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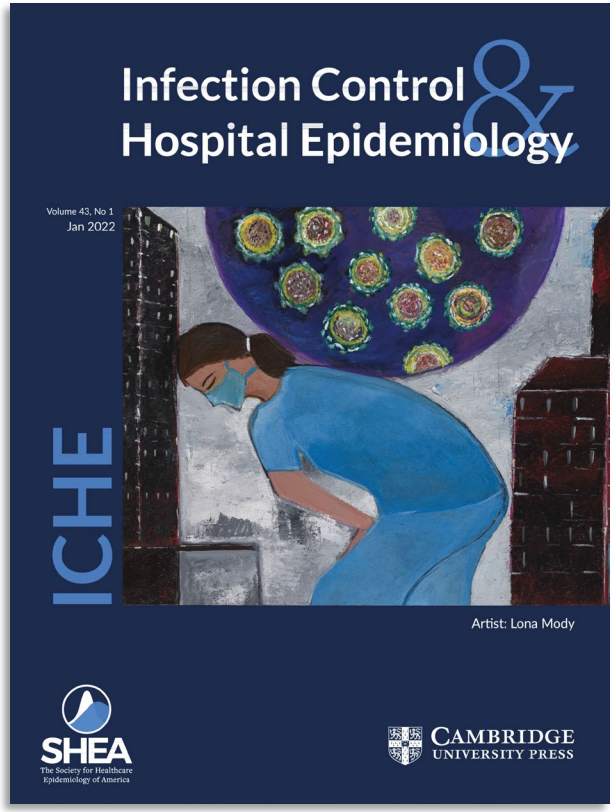

Infection Control & Hospital Epidemiology publishes scientifically authoritative, clinically applicable, peer-reviewed research on control and evaluation of the transmission of pathogens in healthcare institutions and on the use of epidemiological principles and methods to evaluate and improve the delivery of care. Major topics covered include infection control practices, surveillance, antimicrobial stewardship, cost-benefit analyses, resource use, occupational health, and regulatory issues.

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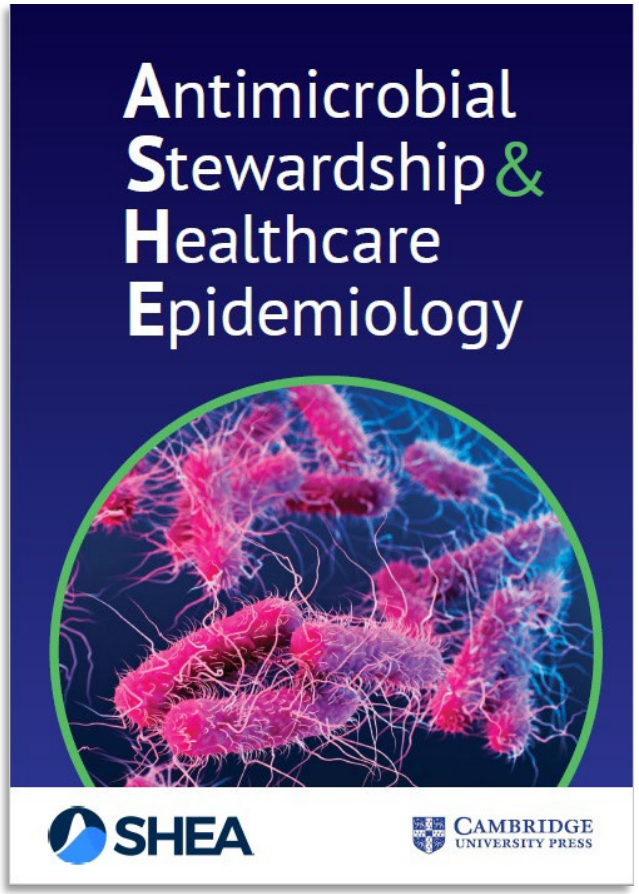
ASHE JOURNAL



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SHEA Webinar

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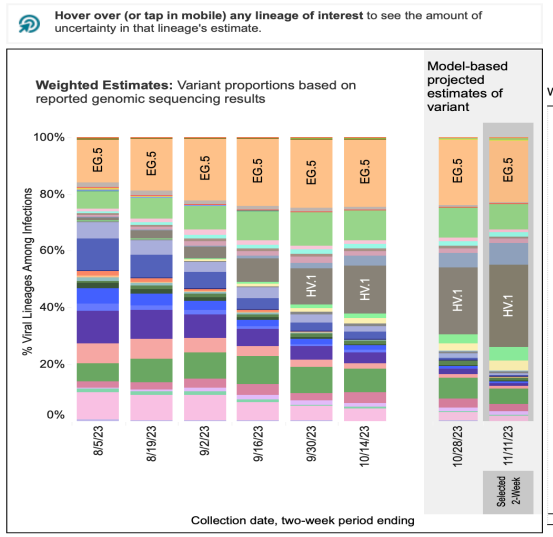
- Webinar recording, PowerPoint presentation, and references available on LearningCE
- Streaming Live on SHEA's Facebook page
- Zoom Q&A and Chat

SHEA Town Hall 93
Overview

SARS-CoV-2 VARIANTS, US, CDC

Weighted and Nowcast Estimates in United States for 2-Week Periods in 7/23/2023 – 11/11/2023

Nowcast Estimates in United States for 10/29/2023 – 11/11/2023



USA

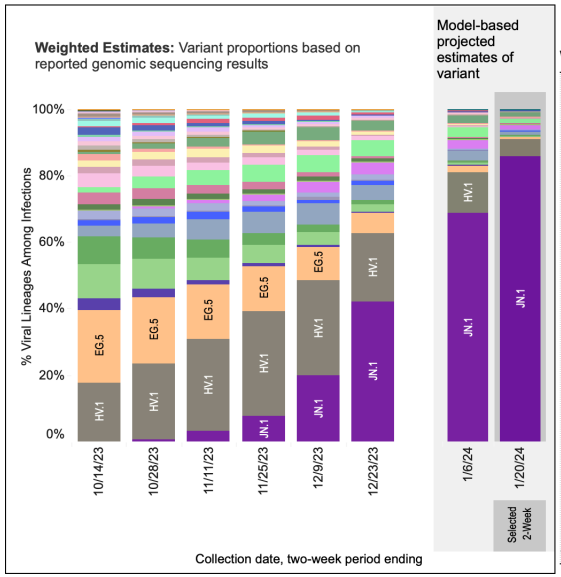
WHO label	Lineage #	%Total	95%PI
Omicron	HV.1	29.0%	26.0-32.1%
	EG.5	21.7%	19.3-24.2%
	FL.1.5.1	9.3%	8.0-10.8%
	HK.3	7.8%	6.2-9.9%
	XBB.1.16.6	5.6%	4.7-6.6%
	JD.1.1	4.6%	3.4-6.1%
	JF.1	3.5%	2.7-4.5%
	XBB.1.16.11	2.5%	2.0-3.2%
	XBB.2.3	1.9%	1.5-2.3%
	GK.1.1	1.6%	1.2-2.3%
	HF.1	1.4%	0.9-2.1%
	XBB.1.16.15	1.4%	1.0-1.9%
	XBB.1.16	1.2%	0.9-1.6%
	XBB.1.5.70	1.2%	0.6-2.2%
	BA.2	1.0%	0.5-2.1%
	GE.1	0.9%	0.6-1.3%
	XBB.1.16.1	0.8%	0.6-1.1%
	XBB	0.8%	0.6-1.0%
	GK.2	0.6%	0.5-0.9%
	EG.6.1	0.5%	0.3-0.7%
	XBB.1.5	0.3%	0.2-0.4%
	XBB.1.9.1	0.3%	0.2-0.4%
	XBB.1.42.2	0.2%	0.1-0.3%
	XBB.1.5.68	0.2%	0.1-0.3%
	XBB.1.9.2	0.2%	0.1-0.2%
	XBB.1.5.72	0.2%	0.1-0.2%
	CH.1.1	0.2%	0.1-0.3%
	XBB.2.3.8	0.1%	0.0-0.2%
	XBB.1.5.10	0.1%	0.0-0.1%
	XBB.1.5.59	0.0%	0.0-0.1%
	FD.1.1	0.0%	0.0-0.0%
	XBB.1.5.1	0.0%	0.0-0.0%
	FE.1.1	0.0%	0.0-0.0%
	EU.1.1	0.0%	0.0-0.0%
Other	Other*	1.1%	0.6-2.0%

* Enumerated lineages are US VOC and lineages circulating above 1% nationally in at least one 2-week period. "Other" represents the aggregation of lineages which are circulating <1% nationally during all 2-w periods displayed.
# BA.1, BA.3 and their sublineages (except BA.1.1 and its sublineages) are aggregated with B.1.1.529. Except BA.2.12.1, BA.2.75, XBB and their sublineages, BA.2 sublineages are aggregated with BA.2. Excep BA.2.75.2, CH.1.1 and BN.1, BA.2.75 sublineages are aggregated with BA.2.75. Except BA.4.6, sublineages of BA.4 are aggregated to BA.4. Except BF.7, BF.11, BA.5.2.6, BQ.1 and BQ.1.1, sublineages of BA.5 an aggregated to BA.5. Except the lineages shown and their sublineages, sublineages of XBB are aggregated to XBB. Except XBB.1.5.1,XBB.1.5.10,FD.2,EU.1.1,XBB.1.5.68 and XBB.1.5.70 sublineages of XBB.1.5 an aggregated to XBB.1.5. Except FL.1.5.1, sublineages of XBB.1.9.1 are aggregated to XBB.1.9.1. Except XBB.1.16.1,XBB.1.16.11,XBB.1.16.15 sublineages of XBB.1.16 are aggregated to XBB.1.16, sublineages c XBB.1.42.2 are aggregated to XBB. Except FE.1.1, sublineages of XBB.1.18.1 are aggregated to XBB. For all the other lineages listed, their sublineages are aggregated to the listed parental lineages respectively Previously, FL.1.5.1, GE.1, EG.6.1 and HV.1, FD.1.1, XBB.2.3.8, HF.1, GK.2, GK.1.1, HK.3, JD.1.1, JF.1 was aggregated to XBB.1.9.1, XBB.2.3.10, XBB.1.9.2, XBB.1.5.15, XBB.2.3, XBB.1.16.13, XBB.1.5.70, XBB.1.9.2.5.1.1, XBB.1.5.102 and XBB.1.16.6 respectively. Lineages BA.2.75.2, XBB, XBB.1.5 , XBB.1.5.1, XBB.1.5.10, FD.2, XBB.1.9.1, XBB.1.9.2, XBB.1.16, XBB.1.16.1, XBB.2.3, BN.1, BA.4.6, BF.7, BF.11, BA.5.2.6 ,BQ.1.1, EU.1.1, XBB.1.5.68, FE.1.1, EG.5, XBB.1.5.72 , FL.1.5.1, GE.1, EG.6.1,XBB.1.16.11, FD.1.1, XBB.1.5.70, XBB.2.3.8, HV.1, XBB.1.42.2, GK.2, HF.1, XBB.1.16.15, GK.1.1, HK.3, JF.1 contain the s

Data from 7/22/2023 – 11/11/2023

Weighted and Nowcast Estimates in United States for 2-Week Periods in 10/1/2023 – 1/20/2024

Nowcast Estimates in United States for 1/7/2024 – 1/20/2024



USA

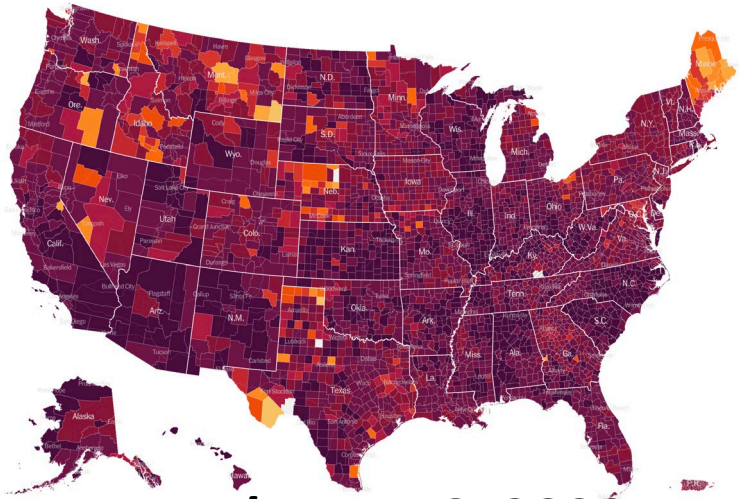
WHO label	Lineage #	%Total	95%PI
Omicron	JN.1	85.7%	82.9-88.2%
	HV.1	5.3%	4.4-6.4%
	JD.1.1	1.6%	1.4-2.0%
	BA.2.86	1.5%	1.1-2.1%
	JG.3	1.5%	1.2-1.9%
	HK.3	1.5%	1.2-1.8%
	EG.5	0.6%	0.5-0.8%
	GE.1	0.4%	0.1-1.5%
	JF.1	0.2%	0.2-0.3%
	FL.1.5.1	0.2%	0.2-0.3%
	EG.5.1.8	0.2%	0.2-0.3%
	BA.2	0.1%	0.0-0.6%
	XBB.1.16.6	0.1%	0.1-0.2%
	XBB.1.16.17	0.1%	0.1-0.3%
	XBB.1.5.70	0.1%	0.1-0.2%
	XBB.1.16.11	0.1%	0.1-0.1%
	GK.1.1	0.1%	0.1-0.1%
	XBB	0.1%	0.0-0.1%
	XBB.1.9.1	0.1%	0.0-0.1%
	HF.1	0.1%	0.0-0.1%
	XBB.1.16.15	0.1%	0.0-0.1%
	XBB.2.3	0.0%	0.0-0.1%
	XBB.1.16	0.0%	0.0-0.0%
	GK.2	0.0%	0.0-0.0%
	CH.1.1	0.0%	0.0-0.0%
	XBB.1.5	0.0%	0.0-0.0%
	EG.6.1	0.0%	0.0-0.0%
	XBB.1.16.1	0.0%	0.0-0.0%
	XBB.1.5.68	0.0%	0.0-0.0%
	XBB.1.9.2	0.0%	0.0-0.0%
	XBB.2.3.8	0.0%	0.0-0.0%
	XBB.1.42.2	0.0%	0.0-0.0%
	XBB.1.5.72	0.0%	0.0-0.0%
	XBB.1.5.59	0.0%	0.0-0.0%
Other	Other*	0.0%	0.0-0.0%

* Enumerated lineages are US VOC and lineages circulating above 1% nationally in at least one 2-week period. "Other" represents the aggregation of lineages which are circulating <1% nationally during all 2-wee periods displayed.
# While all lineages are tracked by CDC, those named lineages not enumerated in this graphic are aggregated with their parent lineages, based on Pango lineage definitions, described in more detail here: https://www.pango.network/the-pango-nomenclature-system/statement-of-nomenclature-rules/.

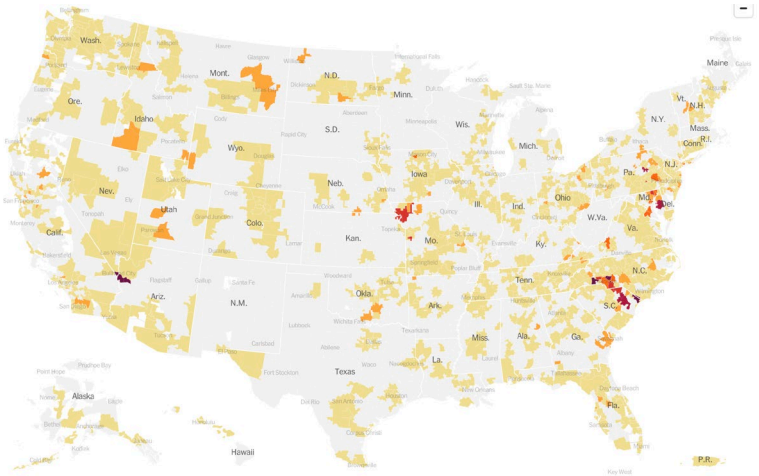
Data from 10/1/23 – 1/20/2024

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

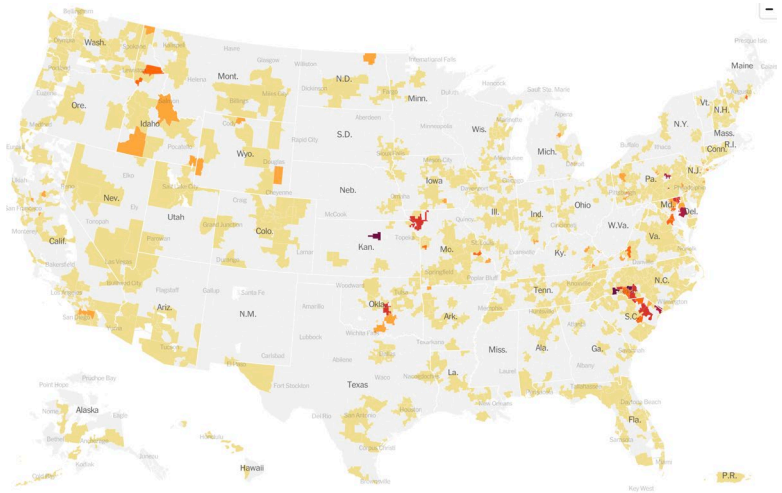
US COVID-19 HOTSPOTS



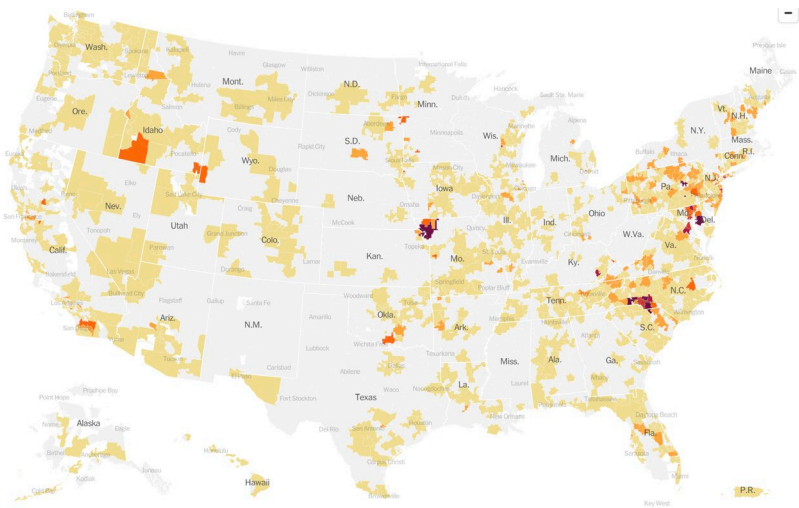
February 6, 2022



October 22, 2023



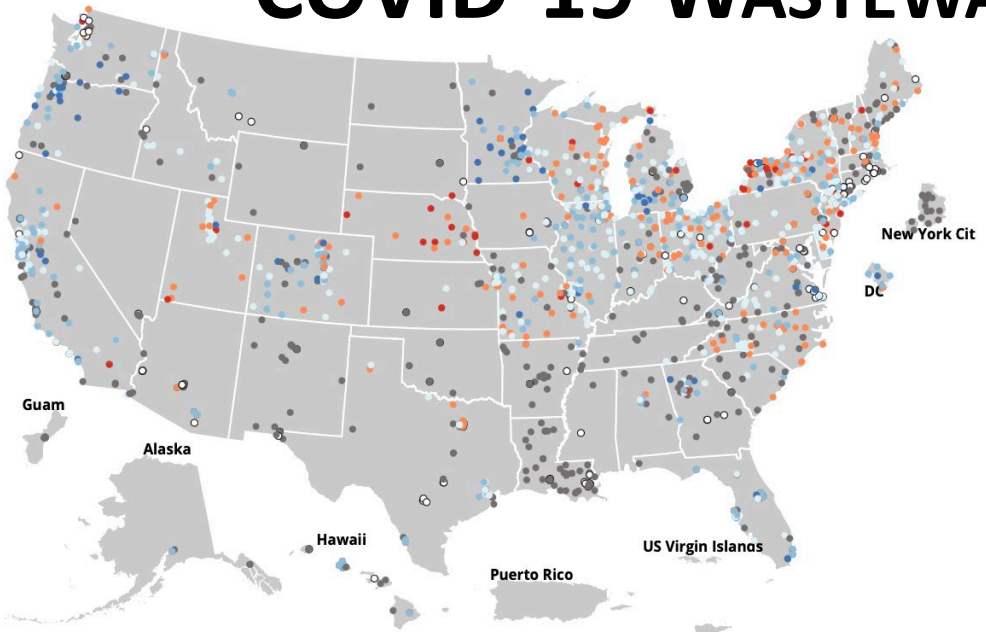
November 17, 2023



February 2, 2023

Source: New York Times https://www.nytimes.com/interactive/2023/us/covid-cases.html 11-17-2023

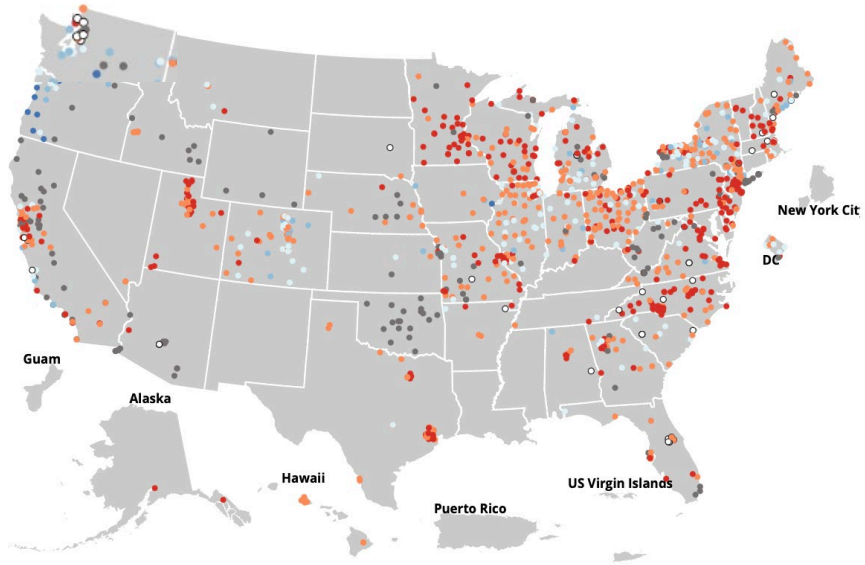
COVID-19 WASTEWATER SURVEILLANCE



Current virus levels category	Num. sites	% sites	Category change in last 7 days
New Site	138	11	1%
0% to 19%	81	6	– 17%
20% to 39%	328	26	– 6%
40% to 59%	438	35	– 3%
60% to 79%	227	18	4%
80% to 100%	41	3	0%

November 17, 2023

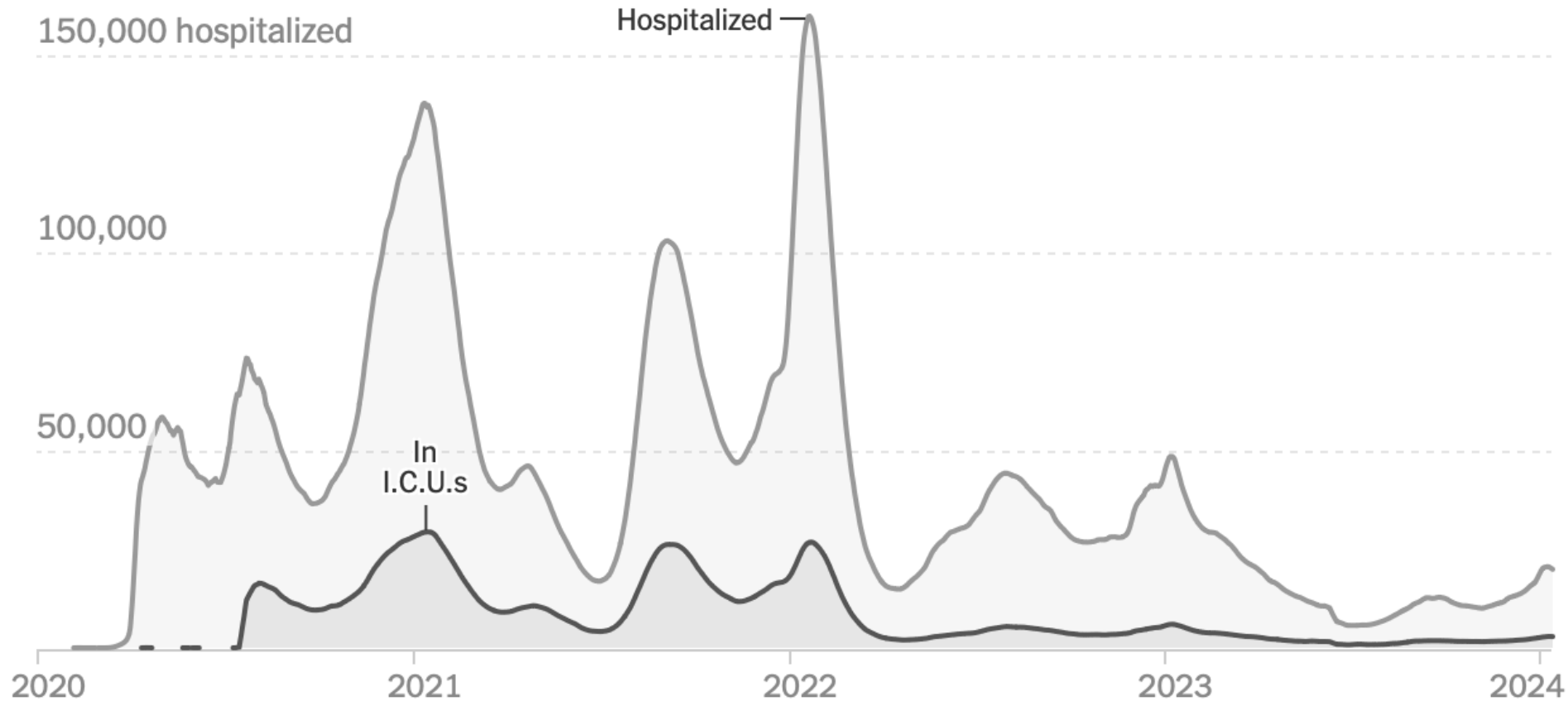
Current virus levels category	Num. sites	% sites	Category change in last 7 days
New Site	37	3	9%
0% to 19%	13	1	8%
20% to 39%	65	6	63%
40% to 59%	191	17	18%
60% to 79%	472	41	– 3%
80% to 100%	371	32	– 24%



February 2, 2024

Source: *CDC – https://covid.cdc.gov/covid-data-tracker/#wastewater-surveillance Accessed 2-2-2024*

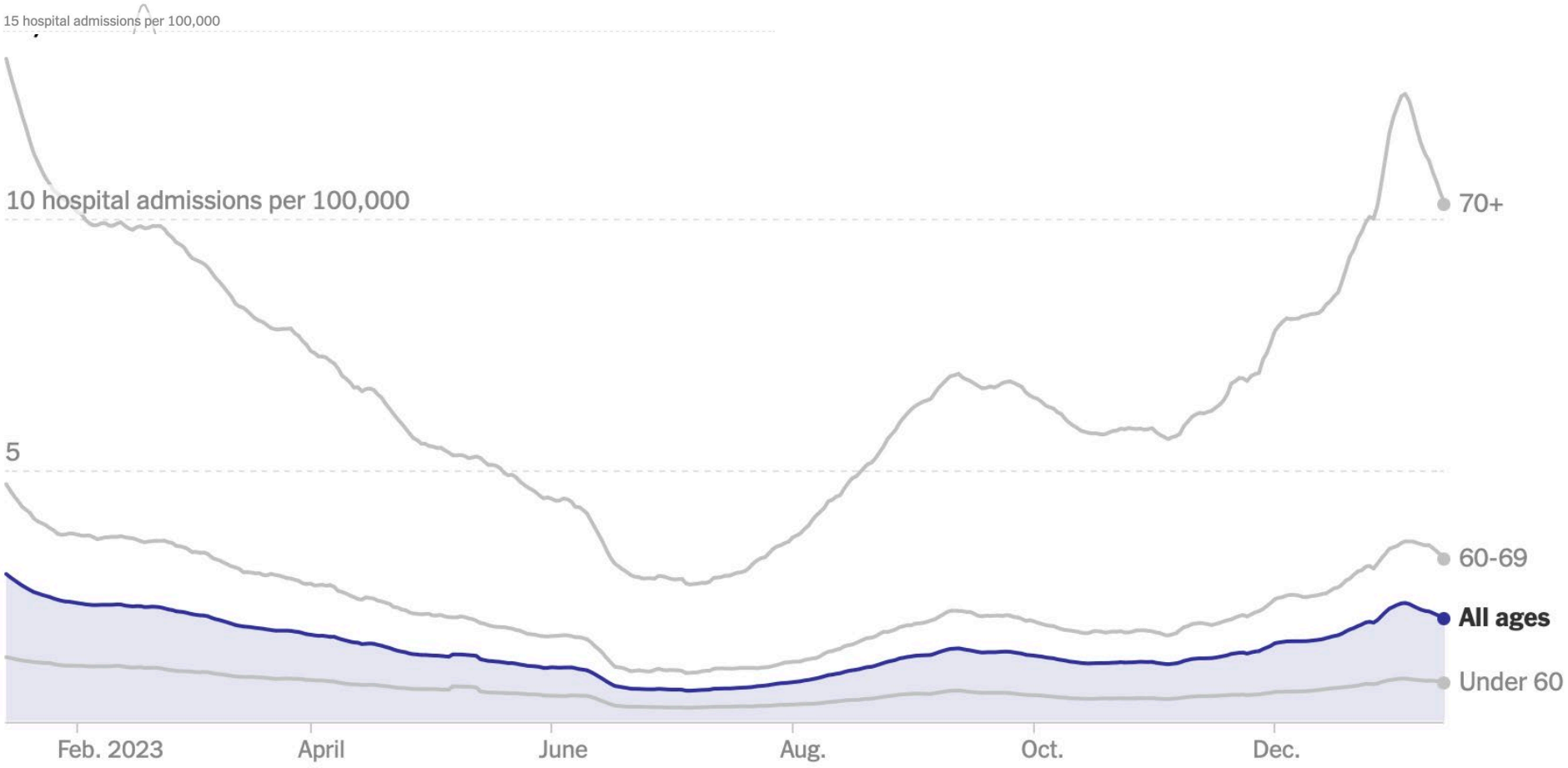
HOSPITALIZATIONS AND ICU HOSPITALIZATIONS FOR COVID-19 IN THE UNITED STATES



Hospitalizations increased by 86.4% from our last Town Hall
ICU admissions increased by 72.5% from our last Town Hall

Source: ***https://www.nytimes.com/interactive/2023/us/covid-cases.html*** ***accessed 2-2-24***

COVID-19 Daily Hospital Admissions in the United States, by Age



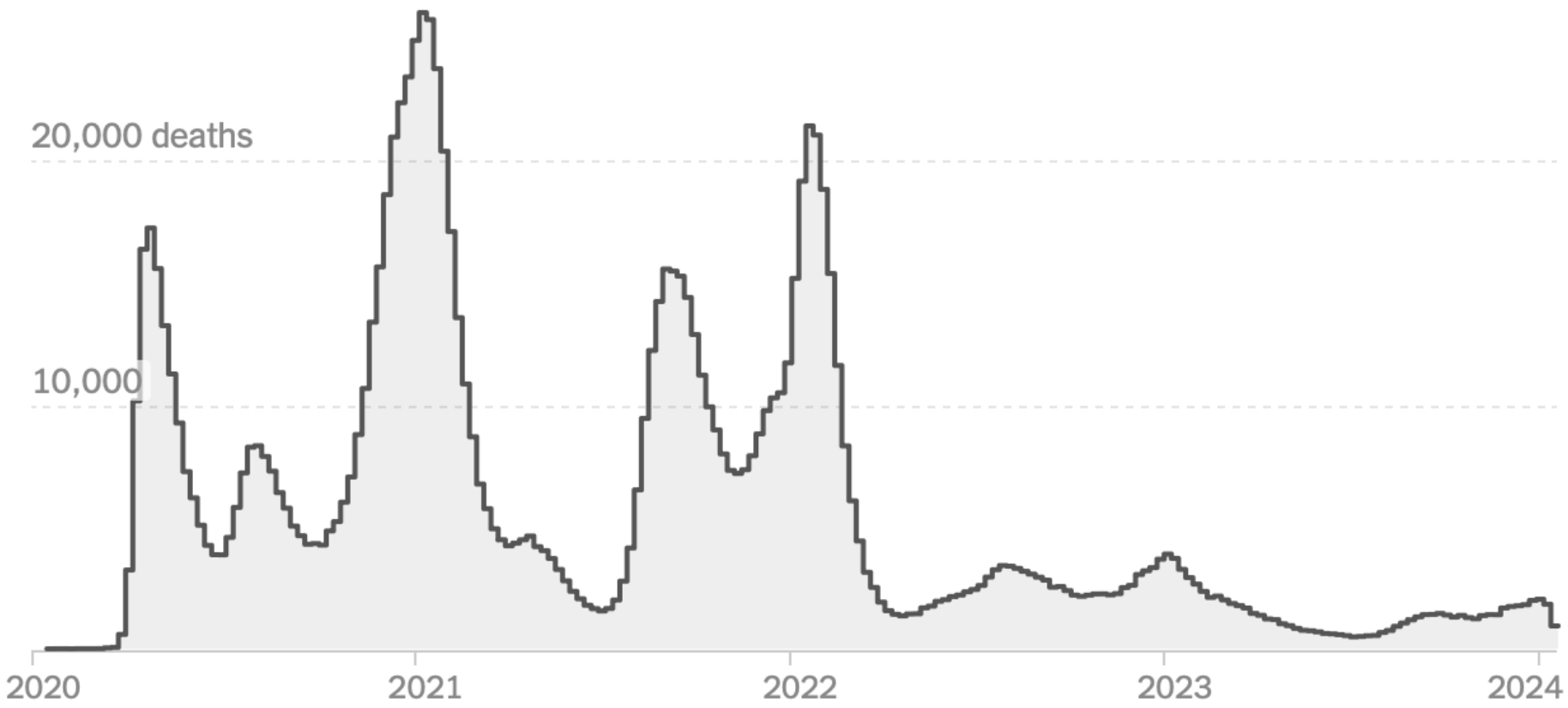
Data from 2/2/2024

Daily hospitalizations increased by 60.1% from two weeks ago

Source: New York Times 2-2-2024

COVID-19 Deaths in the United States

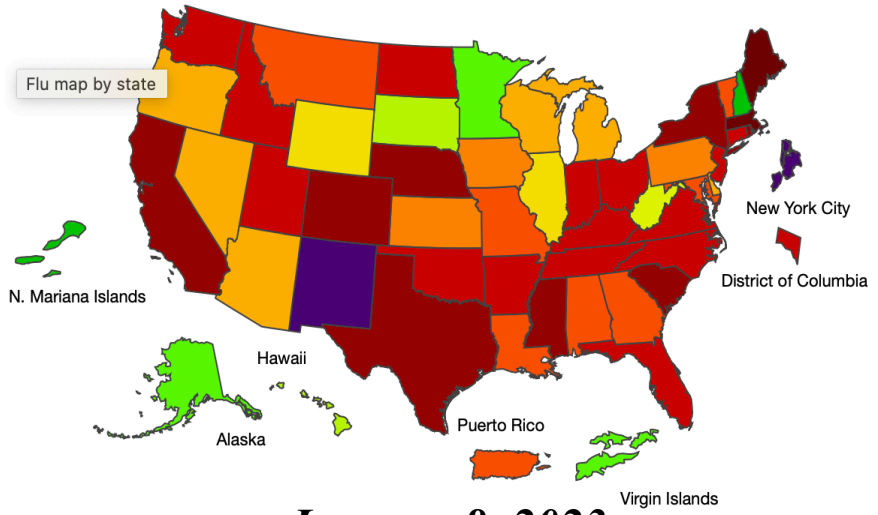
Cumulative Deaths – 1,172,229



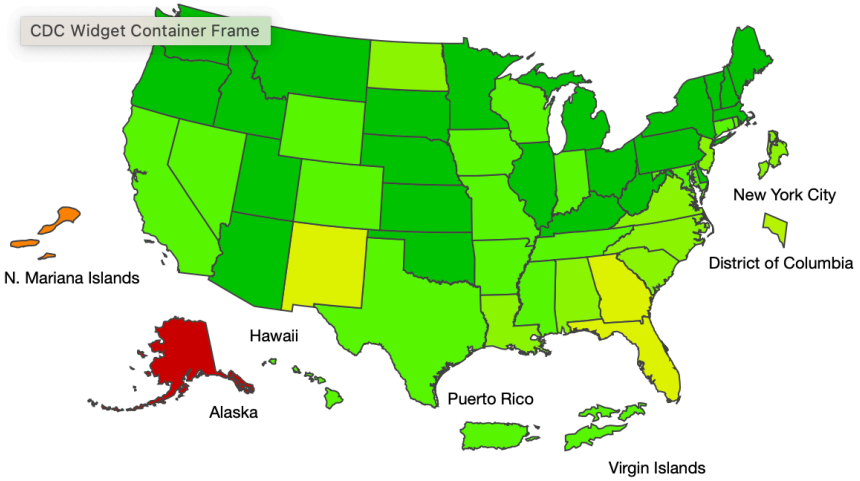
30.4% increased from our last Town Hall

Source: NY Times https://www.nytimes.com/interactive/2023/us/covid-cases.html 2-2-24

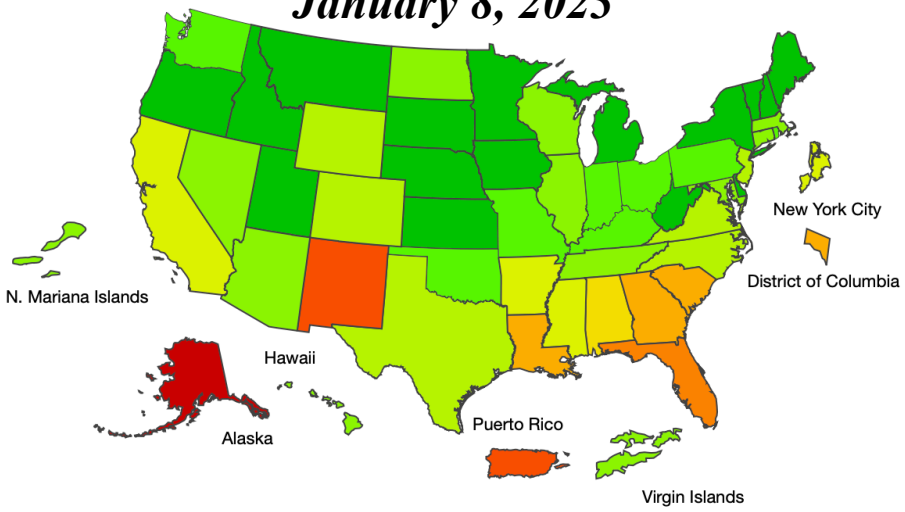
Influenza Activity by State in the United States



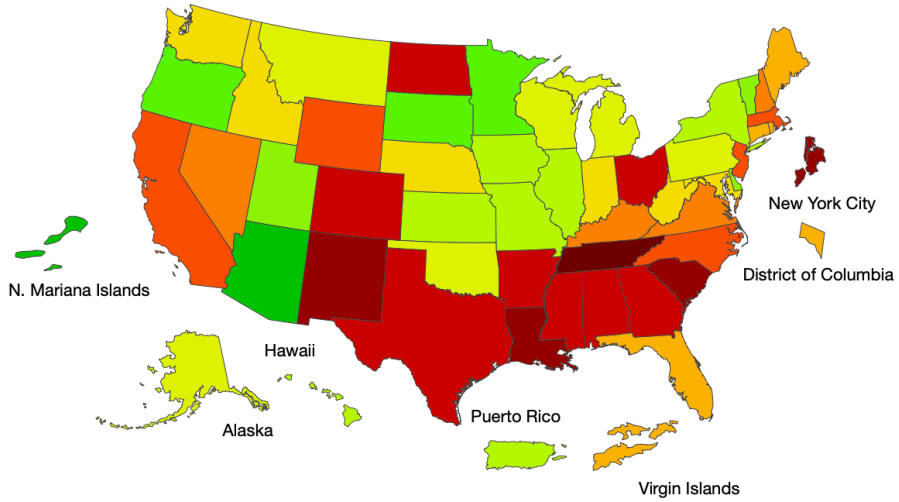
January 8, 2023



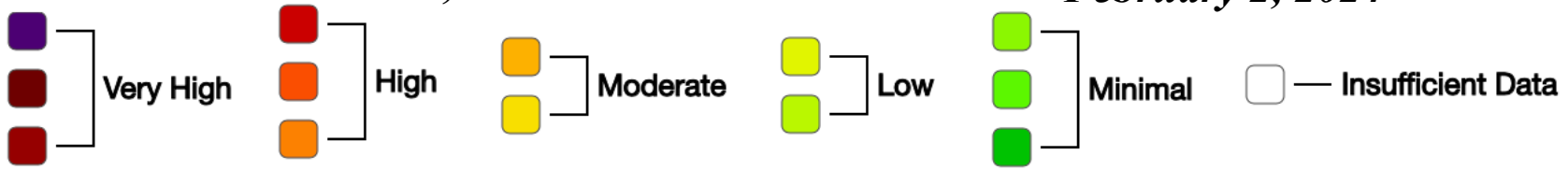
October 22, 2023



November 17, 2023

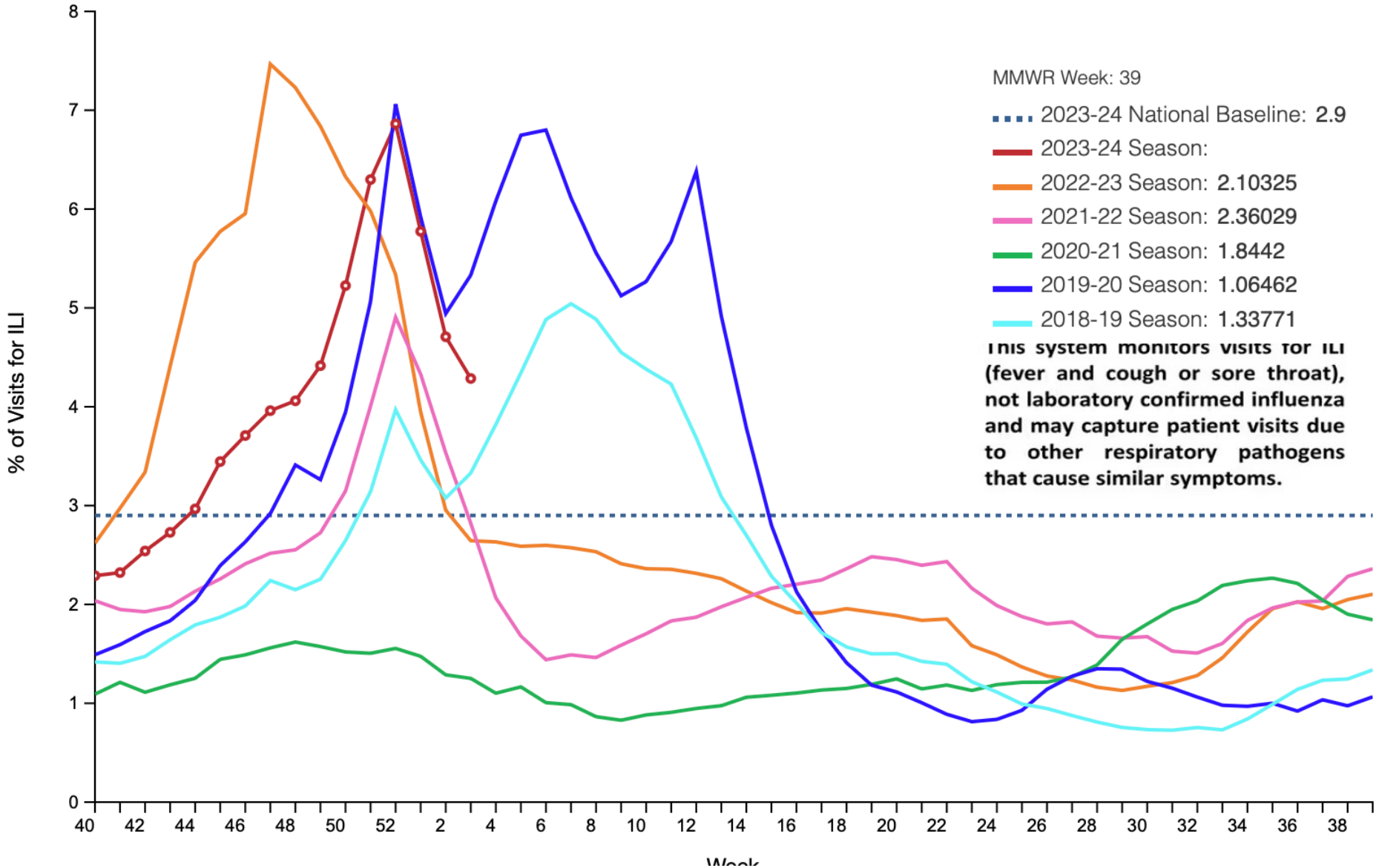


February 2, 2024



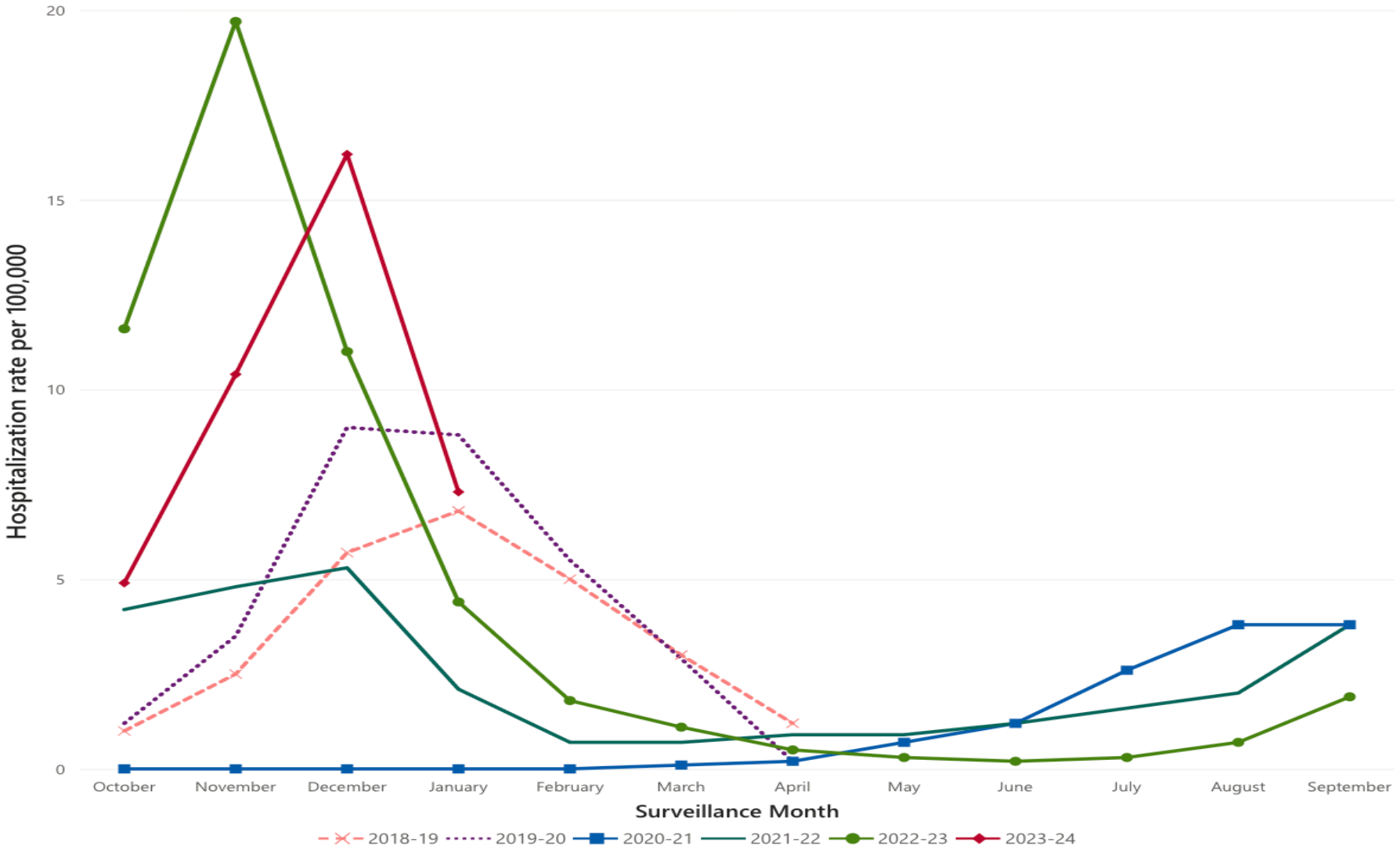
Source: CDC https://www.cdc.gov/flu/weekly/usmap.htm 2-2-2024

Percentage of Outpatient Visits for Influenza-Like Illness



Source: *CDC – https://www.cdc.gov/flu/weekly/index.htm – 2-2-2024*

HOSPITALIZATIONS FOR RESPIRATORY SYNCYTIAL VIRUS, U.S.



Source: *CDC – https://www.cdc.gov/rsv/research/rsv-net/dashboard.html 2-2-24*

Today's Emerging Infectious Disease News

1. *A placebo-controlled trial conducted in China and published in the **New England Journal of Medicine** demonstrated the efficacy of a novel protease inhibitor, Simotrelvir, in shortening time to symptom resolution among adult COVID-19 patients.*
2. *A paper in **JAMA Health Forum** analyzed job flow into and out of health care before and after the COVID-19 pandemic demonstrating what most of us already knew for certain – a dramatic and persistent increase in health care workforce turnover.*
3. *A multinational collaborative study published in the **New England Journal of Medicine** identified children with MIS-C associated with other (i.e., non-SARS-CoV-2) conditions.*
4. *A multicenter, prospective analysis published in **The Lancet** assessed SARS-CoV-2 shedding and evolution in patients who were immunocompromised during the omicron period found that most patients cleared infection reasonably quickly.*
5. *A multinational staggered cohort study in **Lancet Respiratory Disease** demonstrated the effectiveness of COVID-19 vaccines in preventing long COVID symptoms.*
6. *A thought-provoking opinion piece in **JAMA** published by the FDA Commissioner and the Director of the FDA Center for Biologics Evaluation and Research raises concern that the US is near the 'tipping point' for all vaccinations.*
7. *A **Morbidity and Mortality Weekly Report** article published Thursday found that the updated monovalent XBB.1.5–derived vaccine was more than 50% protective against symptomatic SARS-CoV-2 infection.*
8. *A preprint posted in **MedRXiv** describes an NIH study that found that administration of nirmatrelvir/ritonavir to high-risk patients reduced risk for hospitalization by 26% and risk for mortality by 73%.*

References available in the chat

Panelists:

Dr. David Henderson
NIH Consultant

Dr. Sarah Haessler
Baystate Health

Dr. Kristina Bryant
University of Louisville

Dr. David Weber
UNC School of Medicine

UPDATES: SARS-CoV-2 VARIANT JN.1 AND MEASLES

David J. Weber, MD, MPH, FIDSA, FSHEA, FRSM (London)
Sanders Distinguished Professor of Medicine, Pediatrics and Epidemiology
Associate Chief Medical Officer, UNC Medical Center
Medical Director, Hospital Epidemiology, UNC Medical Center
University of North Carolina at Chapel Hill

UNC SCHOOL OF MEDICINE

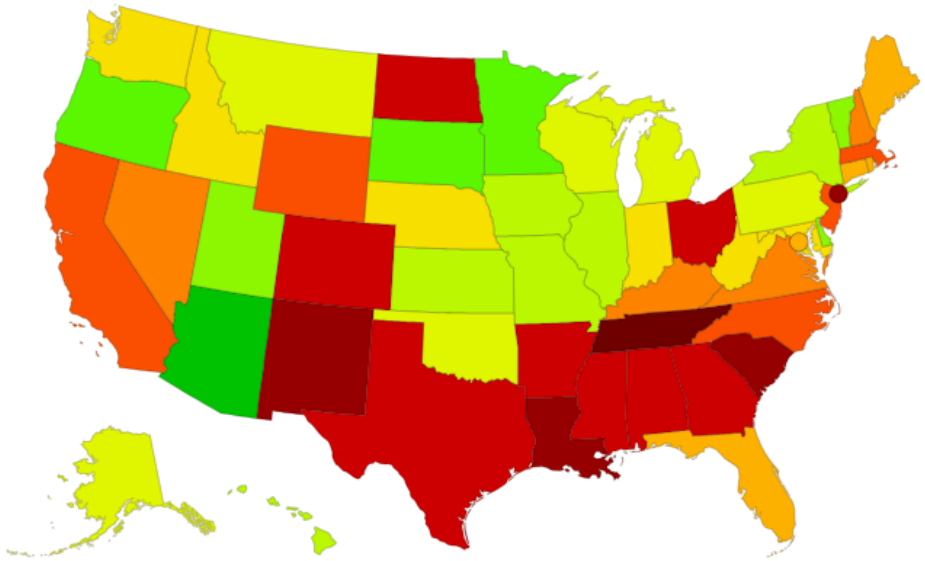
Disclosures: Consultancy; Pfizer, GSK, PDI, BD, GAMA, Germitec

SARS-CoV-2 JN.1 VARIANT

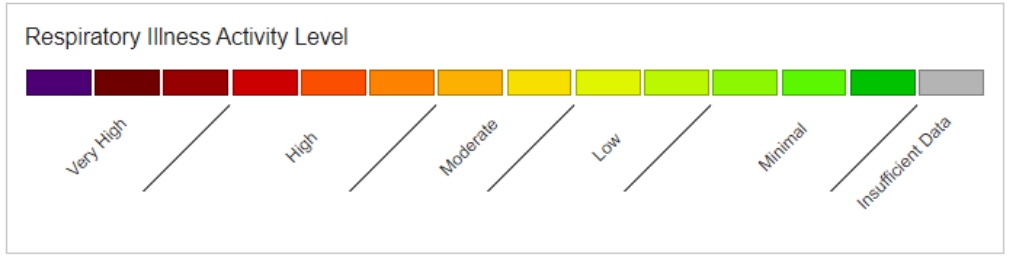
UNC SCHOOL OF MEDICINE

Level of Respiratory Illness Activity

Activity levels determined weekly based on the percentage of visits to enrolled outpatient healthcare providers or emergency departments for fever and cough or sore throat reported to ILINet. Visits can be attributed to a variety of respiratory pathogens that cause these symptoms. Activity levels reflect how the percentage in the most recent week compares to what that jurisdiction typically experiences during low circulation periods. Trend information for the percentages used to calculate activity levels can be found at: National, Regional, and State Level Outpatient Illness and Viral Surveillance (cdc.gov).



Territories PR VI



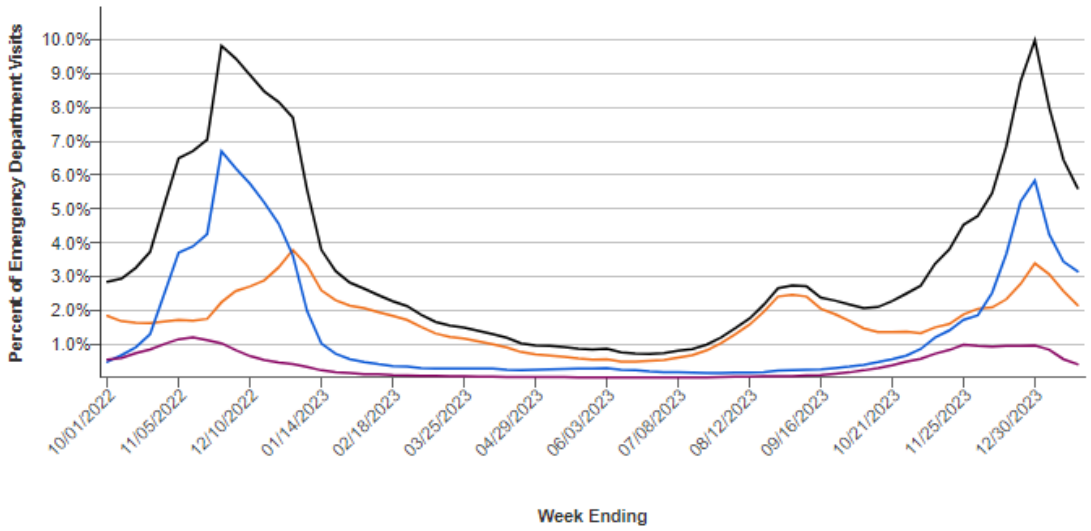
Data presented through: 01/20/2024; Data as of: 01/25/2024

Emergency Department Visits for Viral Respiratory Illness

Weekly percent of total emergency department visits associated with COVID-19, influenza, and RSV.

State: United States County: All

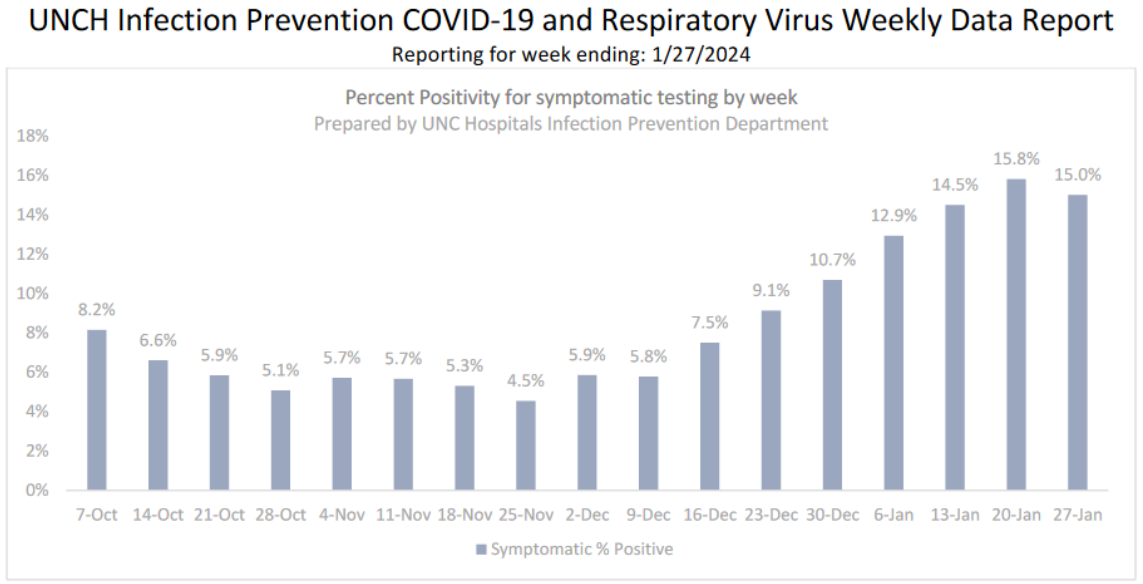
Health Service Area	Counties Represented
All	All



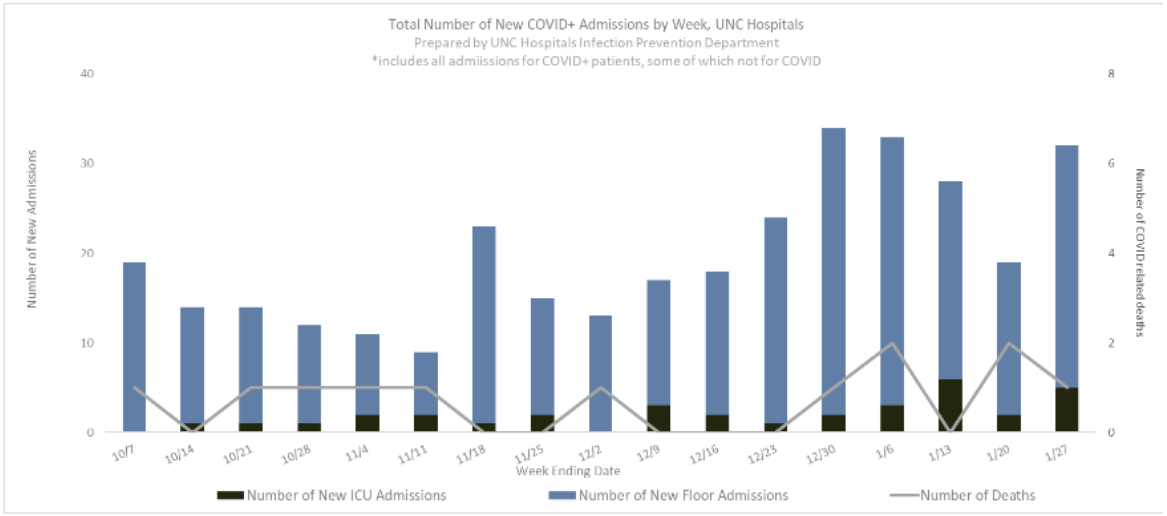
Data presented through: 01/20/2024; Data as of: 01/24/2024

https://www.cdc.gov/respiratory-viruses/data-research/dashboard/activity-levels.html

COVID-19 SURVEILLANCE, UNC MEDICAL CENTER



Data represents symptomatic COVID-19 tests performed by UNC McLendon labs for UNC Hospitals' facilities and includes re-tests. COVID testing done as part of the RPP with COVID order and the RSV/influenza with COVID order is included.

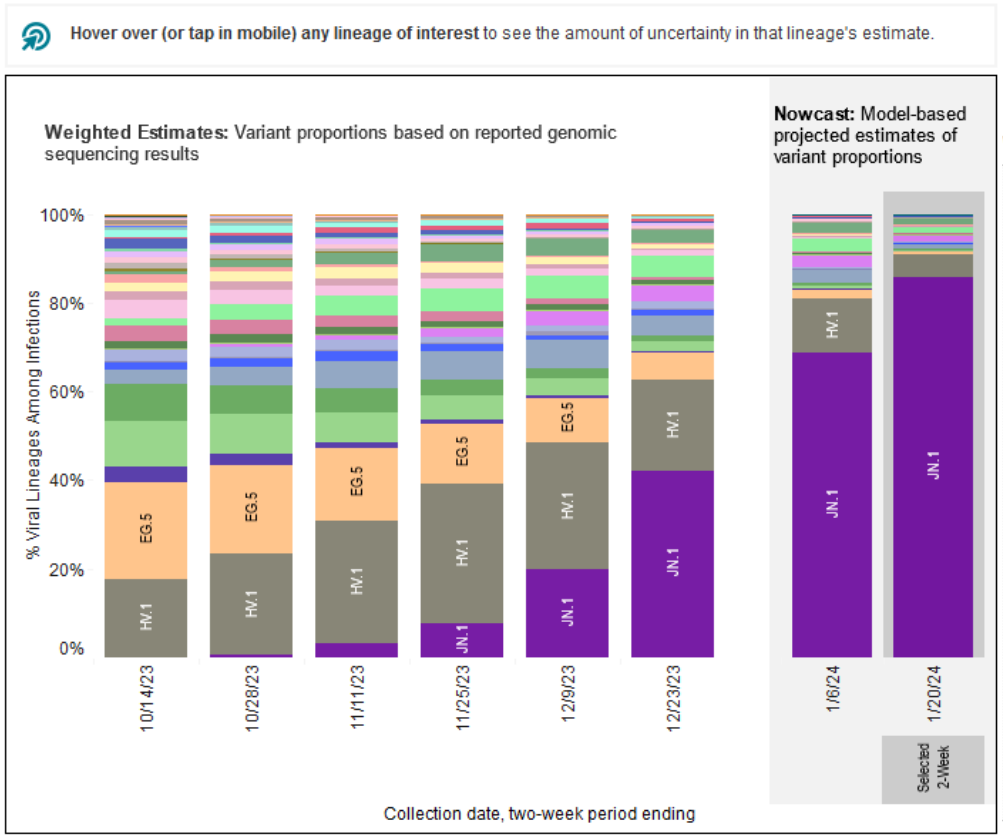


Admissions to UNC Hospitals for patients with COVID-19 broken down by intensive care and floor units. Data includes transfers of patients between intensive care and floor units. Graph also displays number of weekly COVID related deaths.

- Last week, **the COVID-19 symptomatic percent positivity remained high at 15%**
- Last week, we had an **increase in overall new COVID-19 admissions**
  - There was 1 COVID-related death last week
  - Since September we have had 14 deaths from COVID-19

CIRCULATING SARS-CoV-2 VARIANTS, CDC

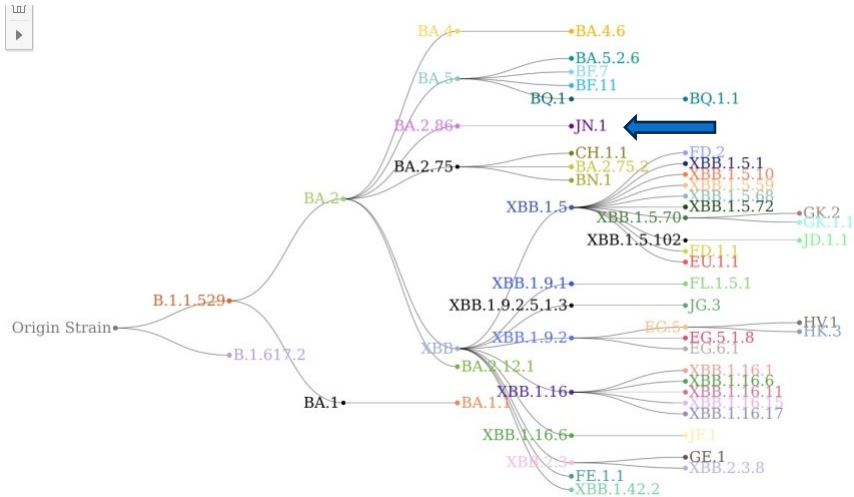
Weighted and Nowcast Estimates in United States for 2-Week Periods in 10/1/2023 – 1/20/2024



Nowcast Estimates in United States for 1/7/2024 – 1/20/2024

USA

WHO label	Lineage #	%Total	95%PI
Omicron	JN.1	85.7%	82.9-88.2%
	HV.1	5.3%	4.4-6.4%
	JD.1.1	1.6%	1.4-2.0%
	BA.2.86	1.5%	1.1-2.1%
	JG.3	1.5%	1.2-1.9%
	HK.3	1.5%	1.2-1.8%
	EG.5	0.6%	0.5-0.8%
	GE.1	0.4%	0.1-1.5%
	JF.1	0.2%	0.2-0.3%
	FL.1.5.1	0.2%	0.2-0.3%
	EG.5.1.8	0.2%	0.2-0.3%
	BA.2	0.1%	0.0-0.6%
	XBB.1.16.6	0.1%	0.1-0.2%
	XBB.1.16.17	0.1%	0.1-0.3%
	XBB.1.5.70	0.1%	0.1-0.2%
	XBB.1.16.11	0.1%	0.1-0.1%
	GK.1.1	0.1%	0.1-0.1%
	XBB	0.1%	0.0-0.1%
	XBB.1.9.1	0.1%	0.0-0.1%
	HF.1	0.1%	0.0-0.1%
	XBB.1.16.15	0.1%	0.0-0.1%
	XBB.2.3	0.0%	0.0-0.1%
	XBB.1.16	0.0%	0.0-0.0%
	GK.2	0.0%	0.0-0.0%
	CH.1.1	0.0%	0.0-0.0%
	XBB.1.5	0.0%	0.0-0.0%
	EG.6.1	0.0%	0.0-0.0%
	XBB.1.16.1	0.0%	0.0-0.0%
	XBB.1.5.68	0.0%	0.0-0.0%
	XBB.1.9.2	0.0%	0.0-0.0%
	XBB.2.3.8	0.0%	0.0-0.0%
	XBB.1.42.2	0.0%	0.0-0.0%
	XBB.1.5.72	0.0%	0.0-0.0%
	XBB.1.5.59	0.0%	0.0-0.0%
Other	Other*	0.0%	0.0-0.0%



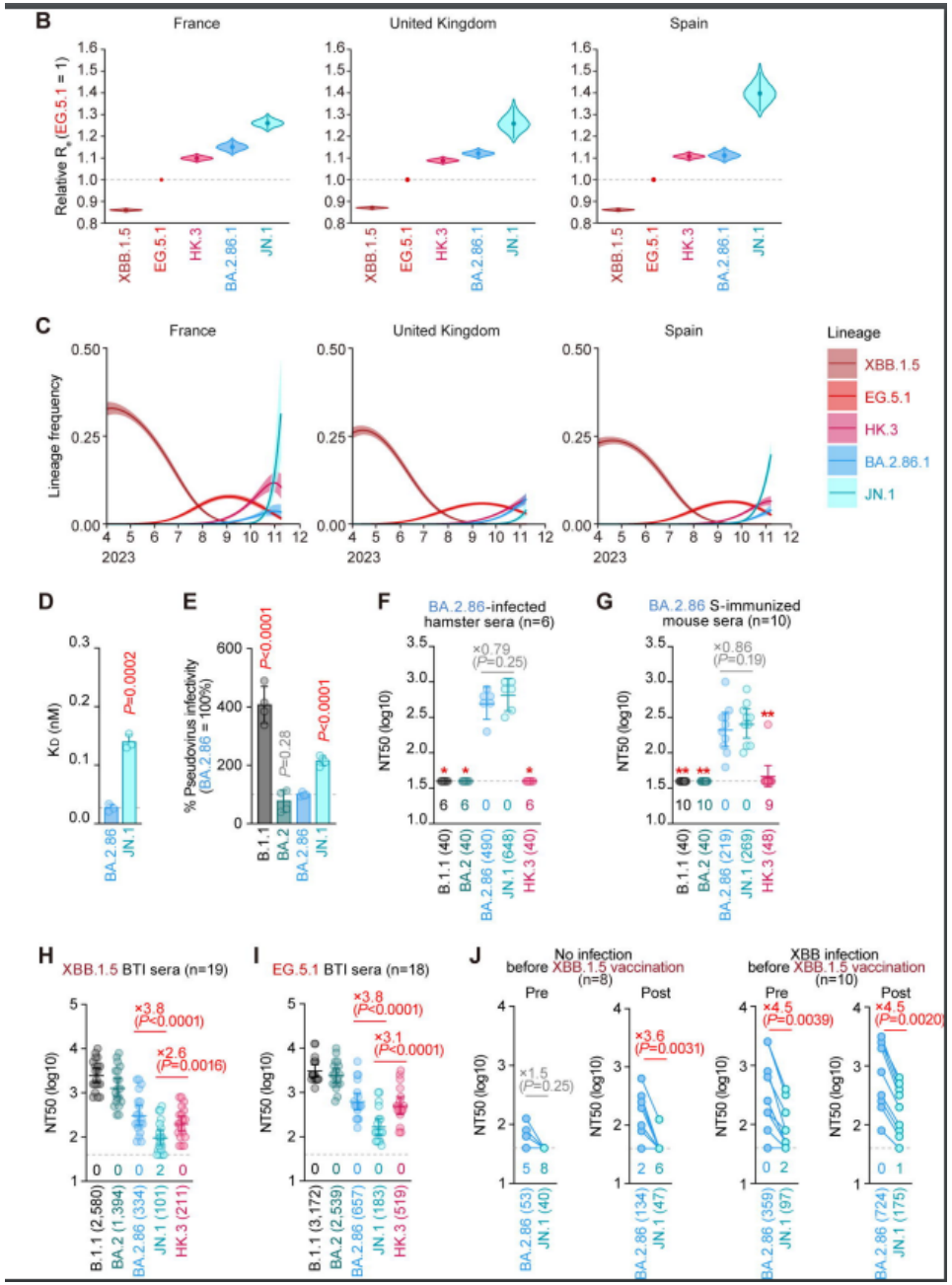
https://covid.cdc.gov/covid-data-tracker/#variant-proportions

* Enumerated lineages are US VOC and lineages circulating above 1% nationally in at least one 2-week period. "Other" represents the aggregation of lineages which are circulating <1% nationally during all 2-week periods displayed.
\# While all lineages are tracked by CDC, those named lineages not enumerated in this graphic are aggregated with their parent lineages, based on Pango lineage definitions, described in more detail here: https://www.pango.network/the-pango-nomenclature-system/statement-of-nomenclature-rules/.

Virological Characteristics of the SARS-CoV-2 JN.1 Variant

The SARS-CoV-2 BA.2.86 lineage, first identified in August 2023, is phylogenetically distinct from the currently circulating SARS-CoV-2 Omicron XBB lineages, including EG.5.1 and HK.3. Comparing to XBB and BA.2, BA.2.86 carries more than 30 mutations in the spike (S) protein, indicating a high potential for immune evasion. BA.2.86 has evolved and its descendant, JN.1 (BA.2.86.1.1), emerged in late 2023. JN.1 harbors S:L455S and three mutations in non-S proteins. S:L455S is a hallmark mutation of JN.1: we have recently shown that HK.3 and other "FLip" variants carry S:L455F, which contributes to increased transmissibility and immune escape ability compared to the parental EG.5.1 variant. Here, we investigated the virological properties of JN.1.

The Re of JN.1 in these three countries was higher than that of BA.2.86.1 and HK.3, one of the XBB lineages with the highest growth advantage at the end of November 2023 (Figure 1B). These results suggest that JN.1 may soon become the dominant lineage worldwide. t\The pseudovirus assay showed that the infectivity of JN.1 is significantly higher than that of BA.2.86. these results suggest that JN.1 is one of the most immune-evading variants to date.



Kaku Y, et al. https://doi.org/10.1101/2023.12.08.570782

XBB.1.5 Monovalent mRNA Vaccine Booster Elicits Robust Neutralizing Antibodies Against Emerging SARS-CoV-2 Variants

COVID-19 vaccines have recently been updated with the spike protein of SARS-CoV-2 XBB.1.5 subvariant alone, but their immunogenicity in humans has yet to be fully evaluated and reported, particularly against emergent viruses that are rapidly expanding. We now report that administration of an updated monovalent mRNA vaccine (XBB.1.5 MV) to uninfected individuals boosted serum virus-neutralization antibodies significantly against not only XBB.1.5 (27.0-fold) and the currently dominant EG.5.1 (27.6-fold) but also key emergent viruses like HV.1, HK.3, JD.1.1, and JN.1 (13.3-to-27.4-fold). In individuals previously infected by an Omicron subvariant, serum neutralizing titers were boosted to highest levels (1,504-to-22,978) against all viral variants tested. While immunological imprinting was still evident with the updated vaccines, it was not nearly as severe as the previously authorized bivalent BA.5 vaccine. Our findings strongly support the official recommendation to widely apply the updated COVID-19 vaccines to further protect the public.

Wang Q, et al. https://www.biorxiv.org/content/10.1101/2023.11.26.568730v2.full.pdf

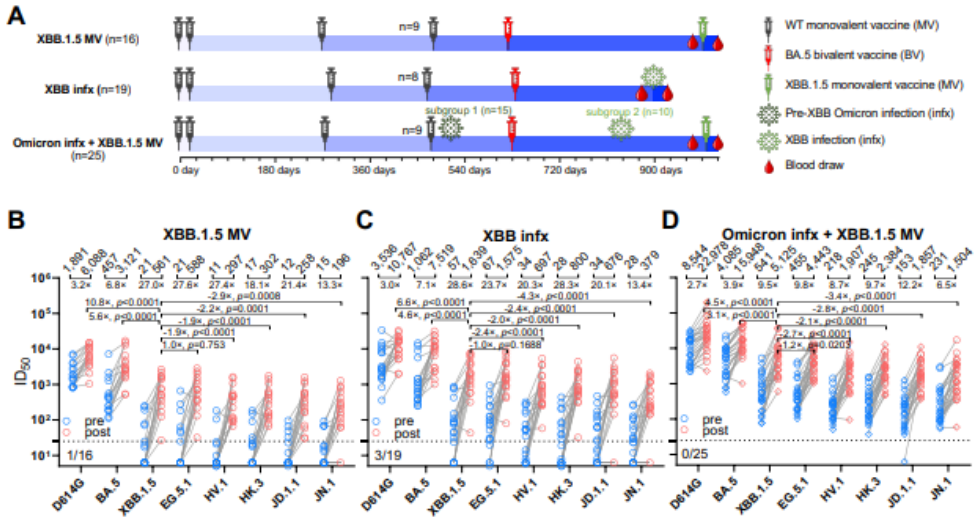


Figure 2. Neutralizing antibody titers before and after an XBB.1.5 mRNA booster, XBB infection, or both.

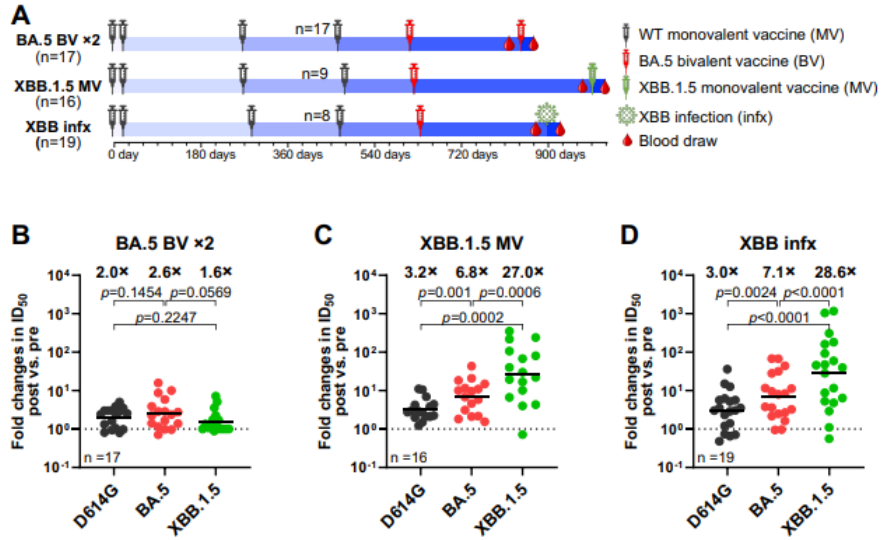


Figure 4. XBB.1.5 monovalent mRNA vaccines induced stronger boosts than a second BA.5 bivalent mRNA vaccine.

MEASLES

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MEASLES: KEY FACTS

- Pathogen: The measles virus is a single-stranded RNA virus of the genus Morbillivirus and the family *Paramyxoviridae*.
  - Vaccine induced immunity protects against all virus strains. Measles is considered a monotypic virus despite the genetic variations.
- Epidemiology: Reservoir = only humans. Incubation period, 10-12 days (range, 7-14 days). Infectious period, 4 before to 4 days after rash onset). Transmission = person-to-person via aerosols (virus may persist in the air for up to 2 hours). Declared eliminated in US (2000).

Clinical Features

- The prodrome starts after a 10–12-day incubation period and is characterized by fever (up to 105°F), conjunctivitis, coryza, cough (3 "C"s) and bronchiolitis. Nearly all infected susceptible individuals develop clinical disease.
- Koplik's spots, the enanthema (pathognomic), appear on the buccal mucosa 1–2 days before the onset of rash. Lack of Koplik's spots does not exclude measles.
- The measles rash, an erythematous maculopapular exanthema, develops 2–4 days after the onset of fever and spreads from the head to the body over the next 3–4 days. The rash, which blanches on pressure early in the course, fades in the order of appearance during the next 3–4 days and assumes a nonblanching appearance.
- Complications: Otitis media, 7–9%; pneumonia,1–6%; diarrhea,8%; post-infectious encephalitis,1/1000-1/2000 cases), and subacute sclerosing panencephalitis (SSPE), 1/100,000 (average time to onset, 7-10 years).
- Case fatality is 1-3/1000; highest in persons <5 years, pregnant persons, older adults and immunocompromised. Pneumonia accounts for six out of ten measles associated deaths.

https://www.ecdc.europa.eu/en/measles/facts; https://www.cdc.gov/measles/hcp/index.html

MEASLES: KEY FACTS

Prevention

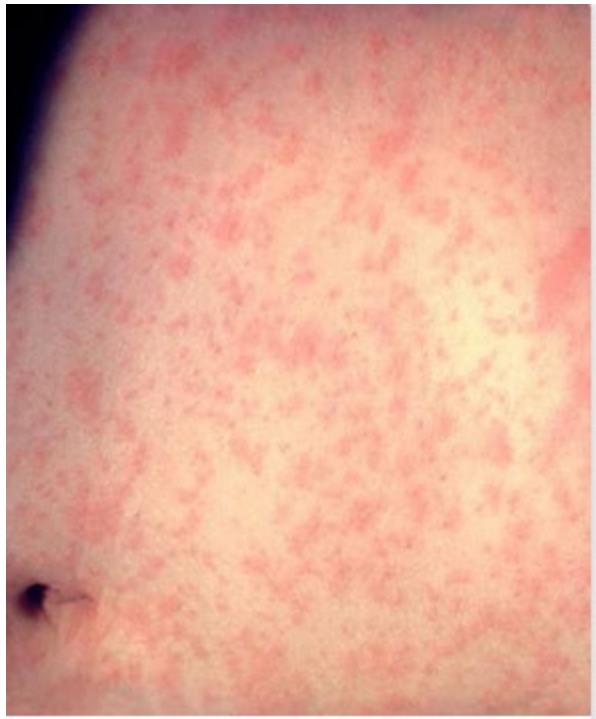
- Immunization is the only effective preventive measure against acquiring measles. Two doses of MMR vaccine are ~99% effective. Primary vaccine failure of the first dose at 12 months of age or older occurs in up to 5% of people, but 95% of first dose failures will seroconvert from a second dose.
  - Preventing outbreaks (i.e., reaching community protection levels) requires ≥95% of the population to be immune.
  - Combination vaccines have been shown to elicit the same immune response as individual vaccines. Vaccinating individuals who are already immune to one or more of the antigens in the combination vaccine, either from previous immunisation or natural infection, are not associated with any increased risk of adverse events.
  - PEP: Administration of a measles containing vaccine is the intervention of choice within 72 hours of exposure is possible as the incubation period for vaccine virus is shorter than that for wild virus. Alternative PEP is IG within 6 days of exposure (do NOT provide simultaneous with vaccine).

Management

- Measles should be suspected in anyone who presents with an acute erythematous rash and fever preceded by cough, coryza, conjunctivitis and photophobia. Measles may in some cases be difficult to distinguish from other causes of febrile illnesses with rash, and infections with rubella, parvovirus B19, and human herpes virus type 6 (HHV-6).
- Diagnosis: Detection of measles-specific IgM antibody in serum and measles RNA by real-time polymerase chain reaction (RT-PCR) in a respiratory specimen are the most common methods for confirming measles infection.
- No specific antiviral therapy is available. Severe measles in children should be treated with vitamin A.
- Isolation = Airborne isolation (PPE for HCP, N95 respirator) in an AII

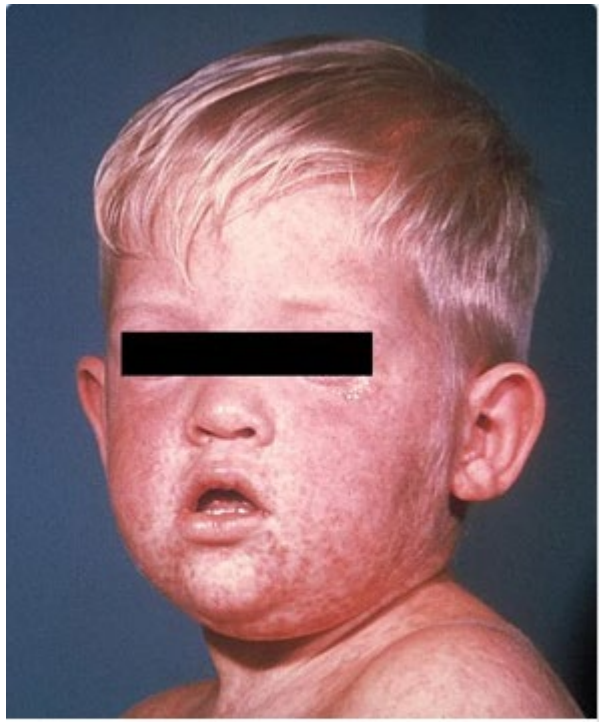
https://www.ecdc.europa.eu/en/measles/facts; https://www.cdc.gov/measles/hcp/index.html

MEASLES ASSOCIATED SKIN FINDINGS



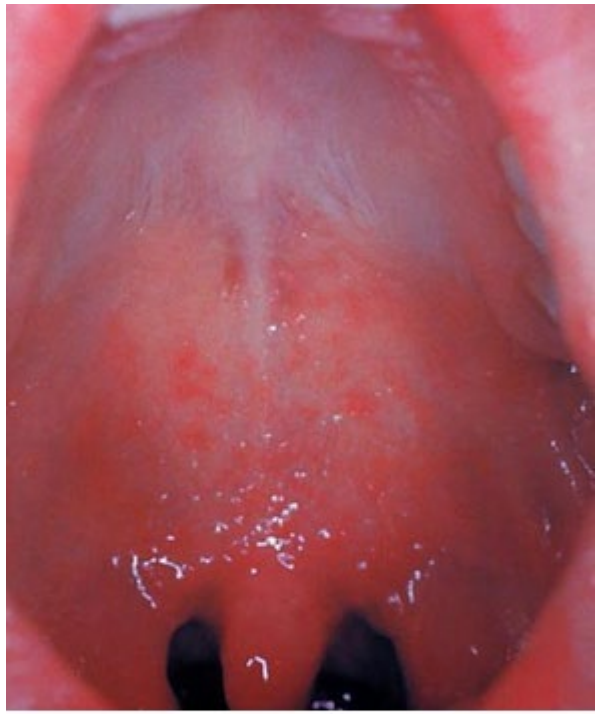
Skin of a patient after three days with measles rash.

Source: CDC/PHIL



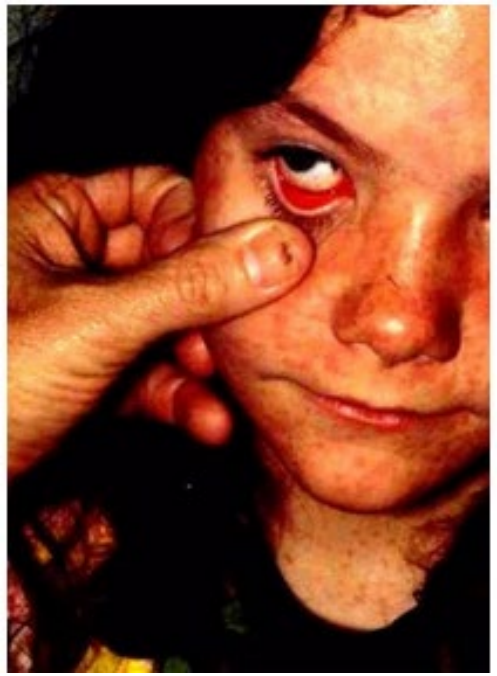
Face of boy after three days with measles rash.

Source: CDC/PHIL



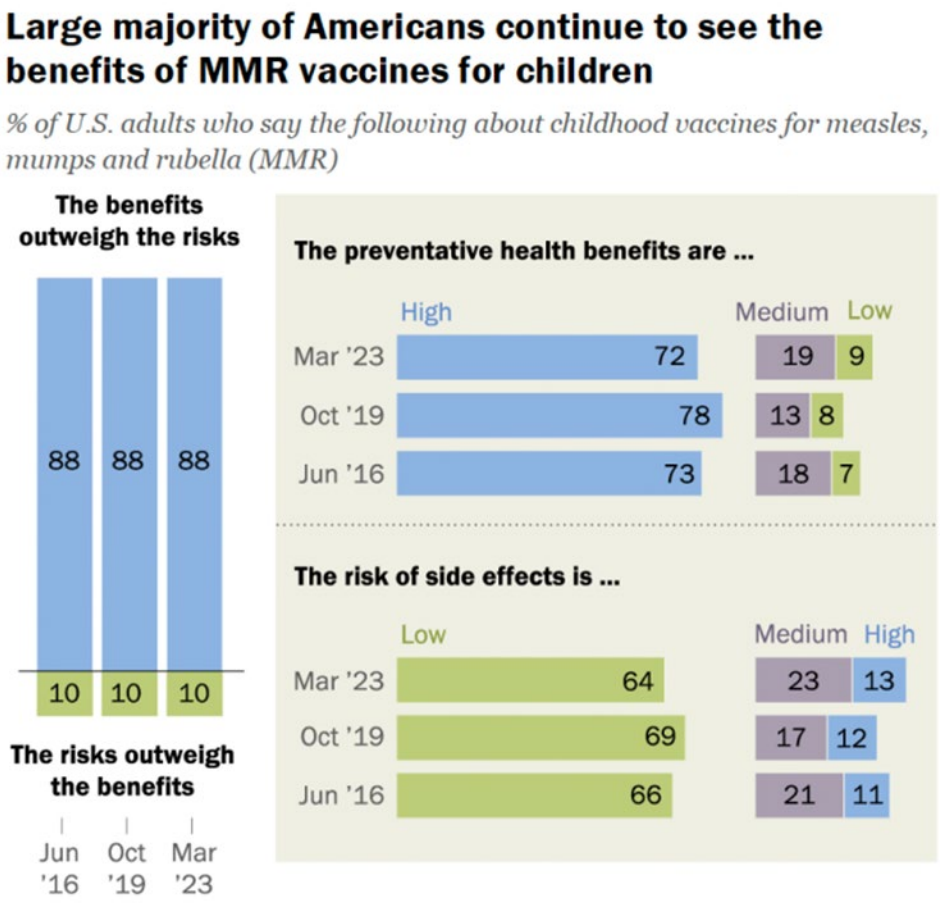
This was a patient who presented with Koplik's spots on palate due to pre-eruptive measles on day three of the illness.

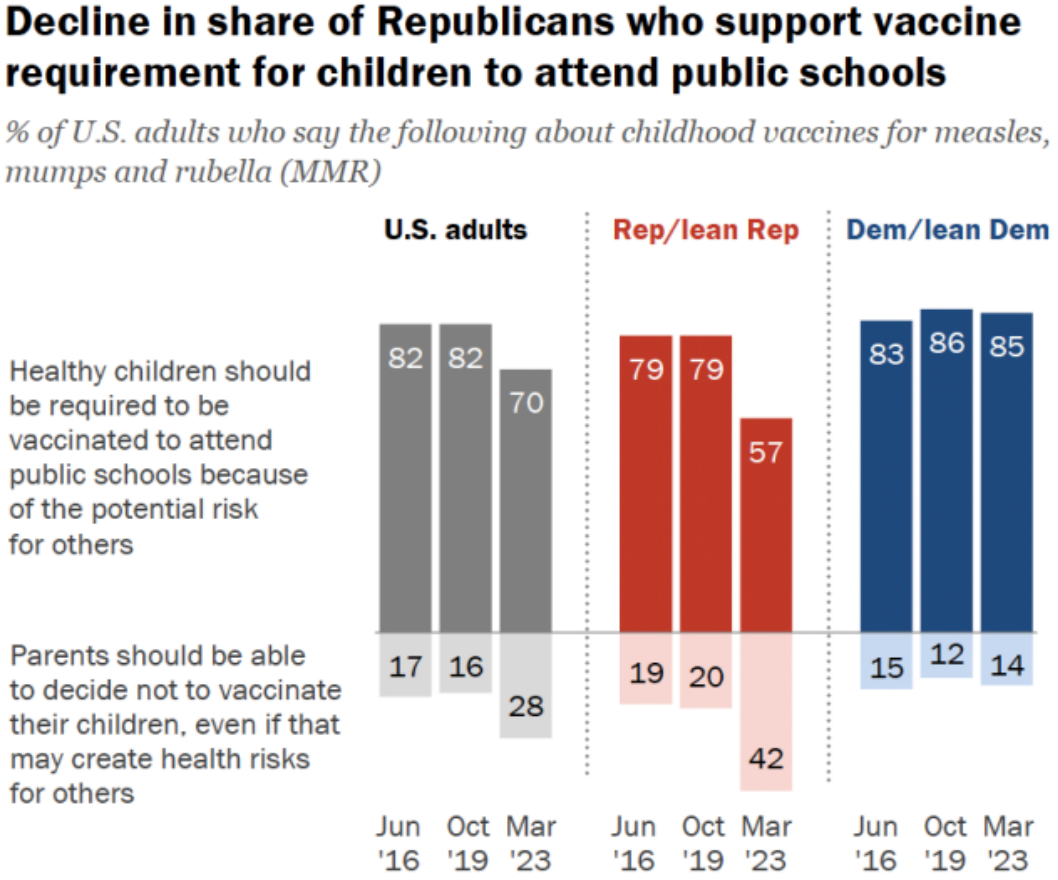
Source: CDC/PHIL



UNC SCHOOL OF MEDICINE

VACCINE HESITANCY: A GROWING PUBLIC HEALTH CONCERN





Pew Research Center: https://www.pewresearch.org/science/2023/05/16/americans-largely-positive-views-of-childhood-vaccines-hold-steady/ps_2023-05-16_vaccines_00-02/

Coverage with Selected Vaccines and Exemption from School Vaccine Requirements Among Children in Kindergarten, US, 2022–23 School Year

Summary

What is already known about this topic?

From the 2019–20 to the 2021–22 school year, national coverage with state-required vaccines among kindergartners declined from 95% to approximately 93%, ranging from 92.7% for diphtheria, tetanus, and acellular pertussis vaccine (DTaP) to 93.1% for polio.

What is added by this report?

During the 2022–23 school year, coverage remained near 93% for all reported vaccines, ranging from 92.7% for DTaP to 93.1% for measles, mumps, and rubella and polio. The exemption rate increased 0.4 percentage points to 3.0%. Exemptions increased in 41 states, exceeding 5% in 10 states.

What are the implications for public health practice?

Exemptions >5% limit the level of achievable vaccination coverage, which increases the risk for outbreaks of vaccine-preventable diseases. Vaccination before school entry or during provisional enrollment periods could reduce exemptions resulting from barriers to vaccination during the COVID-19 pandemic.

Seither R, et al. MMWR 2023;72:1217

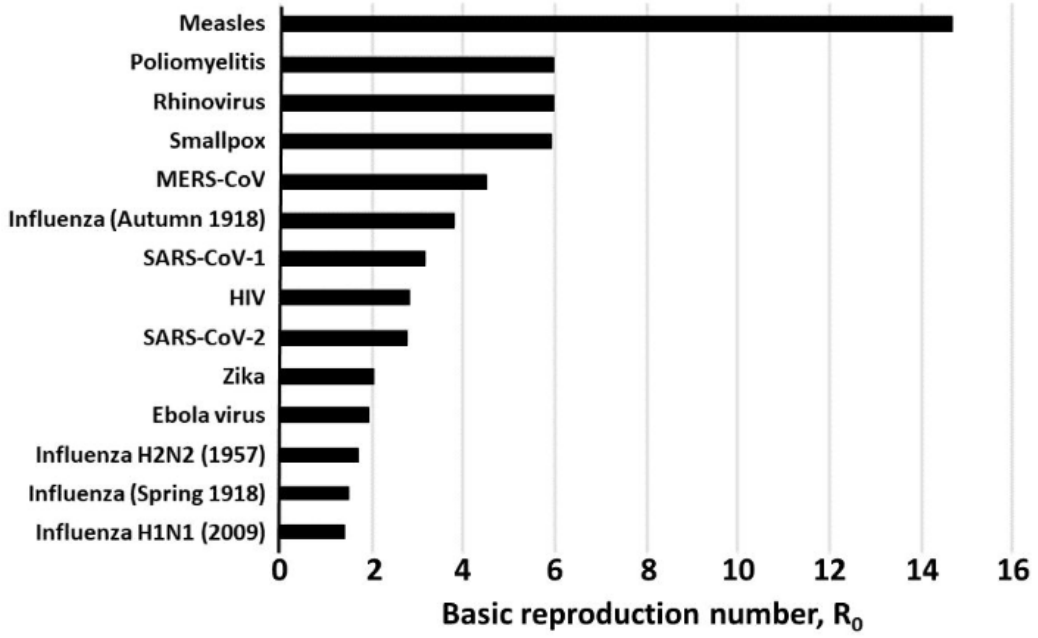
TABLE. Estimated* coverage† with measles, mumps, and rubella; diphtheria, tetanus, and acellular pertussis; poliovirus; and varicella vaccines; grace period or provisional enrollment§; and any exemption¶,** among kindergartners, by immunization program — United States,†† 2022–23 school year

Immunization program	Kindergarten population§§	Percentage							PP change in any exemption from 2021–22 school year
		Surveyed¶¶	2 doses of MMR***	5 doses of DTaP†††	4 doses of polio§§§	2 doses of VAR¶¶¶	Grace period or provisional enrollment	Any exemption	
National estimate**	**3,832,381**	**92.9**	**93.1**	**92.7**	**93.1**	**92.9**	**2.5**	**3.0**	**0.4**
Median**	—	—	**92.1**	**91.9**	**92.2**	**92.7**	**2.0**	**3.3**	**0.6**
U.S. state/Jurisdiction									
Alabama†††,§§§§	59,113	100.0	≥93.9	≥93.9	≥93.9	≥93.9	NP	2.0	0.3
Alaska§§§§,¶¶¶¶	9,650	88.8	83.6	83.8	84.4	81.8	NR	5.7	1.1
Arizona*****	80,814	97.7	89.9	89.6	90.3	94.1	NR	7.4	0.6
Arkansas	38,358	95.8	91.9	90.6	90.7	91.1	9.2	3.1	0.6
California§§§§,*****,†††††	541,132	>99.9	96.5	95.6	96.3	96.1	1.5	0.2	−0.1
Colorado	65,576	97.2	87.0	87.2	87.0	85.9	≥0.6	≥4.3	1.1
Connecticut†††,§§§§	35,580	100.0	97.3	97.3	97.3	97.0	NP	0.8	−1.5
Delaware§§§§,†††††	10,674	9.7	95.1	93.8	94.0	94.0	NR	2.1	0.9
District of Columbia†††,§§§§	8,064	100.0	87.5	85.0	87.8	86.8	NR	1.3	0.8
Florida§§§§	230,309	97.7	≥90.6	≥90.6	≥90.6	≥90.6	4.7	4.5	0.6
Georgia†††,§§§§	123,771	100.0	≥88.1	≥88.1	≥88.1	≥88.1	0.5	3.8	−0.9
Hawaii§§§§	13,195	8.1	86.4	87.0	87.0	84.4	0.5	6.4	3.0
Idaho	23,721	99.3	81.3	81.0	81.8	80.7	1.9	12.1	2.3
Illinois†††,§§§§	135,332	100.0	91.7	91.5	91.4	91.3	NR	≥2.1	0.4
Indiana§§§§,§§§§§	81,307	87.5	92.0	83.0	88.8	91.6	NR	2.8	0.4
Iowa†††,§§§§	39,178	100.0	≥89.9	≥89.9	≥89.9	≥89.9	5.3	3.0	0.6
Kansas§§§§,†††††,§§§§§,¶¶¶¶	35,543	30.8	91.6	90.5	92.2	90.8	NP	2.9	0.6
Kentucky§§§§,†††††,§§§§§	54,742	96.9	≥90.1	≥90.6	≥91.2	≥89.8	NR	1.7	0.4
Louisiana††††	54,314	100.0	92.2	93.1	98.3	93.6	NP	2.3	1.2
Maine	12,403	93.9	96.8	96.6	96.8	96.6	NR	0.9	−0.9
Maryland†††,§§§§,†††††	59,684	100.0	96.7	96.9	97.2	96.6	NR	1.9	0.4
Massachusetts†††,§§§§,†††††	66,041	100.0	96.5	96.2	96.3	96.0	NP	1.4	0.4
Michigan††††	113,678	100.0	92.9	93.1	93.7	92.9	1.0	5.4	0.9
Minnesota	68,152	97.9	87.6	88.3	88.6	87.9	NR	≥4.5	0.8
Mississippi†††,§§§§,*****	36,048	100.0	≥98.4	≥98.4	≥98.4	≥98.4	1.0	0.2	0.1
Missouri†††,§§§§	69,126	100.0	91.3	91.1	91.5	90.8	NR	≥3.8	0.8
Montana	NR	NR	NR	NR	NR	NR	NR	NR	NA
Nebraska†††,§§§§,†††††	23,176	100.0	95.1	95.7	97.0	94.9	2.6	2.6	0.1
Nevada§§§§	34,333	89.1	92.8	92.2	92.8	92.6	1.7	5.6	0.8
New Hampshire †††,§§§§,§§§§§	11,332	100.0	≥89.4	≥89.4	≥89.4	≥89.4	4.5	3.4	0
New Jersey†††,§§§§,§§§§§	104,468	100.0	≥94.3	≥94.3	≥94.3	≥94.3	1.1	3.2	0.6
New Mexico†††,§§§§	21,068	100.0	94.9	94.7	95.0	94.4	2.0	1.5	0.1
New York (including NYC) §§§§,*****	205,906	96.6	97.9	97.2	97.5	97.5	2.3	0.1	0
NYC§§§§,*****	85,379	97.6	97.3	96.3	96.6	96.7	2.3	0.1	0
North Carolina §§§§,†††††,§§§§§	125,679	83.1	93.8	93.7	93.9	93.6	1.6	2.4	0.5
North Dakota	10,554	99.4	92.0	91.8	91.9	91.4	NR	5.1	−0.2
Ohio	134,893	93.7	89.3	89.4	89.7	88.8	5.9	3.8	0.8
Oklahoma†††††	52,548	89.5	89.6	90.0	91.0	94.6	NR	4.7	1.2
Oregon†††,†††††	40,963	100.0	91.9	90.9	91.5	94.1	NR	8.2	1.2
Pennsylvania	137,259	97.2	94.0	94.3	94.1	93.7	2.3	3.8	0.5
Rhode Island§§§§,†††††,§§§§§	10,532	96.5	96.9	96.9	96.9	96.3	0.9	1.5	0.3
South Carolina§§§§,¶¶¶¶	58,878	28.1	93.2	92.1	92.4	92.8	4.7	4.1	0.7
South Dakota†††,§§§§	12,081	100.0	92.5	92.2	92.3	92.0	NR	4.1	0.6
Tennessee†††,§§§§,§§§§§	79,692	100.0	95.4	94.8	95.0	95.1	2.0	3.2	0.8
Texas (including Houston)†††††,§§§§§	381,680	98.0	94.2	93.8	94.1	93.7	1.9	3.5	0.6
Houston†††††,§§§§§	37,664	98.8	91.3	90.7	91.0	90.6	2.6	2.3	0.8
Utah†††,******	46,635	100.0	90.0	89.7	89.9	89.6	3.7	8.1	NA
Vermont†††,§§§§	5,816	100.0	93.1	92.8	92.8	92.6	6.3	3.6	0.3
Virginia§§§§,¶¶¶¶	93,271	1.6	95.8	97.8	94.2	95.6	NR	2.2	0.4
Washington§§§§§	86,284	97.9	91.4	90.1	90.2	90.1	1.6	4.0	0.3
West Virginia§§§§,*****,§§§§§,†††††	19,175	86.1	≥95.6	≥95.6	≥95.6	≥95.6	NR	<0.1	0
Wisconsin†††††	63,593	93.9	86.5	87.0	88.2	85.9	5.7	7.2	0.9
Wyoming†††,§§§§	7,060	100.0	90.8	89.4	90.1	90.5	2.4	4.8	0.9

See table footnotes on the next page.

REPRODUCTIVE NUMBER AND IMPACT ON VACCINE COVERAGE NEEDED TO PREVENT TRANSMISSION

Preventing measles outbreaks requires >95% of the population to be immune



Aronson JK, et al. https://www.cebm.net/wp-content/uploads/2020/04/%E2%80%9CWhen-will-it-be-over_%E2%80%9D_-An-introduction-to-viral-reproduction-numbers-1.pdf

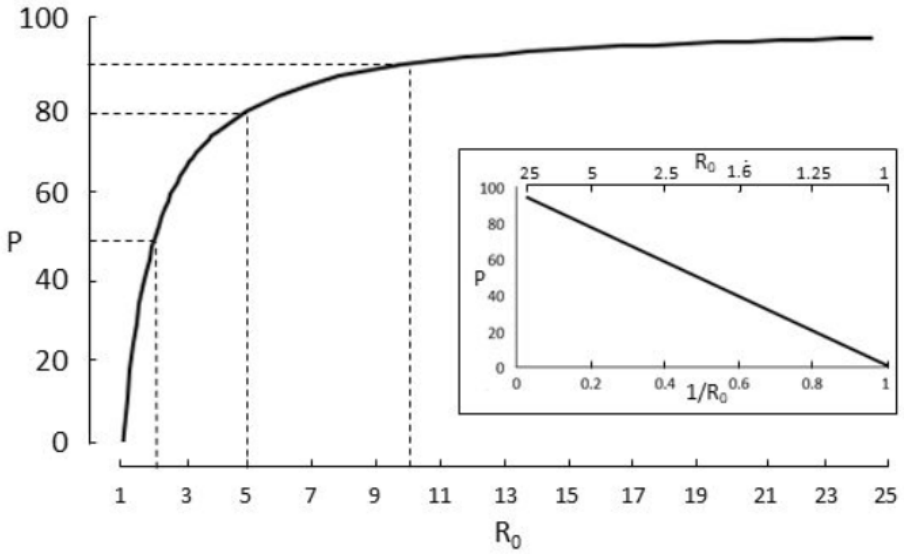


Figure 1. The relation between the basic reproduction number of a virus, R_0, and the proportion of the population that needs to be immunized to achieve herd immunity; note the steep rise of the curve at values of R_0 between 1 and 5; three examples are shown: R_0 =2, proportion = 50%, R_0 = 5, proportion = 80%; R_0 = 10, proportion = 90%; the inset shows a linearization of the main graph, generated by plotting P against $1/R_0$

Survival of Measles Virus in Air

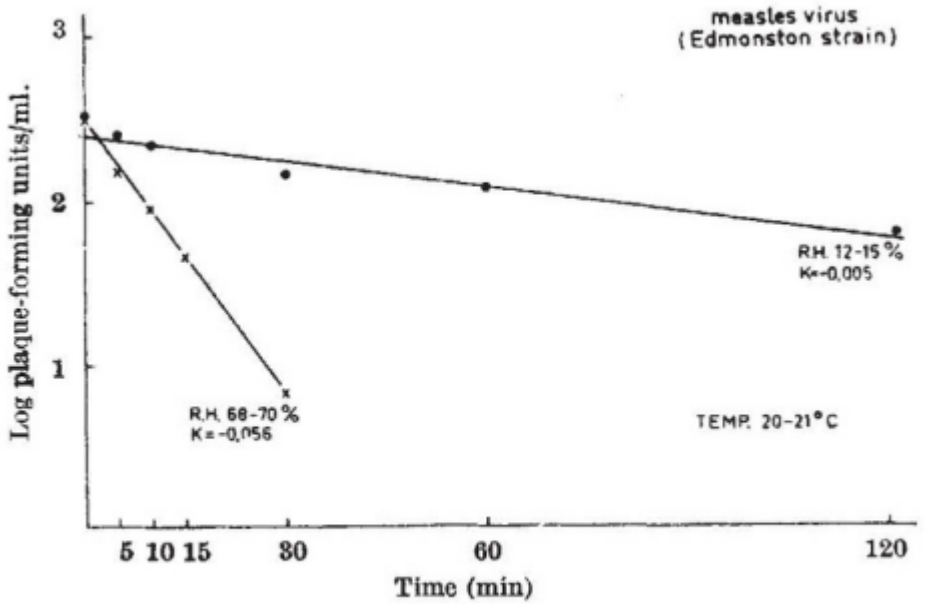


Fig. 1. Survival of measles virus at low and high relative humidity. Ordinates, log plaque-forming units/ml. collection fluid. 1 ml. collection fluid corresponds with 2·2 l. of air

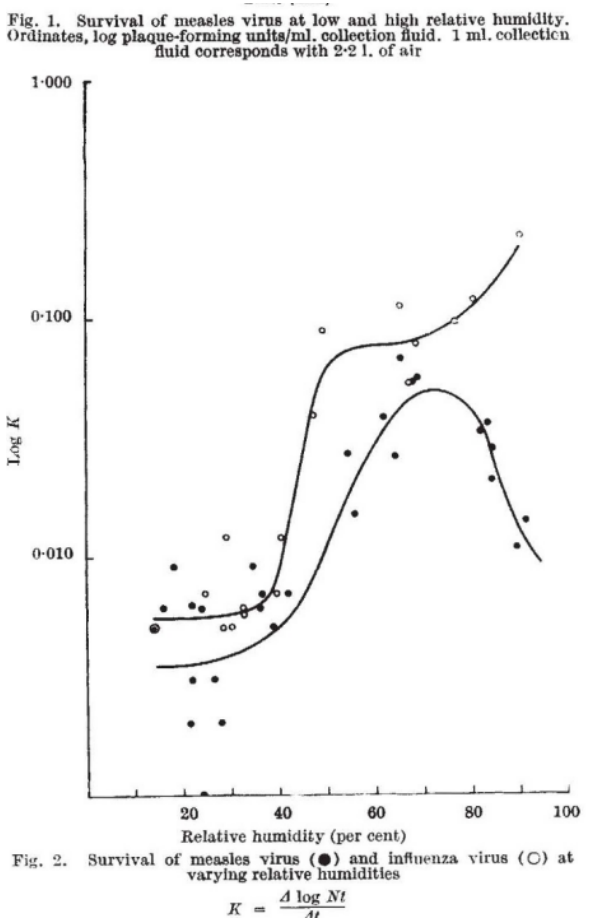


Fig. 2. Survival of measles virus (●) and influenza virus (○) at varying relative humidities

$$K = \frac{\Delta \log Nt}{\Delta t}$$

De Jong JG, Winkler KC. Nature 1964;201;1054

MEASLES OUTBREAK N A PEDIATRIC PRACTICE: AIRBORNE TRANSMISSION IN AN OFFICE SETTING

In February 1981, a measles outbreak occurred in a pediatric practice in DeKaib County, GA. The source case, a i2-year-old boy vaccinated against measles at 11.5 months of age, was in the office for one hour on the second day of rash, primarily in a single examining room. On examination, he was noted to be coughing vigorously. Seven secondary cases of measles occurred due to exposure in the office. Four children had transient contact with the source patient as he entered or exited through the waiting room; only one of the four had face-to-face contact within 1 m of the source patient. The three other children who contracted measles were never in the same room with the source patient; one of the three arrived at the office one hour after the source patient had left. The risk of measles for unvaccinated infants (attack rate 80%, 4/5) was 1O.8 times the risk for vaccinated children (attack rate 7%, 2/27) (P = .022, Fisher exact test, two-tailed). Airflow studies demonstrated that droplet nuclei generated in the examining room used by the source patient were dispersed throughout the entire office suite. Airborne spread of measles from a vigorously coughing child was the most likely mode of transmission. The outbreak supports the fact that measles virus when it becomes airborne can survive at least one hour. The rarity of reports of similar outbreaks suggests that airborne spread is unusual. Modern office design with tight insulation and a substantial proportion of recirculated ventilation may predispose to airborne transmission.

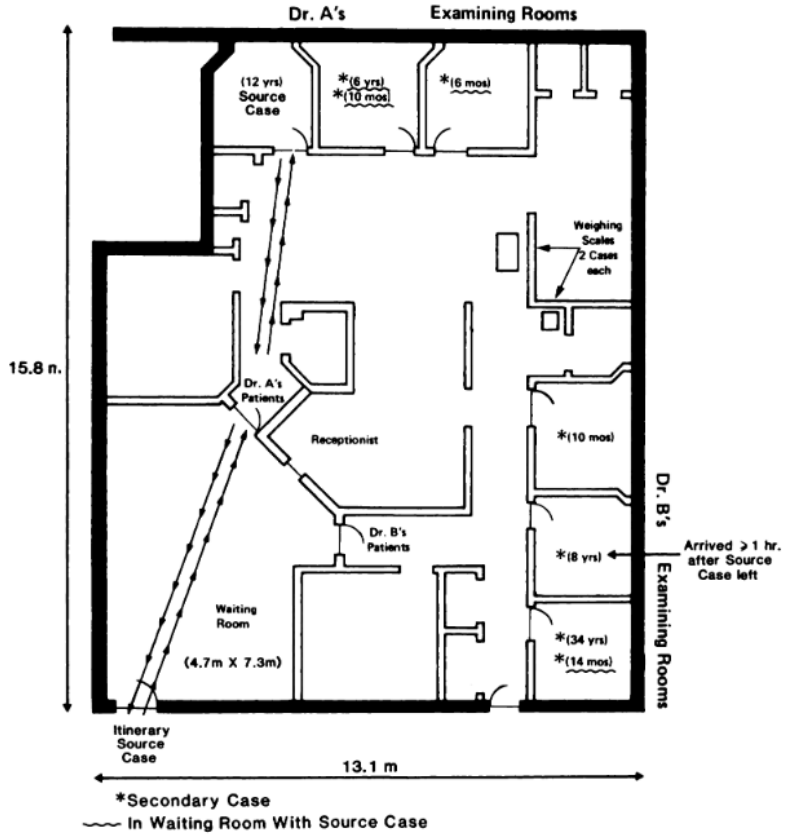


Fig 1. Pediatric office suite, DeKalb County, GA, in which there was a measles outbreak on Feb 6, 1981.

Bloch AB, et al. Pediatric 1985;75:676

AIRBORNE TRANSMISSION OF MEASLES IN A PHYSICIAN'S OFFICE

- **An unusual outbreak of measles occurred in 1982 in a pediatrician's office in Muskegon, Mich. Three children, who had arrived at the office 60 to 75 minutes after a child with measles had departed, developed measles. Using a model based on airborne transmission, it is estimated that the index patient was producing 144 units of infection (quanta) per minute while in the office. Characteristics such as coughing, increased warm air recirculation, and low relative humidity may have increased the likelihood of transmission. Adequate immunization of all patients and staff, respiratory isolation and prompt care of all suspected cases, and adequate fresh-air ventilation should decrease the risk of airborne transmission of measles in this setting. Airborne transmission may occur more often than previously suspected, a possibility that should be considered when evaluating current measles control strategies.**

(*JAMA* 1985;253:1574-1577)

Remington PL, et al.

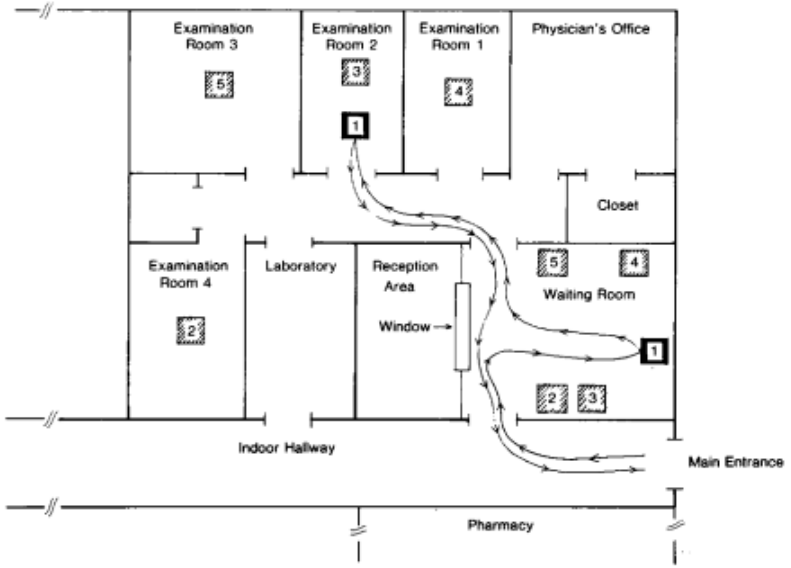


Fig 1.—Pediatric outpatient clinic, Muskegon, Mich. Solid square indicates index case; slashed squares, secondary cases.

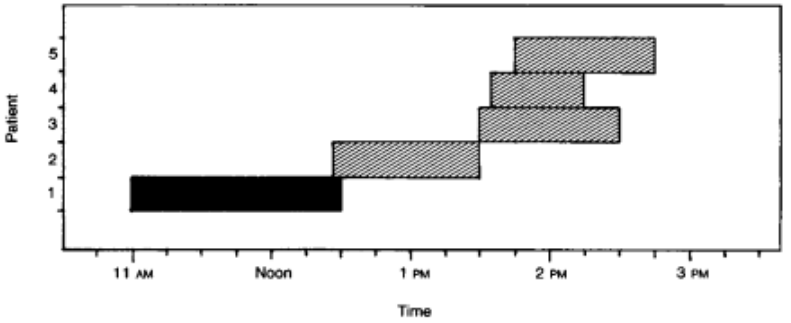


Fig 2.—Duration of pediatrician's office visit by index (solid bar) and secondary (slashed bars) measles cases.

Secondary Attack Rates by Age, Vaccination Status, and Time of Arrival in Pediatrician's Office, Michigan, 1982

	Attack Rate, No. (%)			
		Ages 15 mo-18 yr		
Time in Office	Age <15 mo and Unvaccinated	Unvaccinated	Vaccinated	Age >18 yr
Present *with* index patient (n=24)	0/3 (0)*	1/1 (100)	0/9 (0)	0/11 (0)
Arrived <90 min *after* index patient left (n=32)	2/7 (29)	1/1 (100)	0/8 (0)	0/16 (0)
Arrived ≥90 min *after* index patient left (n=28)	0/5 (0)	0/2 (0)	0/10 (0)	0/11 (0)

*Two of these three patients received immune human serum globulin eight days after exposure.

CURRENT MEASLES EPIDEMIOLOGY AND OUTBREAKS

- Between December 1, 2023 and January 23, 2024, the Centers for Disease Control and Prevention (CDC) was notified of 23 confirmed U.S. cases of measles, including seven direct importations of measles by international travelers and two outbreaks with more than five cases each. Most of these cases were among children and adolescents who had not received a measles-containing vaccine (MMR or MMRV), even if age eligible.[1]
- Central Ohio, 2022-2023: Oct-Dec, 2023. 85 locally acquired cases-80 unvaccinated; 36 hospitalized.[2]
- Nemours Children's Hospital, Wilmington, DL: 29 Dec 2023. 20-30 patient exposed to measles patient.[3]
- Hospitals in PA, Jan 2024, multiple patients exposed, 8 cases of measles reported in Philadelphia.[3]
- Europe: Over 30,000 measles cases were reported by 40 of the Region's 53 Member States between January and October 2023. Compared to 941 cases reported in all of 2022, this represents a more than 30-fold rise.
- Worldwide: The number of countries experiencing large or disruptive outbreaks increased from 22 in 2021 to 37 last year.[4]
- CDC recommendations: Isolate, Notify, Test, Manage, and vaccinate.[1]

[1]https://emergency.cdc.gov/newsletters/coca/2024/012524.html; [2] MMWR 2023;72:847; [3]Measles in Delaware: More than 20 people exposed to patient at Nemours Children's Hospital in Wilmington - 6abc Philadelphia; [4]https://www.usnews.com/news/health-news/articles/2023-11-16/cdc-who-measles-pose-relentlessly-increasing-threat-to-children

MEASLES RECOMMENDATIONS FOR HCP, CDC, 11/4/2023

- For asymptomatic healthcare personnel with presumptive evidence of immunity (MMR x 2 – written documentation should be required, lab evidence of immunity, history confirmation of infection, birth before 1957) to measles who have an exposure (i.e., not wearing recommended respiratory protection) to measles:
  - PEP is not necessary; work restrictions are not necessary.
  - Implement daily monitoring for signs and symptoms of measles infection for 21 days after their last exposure.
- For asymptomatic healthcare personnel *without* presumptive evidence of immunity to measles who have an exposure to measles
  - Administer postexposure prophylaxis in accordance with CDC and ACIP recommendations (https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmr.html).
  - Exclude from work from the 5th day after their first exposure until the 21st day after their last exposure, regardless of receipt of postexposure prophylaxis.
  - HCP who received the first dose of MMR vaccine prior to exposure may remain at work but should receive their second dose (at least 28 days after their first dose) and be monitored for signs and symptoms of measles infection for 21 days after their last exposure.
- For HCP with known or suspected measles, exclude from work for 4 days after the rash appears.
- For immunosuppressed HCP with known or suspected measles, exclude from work for the duration of their illness.
- During a measles outbreak, administer measles vaccine to HCP in accordance with CDC and ACIP recommendations (https://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmr.html).
- Because of the possibility, albeit low (~1%), of measles vaccine failure in HCP exposed to infected patients, all HCP should observe airborne precautions in caring for patients with measles.