SARS-CoV-2, Influenza, and other Respiratory Viruses Update - 2021

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Wisconsin State Laboratory of Hygiene

15 September 2021

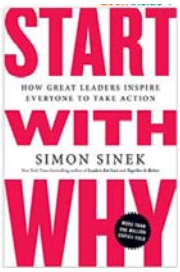
Your participation in the Wisconsin surveillance system is **vital** to monitor for emerging novel strains with pandemic potential and other pathogens that impact community health.

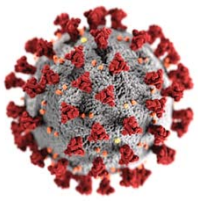
Outline and Learning Objectives

- Review of SARS-CoV-2 circulation and surveillance
- Review of influenza basics
- Review of the 2020-2021 respiratory virus season
- Influenza vaccine updates
- Describe why specimens and testing data are vital for public health programs
- Discuss respiratory virus surveillance strategy for 2021-2022

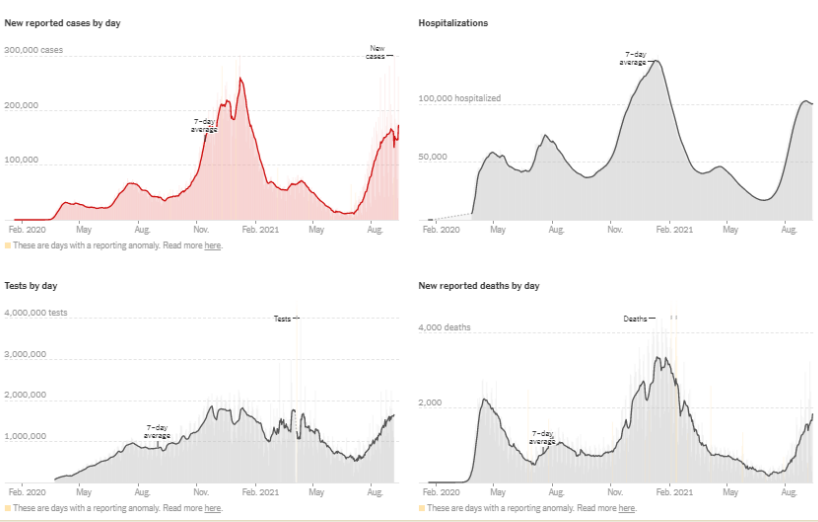
Why Perform Surveillance?

- Depends on the pathogen
- SARS-CoV-2:
  - Number of cases, hospitalizations, deaths
  - Geographic distribution
  - Age/gender distribution
  - Genomic surveillance
    - Track virus lineages/variants of interest and concern
    - Inform monoclonal antibody use



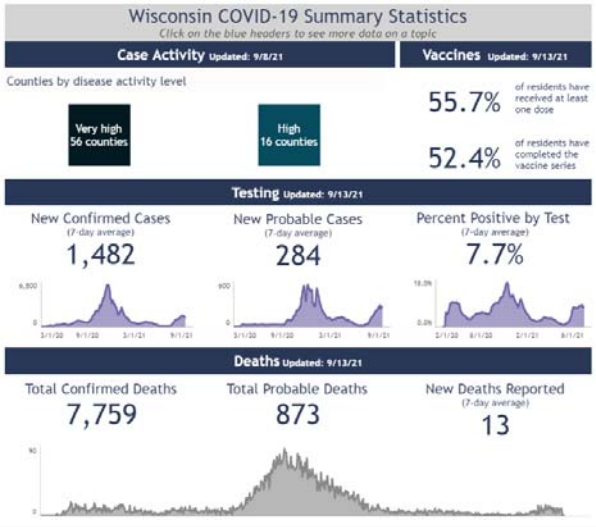


SARS-CoV-2 Surveillance



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

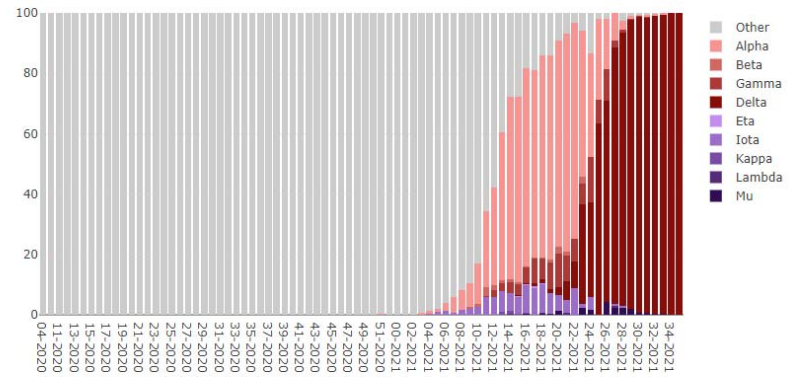
SARS-CoV-2 Surveillance



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

SARS-CoV-2 Surveillance

Proportion of Variants | Variants of Concern | Variants of Interest | Search Variants

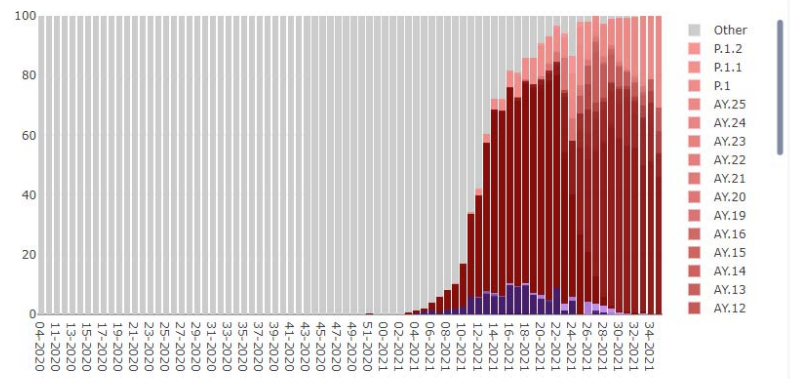


Proportion of sequenced strains that are variants, over time by sample collection date.

https://dataportal.slh.wisc.edu/sc2dashboard#tab-2341-2

SARS-CoV-2 Surveillance

Proportion of Variants | Variants of Concern | Variants of Interest | Search Variants



Proportion of sequenced strains that are variants, over time by sample collection date.

https://dataportal.slh.wisc.edu/sc2dashboard#tab-2341-2

SARS-CoV-2 Whole-genome Sequencing Through the Pandemic

- Began May 2020; low volume and used for outbreaks

Morbidity and Mortality Weekly Report

COVID-19 Outbreak at an Overnight Summer School Retreat — Wisconsin, July–August 2020

Ian W. Pray, PhD[1,2]; Suzanne N. Gibbons-Burgener, DVM, PhD[1]; Avi Z. Rosenberg, MD, PhD[3]; Devlin Cole, MD[1,4]; Shmuel Borenstein[5]; Allen Bateman, PhD[6]; Eric Pevzner, PhD[7]; Ryan P. Westergaard, MD, PhD[1,4]

Morbidity and Mortality Weekly Report

Rapid Spread of SARS-CoV-2 in a State Prison After Introduction by Newly Transferred Incarcerated Persons — Wisconsin, August 14–October 22, 2020

Rebecca B. Hershow, PhD[1,2,*]; Hannah E. Segaloff, PhD[1,2,3,*]; Abigail C. Shockey, PhD[4]; Kelsey R. Florek, PhD[4]; Sabrina K. Murphy, MD[3,5]; Weston DuBose, MPH[1]; Tammy L. Schaeffer[1]; Jo Anna Powell, MPH[1]; Krystal Gayle, MPH[1]; Lauren Lambert, MPH[1]; Amee Schwitters, PhD[1]; Kristie E.N. Clarke, MD[1]; Ryan Westergaard, MD, PhD[3,6]

SARS-CoV-2 Whole-genome Sequencing Through the Pandemic

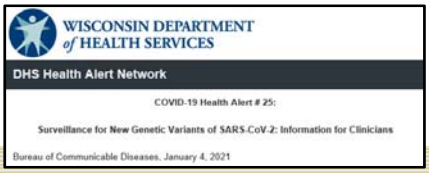
- December 2020: B.1.1.7 in the U.K.

https://www.npr.org/sections/goatsandsoda/2020/12/22/948961575/what-we-know-about-the-new-u-k-variant-of-coronavirus-and-what-we-need-to-find-o

SARS-CoV-2 Whole-genome Sequencing Through the Pandemic

SARS-CoV-2 WGS approach in Wisconsin

- Participate in CDC's NS3 program
- Overall approach: general and targeted
  - General
    - WSLH sequencing all PCR positives from diagnostic testing at WSLH
    - Request positives from clinical labs statewide
      - Selected clinical labs initially; then broadened to all labs
  - Targeted
    - WI DHS Department of health criteria to enrich for variant identification sent to WSLH: positive samples from individuals with
      - International travel
      - Vaccine failure
      - Prolonged infections
      - Suspected re-infections


WISCONSIN DEPARTMENT of HEALTH SERVICES

DHS Health Alert Network

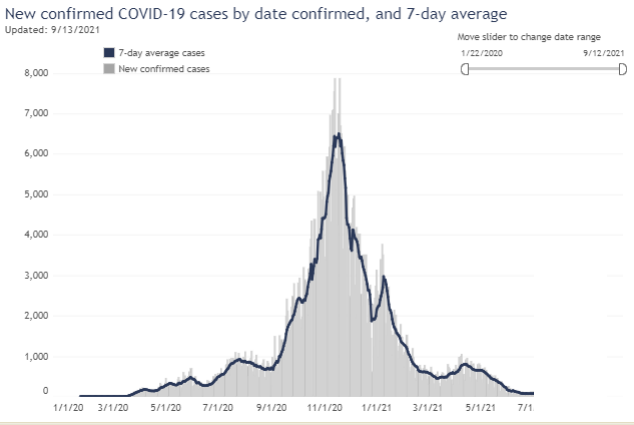
COVID-19 Health Alert # 25:

Surveillance for New Genetic Variants of SARS-CoV-2: Information for Clinicians

Bureau of Communicable Diseases, January 4, 2021

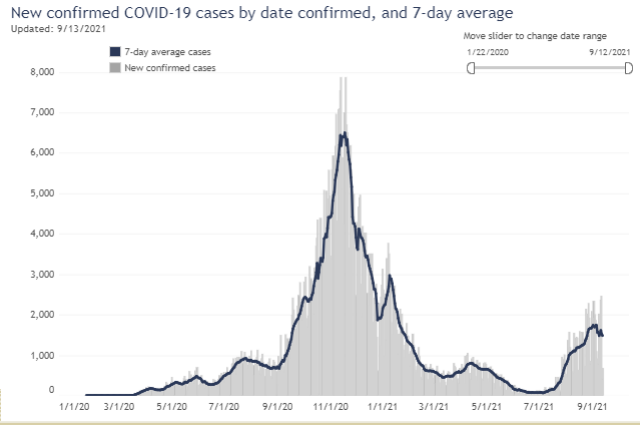
SARS-CoV-2 Whole-genome Sequencing Through the Pandemic

- June/early July 2021: request all positives



SARS-CoV-2 Whole-genome Sequencing Through the Pandemic

- August 2021: 10 per lab per week
- Now: 5 per lab per week



SARS-CoV-2 Whole-genome Sequencing Through the Pandemic

- 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

Thanks for your partnership in genomic surveillance!

Wisconsin State Laboratory of Hygiene
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Kits and Supplies: 800-862-1088

SARS-CoV-2 Ver. 1/2021

(Please type or print using black pen)

Patient Information

Name (Last, First):

Address:

City: State: Zip:

Account: 74200

Date of Birth: Gender: M F

Ethnicity: ☐ Hispanic/Latino ☐ Non-Hispanic

Race: ☐ Amer Indian ☐ Black/Afrian Amer ☐ White ☐ Asian ☐ Pacific Islander Other

Clinician:

Your Patient ID Number:

Your Specimen ID Number:

Date and Time Collected:

Specimen Type:
☐ Nasopharynx Swab
☐ Anterior Nares (Nasal) Swab
☐ Combined Throat/Nasopharynx Swab
☐ Throat Swab
☐ BAL
☐ Sputum
☐ Other

Test
☐ VR01745 – SARS-CoV-2 PCR (must meet WDPH criteria)
☐ VR01763 – SARS-CoV-2 Sequencing (must meet WDPH criteria OR be requested for surveillance)

SARS-CoV-2 PCR (check all that apply)

Pregnant: ☐ Yes ☐ No
Employed in a healthcare setting: ☐ Yes ☐ No
Has symptom related to COVID-19: ☐ Yes ☐ No
If symptomatic, date of onset:
Staff in a congregate care setting: ☐ Yes ☐ No
Resident in a congregate care setting: ☐ Yes ☐ No
Patient was hospitalized because of this condition: ☐ Yes ☐ No
If hospitalized, admitted to ICU: ☐ Yes ☐ No

SARS-CoV-2 Sequencing

- Only for previously PCR positive specimens
- Results are for surveillance only and will not be reported to submitters
- Optimal volume 1 mL

Postmortem: ☐ Yes

Vaccination History (COVID): Was patient vaccinated? ☐ Yes ☐ No ☐ Unknown
If Yes, date first vaccinated: / /

International Travel History (Places and dates):

WISCONSIN STATE LABORATORY OF HYGIENE USE ONLY
2019 Novel Coronavirus Suspect [74] *COVID Sequencing [78]*

SARS-CoV-2 Vaccines

Table. SARS-CoV-2 Vaccines

Vaccine	Manufacturer	Vaccine type	Antigen	Dose	Dosage	Storage conditions	Efficacy against severe COVID-19[a]	Overall efficacy	Current approvals
mRNA-1273	Moderna (US)	mRNA	Full-length spike (S) protein with proline substitutions	100 µg	2 Doses 28 d apart	−25° to −15 °C; 2-8 °C for 30 d; room temperature ≤12 h	100% 14 d After second dose (95% CI, not estimable to 1.00)	92.1% 14 d After 1 dose (95% CI, 68.8%-99.1%); 94.1% 14 d after second dose (95% CI, 89.3%-96.8%)	EUA: the US, EU, Canada, and UK
BNT162b2	Pfizer-BioNTech (US)	mRNA	Full-length S protein with proline substitutions	30 µg	2 Doses 21 d apart	−80° to −60 °C; 2-8 °C for 5 d; room temperature ≤2 h	88.9% After 1 dose (95% CI, 20.1%-99.7%)	52% After 1 dose (95% CI, 29.5%-68.4%); 94.6% 7 d after second dose (95% CI, 89.9%-97.3%)	EUA: the US, EU, Canada, and UK
Ad26.CoV2.S	Janssen/ Johnson & Johnson (US)	Viral vector	Recombinant, replication-incompetent human adenovirus serotype 26 vector encoding a full-length, stabilized SARS-CoV-2 S protein	5×10^{10} Viral particles	1 Dose	−20 °C; 2-8 °C for 3 mo	85% After 28 d; 100% after 49 d	72% in the US; 66% in Latin America; 57% in South Africa (at 28 d)	EUA: the US, EU, and Canada
ChAdOx1 (AZS1222)	AstraZeneca/ Oxford (UK)	Viral vector	Replication-deficient chimpanzee adenoviral vector with the SARS-CoV-2 S protein	5×10^{10} Viral particles (standard dose)	2 Doses 28 d apart (intervals >12 wk studied)	2-8 °C for 6 mo	100% 21 d After first dose	64.1% After 1 dose (95% CI, 50.5%-73.9%); 70.4% 14 d after second dose (95% CI, 54.6%-80.6%)	EUA: WHO/Covax, the UK, India, and Mexico
NVX-CoV2373	Novavax, Inc (US)	Protein subunit	Recombinant full-length, prefusion S protein	5 µg of protein and 50 µg of Matrix-M adjuvant	2 Doses	2-8 °C for 6 mo	Unknown	89.3% in the UK after 2 doses (95% CI, 75.2%-95.4%); 60% in South Africa (95% CI, 19.9%-80.1%)	EUA application planned
CVnCoV	CureVac/ GlaxoSmithKline (Germany)	mRNA	Prefusion stabilized full-length S protein of the SARS-CoV-2 virus	12 µg	2 Doses 28 d apart	2-8 °C for 3 mo; room temperature for 24 h	Unknown	Phase 3 trial ongoing	
Gam-COVID-Vac (Sputnik V)	Gamaleya National Research Center for Epidemiology and Microbiology (Russia)	Viral vector	Full-length SARS-CoV-2 glycoprotein S carried by adenoviral vectors	10^{11} Viral particles per dose for each recombinant adenovirus	2 Doses (first, rAd26; second, rAd5) 21 d apart	−18 °C (Liquid form); 2-8 °C (freeze dried) for up to 6 mo	100% 21 d After first dose (95% CI, 94.4%-100%)	87.6% 14 d After first dose (95% CI, 81.1%-91.8%); 91.1% 7 d after second dose (95% CI, 83.8%-95.1%)	EUA: Russia, Belarus, Argentina, Serbia, UAE, Algeria, Palestine, and Egypt
CoronaVac	Sinovac Biotech (China)	Inactivated virus	Inactivated CN02 strain of SARS-CoV-2 created from Vero cells	3 µg With aluminum hydroxide adjuvant	2 Doses 14 d apart	2-8 °C; Lifespan unknown	Unknown	Phase 3 data not published; reported efficacy 14 d after dose 2: 50.38% (mild) and 78% (mild to severe) in Brazil, 65% in Indonesia, and 91.25% in Turkey	EUA: China, Brazil, Columbia, Bolivia, Brazil, Chile, Uruguay, Turkey, Indonesia, and Azerbaijan
BBIBP-CorV	Sinopharm 1/2 (China)	Inactivated virus	Inactivated HB02 strain of SARS-CoV-2 created from Vero cells	4 µg With aluminum hydroxide adjuvant	2 Doses 21 d apart	2-8 °C; Lifespan unknown	Unknown	Phase 3 data not published; unpublished reports of 79% and 86% efficacy	EUA: China, UAE, Bahrain, Serbia, Peru, and Zimbabwe

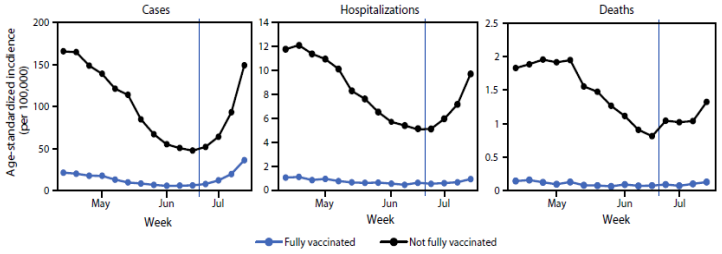
https://jamanetwork.com/journals/jama/fullarticle/2777059

SARS-CoV-2 Vaccines

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Early Release / Vol. 70
September 10, 2021

Monitoring Incidence of COVID-19 Cases, Hospitalizations, and Deaths, by Vaccination Status — 13 U.S. Jurisdictions, April 4–July 17, 2021

FIGURE 2. Weekly trends in age-standardized incidence* of COVID-19 cases, hospitalizations,† and deaths,§ by vaccination status¶ — 13 U.S. jurisdictions, April 4–July 17, 2021**



SARS-CoV-2 is a Systemic Infection

AMERICAN SOCIETY FOR MICROBIOLOGY | Clinical Microbiology Reviews
REVIEW
April 2021 Volume 34 Issue 2 e00133-20
https://doi.org/10.1128/CMR.00133-20

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2): a Systemic Infection

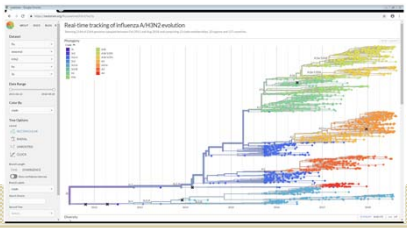
Aleksandra Synowiec [a], Artur Szczepański [a,b], Emilia Barreto-Duran [a], Laurensius Kevin Lie [a], Krzysztof Pyrc [a]

[a]Virogenetics Laboratory of Virology, Malopolska Centre of Biotechnology, Jagiellonian University, Krakow, Poland
[b]Microbiology Department, Faculty of Biochemistry, Biophysics and Biotechnology, Jagiellonian University, Krakow, Poland

SUMMARY To date, seven identified coronaviruses (CoVs) have been found to infect humans; of these, three highly pathogenic variants have emerged in the 21st century. The newest member of this group, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first detected at the end of 2019 in Hubei province, China. Since then, this novel coronavirus has spread worldwide, causing a pandemic; the respiratory disease caused by the virus is called coronavirus disease 2019 (COVID-19). The clinical presentation ranges from asymptomatic to mild respiratory tract infections and influenza-like illness to severe disease with accompanying lung injury, multiorgan failure, and death. Although the lungs are believed to be the site at which SARS-CoV-2 replicates, infected patients often report other symptoms, suggesting the involvement of the gastrointestinal tract, heart, cardiovascular system, kidneys, and other organs; therefore, the following question arises: is COVID-19 a respiratory or systemic disease? This review aims to summarize existing data on the replication of SARS-CoV-2 in different tissues in both patients and *ex vivo* models.

Why Perform Surveillance?

- Influenza and other respiratory viruses
  - Situational awareness of what is circulating, to inform clinical decision-making and public health response
- 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

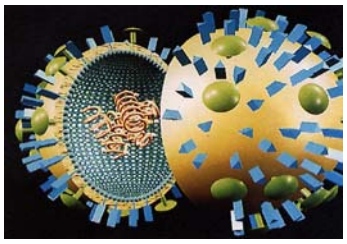


Added Importance of Influenza Surveillance this Year

- Anticipated co-circulation of influenza and SARS-CoV-2
  - Similar presentations to clinicians
  - Need to distinguish for treatment decisions, accurate surveillance and public health decision making
  - Surveillance for SARS-CoV-2 may limit routine influenza testing
- Potential for severe influenza season:
  - Waning immunity in all populations
  - Increased demand on the healthcare system
- Limited data on influenza and SARS-CoV-2 co-infections
- Influenza vaccine uptake and timing with COVID-19 booster

Influenza virus: Changeability is its hallmark

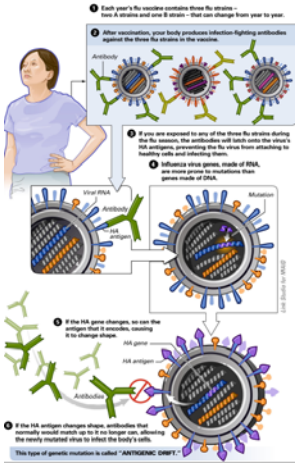
- Influenza **types** A, B, C and D
  - A and B are major human pathogens
- Negative-sense segmented RNA genome
  - 10 major proteins
- Two major surface proteins of A and B viruses: Hemagglutinin (HA) and Neuraminidase (NA)
  - Nomenclature
  - Role in pathogenesis
  - Defines **subtypes**



The Changeability of Influenza

Antigenic Drift →Seasonal Influenza

Antigenic Drift
Manifests in HA and NA as a result of continuous and gradual accumulation of point mutations in the HA and NA genes within a subtype



www.cdc.gov/flu

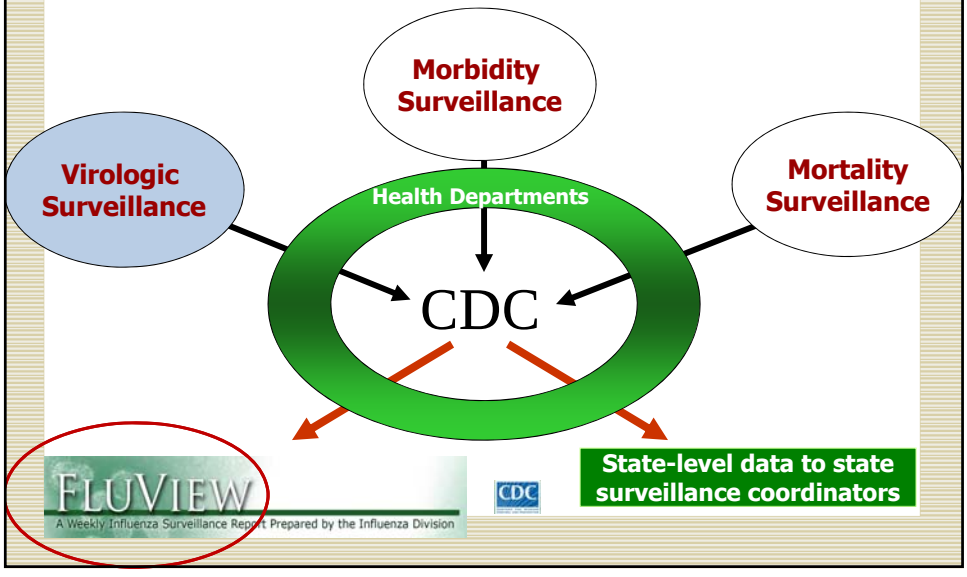
The Annual Impact of Seasonal Influenza

In a given season, 5-20% of community may experience illness

*The top range of these burden estimates are from the 2017-2018 flu season. These are preliminary and may change as data are finalized.

U.S. Influenza Surveillance

www.cdc.gov/flu/weekly/overview.htm



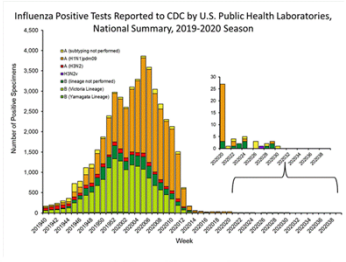
Influenza Virologic Surveillance

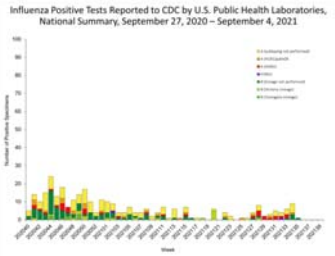
How we monitor the virus

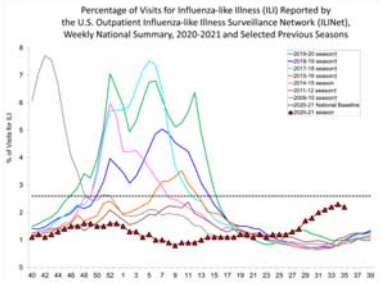
- Provide situational awareness
  - **Clinical lab testing data ⟶ CDC**
    Via PHL or directly
- **Detect novel or reassortant viruses**
- Inform vaccine strain selection
- Detect and monitor antiviral resistance
  - **Specimens from clinical labs → PHL → NIRC→ CDC**

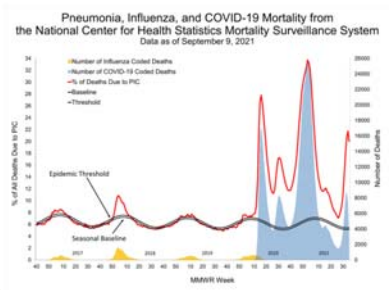
FLUVIEW
A Weekly Influenza Surveillance Report Prepared by the Influenza Division

The 2020-21 Influenza (non-)Season



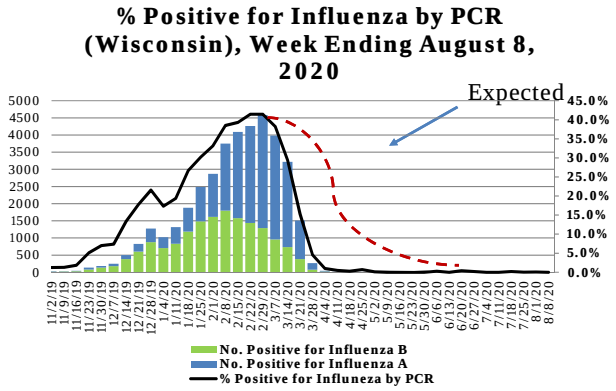






https://www.cdc.gov/flu/weekly/index.htm

2019-2021 Seasonal Influenza Activity, Wisconsin



Influenza Vaccines

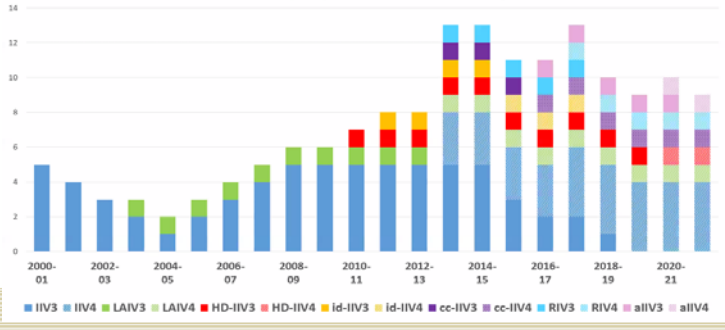
2021–22 ACIP Influenza Statement

Core recommendation (unchanged):

- Annual influenza vaccination is recommended for all persons aged 6 months and older who do not have contraindications.

U.S. Seasonal Influenza Vaccines Since 2000-2001

Number of unique products available by season



Influenza Vaccines 2021-2022

TABLE 1. Influenza vaccines — United States, 2021–22 influenza season*

Trade name (manufacturer)	Presentations	Age indication	µg HA (IIV4s and RIV4) or virus count (LAIV4) for each vaccine virus (per dose)	Route	Mercury (from thimerosal, if present), µg/0.5 mL
IIV4 (standard-dose, egg-based vaccines†)					
Afluria Quadrivalent (Seqirus)	0.25-mL PFS§	6 through 35 mos§	7.5 µg/0.25 mL	IM¶	—
	0.5-mL PFS§	≥3 yrs§	15 µg/0.5 mL	IM¶	—
	5.0-mL MDV§	≥6 mos§ (needle/syringe) 18 through 64 yrs (jet injector)	15 µg/0.5 mL	IM¶	24.5
Fluarix Quadrivalent (GlaxoSmithKline)	0.5-mL PFS	≥6 mos	15 µg/0.5 mL	IM¶	—
FluLaval Quadrivalent (GlaxoSmithKline)	0.5-mL PFS	≥6 mos	15 µg/0.5 mL	IM¶	—
Fluzone Quadrivalent (Sanofi Pasteur)	0.5-mL PFS**	≥6 mos**	15 µg/0.5 mL	IM¶	—
	0.5-mL SDV**	≥6 mos**	15 µg/0.5 mL	IM¶	—
	5.0-mL MDV**	≥6 mos**	15 µg/0.5 mL 7.5 µg/0.25 mL	IM¶	25
ccIIV4 (standard-dose, cell culture–based vaccine)					
Flucelvax Quadrivalent (Seqirus)	0.5-mL PFS	≥2 yrs	15 µg/0.5 mL	IM¶	—
	5.0-mL MDV	≥2 yrs	15 µg/0.5 mL	IM¶	25
HD-IIV4 (high-dose, egg-based vaccine†)					
Fluzone High-Dose Quadrivalent (Sanofi Pasteur)	0.7-mL PFS	≥65 yrs	60 µg/0.7 mL	IM¶	—
aIIV4 (standard-dose, egg-based† vaccine with MF59 adjuvant)					
Fluad Quadrivalent (Seqirus)	0.5-mL PFS	≥65 yrs	15 µg/0.5 mL	IM¶	—
RIV4 (recombinant HA vaccine)					
Flublok Quadrivalent (Sanofi Pasteur)	0.5-mL PFS	≥18 yrs	45 µg/0.5 mL	IM¶	—
LAIV4 (egg-based vaccine†)					
FluMist Quadrivalent (AstraZeneca)	0.2-mL prefilled single-use intranasal sprayer	2 through 49 yrs	$10^{6.5–7.5}$ fluorescent focus units/0.2 mL	NAS	—

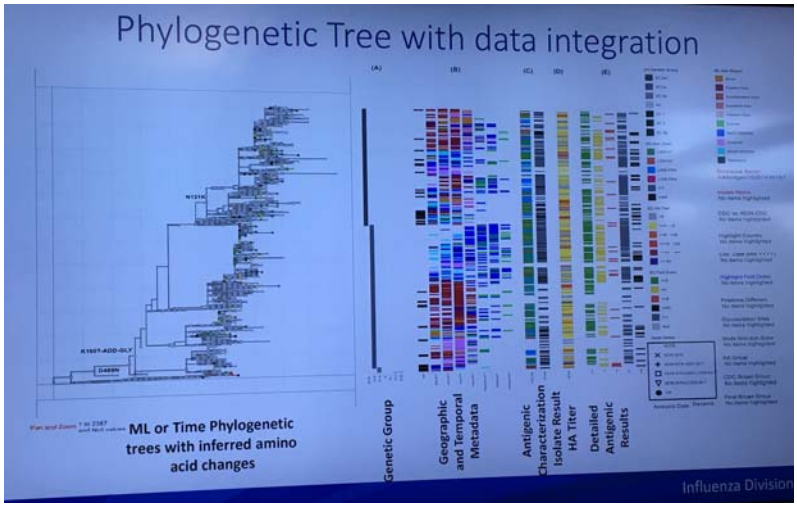
IIV: inactivated influenza vaccine (many)
LAIV: live-attenuated influenza vaccine (one)
RIV: recombinant influenza vaccine (one)

2021–22 Influenza Vaccine Composition

- ***Egg-based IIV4s and LAIV4***:
  - An A/Victoria/2570/2019 (H1N1)pdm09-like virus; UPDATED
  - An A/Cambodia/e0826360/2020 (H3N2)-like virus; UPDATED
  - A B/Washington/02/2019 (Victoria lineage)-like virus; and
  - A B/Phuket/3073/2013 (Yamagata lineage)-like virus.
- ***Cell-culture-based IIV4 and RIV4***:
  - An A/Wisconsin/588/2019 (H1N1)pdm09-like virus; UPDATED
  - An A/Cambodia/e0826360/2020 (H3N2)-like virus; UPDATED
  - A B/Washington/02/2019 (Victoria lineage)-like virus; and
  - A B/Phuket/3073/2013 (Yamagata lineage)-like virus.

IIV: inactivated influenza vaccine (many)
LAIV: live-attenuated influenza vaccine (one)
RIV: recombinant influenza vaccine (one)

Seasonal Influenza – Choosing Vaccine Strains



CDC Influenza Division presentation, August 13, 2021

Coadministration of Influenza Vaccines with COVID-19 Vaccines

- ACIP influenza statement cites current *Interim Clinical Considerations for Use of COVID-19 Vaccines Currently Approved or Authorized in the United States:*
  - States that COVID-19 vaccines may be administered without regard to timing of other vaccines.
  - Vaccines administered at the same visit should be given at different sites (separated by an inch or more, if possible).
  - If COVID-19 vaccines are given with vaccines that might be more likely to cause a local reaction (e.g., high-dose or adjuvanted influenza vaccines), administer in separate limbs, if possible.

REUTERS®

Healthcare & Pharmaceuticals

Moderna working on combination COVID-19 vaccine booster and flu shot

By Michael Erman and Manojna Maddipatla

https://www.reuters.com/business/healthcare-pharmaceuticals/moderna-developing-single-dose-combination-vaccine-covid-19-flu-2021-09-09/

Influenza Vaccine 2021-22

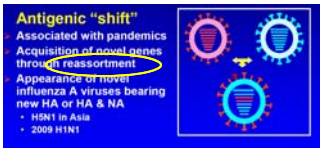
In light of the ongoing SARS-CoV-2 pandemic, more important than ever to get your flu vaccine!

Influenza at the Human-Animal Interface

Influenza A
- **H1 - H16***
- **N1 – N9***

*Bats – H17/18, N10/11

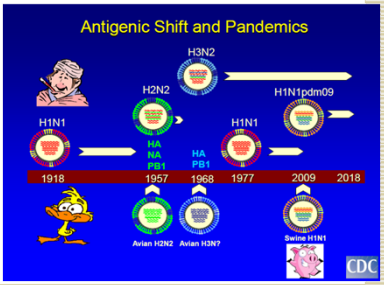
The Changeability of Influenza
Antigenic Shift → Pandemic Influenza



Replication in Humans

Efficient and sustained human-to-human transmission

Pandemic Influenza

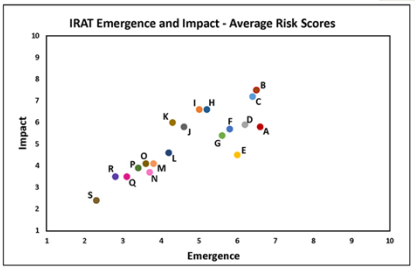


Influenza Risk Assessment Tool - IRAT

- A global public health tool to prioritize pandemic preparedness activities
  - Evaluates risk from novel viruses currently circulating in animals, i.e. in pre-pandemic period
- Assess potential pandemic risk for:
  - Emergence of a novel influenza virus in humans
    - Human-to-human transmission
  - Public health impact
    - Severity
- The IRAT can prioritize readiness activities
  - Diagnostics, reagents, vaccines and antivirals development
  - Stockpiling and deployment
- The IRAT cannot predict the next pandemic strain

CDC. https://www.cdc.gov/flu/pandemic-resources/monitoring/irat.htm

A Global Tool for Pandemic Preparedness



	Virus	Emergence Score	Impact Score
A	A(H3N2) variant [A/Ohio/13/2017]	6.6	5.8
B	A(H7N9) [A/Hong Kong/125/2017]	6.5	7.5
C	A(H7N9) [A/Shanghai/02/2013]	6.4	7.2
D	A(H9N2) Y280 lineage [A/Anhui-Lujiang/13/2018]	6.2	5.9
E	A(H3N2) variant [A/Indiana/08/2011]	6.0	4.5
F	A(H1N2) variant [A/California/62/2018]	5.8	5.7
G	A(H9N2) G1 lineage [A/Bangladesh/0994/2011]	5.6	5.4
H	A(H5N1) Clade 1 [A/Vietnam/1203/2004]	5.2	6.6
I	A(H5N6) [A/Yunnan/14564/2015] – like	5.0	6.6
J	A(H7N7) [A/Netherlands/219/2003]	4.6	5.8
K	A(H10N8) [A/Jiangxi-Donghu/346/2013]	4.3	6.0
L	A(H5N8) [A/gyrfalcon/Washington/41088/2014]	4.2	4.6
M	A(H5N2) [A/Northern pintail/Washington/40964/2014]	3.8	4.1
N	A(H3N2) [A/canine/Illinois/12191/2015]	3.7	3.7
O	A(H5N1) [A/American green-winged teal/Washington/1957050/2014]	3.6	4.1
P	A(H7N8) [A/turkey/Indiana/1573-2/2016]	3.4	3.9
Q	A(H7N9) [A/chicken/Tennessee/17-007431-3/2017]	3.1	3.5
R	A(H7N9) [A/chicken/Tennessee/17-007147-2/2017]	2.8	3.5
S	A(H1N1) [A/duck/New York/1996]	2.3	2.4

CDC Influenza Risk Assessment

- CDC Influenza Risk Assessment Tool (IRAT)
  - Ten elements of the virus, population, and animal/human ecology are evaluated to develop a score

Virus	1. Genomic variation 2. Receptor binding 3. Transmission in Laboratory animals 4. Antivirals and Treatment Options
Population	5. Existing Population Immunity 6. Disease Severity and Pathogenesis 7. Antigenic Relationship to Vaccine Candidates
Ecology	8. Global Geographic Distribution 9. Infection in Animals, Human Risk of Infection 10. Human Infections and Transmission

Weekly U.S. Influenza Surveillance Report

FLUVIEW

A Weekly Influenza Surveillance Report Prepared by the Influenza Division

Note: CDC is tracking the COVID-19 pandemic in a weekly publication called COVID Data Tracker Weekly Review.

2020-2021 Influenza Season for Week 32, ending August 14, 2021

Novel Influenza A Virus

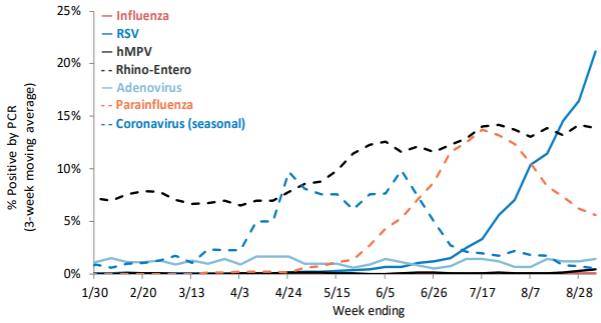
Two human infections with a novel influenza A virus were reported by Wisconsin. Both individuals were infected with influenza A(H1N1) variant (A(H1N1)v) virus. Both patients were ≥18 years of age. One patient was hospitalized, and both have completely recovered from their illness. Investigation into the source of the infections revealed that prior to illness onset both patients attended the same county fair where swine were being exhibited. No human-to-human transmission of (A(H1N1)v) virus associated with either patient has been identified.

Surveillance for Other Respiratory Viruses

Division of Public Health | Respiratory Virus Surveillance Report | Week 35: Ending September 4, 2021

WISCONSIN LABORATORY SURVEILLANCE FOR RESPIRATORY VIRUSES BY PCR

Trends in respiratory virus activity by PCR

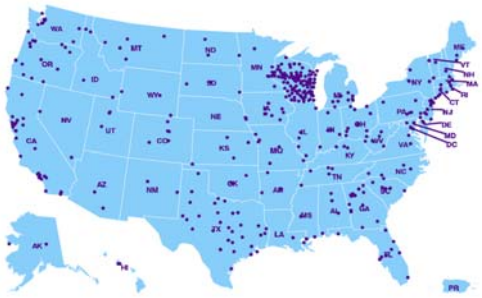


Aggregate data from Wisconsin Clinical Laboratories

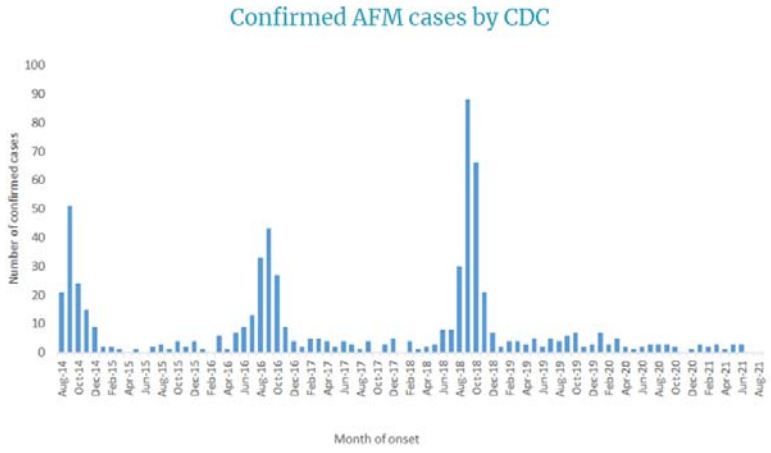
CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Map of Participating Labs

The National Respiratory and Enteric Virus Surveillance System (NREVSS)



Acute Flaccid Myelitis (AFM)



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

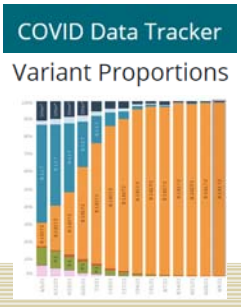
Virus Activity Resources

Wisconsin

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

National

- FluView (CDC)
- COVID Data Tracker (CDC) **NEW!**
- NREVSS (CDC)



Wisconsin Testing and Surveillance 2021-2022

Possible Impacts of COVID on flu testing

- Lab supply chain shortages and disruptions
- Managing multiple testing platforms
- Less staffing resources for flu and other diagnostic testing
- Coordinating specimen types
- Trend toward testing asymptomatics

Impacts on surveillance: a public health concern

WSLH Testing Strategy for Influenza and SARS-CoV-2

- Implemented CDC Multiplex PCR assay in September 2020
  - Flu A, Flu B, SARS-CoV-2
- Surveillance testing & outbreak response for suspected influenza or SARS-CoV-2
- Looking to onboard Hologic Panther multiplex test if/when reagents available
- Many commercial manufacturers have developed multiplex tests

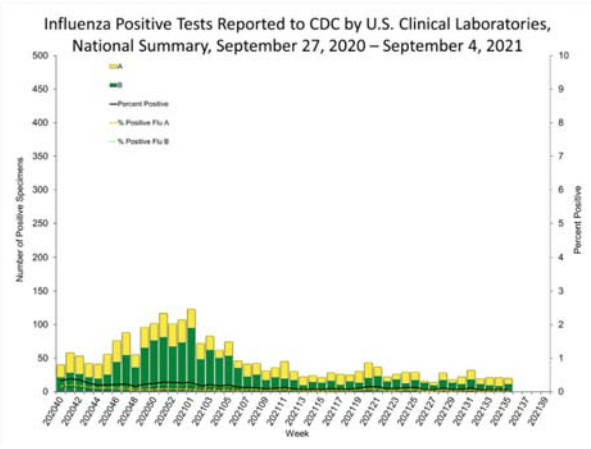
Influenza subtyping

2021-2022 Strategy

- Characterize H1 and H3 subtypes and B lineage (B/Victoria vs. B/Yamagata)
- Select samples based upon CDC criteria
  - May not be on 100% of positive specimens submitted
- Reporting to labs may be LDT or FDA
  - depends on nucleic acid extraction throughput needed

Influenza and other respiratory virus activity this coming season

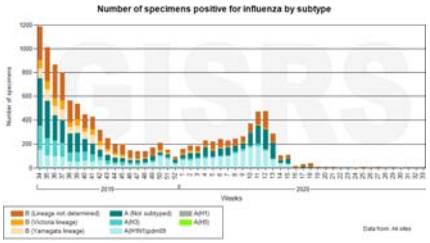
Early in 2021-2022 season……

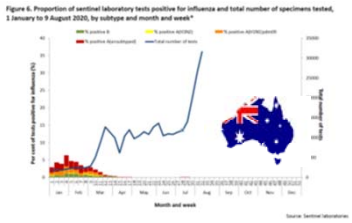


https://www.cdc.gov/flu/weekly/index.htm

WHO Global Influenza Surveillance and Response System (GISRS)

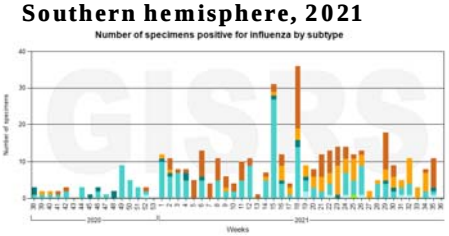
Southern hemisphere, 2020





Source: Australian Influenza Surveillance Report No. 9 (2020)

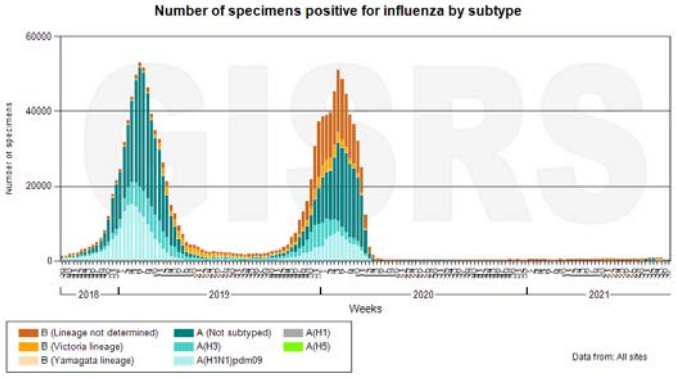
Southern hemisphere, 2021



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

WHO Global Influenza Surveillance and Response System (GISRS)

Northern hemishere



PUBLIC HEALTH

SCIENTIFIC AMERICAN.

Flu Has Disappeared for More Than a Year

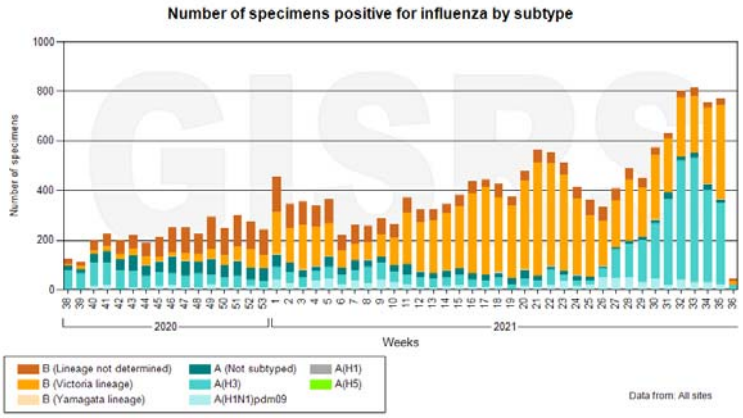
Mask wearing, social distancing and other steps to stop COVID-19 have also curtailed influenza

By Katie Peek on April 29, 2021

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

WHO Global Influenza Surveillance and Response System (GISRS)

Northern hemisphere, 2021



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

Circulation of influenza, RSV, and SARS-CoV-2: an uncertain season ahead

"We could get RSV, influenza, and SARS-CoV-2 circulating at the same time, and we just do not know how that is going to play out"

Lancet Respir Med 2021

Published **Online**
August 6, 2021
https://doi.org/10.1016/S2213-2600(21)00364-7

For the **Academy of Medical Sciences report** see https://acmedsci.ac.uk/file-download/4747802

Respiratory Pathogen Surveillance in Wisconsin

2021-2022 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

Multi-element approach

1. Rapid Influenza Diagnostic Testing (RIDT) Sites
   - Now ~50% of influenza testing in WI
   - Confirmatory testing during periods of low prevalence may be warranted
   - Please notify WSLH of suspected performance issues (e.g. False positives/negatives)

Influenza Surveillance in Wisconsin

Multi-element approach

2. Enrolled Surveillance Sites
   - 17 labs in 5 public health regions.
   - Provide randomized specimens weekly.
   - Provided a "blue" specimen submission form.

Request to continue to submit the first 2 or 3 specimens per week from symptomatic patients with influenza test requests to WSLH.

Influenza Surveillance in Wisconsin

Multi-element approach

3. PCR Labs
   - "Gold Standard" testing.
   - Provide weekly testing data summary reports.
   - **Provide early season influenza positive specimens**

Request to report both the *number positive* and the *number tested* weekly.
**Send Flu A unsubtypable specimens when subtyping for both 2009 H1N1 and seasonal H3 were attempted (Ct<35).

Influenza Surveillance in Wisconsin

Multi-element approach

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

Request to up to 3 specimens per week for respiratory pathogen testing and characterization.

Laboratory-based Surveillance

All Clinical Laboratories performing influenza diagnostic testing please send positives

After activity increases:
- Send those with international travel histories
- *Up to one* influenza-related hospitalization per week
- Unusual presentations/results
- Contact with swine/ sick or dead poultry
- Pediatric deaths

Summary of Influenza Surveillance Activities

PCR Labs & RIDT Sites

- Early season positive influenza specimens
- Continue to report testing data weekly

Enrolled Regional Surveillance Sites

- Send the first 2 to 3 specimens/week

University Health Clinics

- Send up to 3 specimens per week

All labs: Please continue to send all positive influenza specimens while influenza transmission is low.

WSLH has Influenza Surveillance Supplies!!

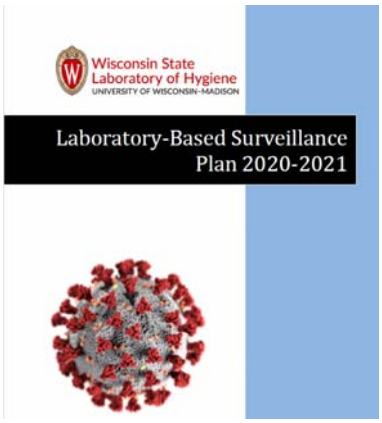
- Specimen collection supplies
  - VTM and swabs
- Shipping supplies
  - Insulated shippers
  - Cold packs
- Specimen submission forms

Contact our Clinical Orders Department at

800-862-1088

Laboratory-based Surveillance Plan

- 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