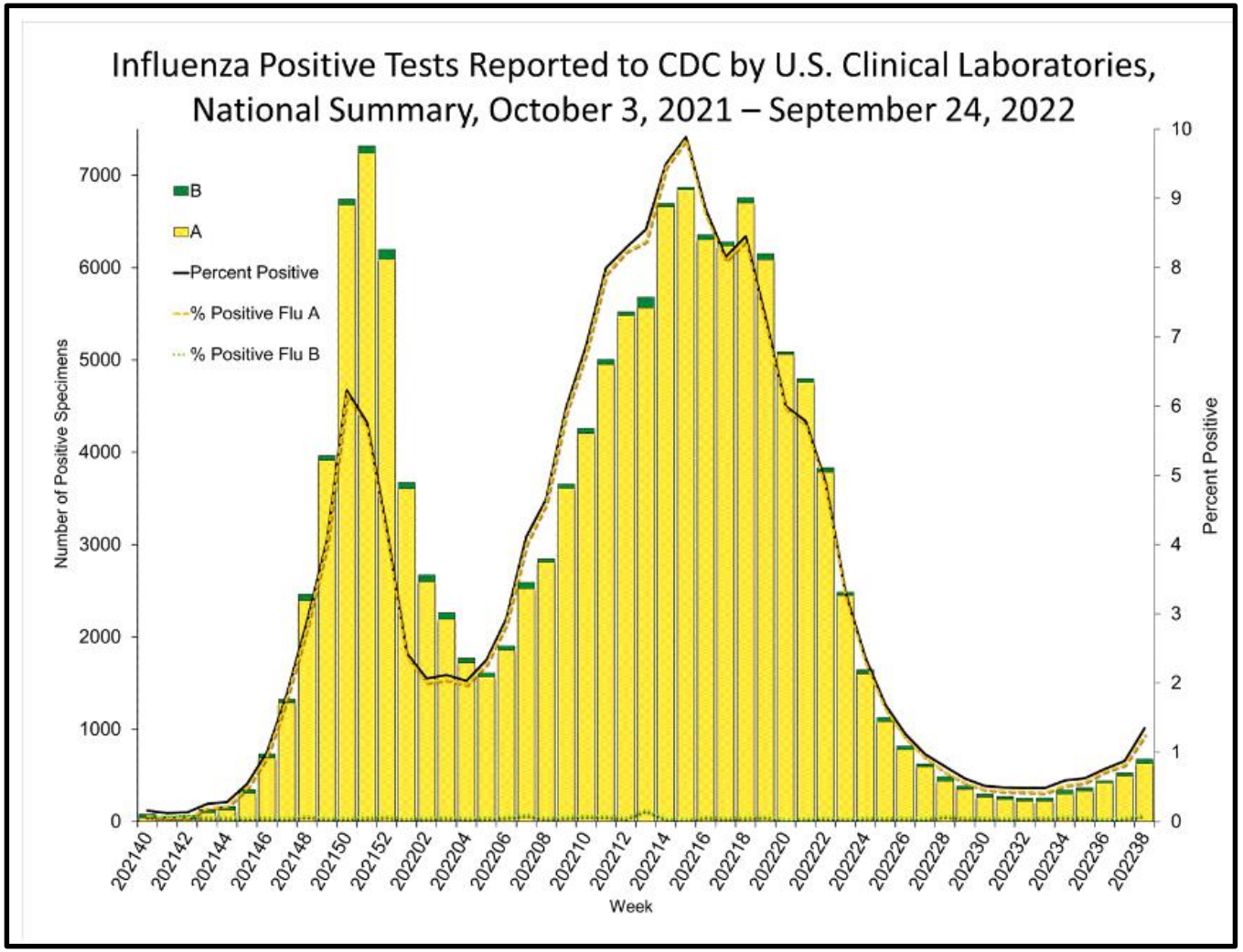
- Influenza types A, B, C and D
  - A and B are major human pathogens
- Negative-sense segmented RNA genome
  - 8 separate RNA segments
- Two major surface proteins of A and B viruses: Hemagglutinin (HA) and Neuraminidase (NA)
  - Role in pathogenesis
  - Defines subtypes
- Annual epidemics
  - Antigenic drift – small changes in HA and NA
- Periodic pandemic
  - Antigenic shift – HA that is new to the human population



U.S. Influenza Surveillance

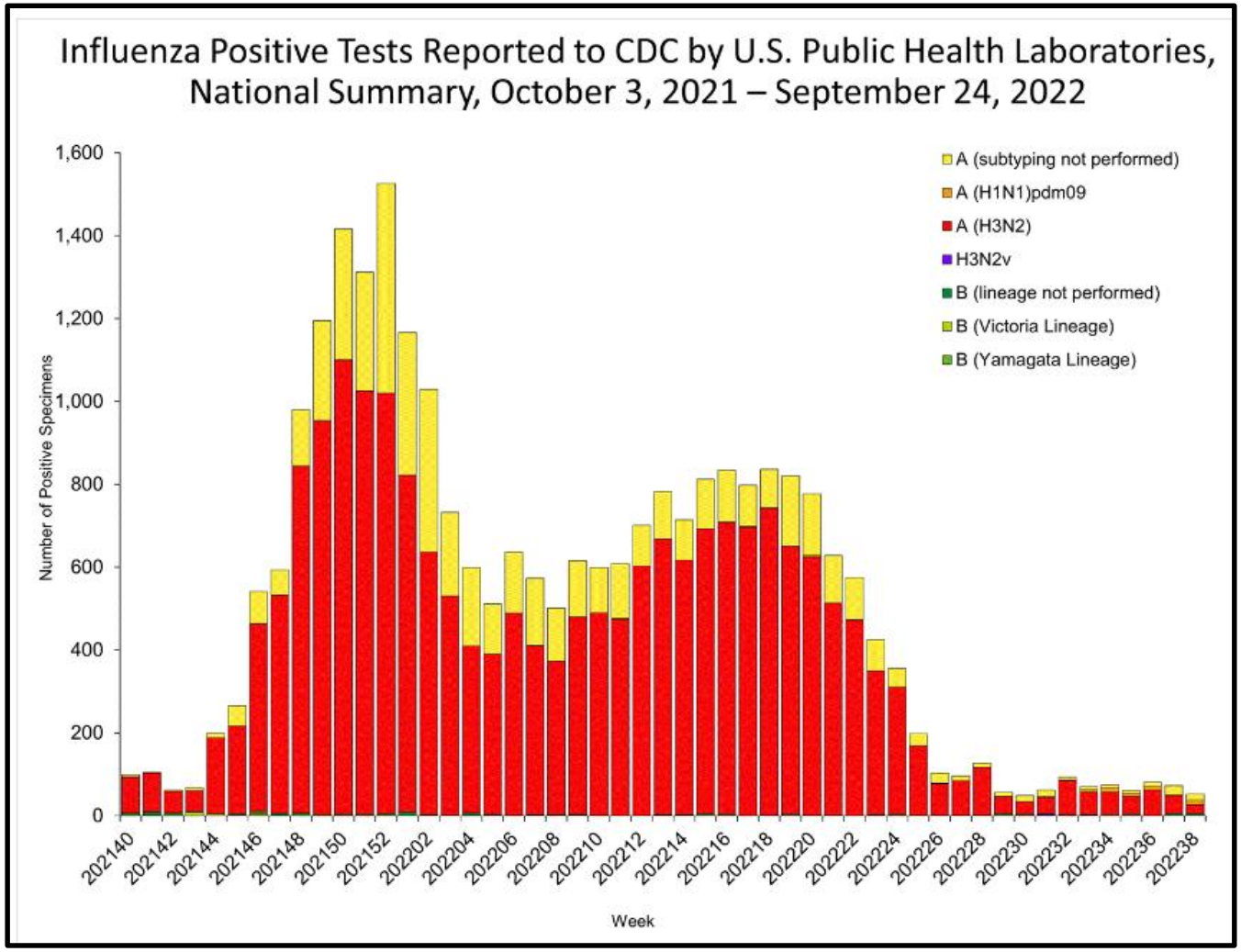


The 2021-22 Influenza Season (epidemic)



https://www.cdc.gov/flu/weekly/index.htm

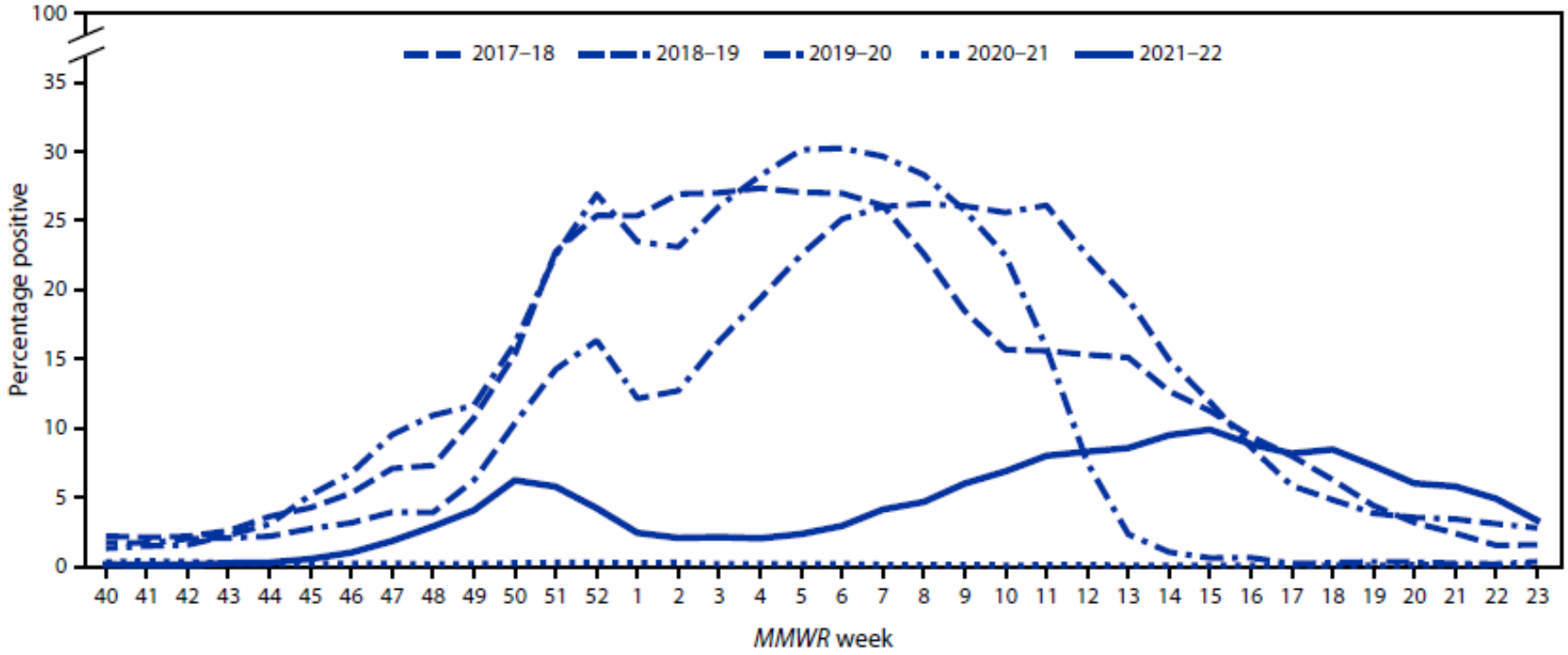
The 2021-22 Influenza Season



https://www.cdc.gov/flu/weekly/index.htm

The Moderate 2021-22 Influenza Season

FIGURE 1. Influenza-positive test results reported by clinical laboratories to CDC, by *MMWR* week and influenza season — United States, October–June, 2017–18 to 2021–22



https://www.cdc.gov/mmwr/volumes/71/wr/mm7129a1.htm

Influenza Vaccines

State of Wisconsin
Department of Health Services

Re: The 2022–2023 Advisory Committee on Immunization Practices (ACIP) recommendations for the prevention and control of seasonal influenza with vaccines

- Updated strains – updated H3N2 and B/Victoria
- Recommendation that everyone over 6 months be vaccinated
- Protect somewhat against infection, and strongly protect against severe disease – just like COVID-19 vaccines!

Influenza Vaccines

Strains included in this year's vaccine:

- A/**Wisconsin**/588/2019 (H1N1)pdm09-like virus
- A/Darwin/6/2021 (H3N2)-like virus
- B/Austria/1359417/2021 (Victoria lineage)-like virus
- B/Phuket/3073/2013 (Yamagata lineage)-like virus

Influenza Vaccines

State of Wisconsin
Department of Health Services

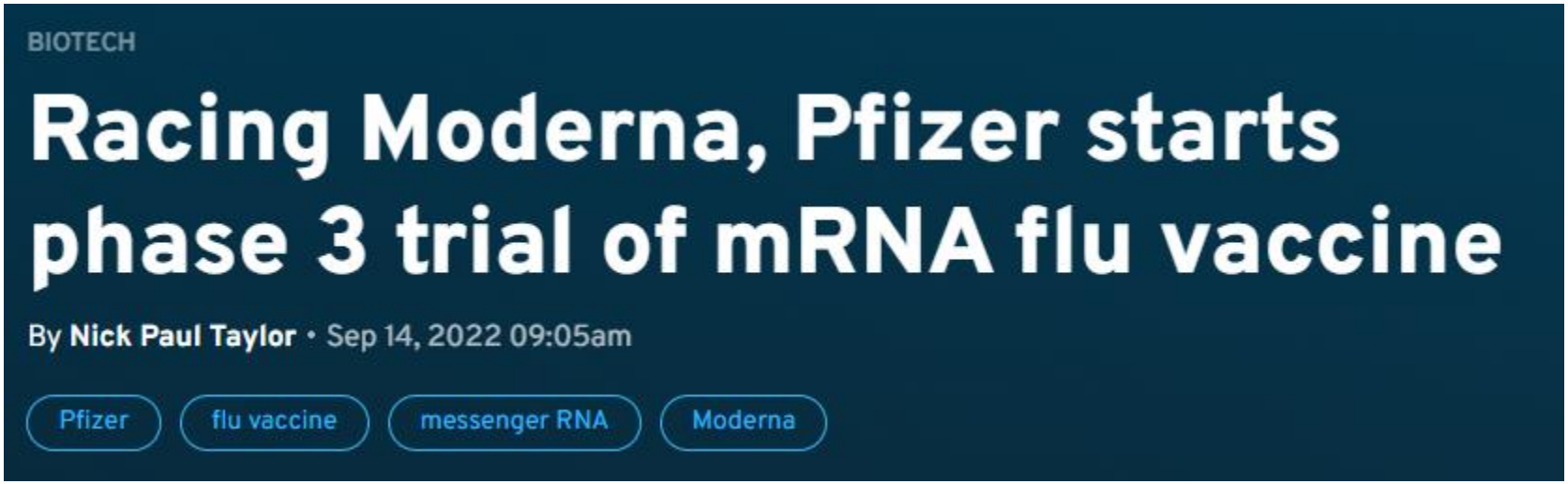
Re: The 2022–2023 Advisory Committee on Immunization Practices (ACIP) recommendations for the prevention and control of seasonal influenza with vaccines

- ACIP says adults aged ≥65 years should receive an enhanced influenza vaccine (EIV) to improve their immunity:
  - high-dose inactivated influenza vaccine
  - recombinant influenza vaccine
  - adjuvanted inactivated influenza vaccine

REUTERS®

2 minute read · September 14, 2022 5:47 AM CDT · Last Updated 20 days ago

Pfizer starts late-stage trial of mRNA-based flu vaccine

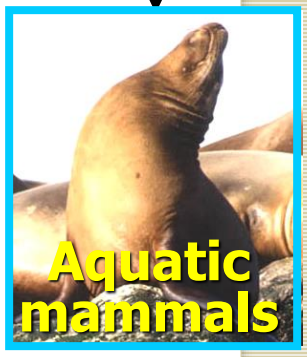


https://www.reuters.com/business/healthcare-pharmaceuticals/pfizer-starts-late-stage-trial-mrna-based-flu-vaccine-2022-09-14/
https://www.fiercebiotech.com/biotech/racing-moderna-pfizer-starts-phase-3-trial-mrna-flu-vaccine

Pandemic Influenza Generation: Viruses at the Human-Animal Interface

Influenza A

- **H1 - H16***
- **N1 – N9***



*Bats – H17/18, N10/11

Influenza Swine Variants

- Spillover of swine influenza into humans
- Close proximity to pigs (farms, fairs)
- "Variant influenza virus"
  - H1N2v
  - H3N2v
- Minimal ongoing human-to-human transmission (so far!)

Home » Headlines » Wisconsin reports influenza A(H1N2) variant infection, 7 'swine flu' cases reported in the US this year

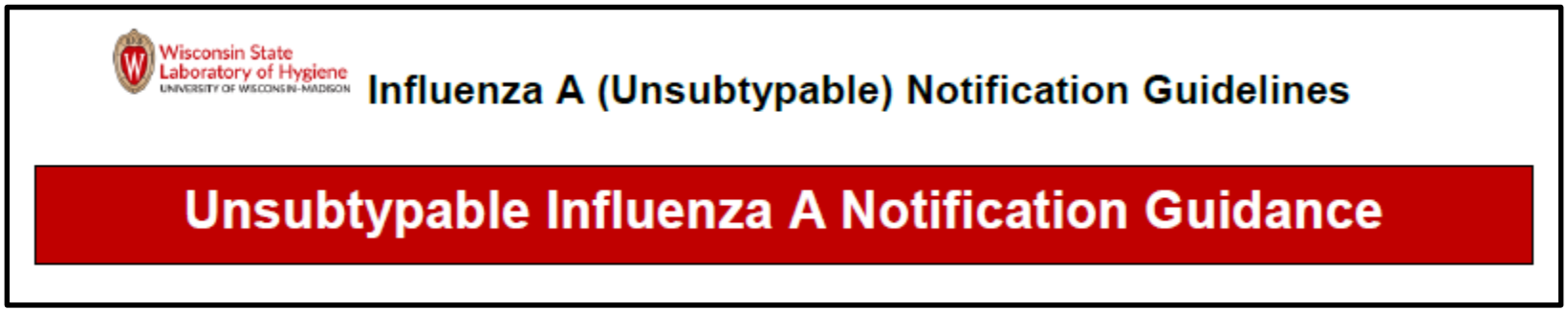
Wisconsin reports influenza A(H1N2) variant infection, 7 'swine flu' cases reported in the US this year

by NEWS DESK

September 16, 2022 Headlines, US News 2 Comments

http://outbreaknewstoday.com/wisconsin-reports-influenza-ah1n2-variant-infection-7-swine-flu-cases-reported-in-the-us-this-year-56424/

Influenza Swine Variants – WSLH testing



http://www.slh.wisc.edu/wp-content/uploads/2022/09/220913_Lab-Surveillance-Plan_2022-2023_WEB.pdf

Avian Influenza - 2022

The Atlantic

SCIENCE

Wild Birds in North America Are Dying Like Never Before

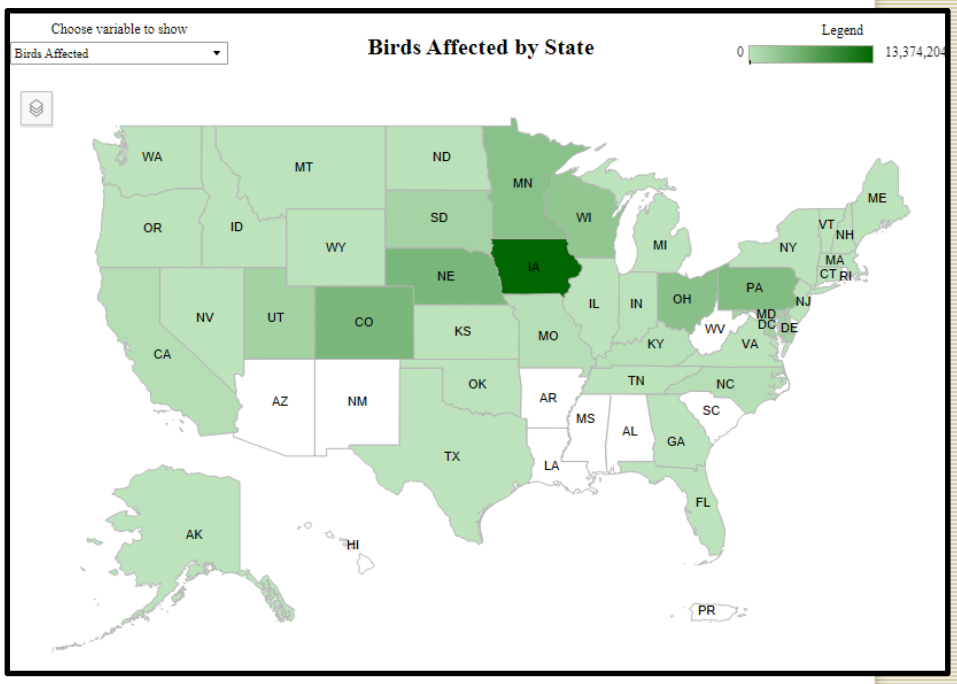
Scientists are concerned for North American wildlife as the worst avian flu outbreak since 2015 rages on.

By Sarah Trent

Avian Influenza - 2022

- New H5N1 strain of avian influenza affecting entire world
- Began in the U.S. in December 2021
- Previous avian influenza in 2014/15
  - Caused ~$3 billion in losses to U.S. farmers
  - 50 million chickens and turkeys culled
- This year's outbreak:
  - 47 million poultry affected (so far)
  - Orders of magnitude larger in wild bird populations

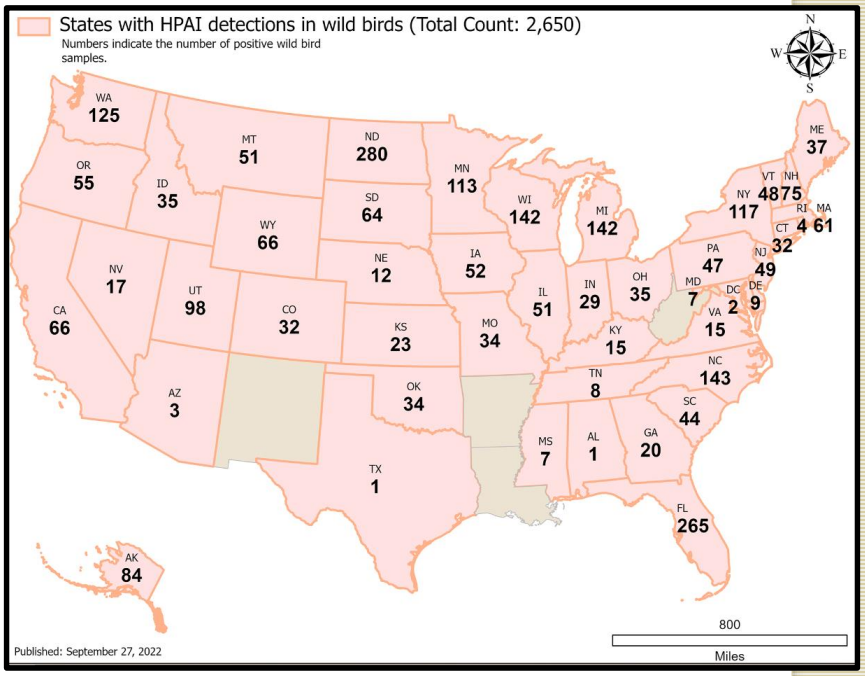
Commercial and Backyard Flocks



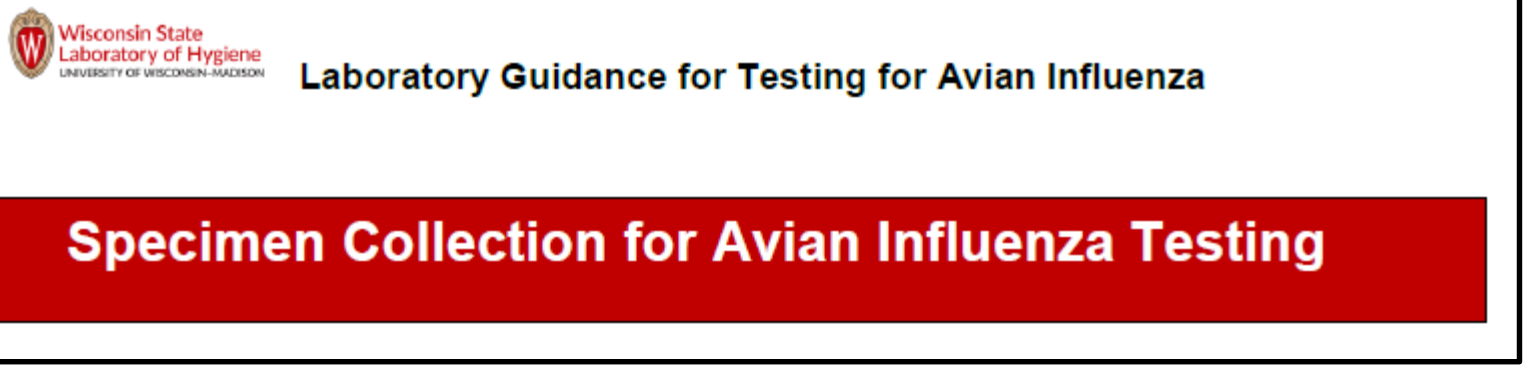
https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/avian-influenza/hpai-2022/2022-hpai-commercial-backyard-flocks

Avian Influenza - 2022

- 2014–15 outbreak: 18 wild-bird species across 16 states
- 2022 outbreak: 108 wild-bird species across nearly every state
- Mammal cases and deaths also confirmed:
  - foxes, skunks, opossums, raccoons, bobcats, minks, harbor seals, black bear, and one bottlenose dolphin
- This strain is different from previous ones!
- Currently low risk of mutating to become widely infectious and transmissible in humans, but we need to identify possible human infections to stop transmission



Avian Influenza – WSLH testing



If you suspect a symptomatic patient is at increased risk of being infected with Avian Influenza notify the

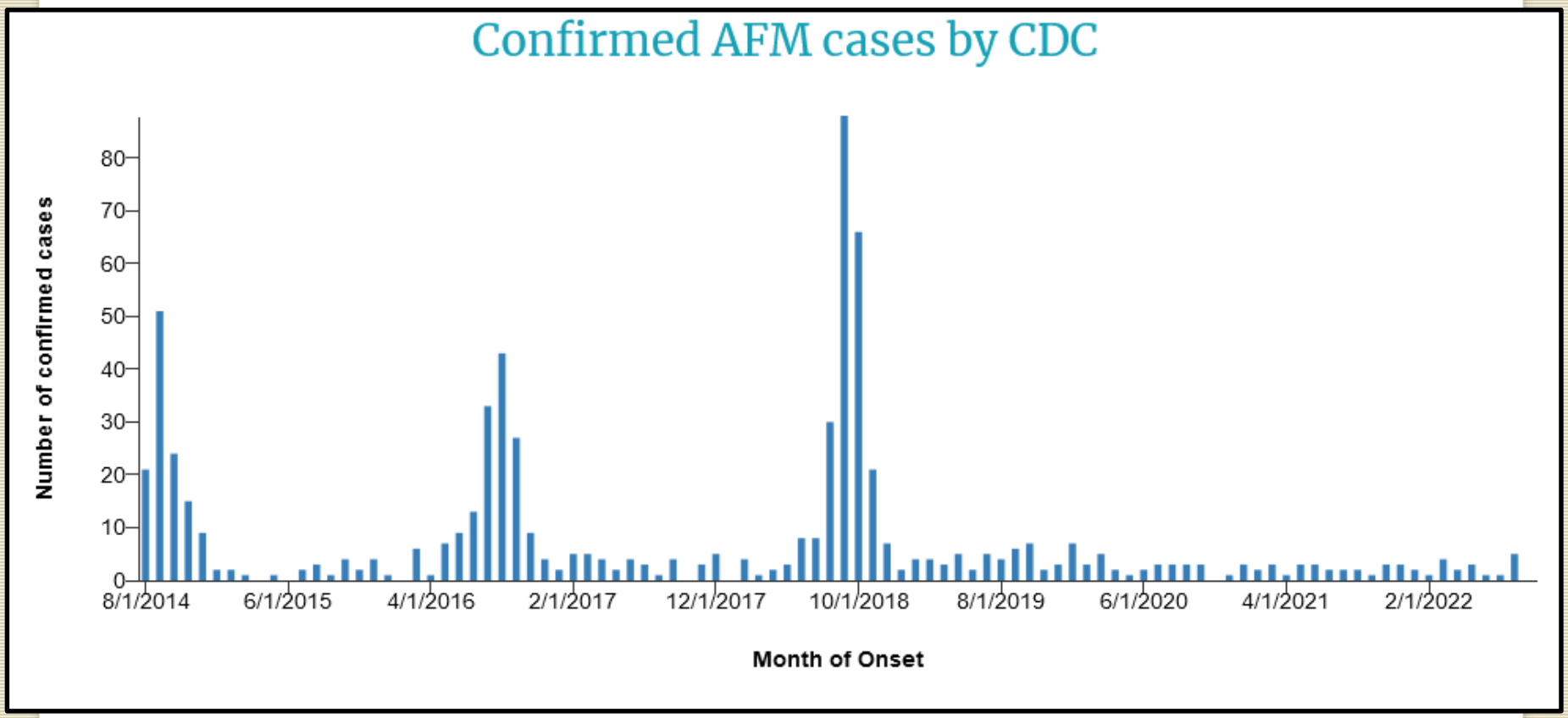
Wisconsin Division of Public Health (WDPH)

7:45 AM - 4:30 PM Monday-Friday, call **608-266-5326**

After-hours, ask for "Communicable Disease Epidemiologist on-call" at **608-258-0099**

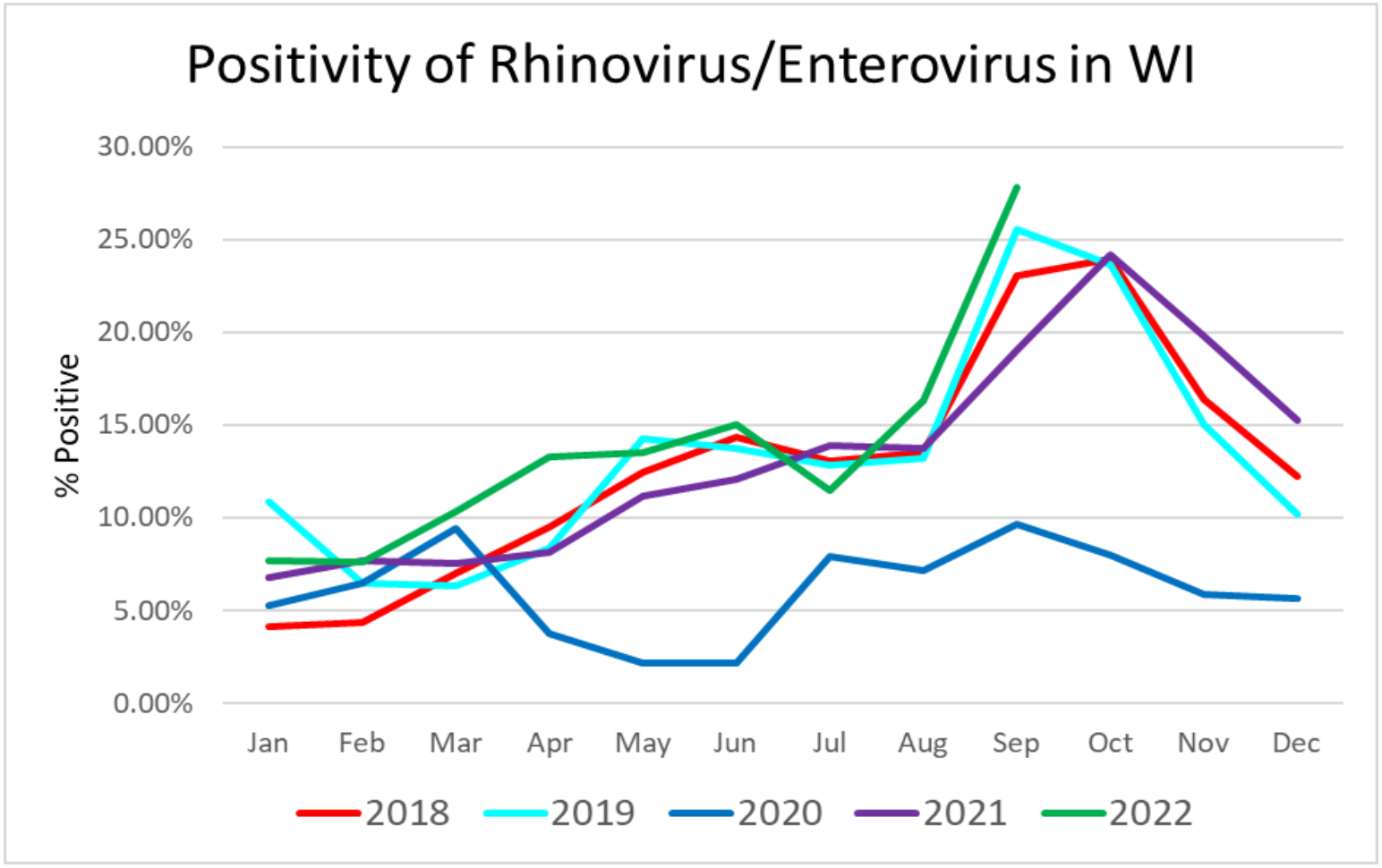
http://www.slh.wisc.edu/wp-content/uploads/2022/09/220913_Lab-Surveillance-Plan_2022-2023_WEB.pdf

Acute Flaccid Myelitis (AFM)



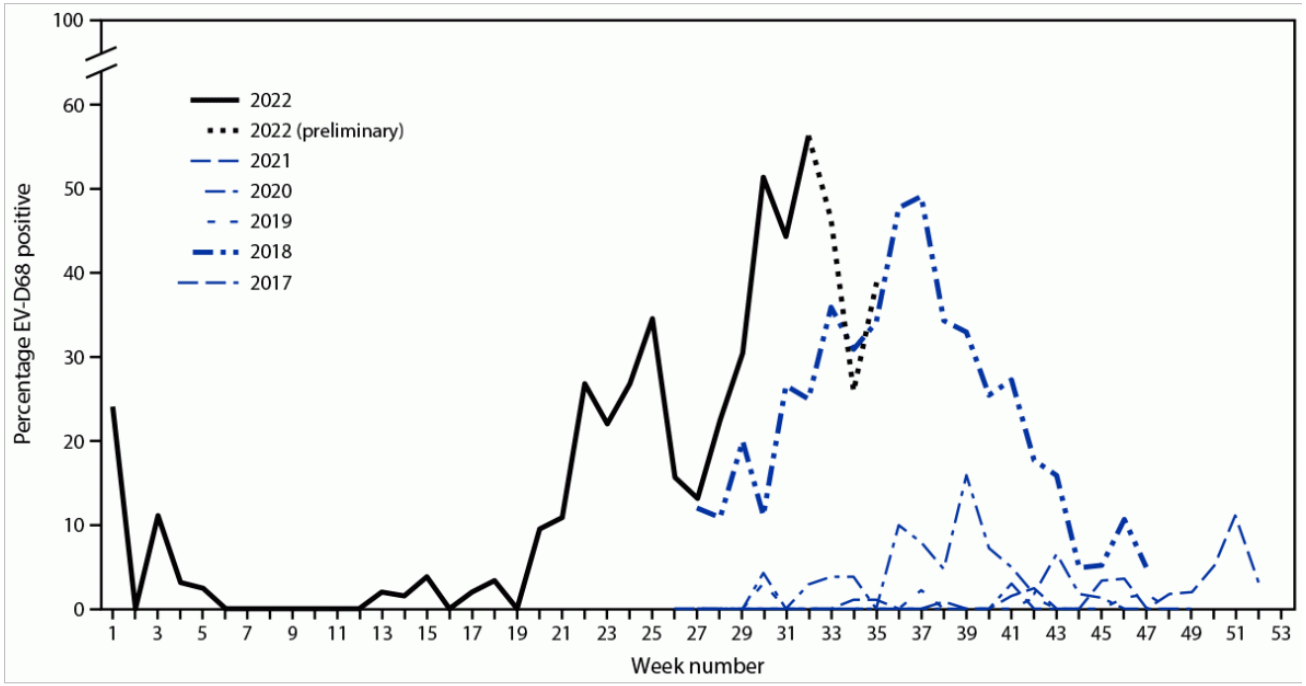
https://www.cdc.gov/acute-flaccid-myelitis/cases-in-us.html

Rhinovirus/Enterovirus in WI



Enterovirus D68

- Randomized study of 5,633 children with ARI seeking emergency care
  - RV/EV detected in 26.4% of these patients, 17.4% of whom had a positive EV-D68 result
  - EV-D68 positivity peaked at 56% in August 2022



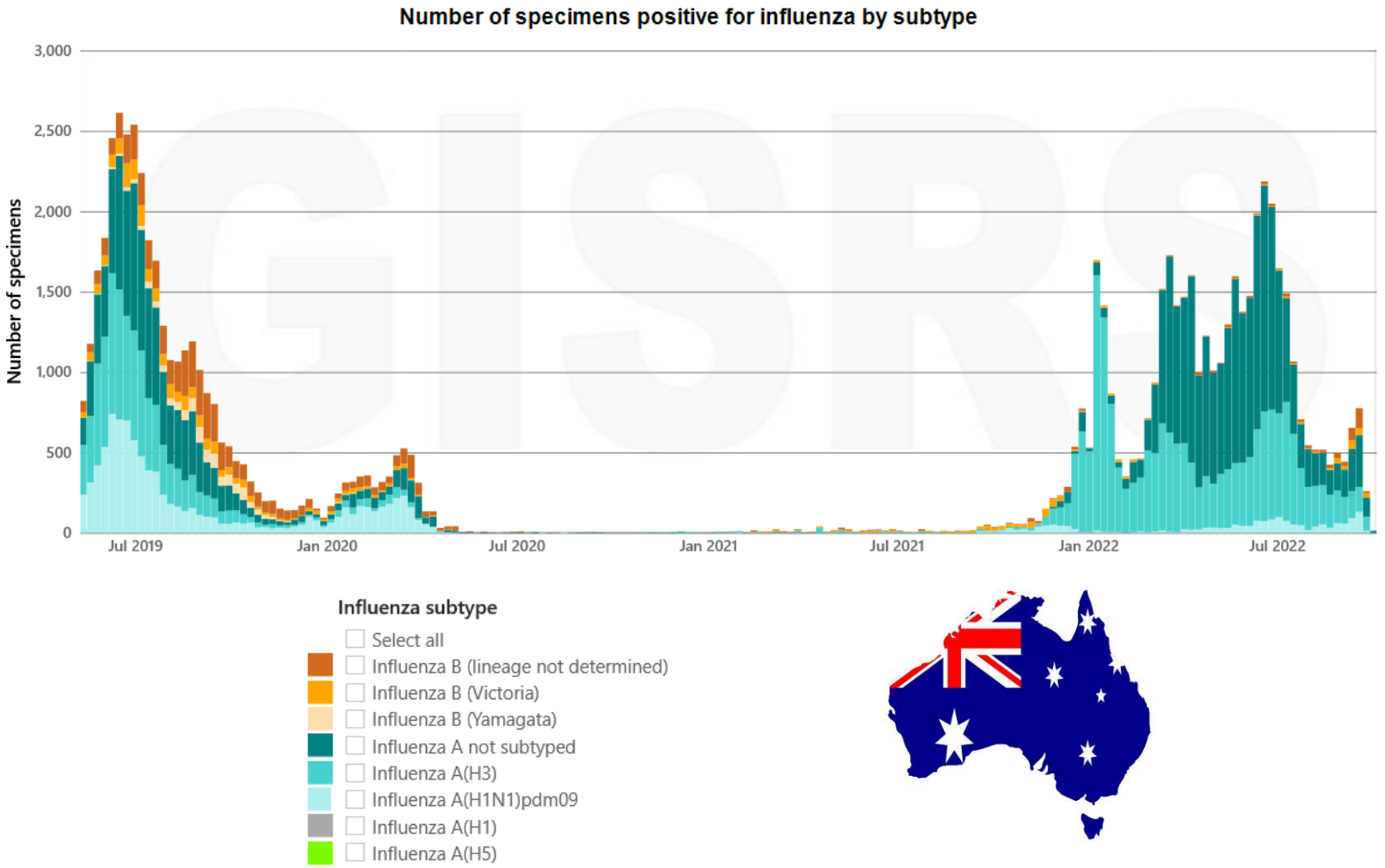
Abbreviation: EV-D68 = enterovirus D68.

https://www.cdc.gov/mmwr/volumes/71/wr/mm7140e1.htm?s_cid=mm7140e1_x

Wisconsin Testing and Surveillance 2022-2023

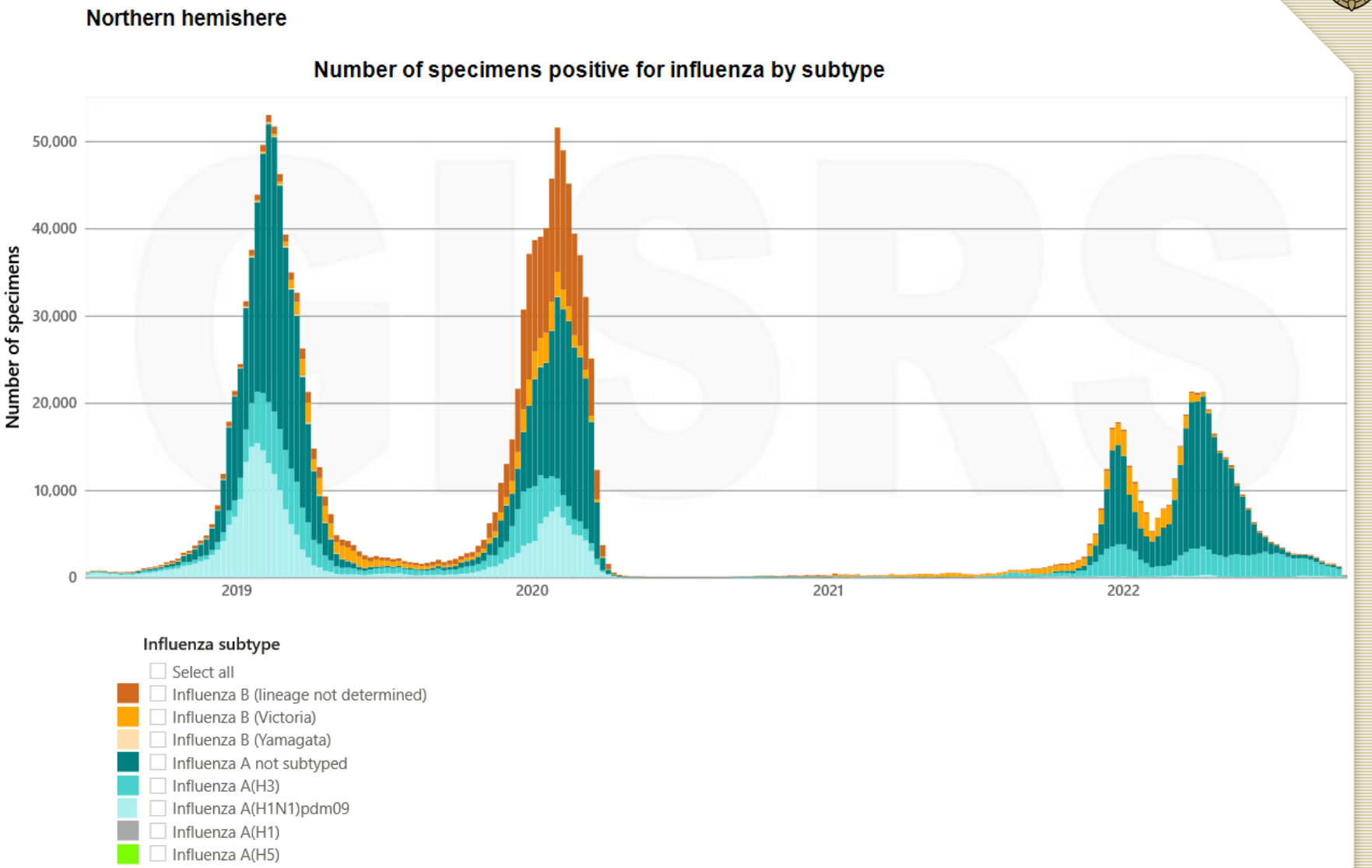
WHO Global Influenza Surveillance and Response System (GISRS)

Southern hemisphere, 2019-22



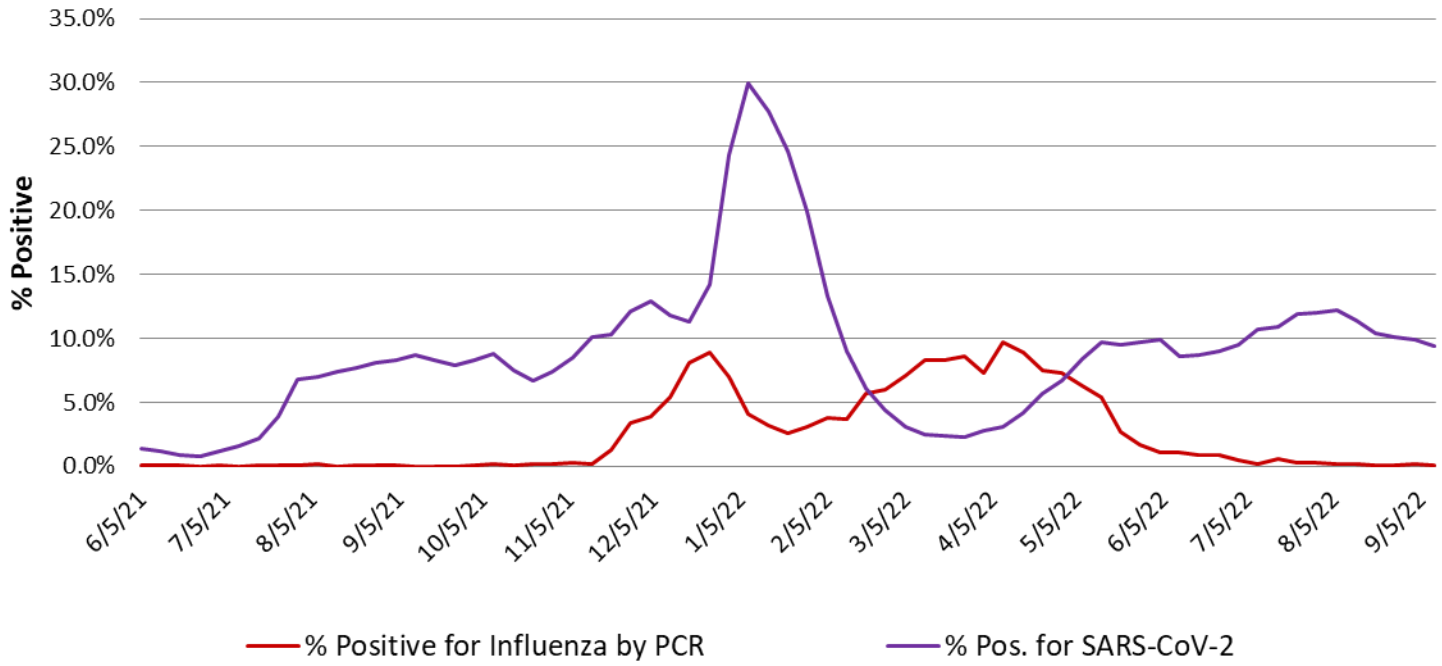
https://apps.who.int/flumart/Default?ReportNo=5&Hemisphere=Southern

WHO Global Influenza Surveillance and Response System (GISRS)



https://apps.who.int/flumart/Default?ReportNo=5&Hemisphere=Northern

% Positive for Influenza by PCR (Wisconsin), June 2021 to Week Ending September 10, 2022



Respiratory Pathogen Surveillance in Wisconsin

2022-2023 Season

SARS-CoV-2 Surveillance in Wisconsin

Multi-element approach

1. Reportable disease: all positive and negative results reportable
   - Track cases geographically and over time
2. DHS also tracks hospitalizations and deaths geographically and over time
3. Genomic surveillance: 5 positive samples per week per lab

Influenza Surveillance in Wisconsin

All Clinical Laboratories Performing Influenza Testing: **Please send early season positive influenza specimens to WSLH**

- Early season positives are critical:
  1. Inform vaccine strain selection.
  2. Provide samples to make candidate vaccine viruses.

Influenza Surveillance in Wisconsin

Dual Approach:

1. Data Submission
    a. All Clinical labs
    b. Report data **weekly all year!**
2. Specimen Submission
    a. Rapid Influenza Diagnostic Testing (RIDT) Sites
    b. PCR/Molecular Laboratories
    c. Enrolled Surveillance Sites
    d. University Health Clinics

Surveillance: Data Submission

Pathogen	Testing Data requested	Frequency to Report
Respiratory Pathogens - Antigen Detection		
Influenza A/B	Number detected and number tested	Weekly
SARS-CoV-2		
RSV		
Respiratory Pathogens - PCR/Molecular Detection		
Influenza A/B	Number detected and number tested	Weekly
SARS-CoV-2		
Non-influenza respiratory pathogens (RSV, Rhinovirus, etc)		
B. pertussis* and *parapertussis		

Surveillance: Data Submission

Pathogen	Testing Data requested	Frequency to Report
Non-Respiratory Viruses - PCR/Molecular Detection		
Adenovirus (non-respiratory)	Number detected and number tested	Weekly
Enterovirus (non-respiratory)		
Measles		
Mumps		
Rubella		
VZV		
Parechovirus		

Surveillance: Data Submission

Step-by-Step instructions can be found in the Laboratory Surveillance Report 2022-23

1. Web-Based Reporting (Preferred):
   a. Go to the WSLH website **http://www.slh.wisc.edu/wcln-surveillance/surveillance/** then click on **"*Click here to report Wisconsin Test Data*"** center of the page.

2. Fax Reporting:
   a. Please FAX to WSLH Customer Service by noon Wednesday of each week at **844-390-6233**

WI Respiratory Data Distribution

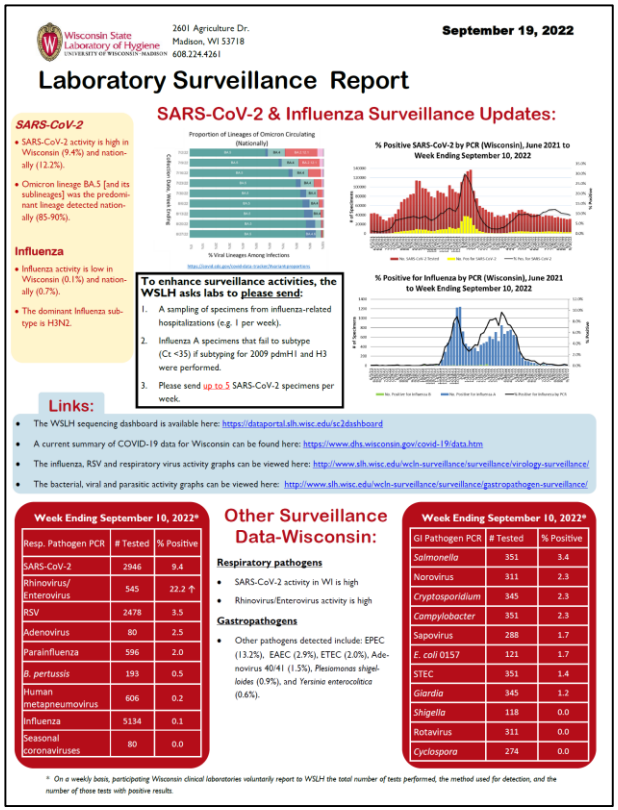
Wisconsin

- Bi-weekly Laboratory Surveillance Report

  Subscribe at: wcln@slh.wisc.edu
- Virus Activity Graphs: http://www.slh.wisc.edu/wcln-surveillance/surveillance/
- DHS Weekly Respiratory Report

National

- NREVSS (CDC)
- COVID Data Tracker (CDC)
- FluView (CDC)



Wisconsin State Laboratory of Hygiene
UNIVERSITY OF WISCONSIN–MADISON
2601 Agriculture Dr.
Madison, WI 53718
608.224.4261

September 19, 2022

Laboratory Surveillance Report

SARS-CoV-2 & Influenza Surveillance Updates:

SARS-CoV-2

- SARS-CoV-2 activity is high in Wisconsin (9.4%) and nationally (12.2%).
- Omicron lineage BA.5 [and its sublineages] was the predominant lineage detected nationally (85-90%).

Influenza

- Influenza activity is low in Wisconsin (0.1%) and nationally (0.7%).
- The dominant Influenza subtype is H3N2.

Proportion of Lineages of Omicron Circulating (Nationally)

% Positive SARS-CoV-2 by PCR (Wisconsin), June 2021 to Week Ending September 10, 2022

% Positive for Influenza by PCR (Wisconsin), June 2021 to Week Ending September 10, 2022

To enhance surveillance activities, the WSLH asks labs to please send:

1. A sampling of specimens from influenza-related hospitalizations (e.g. 1 per week).
2. Influenza A specimens that fail to subtype (Ct <35) if subtyping for 2009 pdmH1 and H3 were performed.
3. Please send up to 5 SARS-CoV-2 specimens per week.

Links:

- The WSLH sequencing dashboard is available here: https://dataportal.slh.wisc.edu/sc2dashboard
- A current summary of COVID-19 data for Wisconsin can be found here: https://www.dhs.wisconsin.gov/covid-19/data.htm
- The influenza, RSV and respiratory virus activity graphs can be viewed here: http://www.slh.wisc.edu/wcln-surveillance/surveillance/virology-surveillance/
- The bacterial, viral and parasitic activity graphs can be viewed here: http://www.slh.wisc.edu/wcln-surveillance/surveillance/gastropathogen-surveillance/

Week Ending September 10, 2022*

Resp. Pathogen PCR	# Tested	% Positive
SARS-CoV-2	2946	9.4
Rhinovirus/ Enterovirus	545	22.2 ↑
RSV	2478	3.5
Adenovirus	80	2.5
Parainfluenza	596	2.0
B. pertussis	193	0.5
Human metapneumovirus	606	0.2
Influenza	5134	0.1
Seasonal coronaviruses	80	0.0

Other Surveillance Data-Wisconsin:

Respiratory pathogens

- SARS-CoV-2 activity in WI is high
- Rhinovirus/Enterovirus activity is high

Gastropathogens

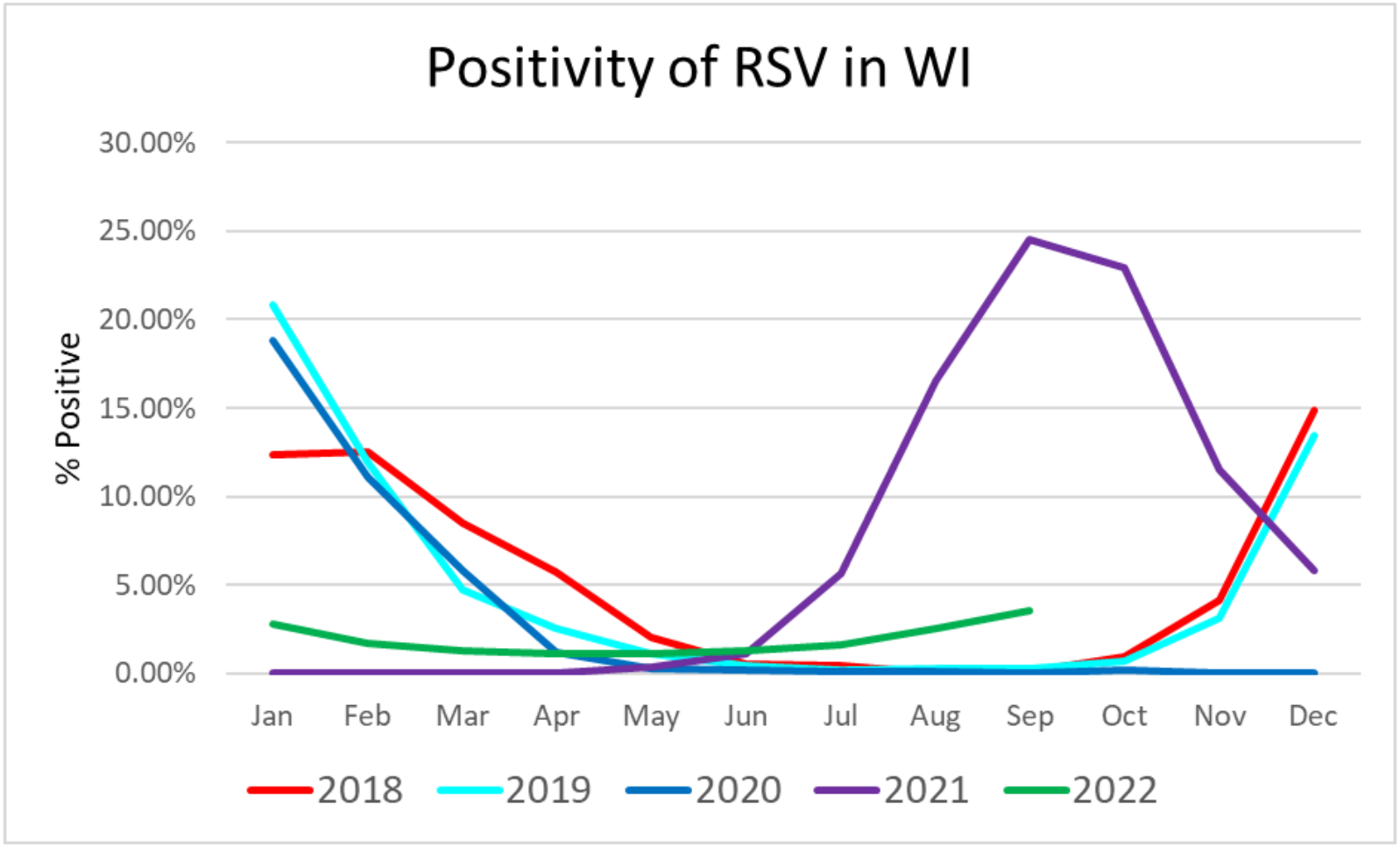
- Other pathogens detected include: EPEC (13.2%), EAEC (2.9%), ETEC (2.0%), Adenovirus 40/41 (1.5%), *Plesiomonas shigelloides* (0.9%), and *Yersinia enterocolitica* (0.6%).

Week Ending September 10, 2022*

GI Pathogen PCR	# Tested	% Positive
Salmonella	351	3.4
Norovirus	311	2.3
Cryptosporidium	345	2.3
Campylobacter	351	2.3
Sapovirus	288	1.7
E. coli 0157	121	1.7
STEC	351	1.4
Giardia	345	1.2
Shigella	118	0.0
Rotavirus	311	0.0
Cyclospora	274	0.0

* *On a weekly basis, participating Wisconsin clinical laboratories voluntarily report to WSLH the total number of tests performed, the method used for detection, and the number of those tests with positive results.*

Surveillance for Other Respiratory Viruses

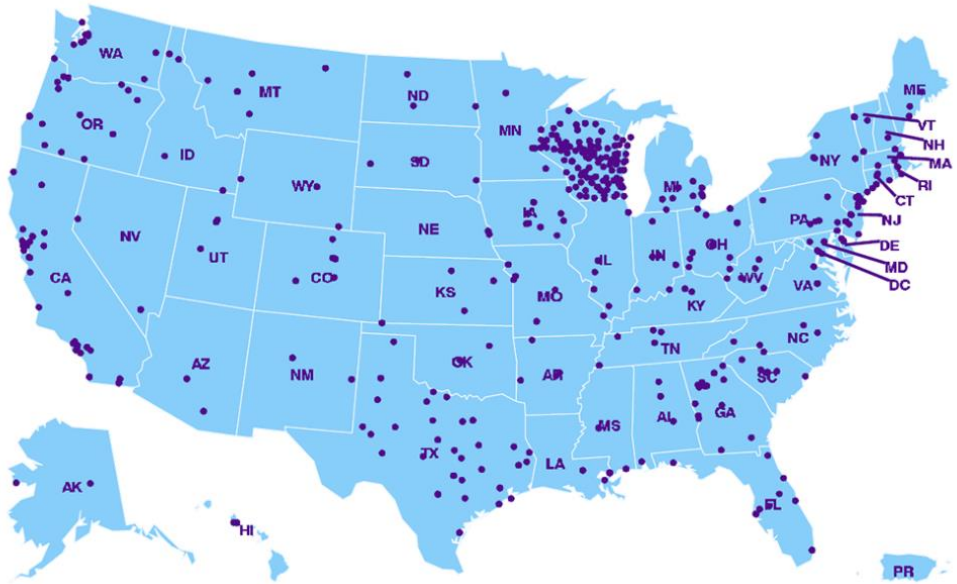


Aggregate data from Wisconsin Clinical Laboratories

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Map of Participating Labs

The National Respiratory and Enteric Virus Surveillance System (NREVSS)



Influenza Surveillance in Wisconsin

Dual Approach:

1. Data Submission
   a. All Clinical labs
   b. Report data **weekly all year!**
2. Specimen Submission
   a. Rapid Influenza Diagnostic Testing (RIDT) Sites
   b. PCR/Molecular Laboratories
   c. Enrolled Surveillance Sites
   d. University Health Clinics

Surveillance: Specimen Submission

1. Rapid Influenza Diagnostic Testing (RIDT) Sites
   - Laboratories performing influenza antigen tests
     - Geographic distribution throughout WI
   - Please notify WSLH of suspected performance issues (e.g. False positives/negatives)

Submit ALL out of season and early season influenza positive specimens to WSLH

- During Flu season, please submit:
  - ❑ The FIRST Influenza A or B of the season
  - ❑ Influenza A positive specimens with international travel history or swine/avian exposure

Surveillance: Specimen Submission

2. PCR/Molecular Laboratories
   - Perform PCR and/or Molecular testing for influenza, SARS-CoV-2 or other respiratory pathogens
   - "Gold Standard" testing.

Submit ALL out of season and early season influenza positive specimens to WSLH

- During Flu season, please submit:
  - **ONE influenza-related hospitalization per week**
  - Influenza A positive specimens that are unsubtypable (Ct <35)
  - Influenza A positive specimens with international travel history or swine/avian exposure.

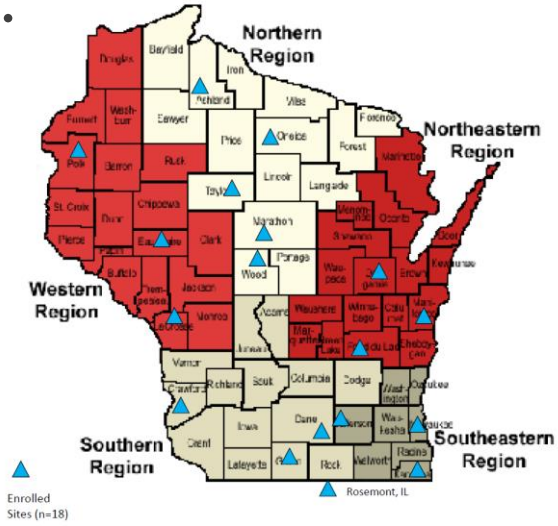
Surveillance: Specimen Submission

Dual Approach:

1. Data Submission
    a. All Clinical labs
    b. Report data **weekly all year!**
2. Specimen Submission
    a. Rapid Influenza Diagnostic Testing (RIDT) Sites
    b. PCR/Molecular Laboratories
    c. Enrolled Surveillance Sites
    d. University Health Clinics

Surveillance: Specimen Submission

3. Enrolled Surveillance Sites
   - 17 labs in 5 public health regions.
   - Provide randomized specimens weekly <u>all year.</u>
     - ❑ Tested for influenza and SARS-CoV-2.
     - ❑ Subset tested with a 20-target respiratory pathogen panel



Submit the <u>first 2 or 3 specimens per week from symptomatic patients</u> with influenza test requests to WSLH.

Surveillance: Specimen Submission

4. University Health Clinics
    - Monitor influenza, SCV2 and other respiratory pathogens impacting student health.
    - Monitor for severe adenovirus infections.

Submit up to 3 specimens per week from symptomatic patients to WSLH

Testing Site:	Season		
	Off Season (June-September)	**Early Season (Fall*)**	**Respiratory Season (Winter/Spring*)**
Influenza and Other Respiratory Viruses			
Rapid Testing	ALL influenza positives	First influenza A or B of the year	Influenza A positive specimens with: • International travel history • Swine exposure
PCR/Molecular	ALL influenza positives	ALL influenza Positives	One influenza-related hospitalization per week AND Unsubtypable influenza A positives (Ct < 35) AND Influenza A positive specimens with: • International travel history • Swine exposure
Sentinel Surveillance	First 2-3 specimens per week from symptomatic patients (regardless of initial test results)		
University Health	Up to 3 respiratory specimens per week from symptomatic patients		
SARS-CoV-2			
All Sites	Five positive SARS-CoV-2 samples per week for genomic surveillance		

Surveillance: Specimen Submission

What does WSLH do with these specimens??

1. Provide confirmatory testing
    a) Look for repeated issues with commercial tests
    b) Perform influenza typing and subtyping with CDC primer sets
2. "National Influenza Reference Center" pipeline
    a) CDC performs influenza characterization
    b) WSLH performs whole genome sequencing
    c) Original specimens can be vaccine candidates
3. Perform 20-target respiratory pathogen panel testing on a subset of specimens

Influenza Surveillance in Wisconsin

We will notify labs when influenza activity increases:

- WCLN Messaging
- Bi-Weekly Surveillance Report

After influenza activity increases, submit specimens with:

- International travel histories
- Unusual presentations
- Contact with swine/poultry
- Pediatric deaths

WSLH has Influenza Surveillance Supplies!!

- Specimen collection supplies
  - VTM and swabs
- Shipping supplies
  - Insulated shippers
  - Cold packs
- Specimen submission forms

Contact our Clinical Orders Department at

800-862-1088

Laboratory-based Surveillance Plan

- Available on the WSLH website
- Detailed instructions
- Description of surveillance requests
- Web-based reporting instructions

Your participation in the Wisconsin surveillance system is **vital** to monitor for emerging novel strains with pandemic potential and other pathogens that impact community health.

Contacts

Virology lab

Virus@slh.wisc.edu

Customer Service

1-800-862-1013

WSLH Surveillance Reports

Wisconsin State Laboratory of Hygiene
UNIVERSITY OF WISCONSIN-MADISON

2601 Agriculture Dr.
Madison, WI 53718
608.224.4261

June 28, 2021

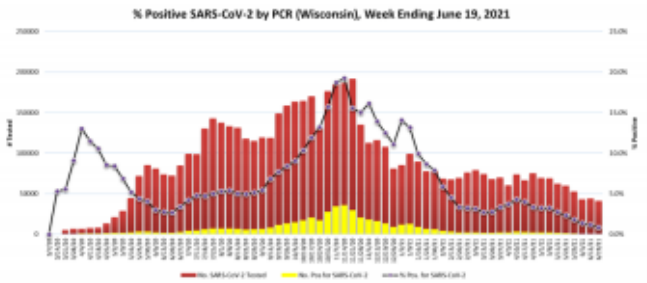
Laboratory Surveillance Report

Surveillance Data Synopsis

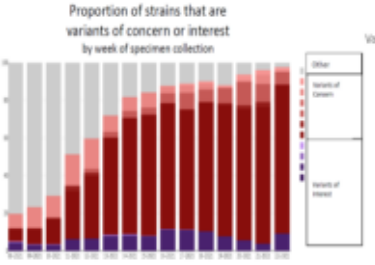
- **The percentage of specimens testing positive for SARS-CoV-2 *decreased* to <1%.**
- **The Alpha [B.1.1.7] SARS-CoV-2 variant of concern (VOC) was the predominant lineage detected.**
- **There has been an increase in RSV and Parainfluenza detections in Wisconsin.**

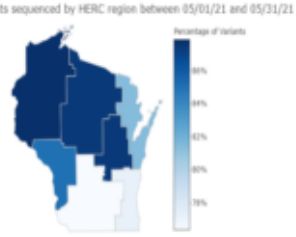
Influenza & SARS-CoV-2 Surveillance Updates

SARS-CoV-2 Update



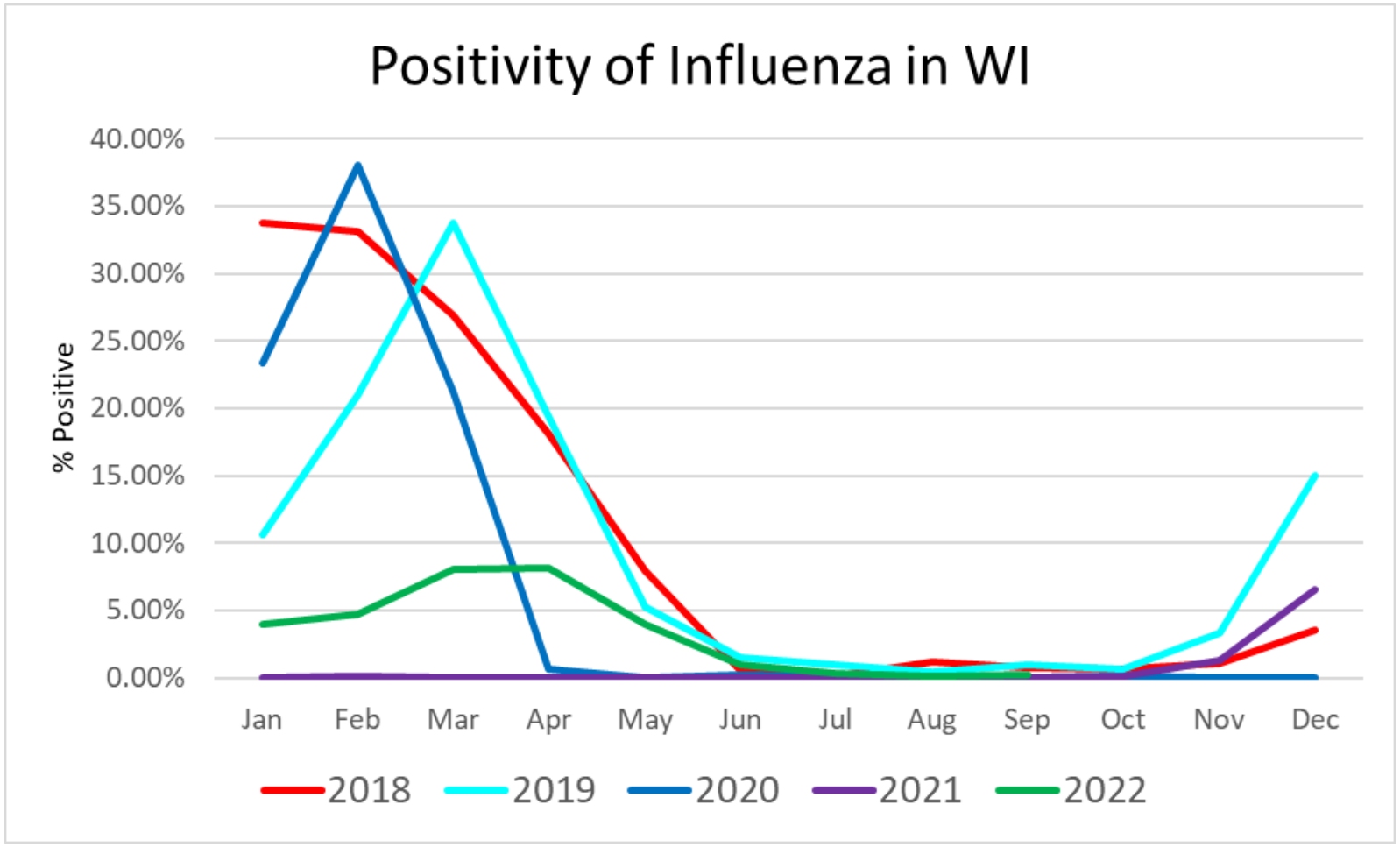
- In Wisconsin, positivity *decreased to* <1% of the 41,218 specimens tested by PCR and reported to WSLH.
- In the US, 7 day average percent positivity dropped to 1.7%.
- Wisconsin genomic sequencing data showed Alpha [B.1.1.7] variant of concern was the predominant lineage detected.
- Nationally, Alpha [B.1.1.7] was the predominant lineage followed by Gamma [P.1] and Delta [B.1.617.2].
- Sequencing dashboard is available at https://dataportal.slh.wisc.edu/sc2dashboard





http://www.slh.wisc.edu/wcln-surveillance/surveillance/

Surveillance for Other Respiratory Viruses



Surveillance for Other Respiratory Viruses