

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



Allen Bateman, PhD, D(ABMM)
Communicable Disease Division Director

Erika Hanson, MS
Virology Team Lead

5 October 2022

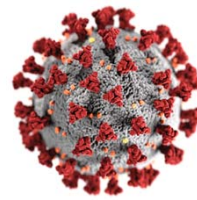
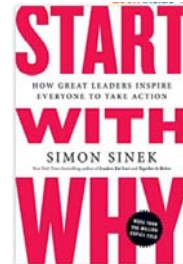
Outline



- 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

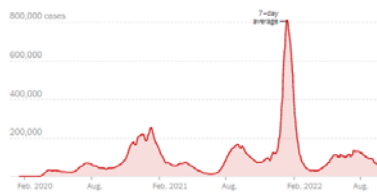


SARS-CoV-2 Surveillance

U.S. trends

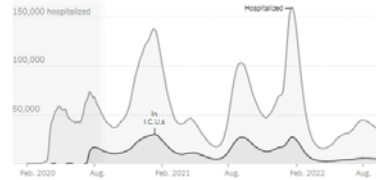
All time Last 90 days

New reported cases by day

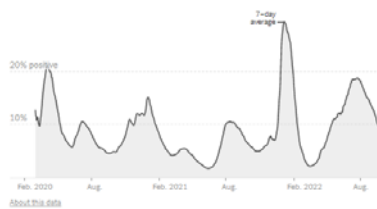


Covid patients in hospitals and I.C.U.s

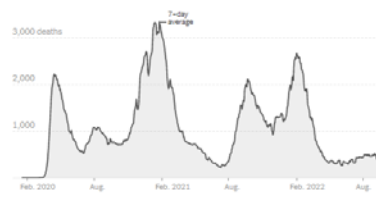
Early data may be incomplete.



Test positivity rate

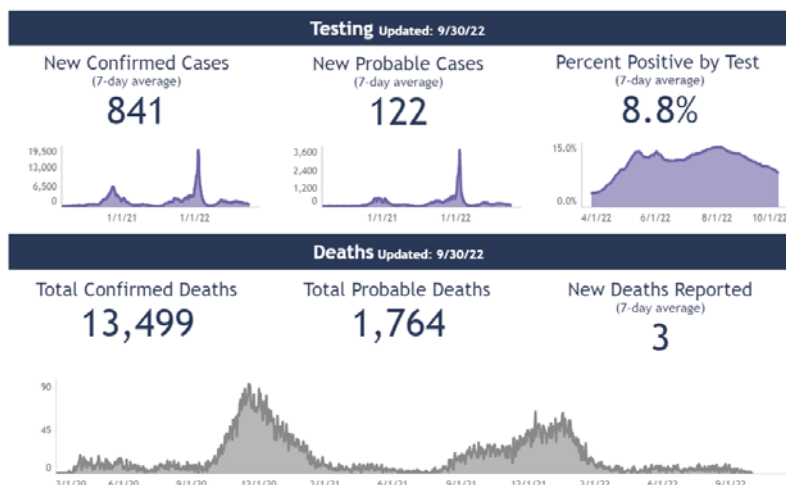


New reported deaths by day



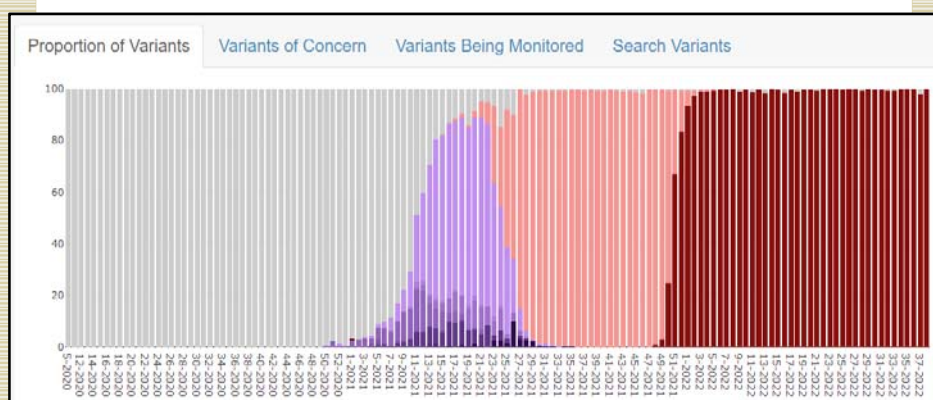
<https://www.nytimes.com/interactive/2021/us/covid-cases.html>

SARS-CoV-2 Surveillance



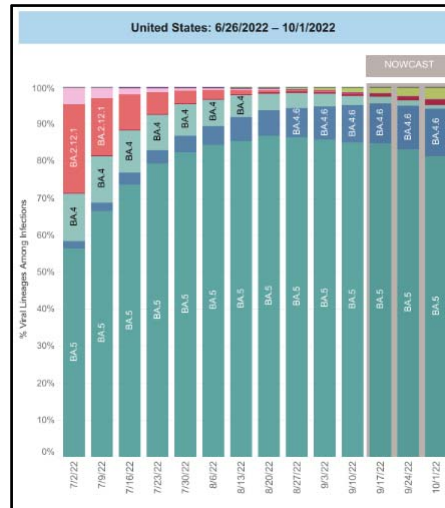
<https://www.dhs.wisconsin.gov/covid-19/data.htm>

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

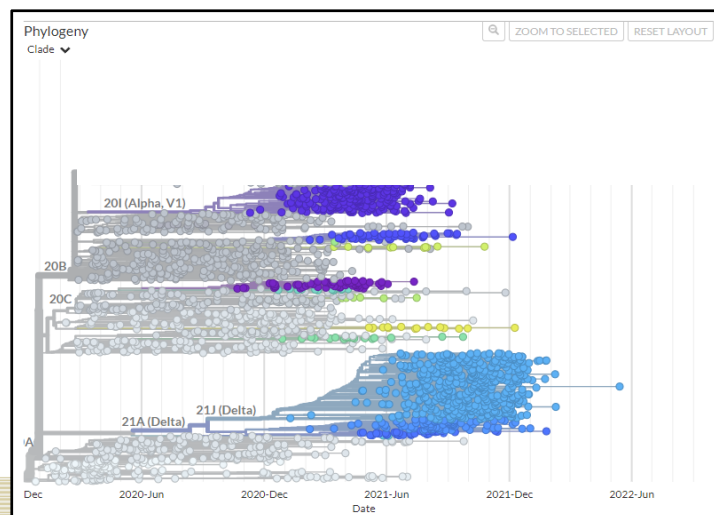
For Immediate Release: August 31, 2022

- 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

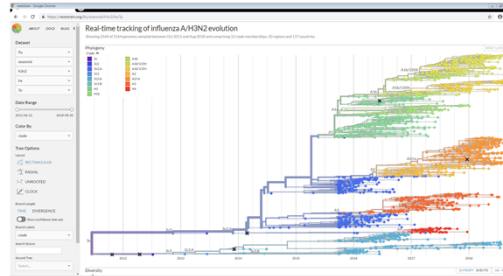
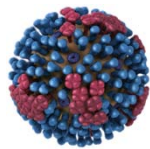


- Why include the original strain again?



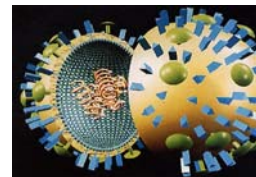
Why Perform Surveillance?

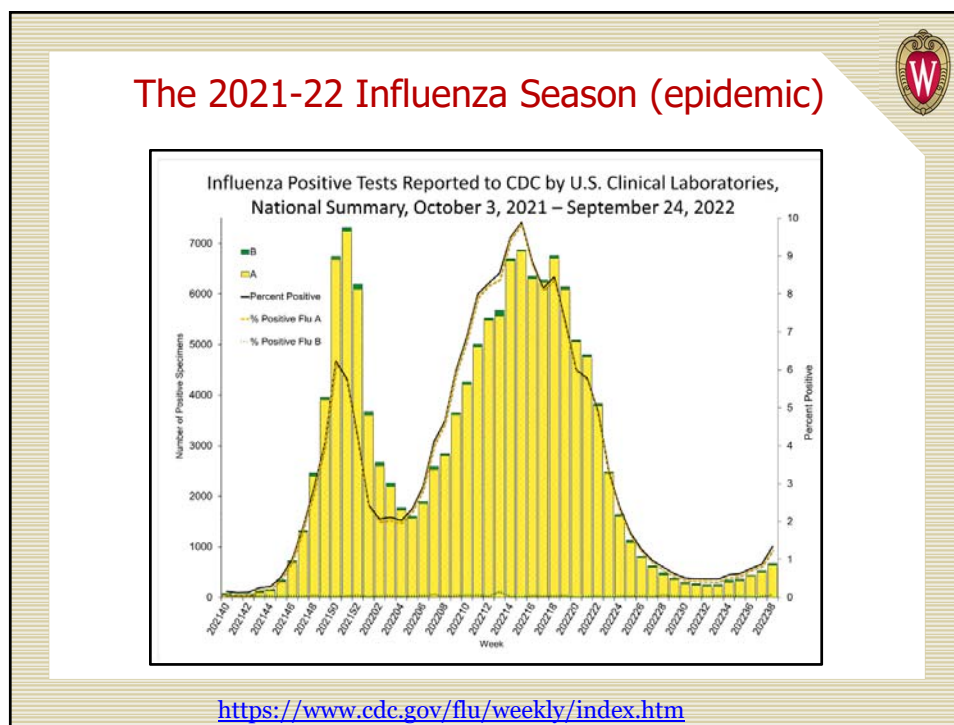
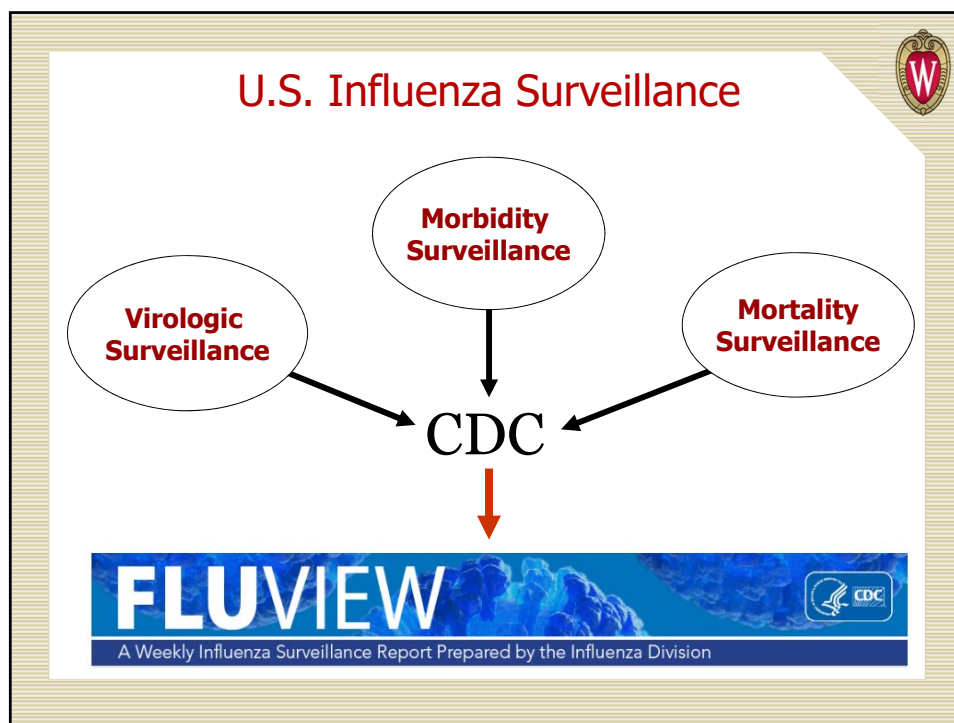
- Influenza
 - Track circulating strains to estimate vaccine match
 - Detect antiviral resistance
 - Isolate viruses for inclusion into future vaccines
 - Detect novel influenza viruses with pandemic potential



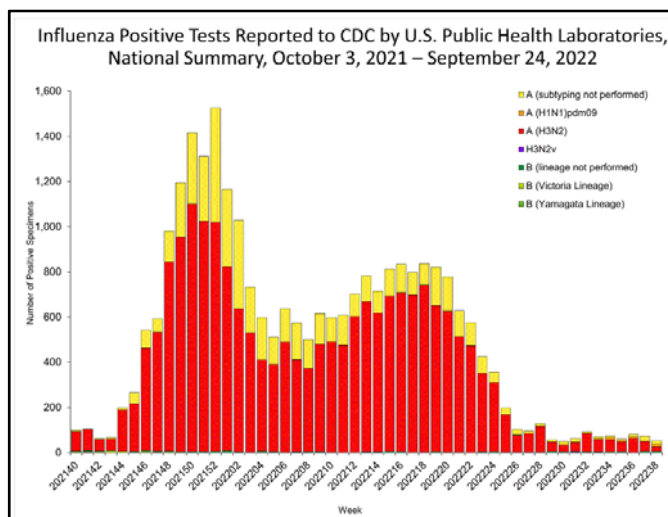
Influenza virus: Changeability is its hallmark

- 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





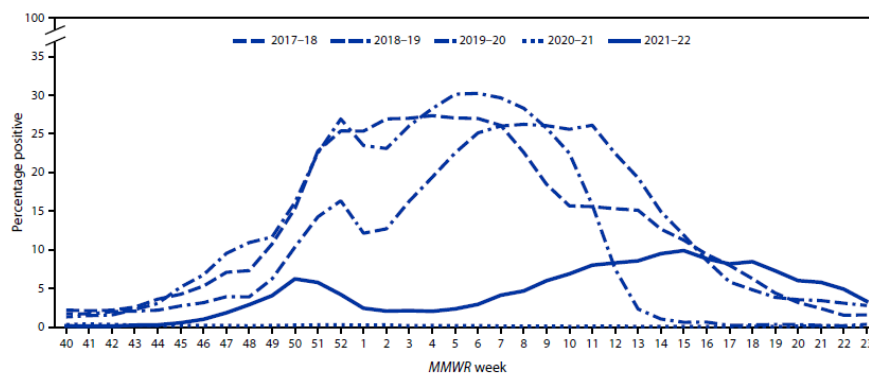
The 2021-22 Influenza Season



<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



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

BIOTECH

Racing Moderna, Pfizer starts phase 3 trial of mRNA flu vaccine

By Nick Paul Taylor · Sep 14, 2022 09:05am

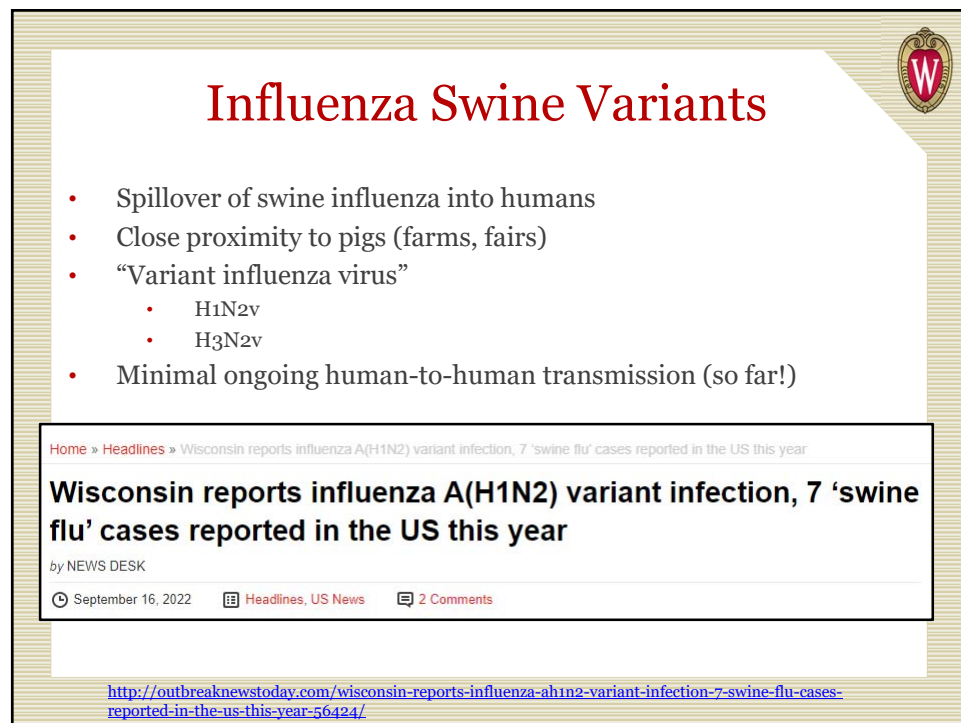
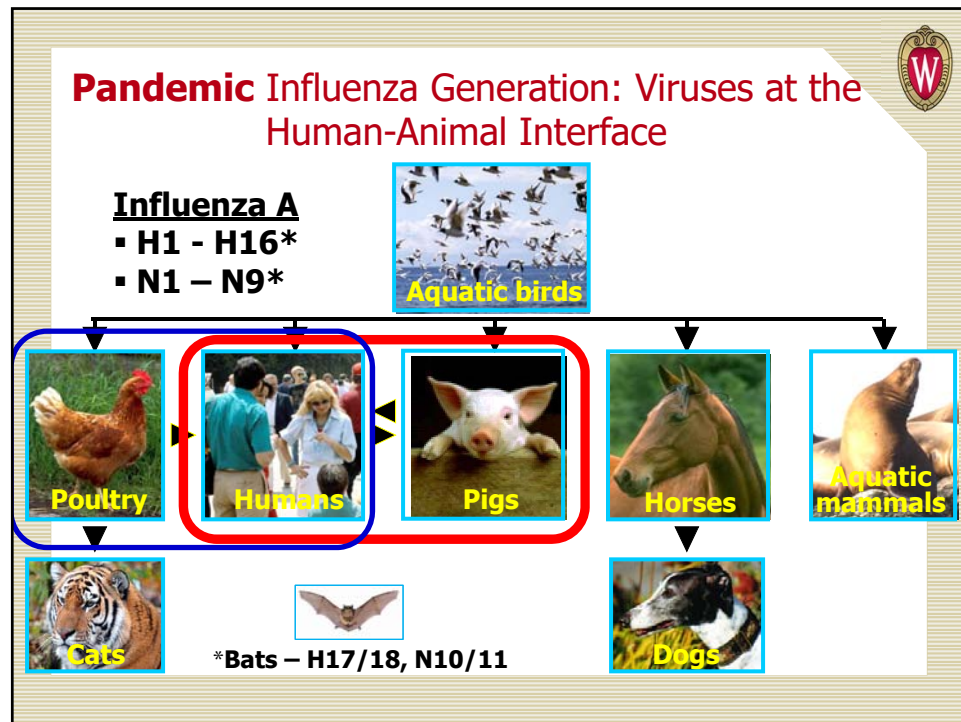
Pfizer

flu vaccine

messenger RNA

Moderna

<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>



Influenza Swine Variants – WSLH testing



Influenza A H1v & H3v Variant Virus Information

Influenza A (H1v/H3v) Variant Virus Testing



Influenza A (Unsubtypable) Notification Guidelines

Unsubtypable Influenza A Notification Guidance

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.

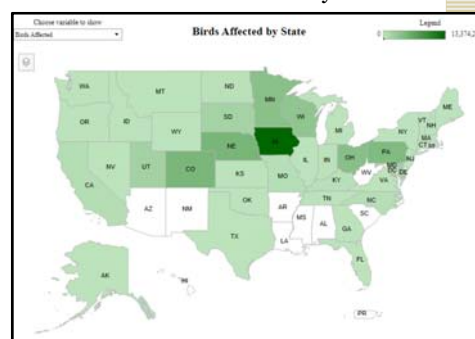
By Sarah Trent

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

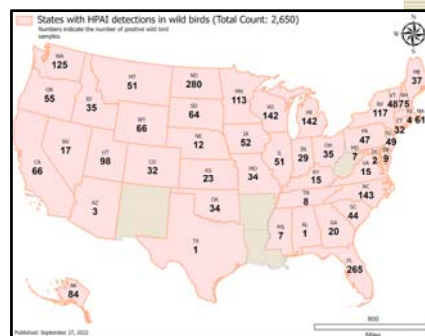


<https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/avian-influenza/hpai-2022/2022-hpai-commercial-backyard-flocks>

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



Laboratory Guidance for Testing for Avian Influenza

Specimen Collection for Avian Influenza 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

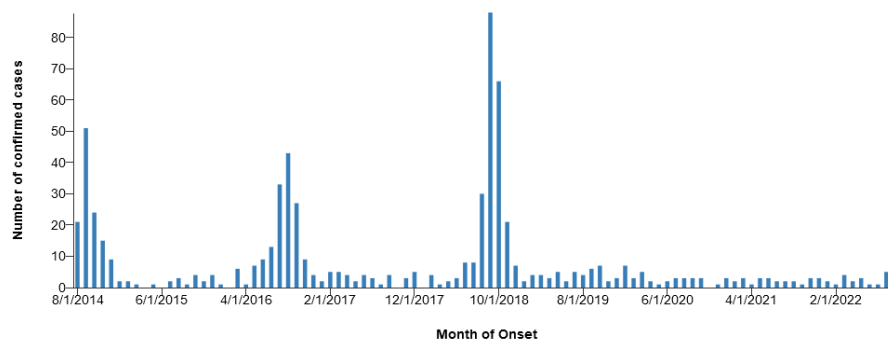
After-hours, ask for "Communicable Disease Epidemiologist on-call" at 608-258-0099

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

Acute Flaccid Myelitis (AFM)

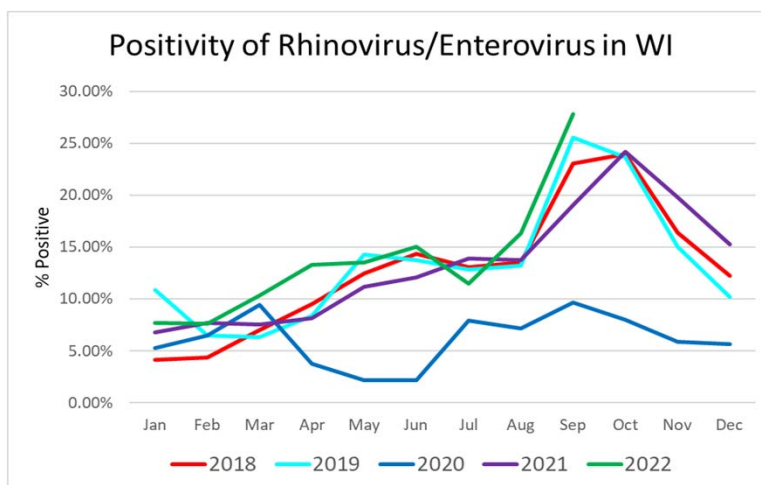


Confirmed AFM cases by CDC



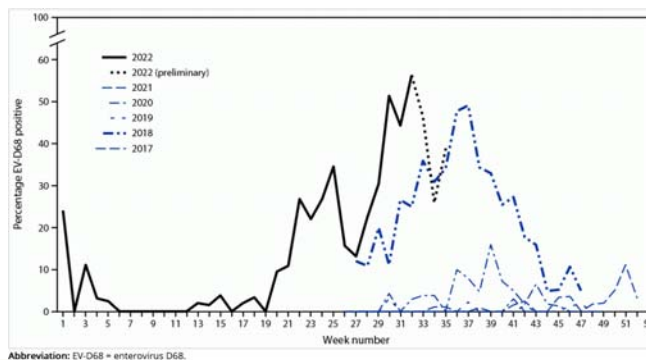
<https://www.cdc.gov/acute-flaccid-myelitis/cases-in-us.html>

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



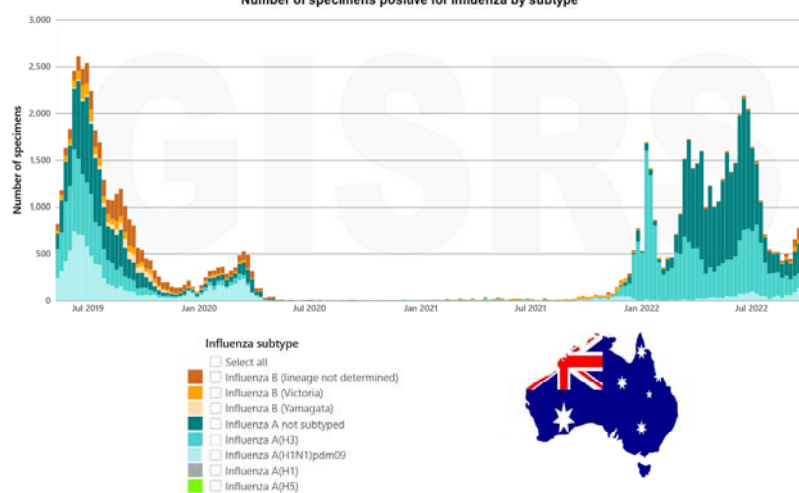
https://www.cdc.gov/mmwr/volumes/71/wr/mm7140e1.htm?s_cid=mm7140e1_x

Wisconsin Testing and Surveillance 2022-2023

WHO Global Influenza Surveillance and Response System (GISRS)

Southern hemisphere, 2019-22

Number of specimens positive for influenza by subtype



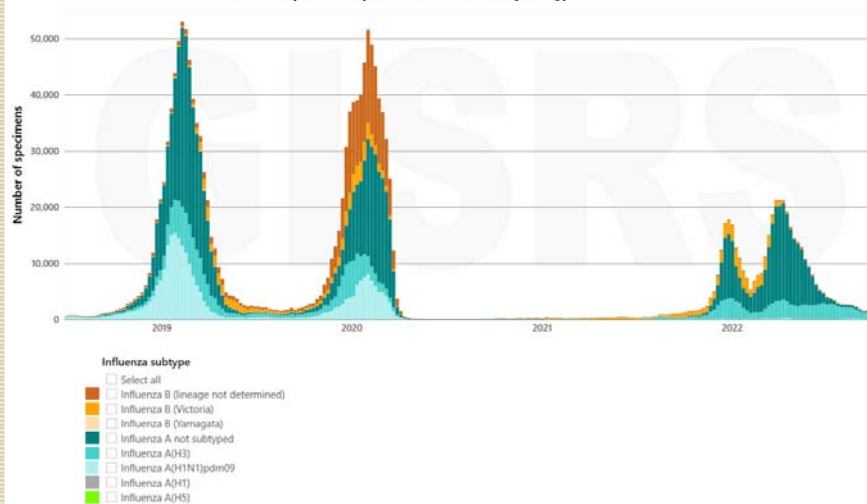
<https://apps.who.int/flumart/Default?ReportNo=5&Hemisphere=Southern>

WHO Global Influenza Surveillance and Response System (GISRS)



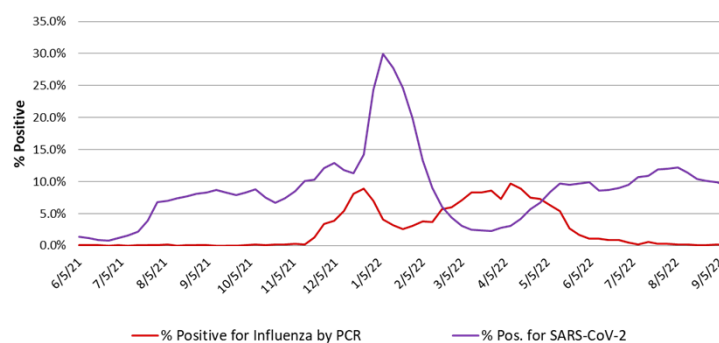
Northern hemisphere

Number of specimens positive for influenza by subtype



<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)		
<i>B. pertussis</i> and <i>parapertussis</i>		

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.

Reporting Your Results



For more information regarding reportable diseases, please see the following:

2. Fax Reporting:

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

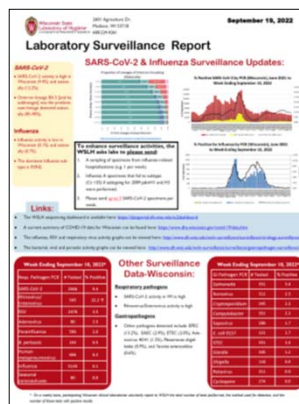
WI Respiratory Data Distribution

Wisconsin

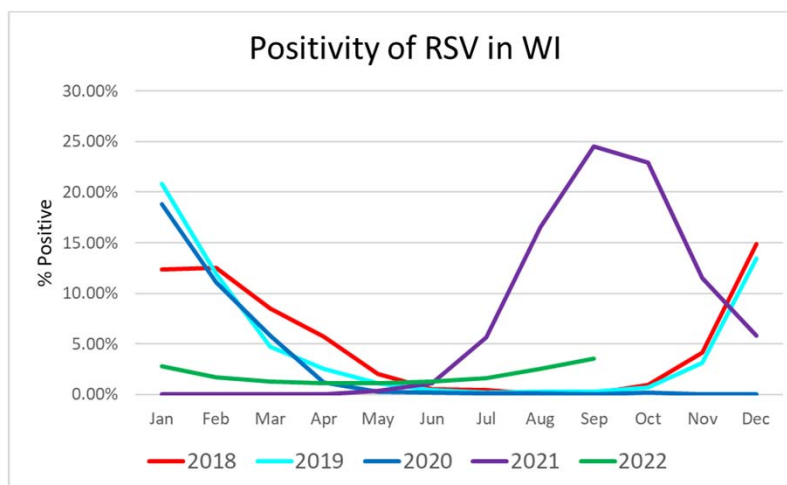
- Bi-weekly Laboratory Surveillance Report
Subscribe at: wcln@slh.wisc.edu
- Virus Activity Graphs:
<http://www.slh.wisc.edu/wcln-surveillance/surveillance/>
- DHS Weekly Respiratory Report

National

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



Surveillance for Other Respiratory Viruses



WISCONSIN STATE LABORATORY OF HYGIENE - UNIVERSITY OF WISCONSIN

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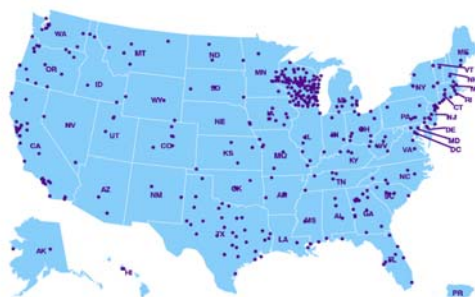
Aggregate data from Wisconsin Clinical Laboratories



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 unsubtypeable (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 all year.
 - ❑ Tested for influenza and SARS-CoV-2.
 - ❑ Subset tested with a 20-target respiratory pathogen panel




Submit the first 2 or 3 specimens per week from symptomatic patients 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	<u>ALL</u> influenza positives	First influenza A or B of the year	Influenza A positive specimens with: <ul style="list-style-type: none"> • International travel history • Swine exposure
PCR/Molecular	<u>ALL</u> influenza positives	<u>ALL</u> influenza Positives	One influenza-related hospitalization per week AND <u>Unsubtypable</u> influenza A positives (Ct < 35) AND Influenza A positive specimens with: <ul style="list-style-type: none"> • 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!!

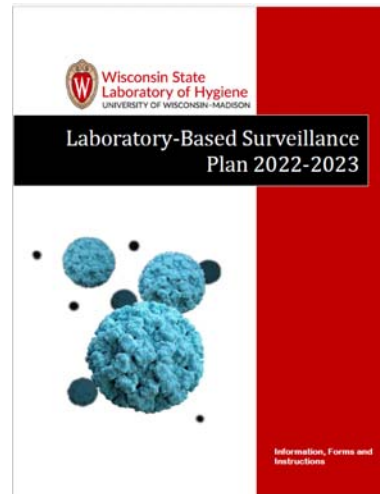


- Specimen collection supplies
 - VTM and swabs
- Shipping supplies
 - Insulated shippers
 - Cold packs
- Specimen submission forms

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

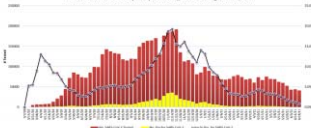
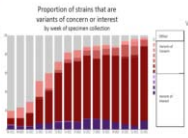
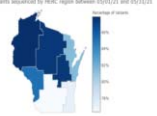
**Surveillance Data
Synopsis**

- 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

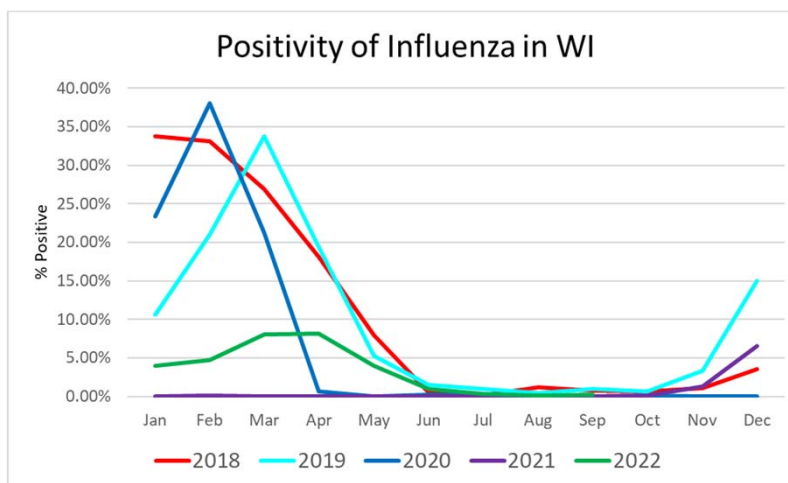
SARS-CoV-2 Update

- 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/wcsl-surveillance/surveillance/>

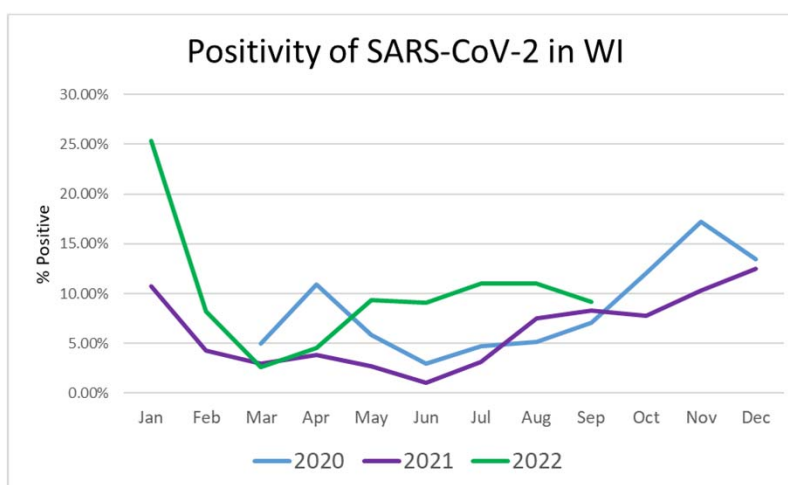
Surveillance for Other Respiratory Viruses



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Surveillance for Other Respiratory Viruses



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