

# Pandemic Update: Monkeypox and COVID-19

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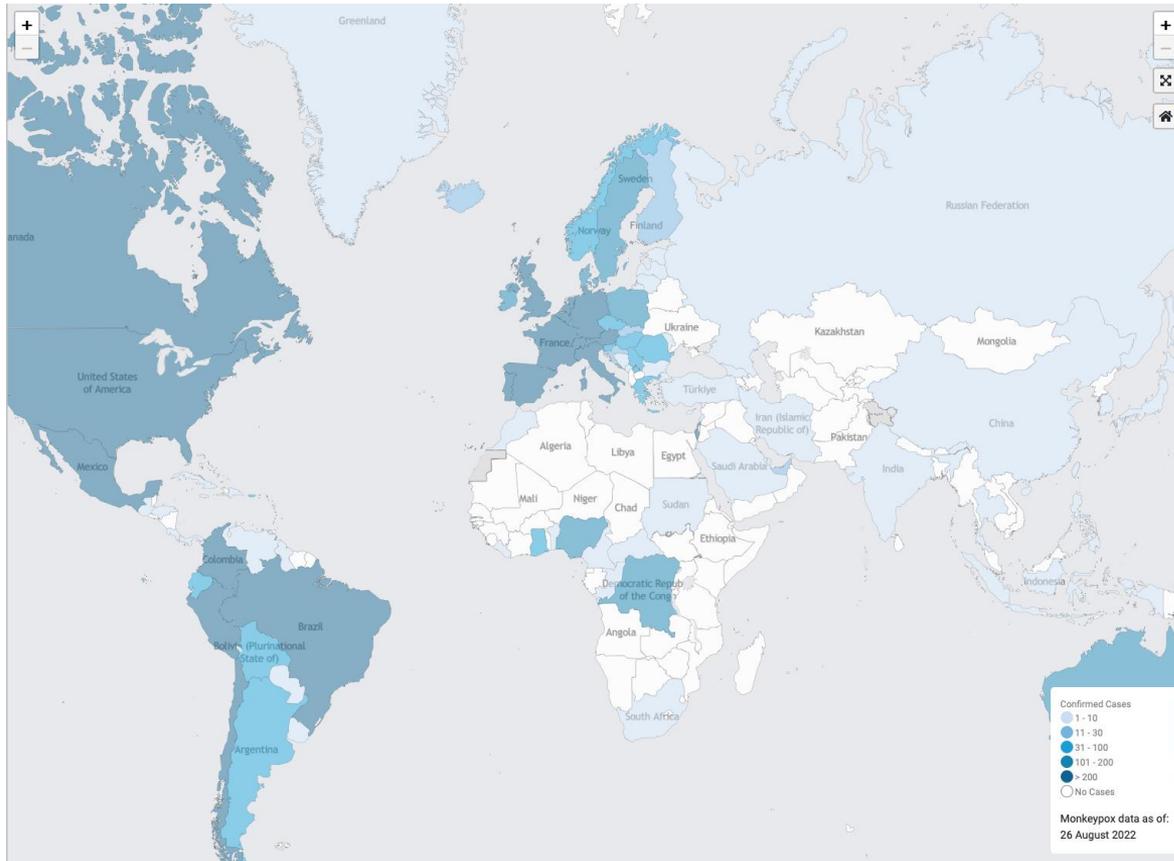
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Northwestern University Feinberg School of Medicine

# Disclosures

- Research Support<sup>°</sup>
  - GlaxoSmithKline, Pulmocide
- Paid Consultation
  - Adagio, ADMA Biologics, AlloVir, Cidara, Genentech/Roche, Janssen, Shionogi, Takeda, Viracor Eurofins
- Royalties
  - UpToDate
- Data & Safety Monitoring Board Participation
  - Adamis, Allovir, CSL Behring, Janssen, Merck, Sequiris, Takeda, Talaris

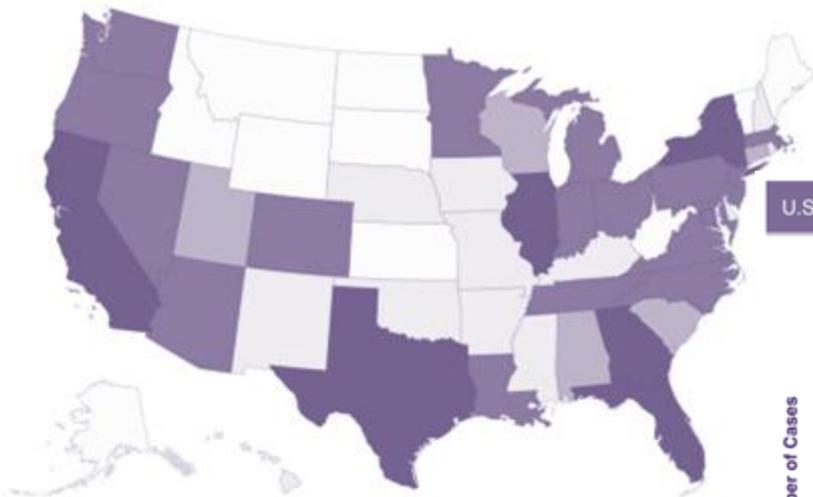
# Monkeypox: *Current State of Cases*



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16,926 Total confirmed monkeypox/orthopoxvirus cases

\*One Florida case is listed here but included in the United Kingdom case counts because the individual was tested while in the UK.

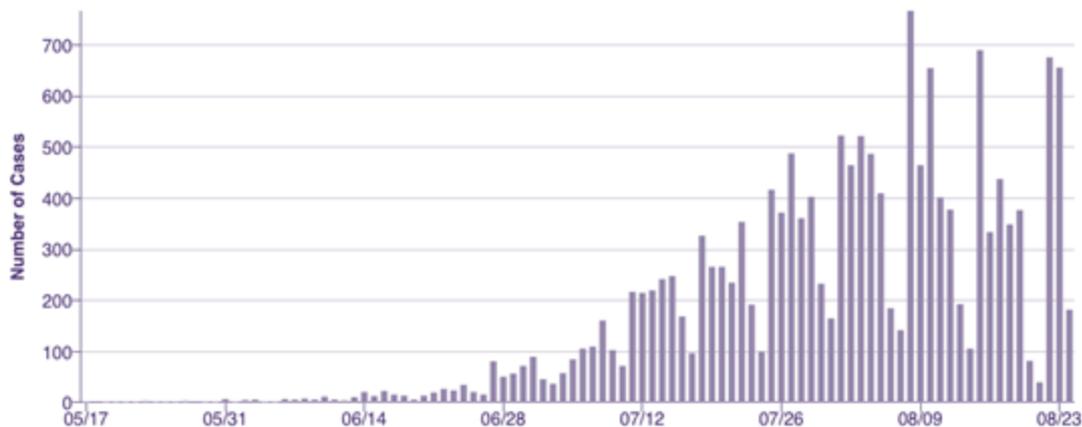


Territories

Case Range

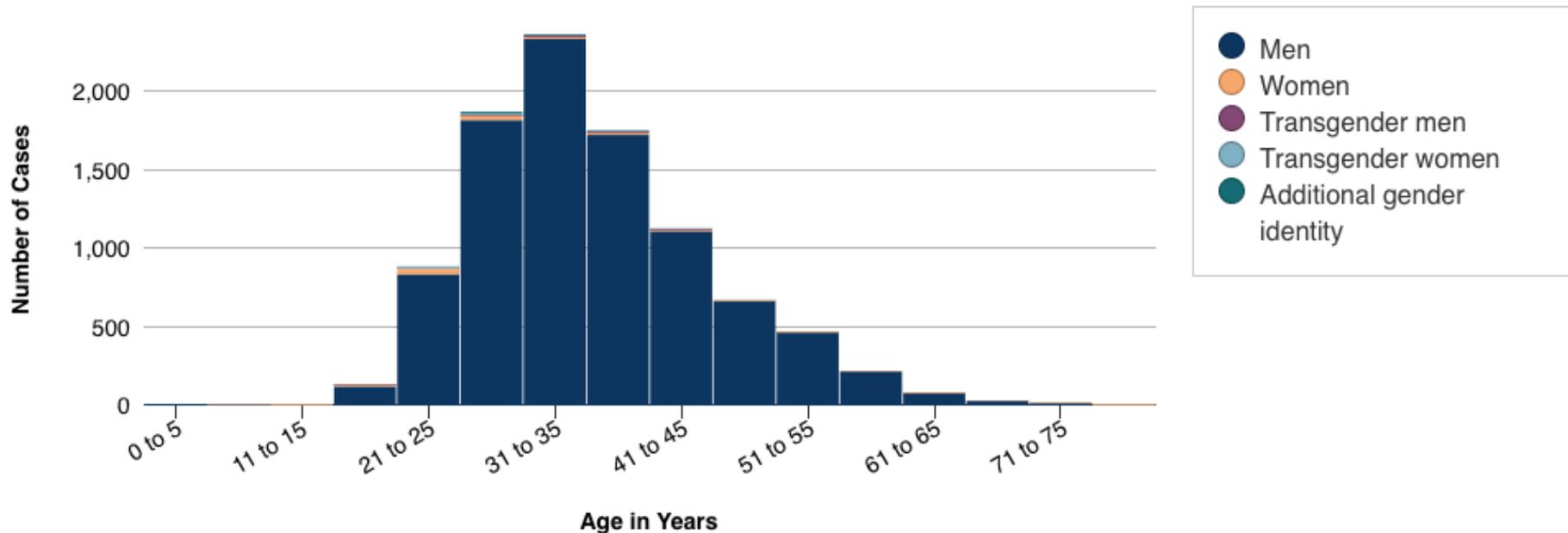
- 1 to 10
- 51 to 100
- >500
- 11 to 50
- 101 to 500

U.S. Monkeypox Case Trends Reported to CDC



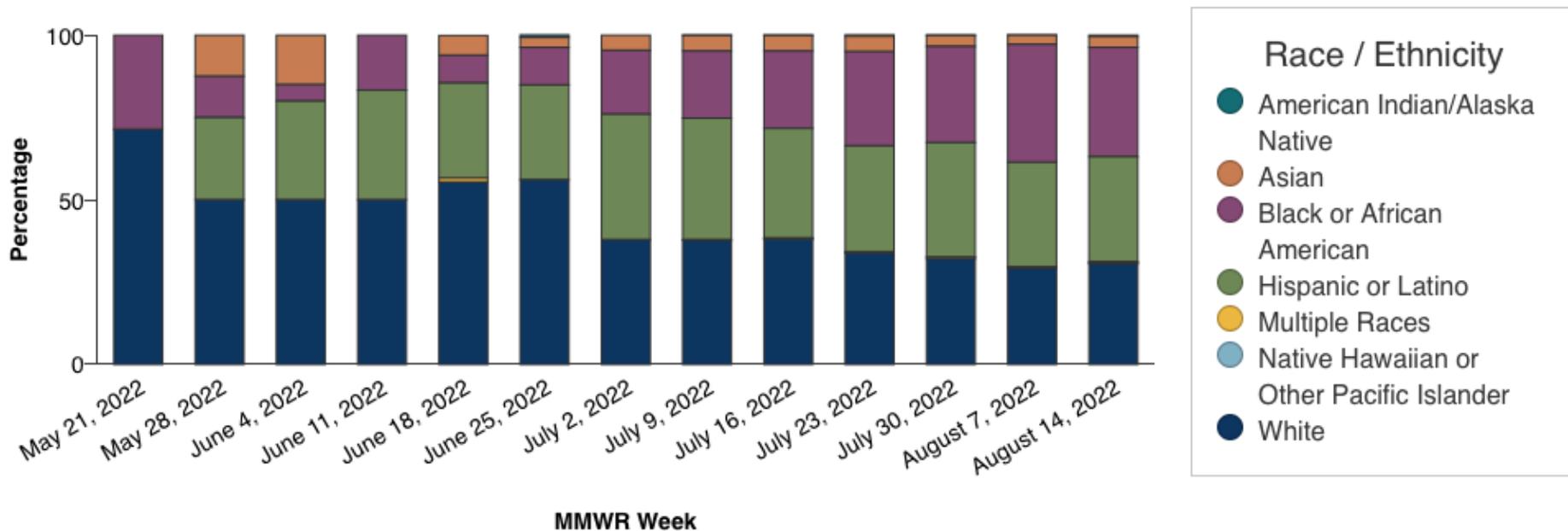
# Monkeypox: *Current State of Cases*

## Monkeypox cases reported to CDC: Age and Gender



# Monkeypox: *Current State of Cases*

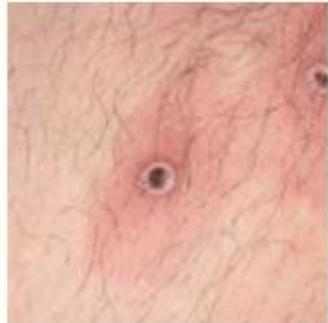
## Monkeypox cases reported to CDC: Race/Ethnicity



## Monkeypox: *Clinical Presentation*

- Incubation Period
  - Monkeypox symptoms usually start within 3 weeks of exposure to the virus
  - If someone has flu-like symptoms, they will usually develop a rash 1-4 days later
  - Monkeypox can be spread from the time symptoms start until the rash has healed, all scabs have fallen off, and a fresh layer of skin has formed
  - The illness typically lasts 2-4 weeks
- Clinical Presentation
  - Often a flu-like prodrome before rash
  - Some presents with rash at onset
  - Other symptoms: Fever, chills, swollen lymph nodes, fatigue, muscle aches, headache, respiratory symptoms

# Monkeypox: *Rash*

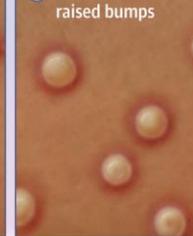


## PROGRESSION OF MONKEYPOX RASH

1 Flat red bumps



2 Firm, fluid-filled raised bumps



3 Scabs that heal over many weeks



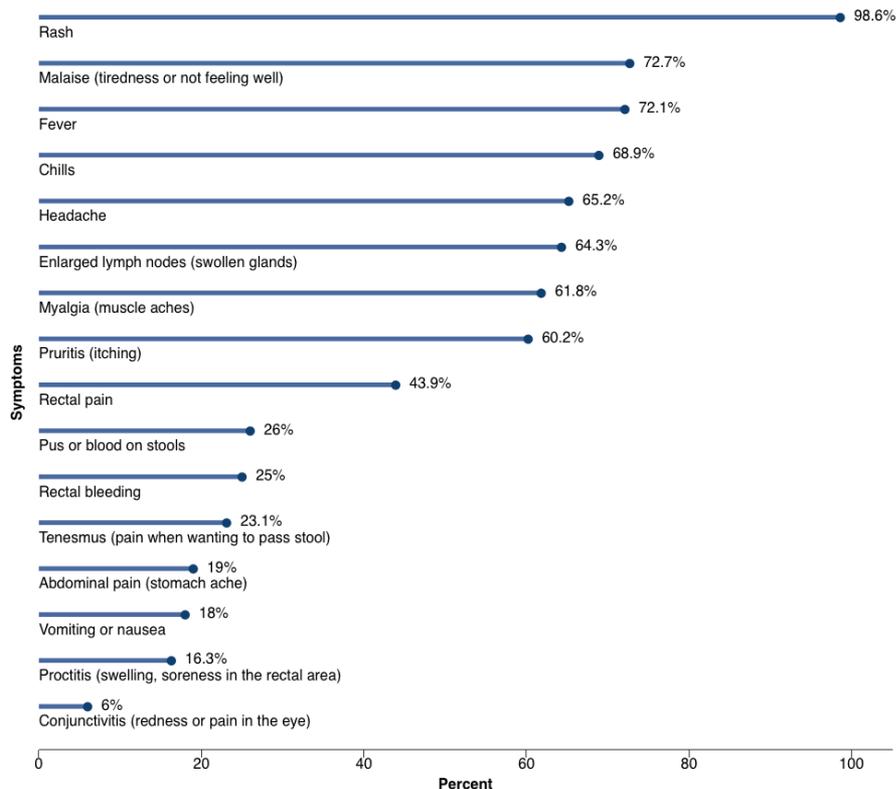
Individuals diagnosed with monkeypox should isolate at home and avoid contact with others until all skin lesions have healed.

# Monkeypox: *Rash*

Stage	Stage Duration	Characteristics
<b>Enanthem</b>		<ul style="list-style-type: none"><li>• Sometimes, lesions first form on the tongue and in the mouth.</li></ul>
<b>Macules</b>	1-2 days	<ul style="list-style-type: none"><li>• Macular lesions appear.</li></ul>
<b>Papules</b>	1-2 days	<ul style="list-style-type: none"><li>• Lesions typically progress from macular (flat) to papular (raised).</li></ul>
<b>Vesicles</b>	1-2 days	<ul style="list-style-type: none"><li>• Lesions then typically become vesicular (raised and filled with clear fluid).</li></ul>
<b>Pustules</b>	5-7 days	<ul style="list-style-type: none"><li>• Lesions then typically become pustular (filled with opaque fluid) – sharply raised, usually round, and firm to the touch (deep seated).</li><li>• Finally, lesions typically develop a depression in the center (umbilication).</li><li>• The pustules will remain for approximately 5 to 7 days before beginning to crust.</li></ul>
<b>Scabs</b>	7-14 days	<ul style="list-style-type: none"><li>• By the end of the second week, pustules have crusted and scabbed over.</li><li>• Scabs will remain for about a week before beginning to fall off.</li></ul>

# Monkeypox: *Current State of Cases*

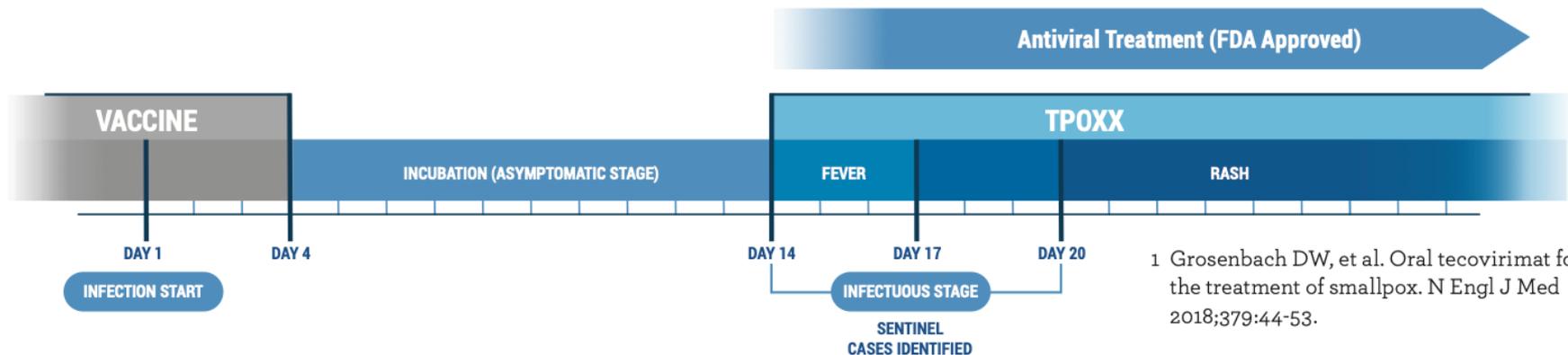
Monkeypox cases reported to CDC: Symptoms



## Monkeypox: *Transmission*

- Close or Intimate Contact
  - Monkeypox can spread to anyone through close, personal, often skin-to-skin contact, including:
    - Direct contact with monkeypox rash, scabs, or body fluids from a person with monkeypox.
    - Touching objects, fabrics (clothing, bedding, or towels), and surfaces that have been used by someone with monkeypox.
    - Contact with respiratory secretions.
- This direct contact can happen during intimate contact, including:
  - Oral, anal, and vaginal sex or touching the genitals (penis, testicles, labia, and vagina) or anus (butthole) of a person with monkeypox.
  - Hugging, massage, and kissing.
  - Prolonged face-to-face contact.
  - Touching fabrics and objects during sex that were used by a person with monkeypox and that have not been disinfected, such as bedding, towels, fetish gear, and sex toys.
- Not transmitted through routine day-to-day exposures (riding CTA, going to the bathroom)

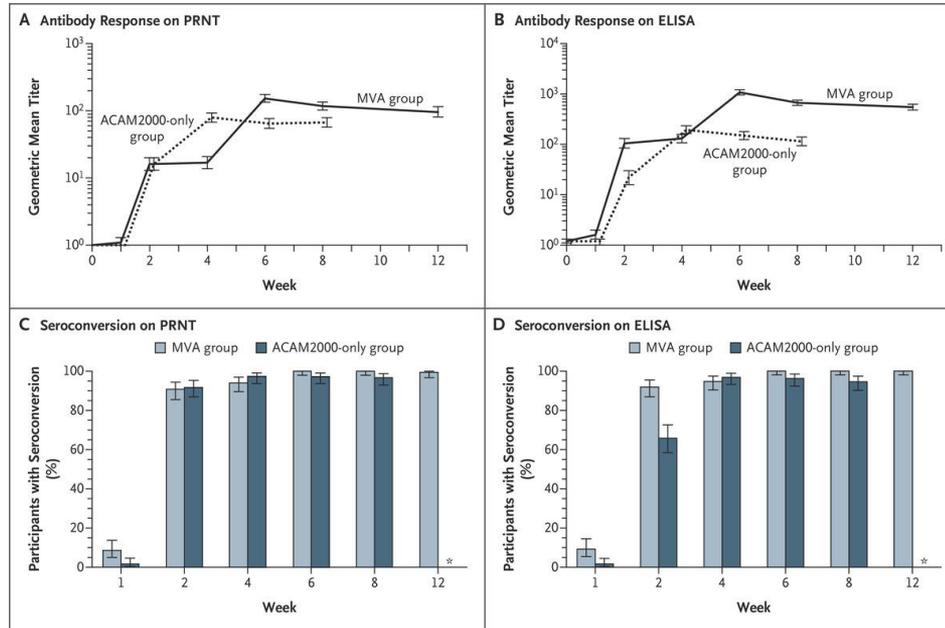
# Monkeypox: Approach



1 Grosenbach DW, et al. Oral tecovirimat for the treatment of smallpox. *N Engl J Med* 2018;379:44-53.

# Monkeypox: Vaccines

- Two vaccines are available
  - ACAM2000: Live Smallpox Vaccine, skin prick (85% effective against MPV)
  - Jynneos: Non-replicating virus, SubQ injection 4 weeks apart



## Monkeypox: Vaccines

- Jynneos Use
  - The sooner it is given the better
  - Use within 4 days of exposure is associated with prevention of onset of disease
  - Use between 4 and 14 days may be associated with reduced severity of infection
  - Protection 2 weeks after 2<sup>nd</sup> dose
  - If prior smallpox vaccine >3 years ago, would get revaccinated



# MPV VACCINE ELIGIBILITY UPDATE

**AS OF 8.18.22**

## **YOU ARE ELIGIBLE FOR A MPV VACCINE IF YOU:**

1. Live anywhere in Chicago or Illinois and have not previously been infected with MPV **AND meet the criteria below:**
2. Have had close contact (e.g., household members with close physical contact or intimate partners) with someone diagnosed with MPV **regardless of sex, gender, or sexual orientation**  
**OR**  
Are a gay, bisexual, or other man who has sex with men and/or transgender person **who is sexually active.**

*If you meet eligibility criteria, especially consider getting vaccinated if you met recent partners through online applications or social media platforms (such as Grindr, Tinder or Scruff), or at clubs, raves, sex parties, saunas, or exchange good or services for sex. At this time, MPV vaccine is NOT recommended for the general public. As vaccine supply increases, guidance may evolve.*

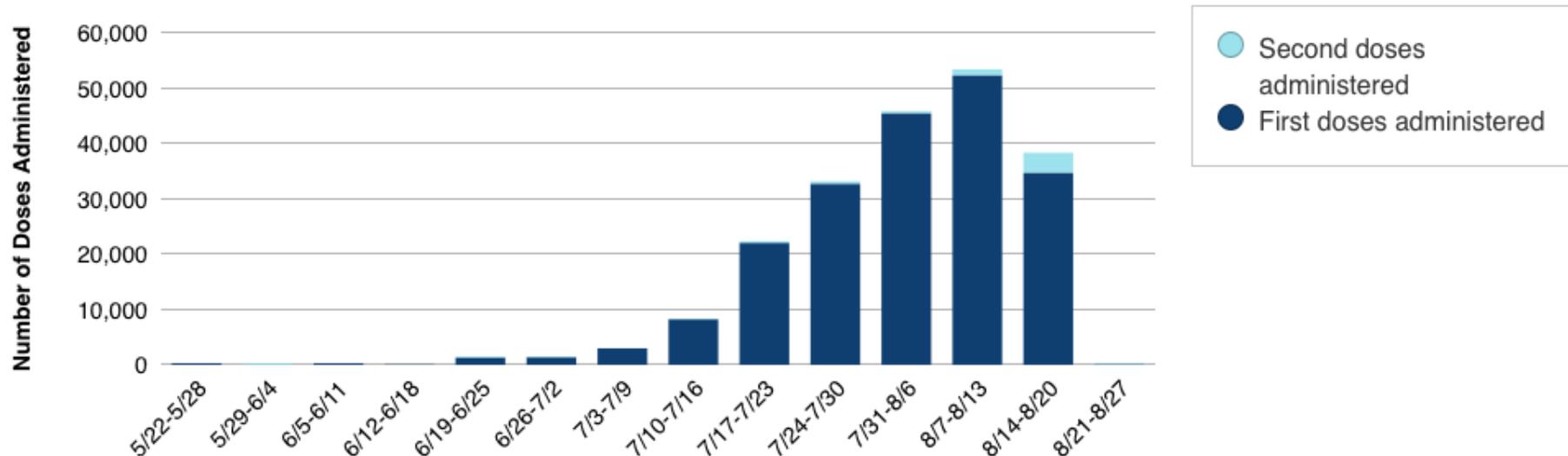
# Monkeypox: Vaccines

**Table 3.** Pooled Solicited and Unsolicited Adverse Events during the Active Trial Phase in Each Vaccination Period (Full-Analysis Population).<sup>\*,‡</sup>

Event	MVA Group							ACAM2000- Only Group
	Period 1 MVA (N=220)	P Value <sup>†</sup>	Period 2 MVA (N=208)	P Value <sup>†</sup>	Periods 1 and 2 MVA (N=220)	Period 3 ACAM2000 (N=196)	P Value <sup>†</sup>	
	no. (%)		no. (%)		no. (%)	no. (%)		
Documented adverse event	169 (76.8)	<0.001	135 (64.9)	<0.001	184 (83.6)	181 (92.3)	0.008	209 (98.1)
Nonserious adverse event within 29 days after vaccination	168 (76.4)	<0.001	135 (64.9)	<0.001	183 (83.2)	181 (92.3)	0.008	209 (98.1)
Serious adverse event <sup>‡</sup>	2 (0.9)	1.0	0	1.0	2 (0.9)	0	1.0	1 (0.5)
Adverse event of special interest	2 (0.9)	0.44	2 (1.0)	0.68	4 (1.8)	2 (1.0)	0.69	4 (1.9)
Related adverse event within 29 days after vaccination <sup>§</sup>	112 (50.9)	<0.001	76 (36.5)	<0.001	130 (59.1)	61 (31.1)	<0.001	158 (74.2)
Adverse event grade ≥3 within 29 days after vaccination	13 (5.9)	<0.001	4 (1.9)	<0.001	17 (7.7)	10 (5.1)	<0.001	64 (30.0)
Related adverse event grade ≥3 <sup>§</sup>	3 (1.4)	<0.001	2 (1.0)	<0.001	5 (2.3)	3 (1.5)	<0.001	22 (10.3)
Related adverse event grade ≥3 within 29 days <sup>§</sup>	3 (1.4)	<0.001	2 (1.0)	<0.001	5 (2.3)	3 (1.5)	<0.001	22 (10.3)
Adverse event leading to withdrawal from trial	2 (0.9)	0.5	0	NA	2 (0.9)	0	NA	0
Adverse event leading to withdrawal from vaccination	2 (0.9)	0.5	0	NA	2 (0.9)	0	NA	0

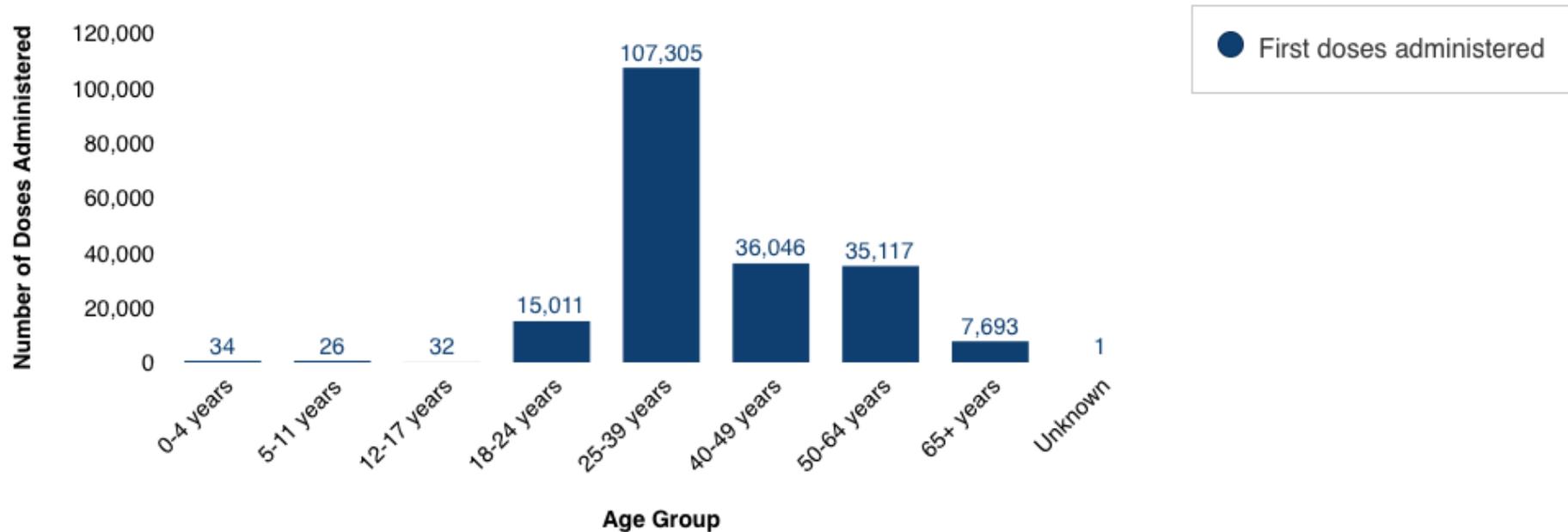
# Monkeypox: Vaccine Update

## Total JYNNEOS Vaccine Doses Administered and Reported to CDC

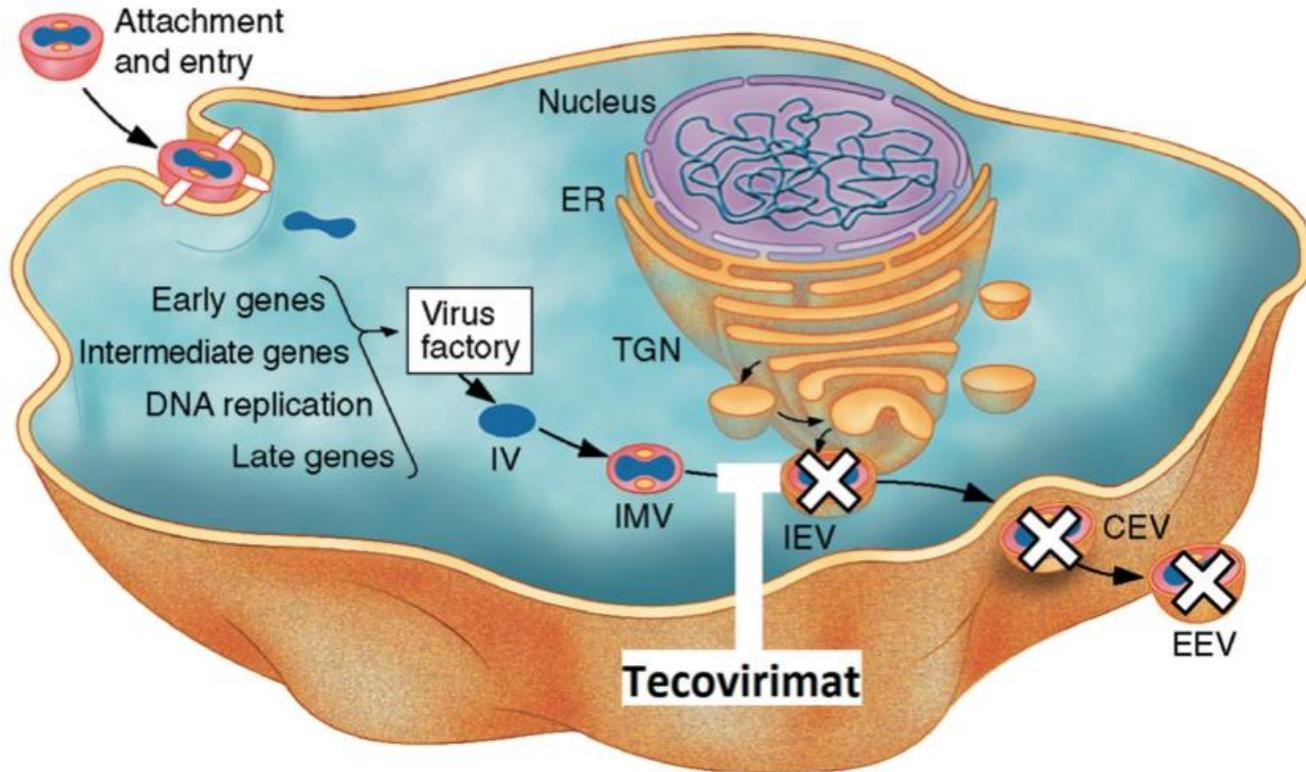


# Monkeypox: Vaccine Update

JYNNEOS Vaccine Doses Administered, by Age



# Monkeypox: *Tecovirimat* for Treatment



# Monkeypox: *Tecovirimat* for Treatment

**Table 6: Survival Rates in Tecovirimat Treatment Studies in Cynomolgus Macaques and NZW Rabbits Exhibiting Clinical Signs of Orthopoxvirus Disease**

	Treatment Initiation <sup>a</sup>	Survival Percentage (# survived/n)		p-value <sup>b</sup>	Survival Rate Difference <sup>c</sup> (95% CI) <sup>d</sup>
		Placebo	Tecovirimat		
<b>Cynomolgus Macaques</b>					
Study 1	Day 4	0% (0/7)	80% (4/5)	0.0038	80% (20.8%, 99.5%)
Study 2	Day 4	0% (0/6)	100% (6/6)	0.0002	100% (47.1%, 100%)
Study 3	Day 4	0% (0/3)	83% (5/6)	0.0151	83% (7.5%, 99.6%)
	Day 5		83% (5/6)	0.0151	83% (7.5%, 99.6%)
	Day 6		50% (3/6)	0.1231	50% (-28.3%, 90.2%)
<b>NZW Rabbits</b>					
Study 4	Day 4	0% (0/10)	90% (9/10)	< 0.0001	90% (50.3%, 99.8%)
Study 5	Day 4	NA <sup>c</sup>	88% (7/8)	NA	NA

## Monkeypox: *Tecovirimat* for Treatment

**Table 2: Adverse Reactions Reported in  $\geq 2\%$  of Healthy Adult Subjects Receiving at Least One Dose of TPOXX 600 mg**

<b>Adverse Reaction</b>	<b>TPOXX 600 mg N = 359 (%)</b>	<b>Placebo N = 90 (%)</b>
Headache	12	8
Nausea	5	4
Abdominal pain <sup>a</sup>	2	1
Vomiting	2	0

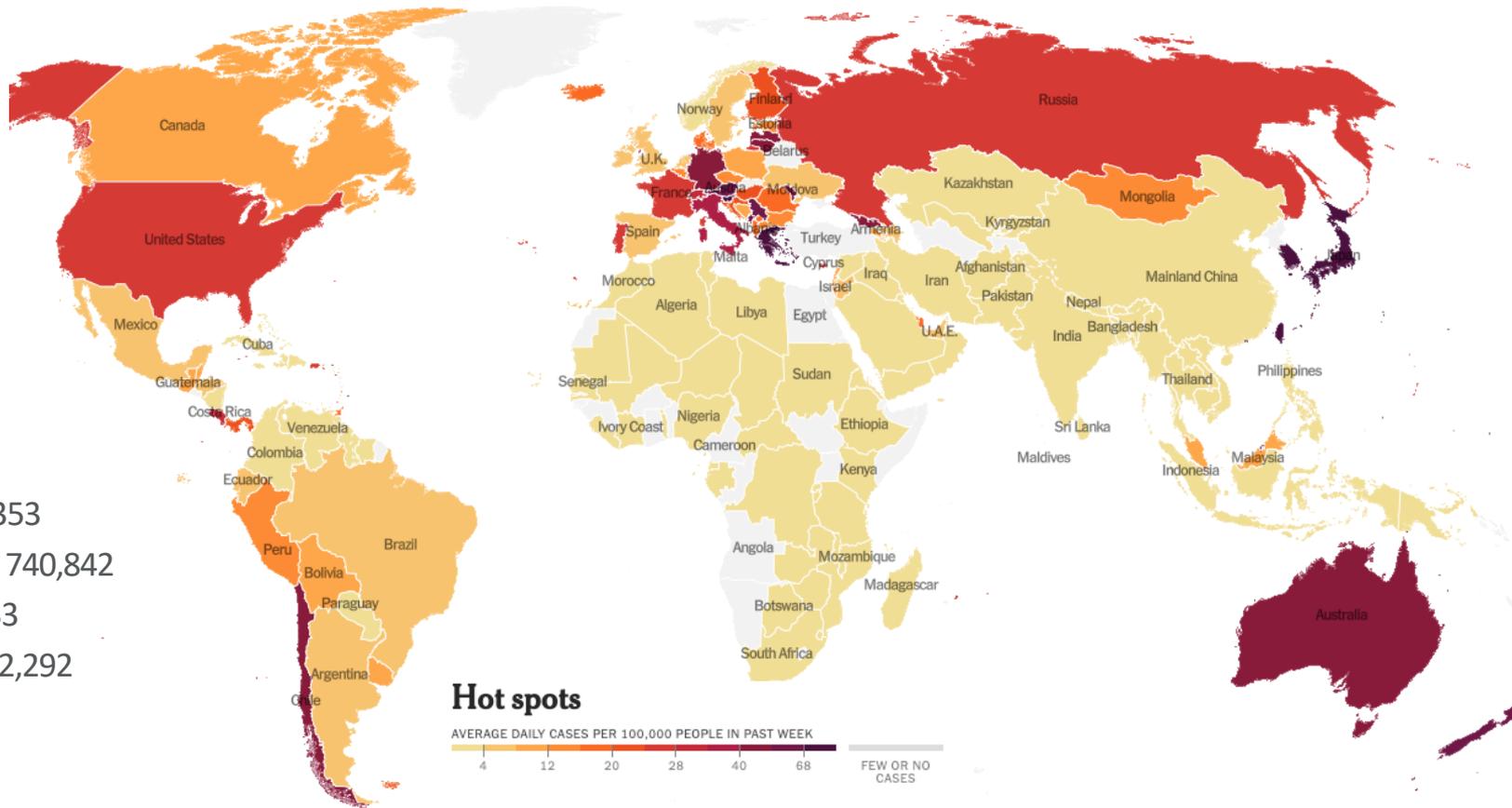
<sup>a</sup> Includes abdominal pain, abdominal pain upper, abdominal distension, abdominal discomfort, abdominal pain lower, epigastric pain

## Monkeypox: *Tecovirimat* for Treatment

Tecovirimat may be considered for treatment in people infected with *Monkeypox virus*:

- With severe disease (e.g., hemorrhagic disease, confluent lesions, sepsis, encephalitis, or other conditions requiring hospitalization)
- Who are at high risk of severe disease:
  - People with immunocompromising conditions
  - Pediatric populations, particularly patients younger than 8 years of age
  - Pregnant or breastfeeding women
  - People with a history or presence of atopic dermatitis, people with other active exfoliative skin conditions (e.g., eczema, burns, impetigo, varicella zoster virus infection, herpes simplex virus infection, severe acne, severe diaper dermatitis with extensive areas of denuded skin, psoriasis, or Darier disease)
  - People with one or more complication (e.g., secondary bacterial skin infection; gastroenteritis with severe nausea/vomiting, diarrhea, or dehydration; bronchopneumonia; concurrent disease or other comorbidities)
- With aberrant infections involving accidental implantation in eyes, mouth, or other anatomic areas where *Monkeypox virus* infection might constitute a special hazard (e.g., the genitals or anus)

# COVID-19: Global Trends



Cases: 599,176,353

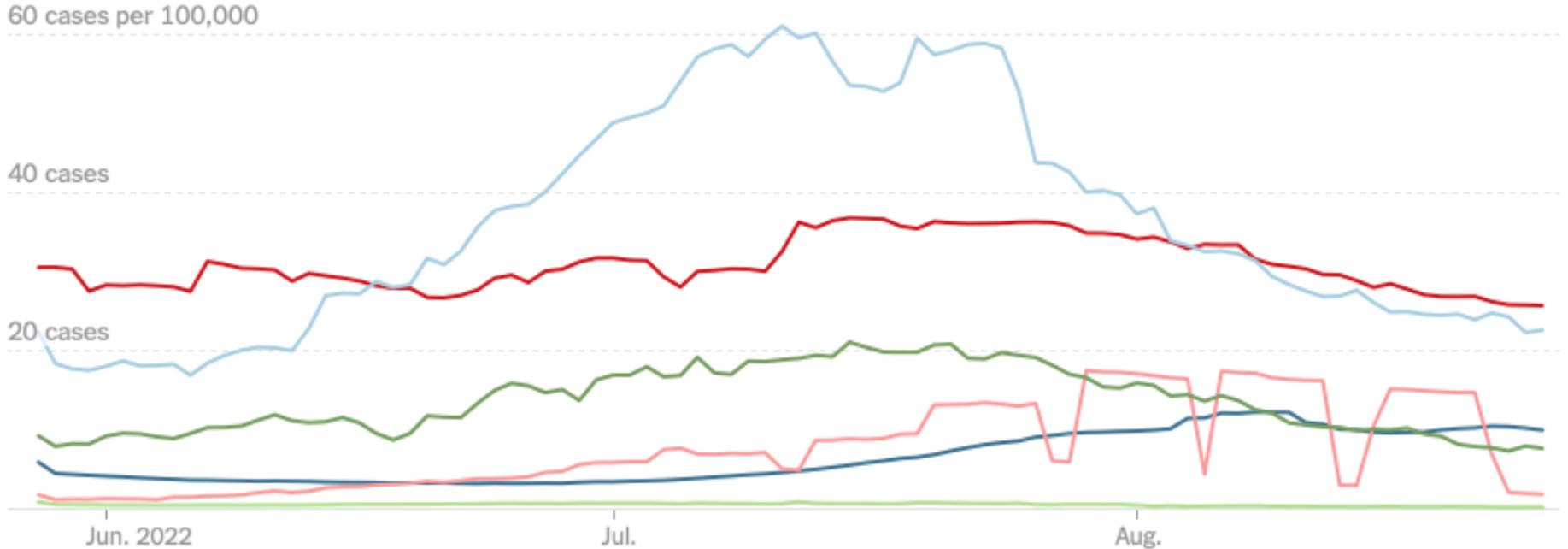
Daily Average: 740,842

Deaths: 6,460,533

Daily Deaths: 2,292

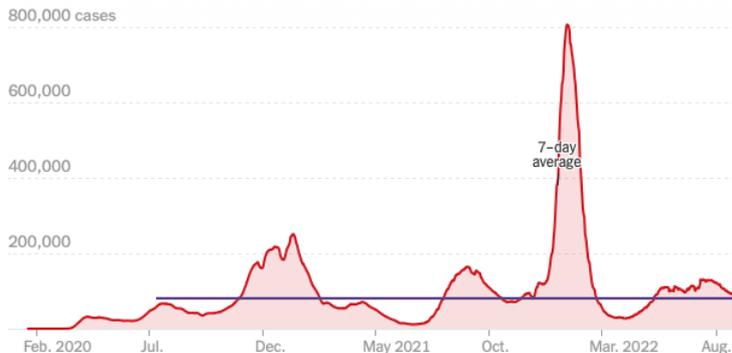
# COVID-19: Global Trends

Africa Asia-Pacific Europe Latin America Middle East U.S. and Canada



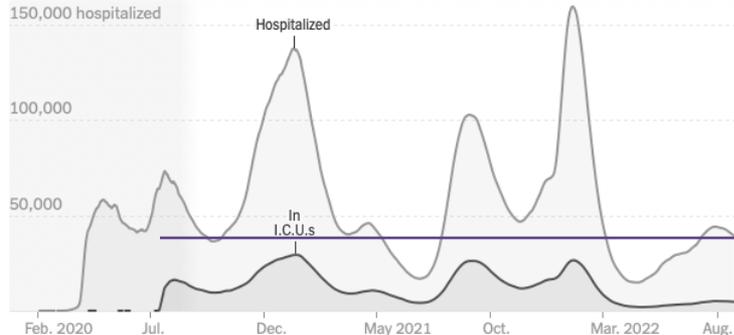
# COVID-19: US Trends

New reported cases by day

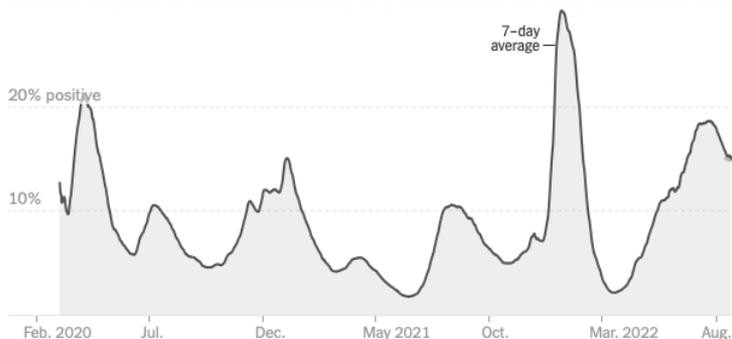


Covid patients in hospitals and I.C.U.s

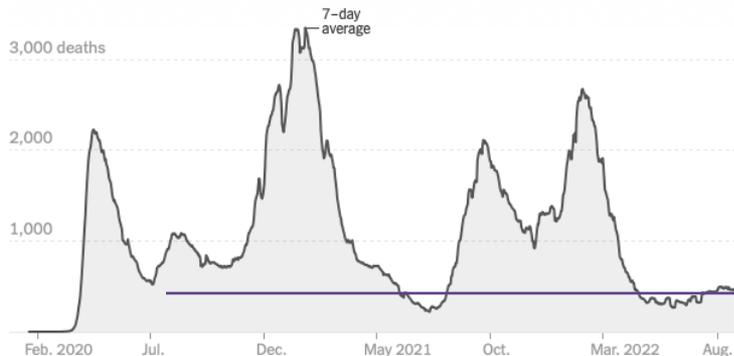
Early data may be incomplete.



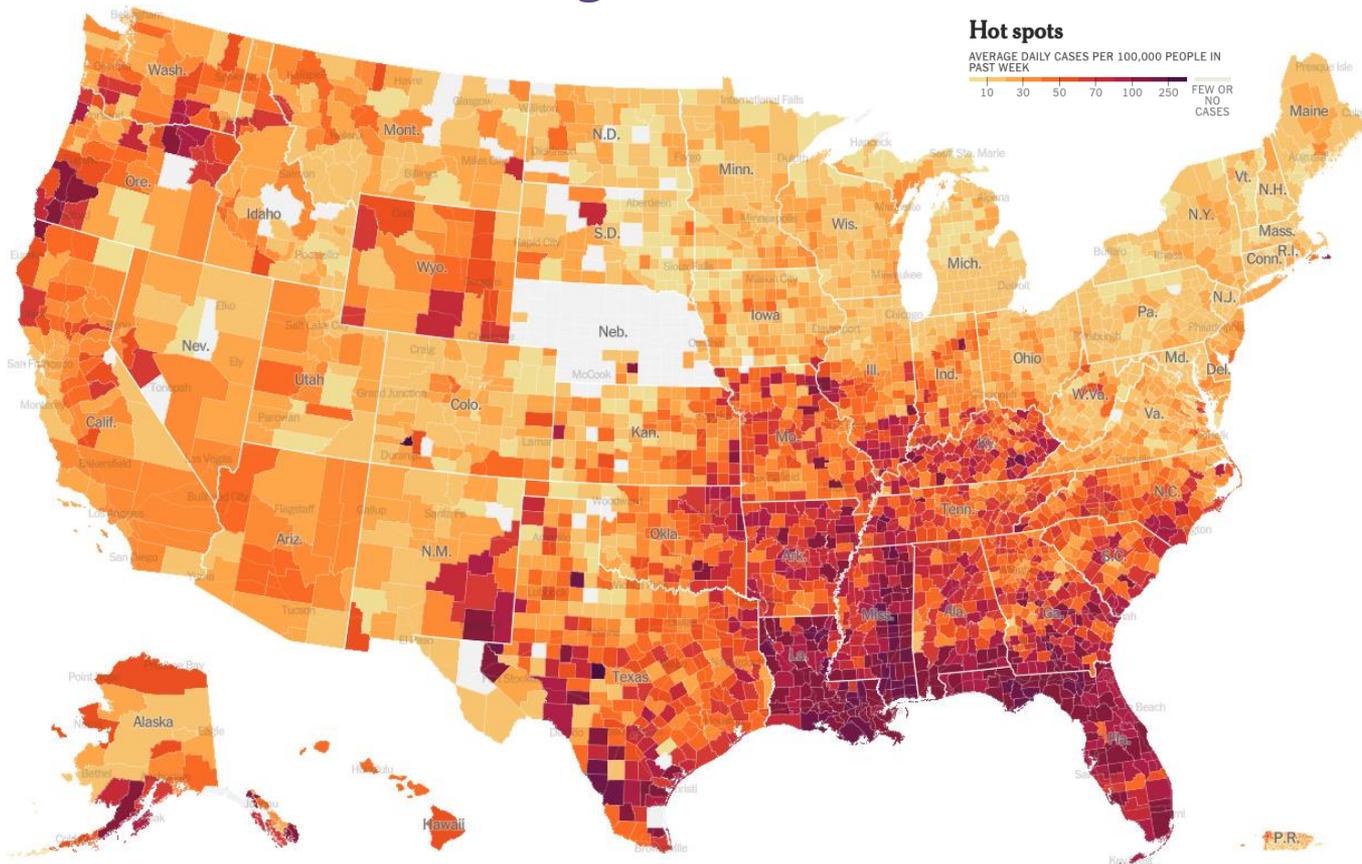
Test positivity rate



New reported deaths by day



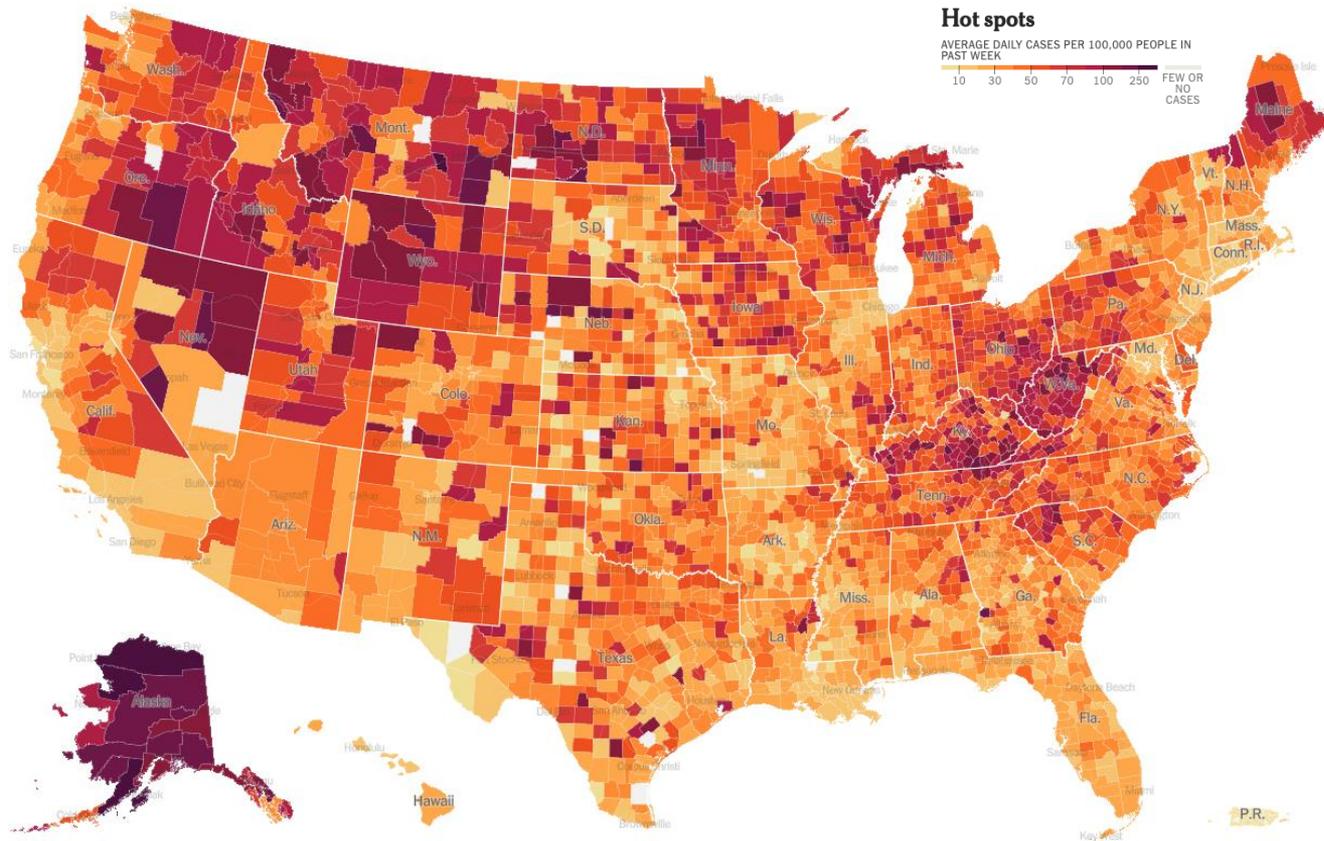
# COVID-19: US Trends August 2021



# COVID-19: US Trends October 2021

Cases: 46,683,764

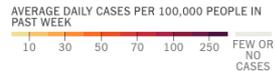
Deaths: 701,178



# COVID-19: US Trends Mid-December 2021

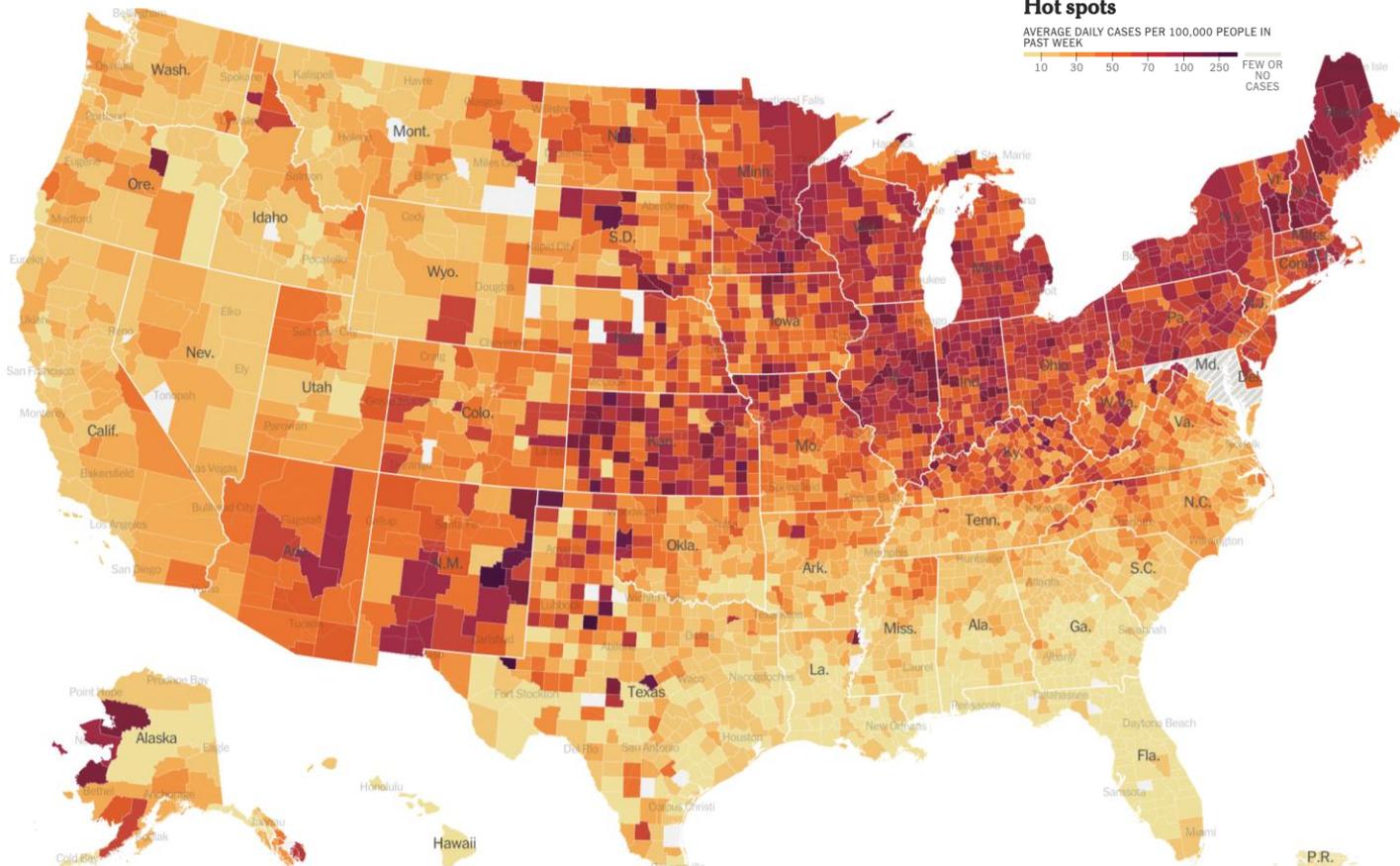
## Hot spots

AVERAGE DAILY CASES PER 100,000 PEOPLE IN PAST WEEK



10 30 50 70 100 250 FEW OR NO CASES

The legend shows a color gradient from light yellow (10 cases) to dark purple (250+ cases). The text 'FEW OR NO CASES' is positioned to the right of the scale.



Cases: 46,683,764

Daily New Cases: 119,301

Hospitalizations: 65,962

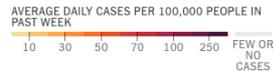
Deaths: 800,922

Daily Deaths: 1,298

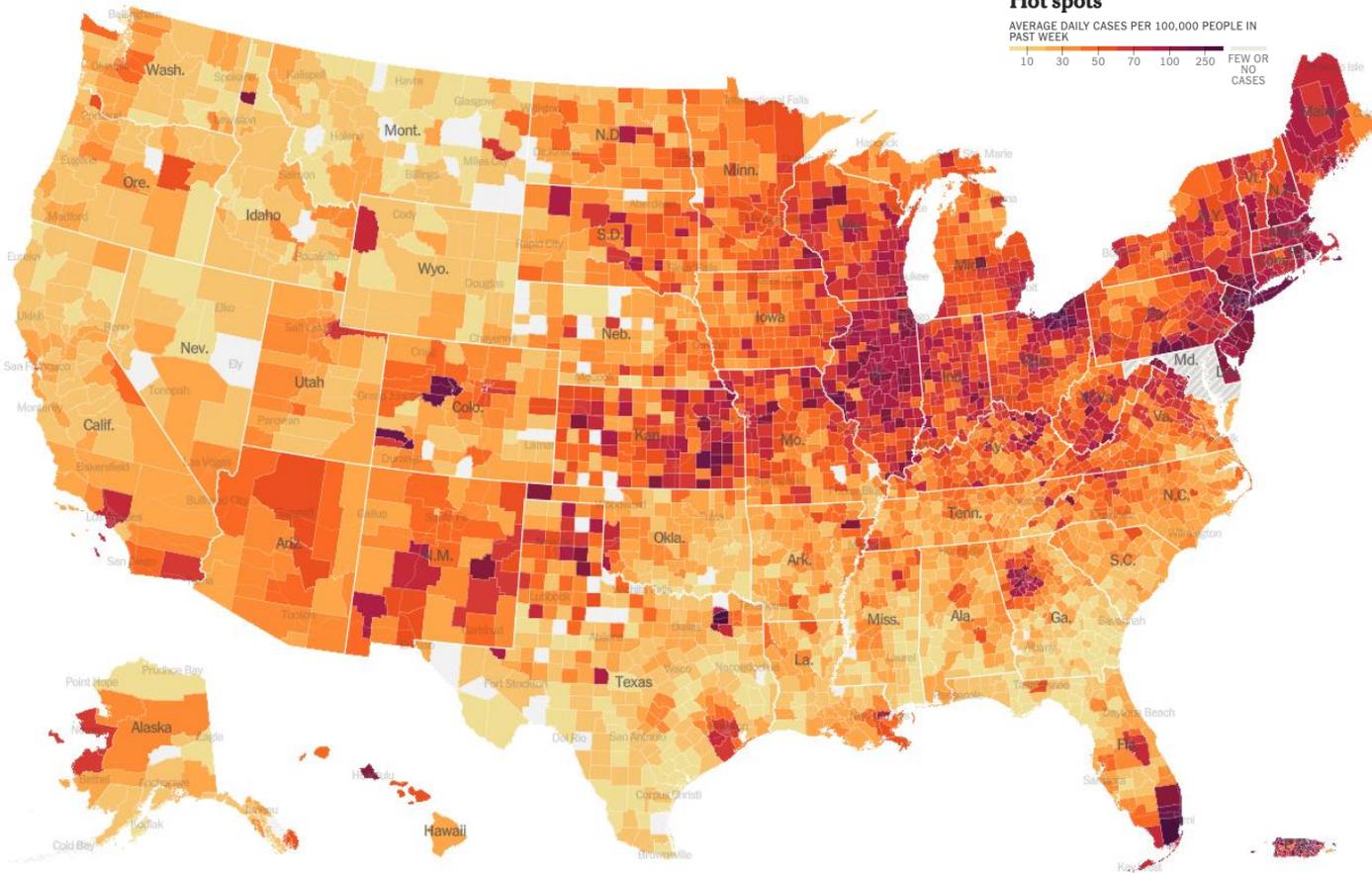
# COVID-19: US Trends Post-Christmas 2021

## Hot spots

AVERAGE DAILY CASES PER 100,000 PEOPLE IN PAST WEEK



10 30 50 70 100 250 FEW OR NO CASES



Cases: 52,244,696

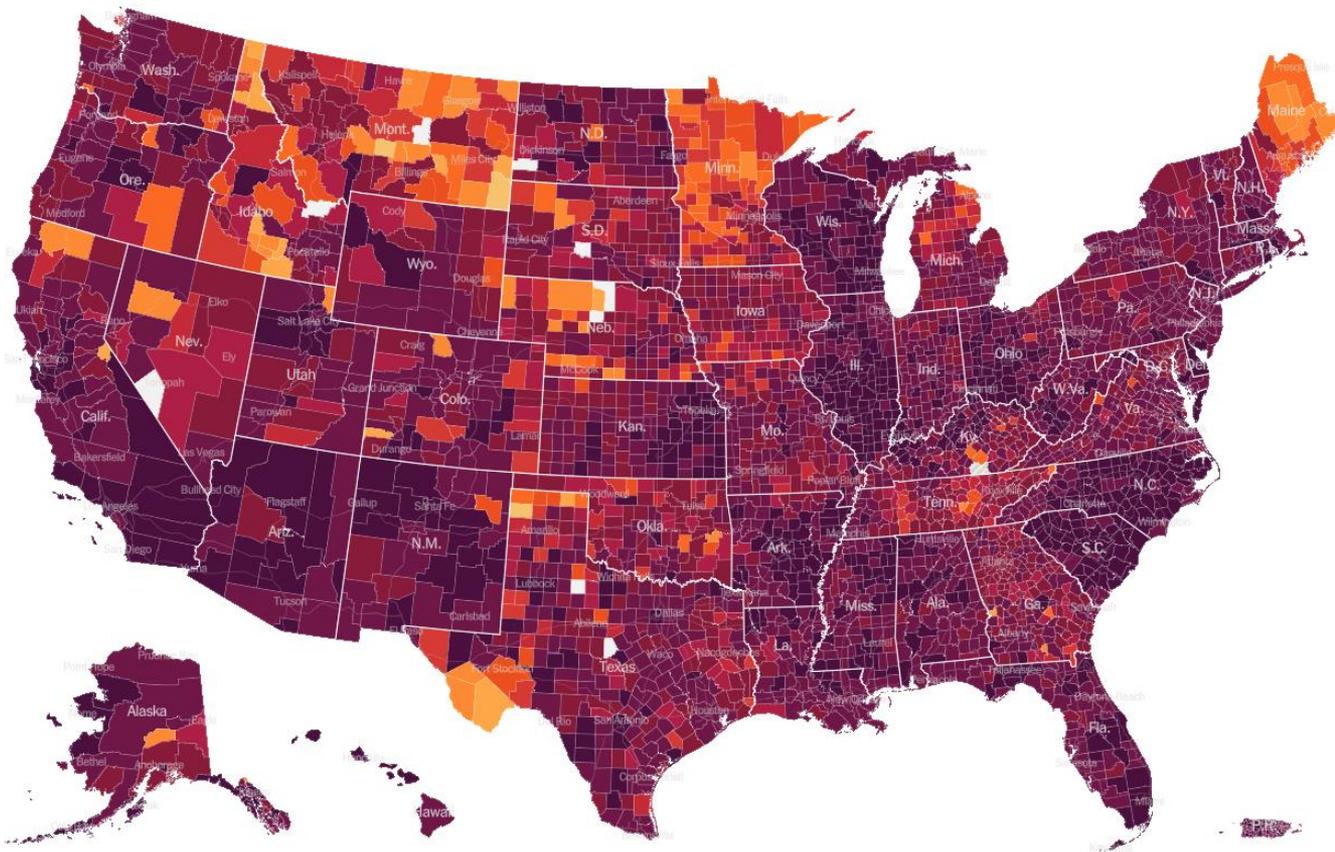
Daily New Cases: 214,499

Hospitalizations: 71,034

Deaths: 814,970

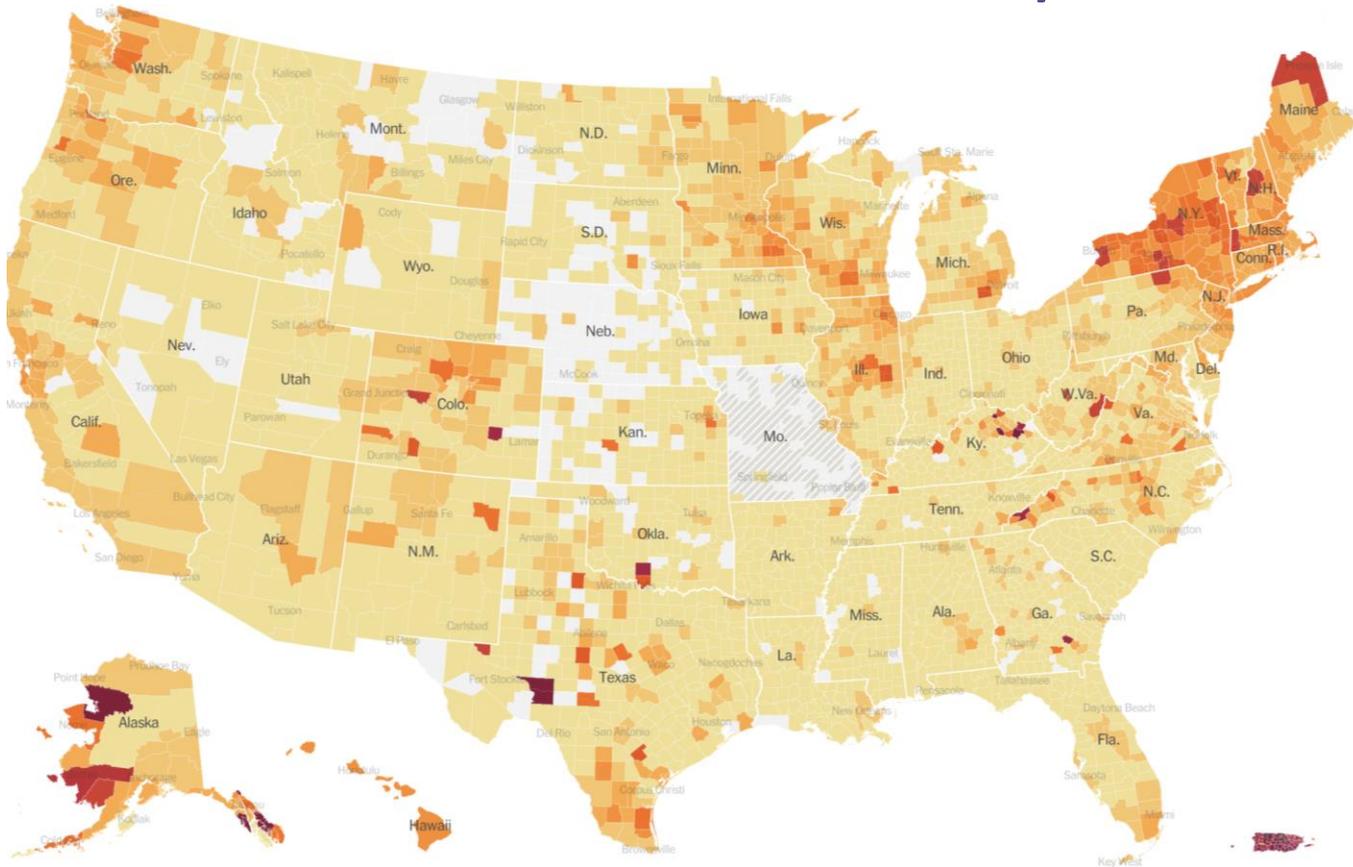
Daily Deaths: 1,328

## Current Situation: *United States – Mid-January*



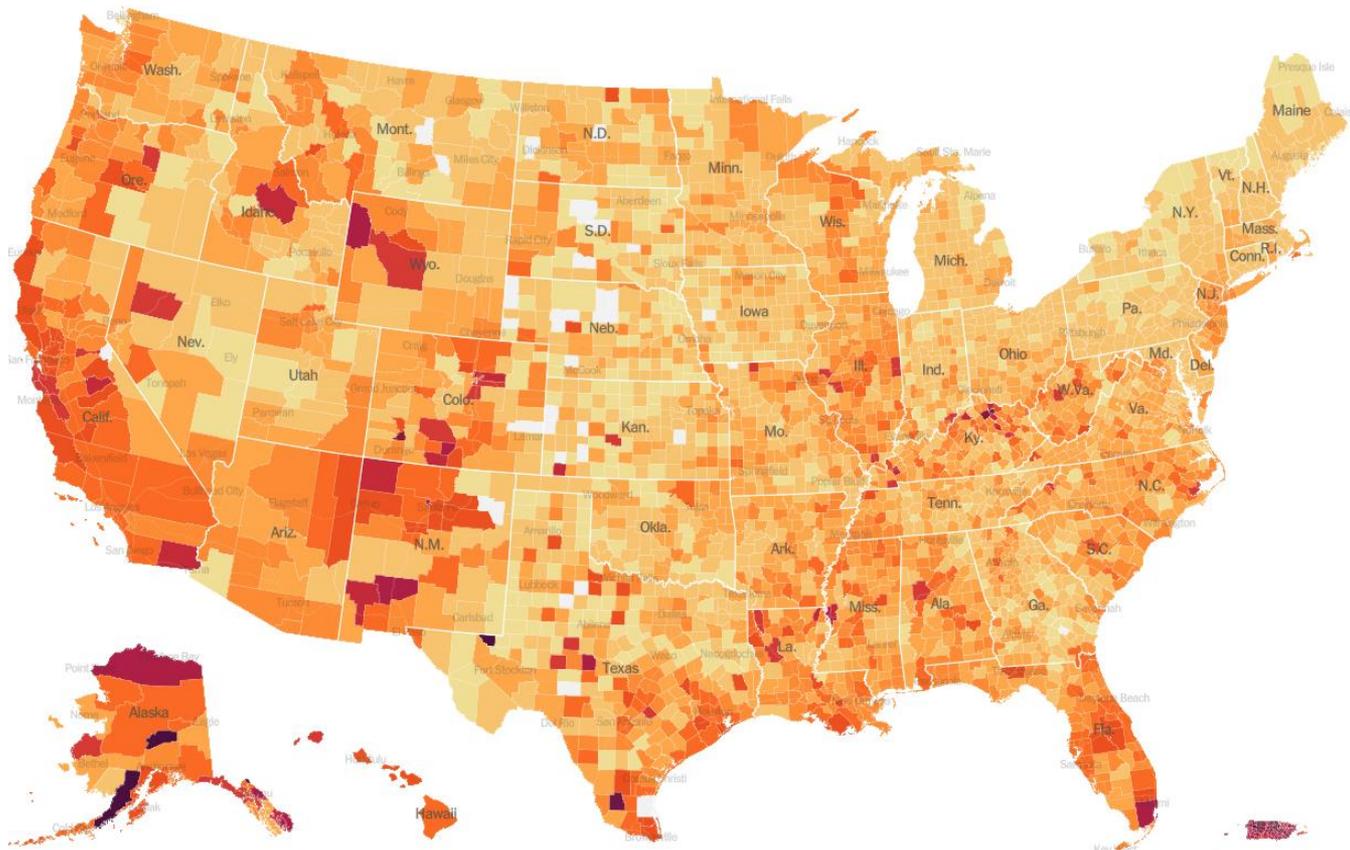
- Cases:
  - Total: 67,705,330
  - Daily: 756,752
- Hospitalizations
  - Daily: 156,894
- Deaths
  - Total: 853,740
  - Daily: 1,889

# Current Situation: *United States – April 2022*



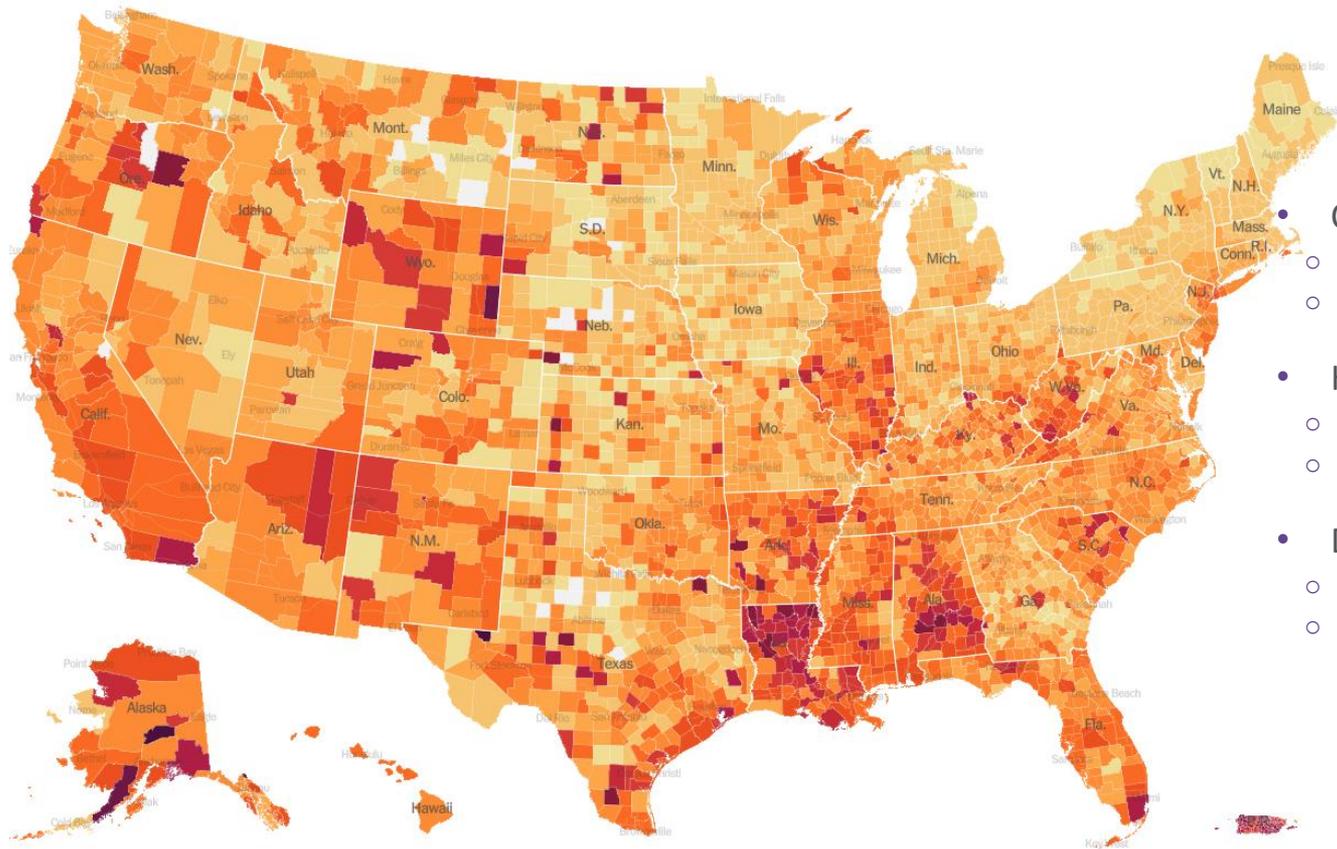
- **Cases:**
  - Total: 81,237,905
  - Daily: 56,869
- **Hospitalizations**
  - Daily: 16,897
  - ICU: 1,973
- **Deaths**
  - Total: 991,921
  - Daily: 316

## Current Situation: *United States – Current Status*

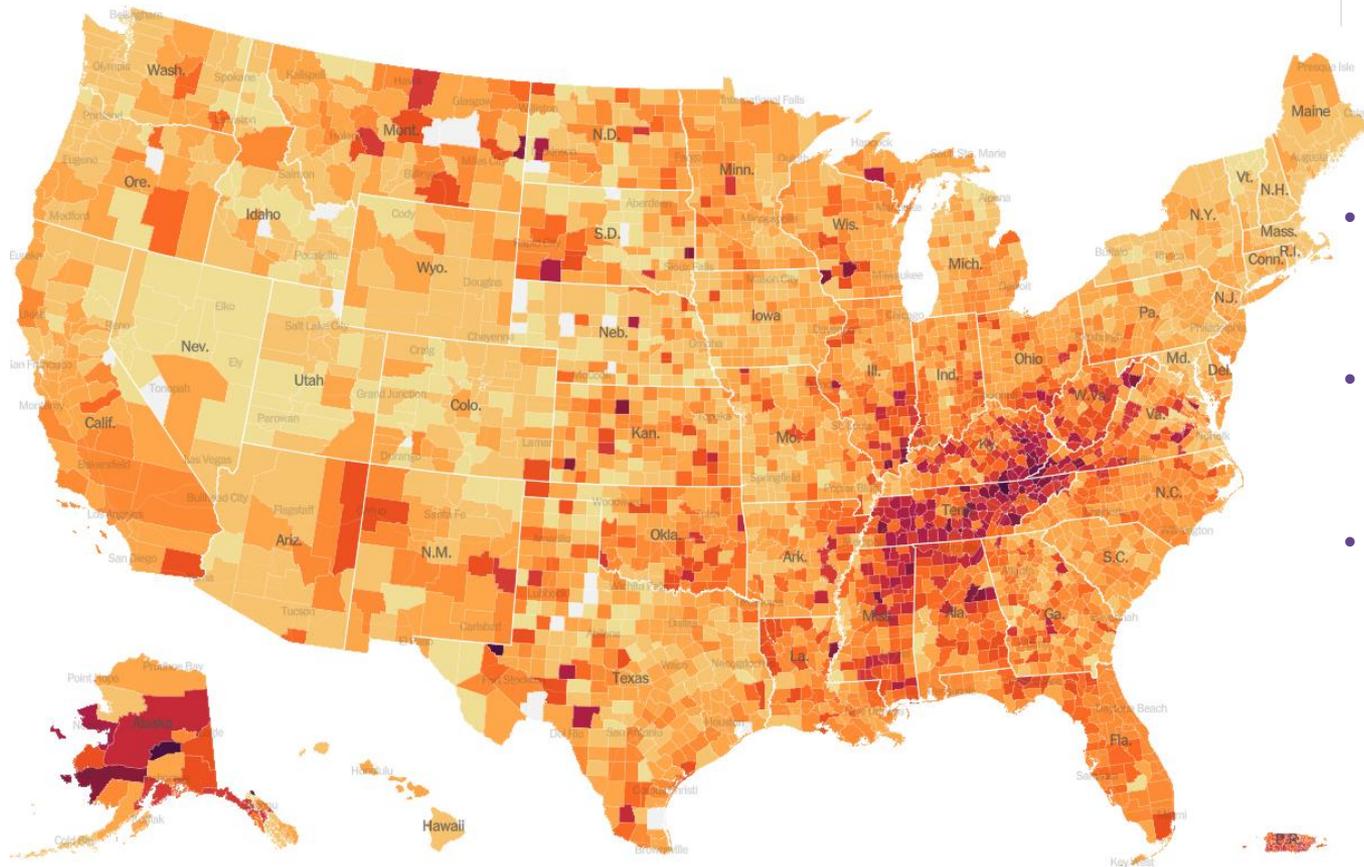


- Cases:
  - Total: 86,899,773
  - Daily: 102,818
- Hospitalizations
  - Daily: 31,650
  - ICU: 3,498
- Deaths
  - Total: 1,012,486
  - Daily: 348

## Current Situation: *United States – Current Status*



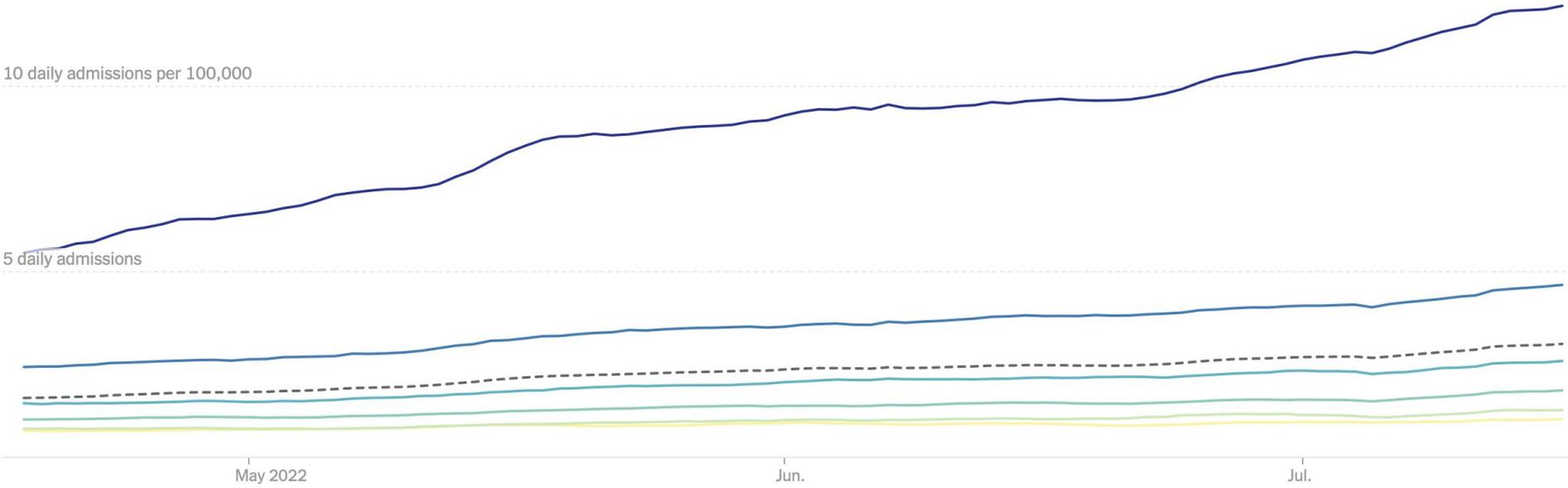
## Current Situation: *United States – Current Status*



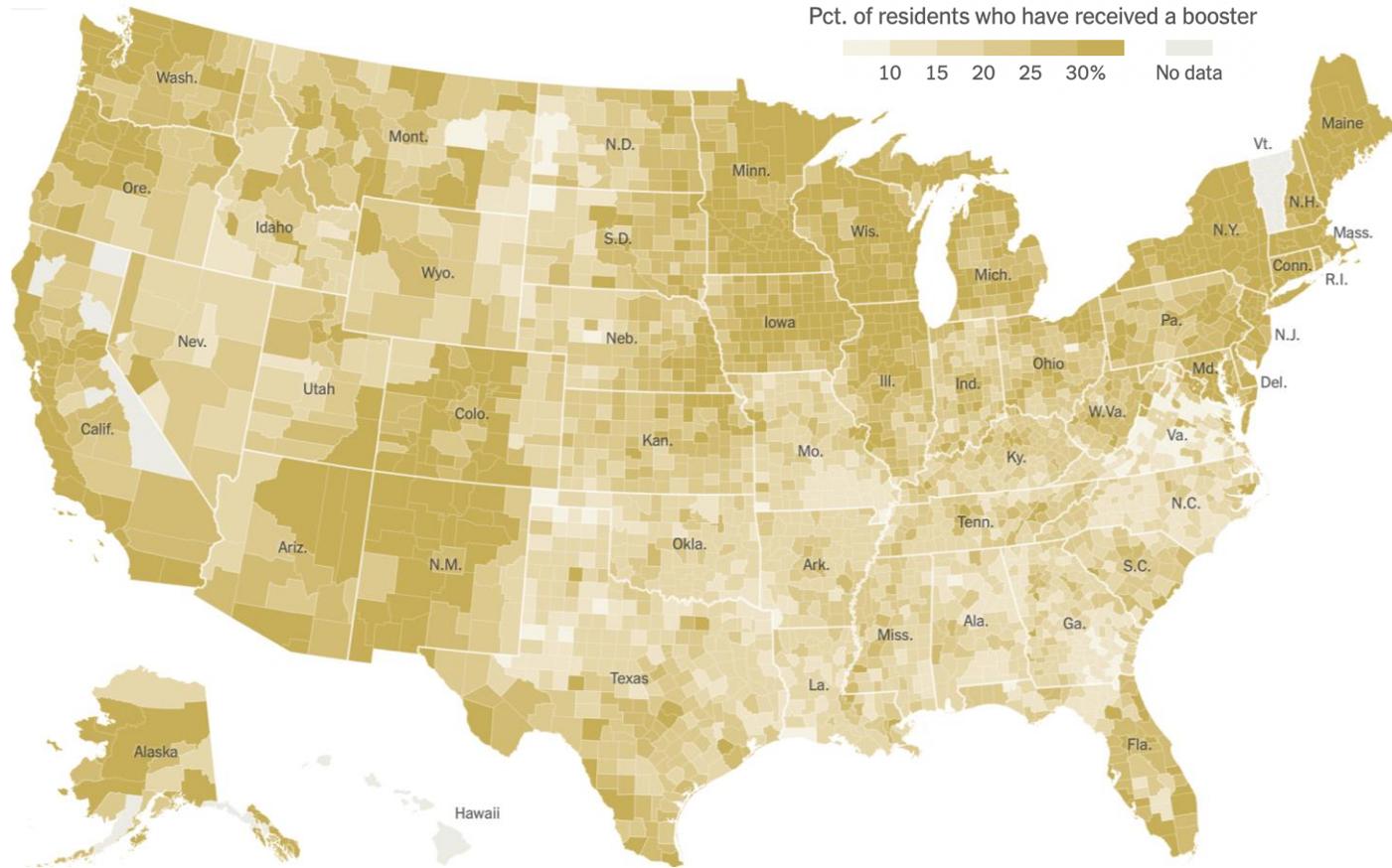
- Cases:
  - Total: 93,838,712
  - Daily: 91,400
- Hospitalizations
  - Daily: 39,071
  - ICU: 4,653
- Deaths
  - Total: 1,039,018
  - Daily: 460

# COVID-19: US Risk by Age

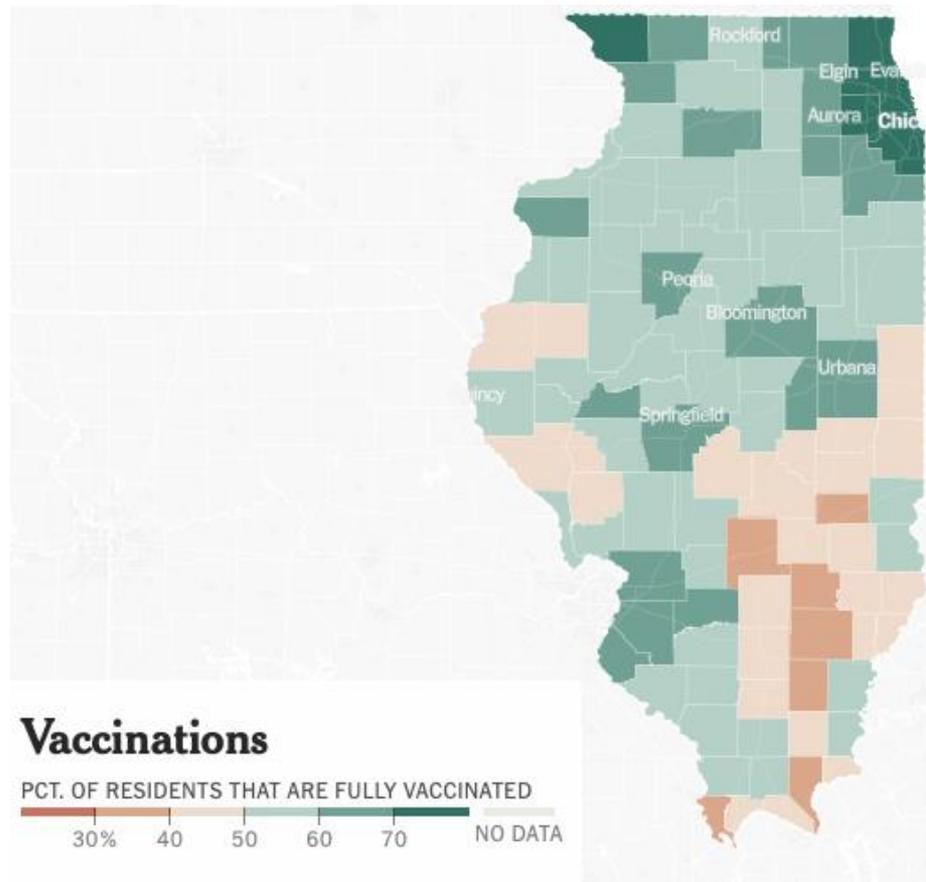
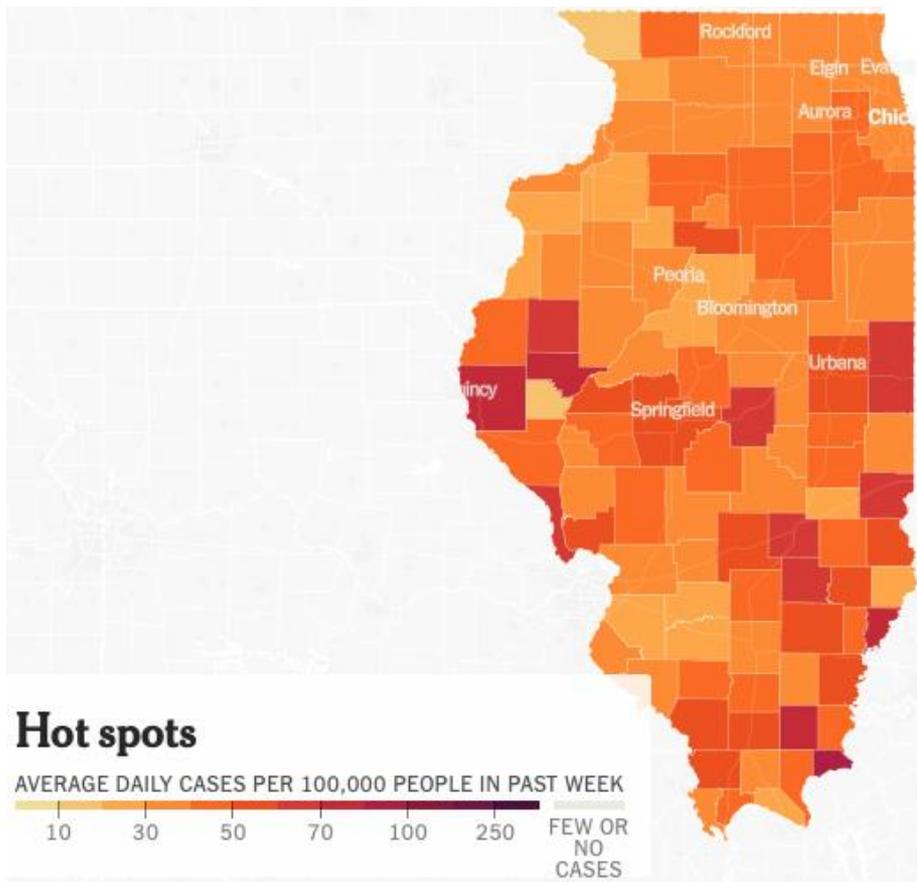
UNDER 18 18-29 30-49 50-59 60-69 70+ ALL AGES



# COVID-19: *Booster Uptake is Slow*



# COVID-19: Illinois Trends and Vaccination



# Current Situation: *Chicago*

## CHICAGO | COVID-19 Summary

Data current as of Aug 26, 2022.  
Data are updated M-F at 5:30 p.m., except for City holidays.  
All data are provisional and subject to change.

**SUMMARY** CASES CASES BY ZIP TESTS VACCINES VACCINES BY ZIP

Learn how to use this dashboard.

### CASES

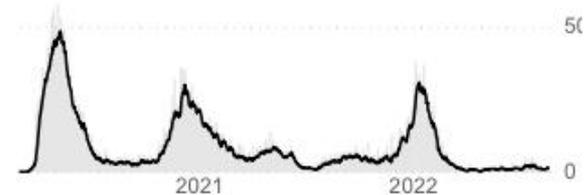
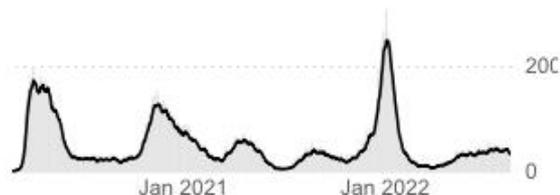
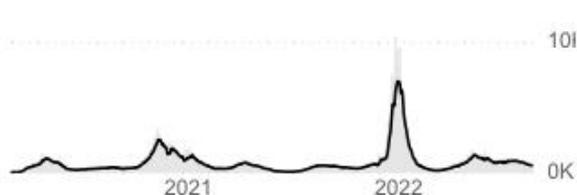
529 ▼ 587 (-10%) 682,654 19.6  
Current daily average Prior week Cumulative Daily rate per 100

### HOSPITALIZATIONS

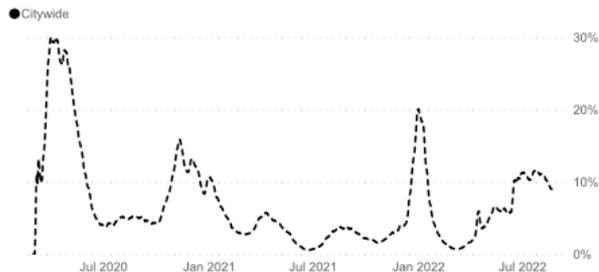
33 ▼ 43 (-22%) 46,065 1.2  
Current daily average Prior week Cumulative Daily rate per 100

### DEATHS

1.14 ▲ 0.71 (+60%) 7,823 0.0  
Current daily average Prior week Cumulative Daily rate per 100



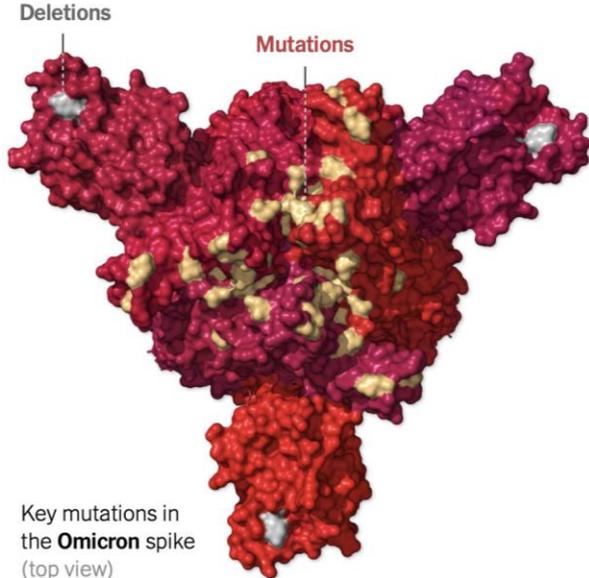
### Daily positivity rate for Citywide



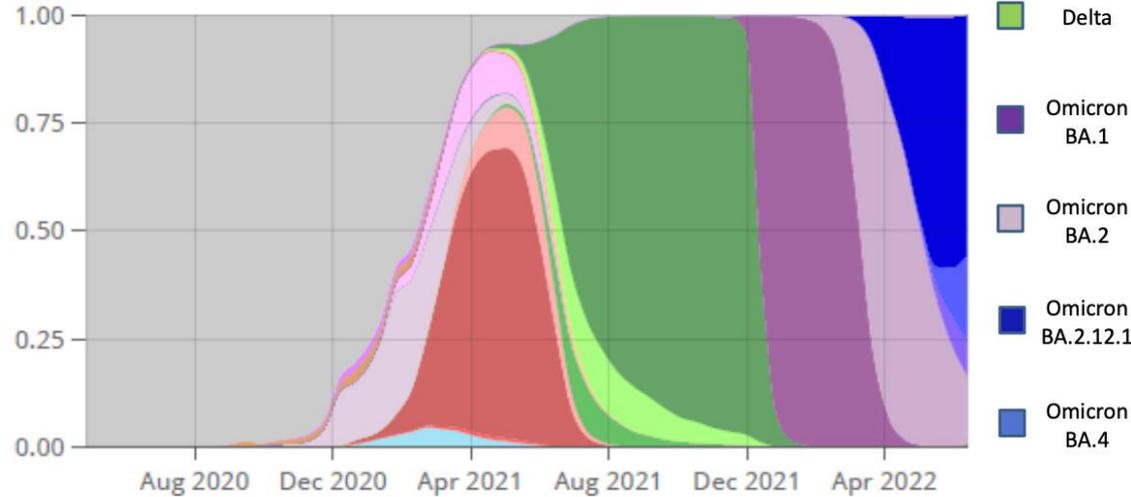
# SARS-CoV-2 Key Variant

- Omicron Variant:

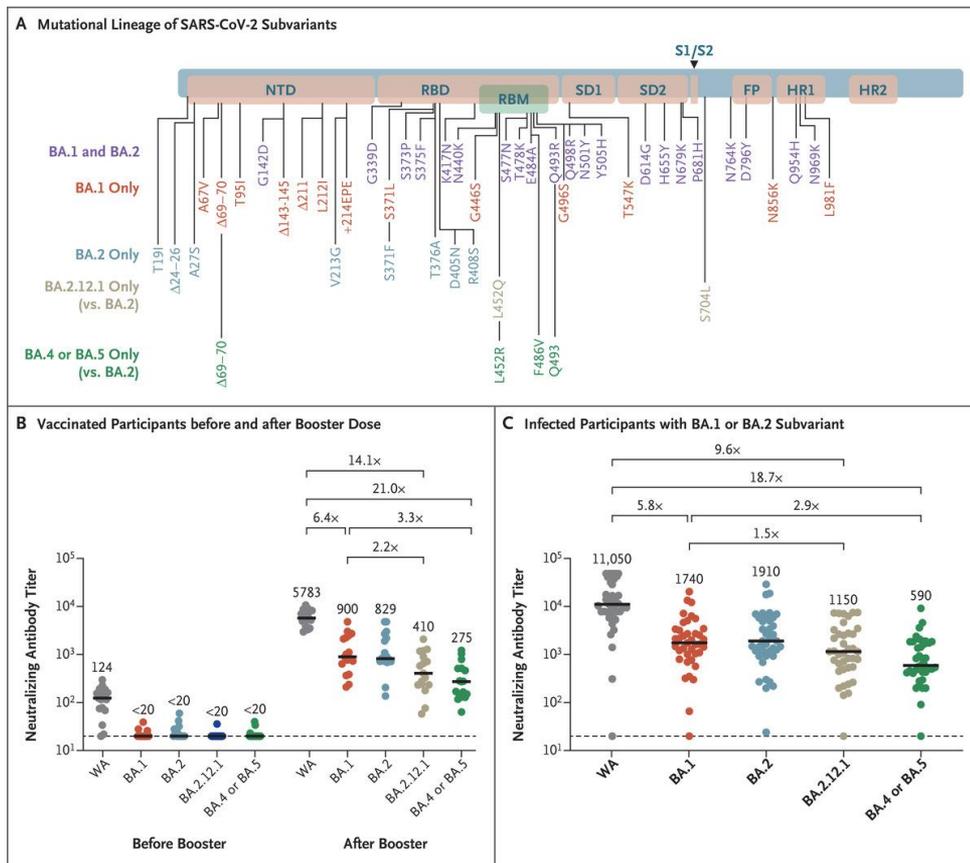
- 30 mutations and deletions in the spike protein
- Associated with increase rates of infection, reduced protection from 2 doses of vaccine



Key mutations in the **Omicron** spike (top view)



# Omicron BA.5: What Do We Know?



# COVID-19 Vaccine: Schedules

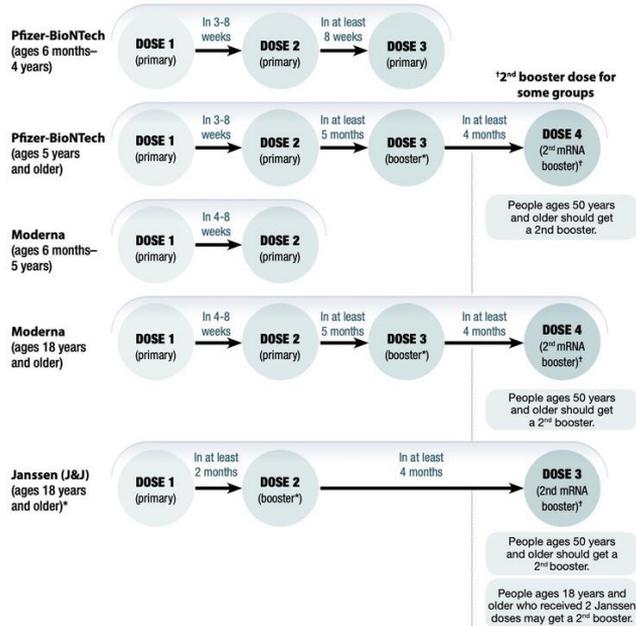
## AT-A-GLANCE

### COVID-19 Vaccination Schedules

Use the schedules below to determine how many total COVID-19 vaccine doses are recommended based on primary series product, age, and immune status. This schedule does not include clinical details necessary for administering COVID-19 vaccines. For clinical details, see the resources at the end of this document.

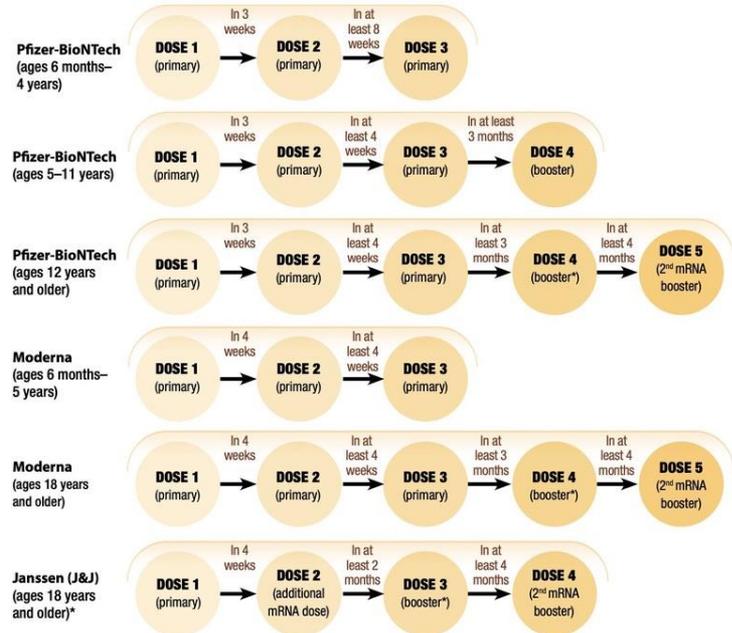
#### COVID-19 Vaccination Schedule for Most People

##### Number and intervals of COVID-19 vaccine doses



#### COVID-19 Vaccination Schedule for People Who Are Moderately or Severely Immunocompromised

##### Number and intervals of COVID-19 vaccine doses



\* Age-appropriate mRNA COVID-19 vaccines are preferred over Janssen COVID-19 Vaccine for primary and booster vaccination. Janssen COVID-19 Vaccine should only be used in limited situations. See: <https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#considerations-Janssen>.

For more specific clinical guidance, see:

- [Interim COVID-19 Immunization Schedule](#)
- [Interim Clinical Considerations for Use of COVID-19 Vaccines Currently Approved or Authorized in the United States](#)

## SARS-CoV-2 Boosters: Bivalent Vaccine

- Same Moderna and Pfizer vaccine technology
- Contains mRNA for 2 different spike proteins
  - Original Wuhan-like virus
  - Omicron virus
  - Studies of the BA.1 virus showed improvement in protection but less protection vs. BA.5
  - New vaccine to include BA.4/BA.5 spike protein
    - Using studies to suggest what the antibody levels against BA.5 will be with this approach
    - Clinical studies will follow authorization

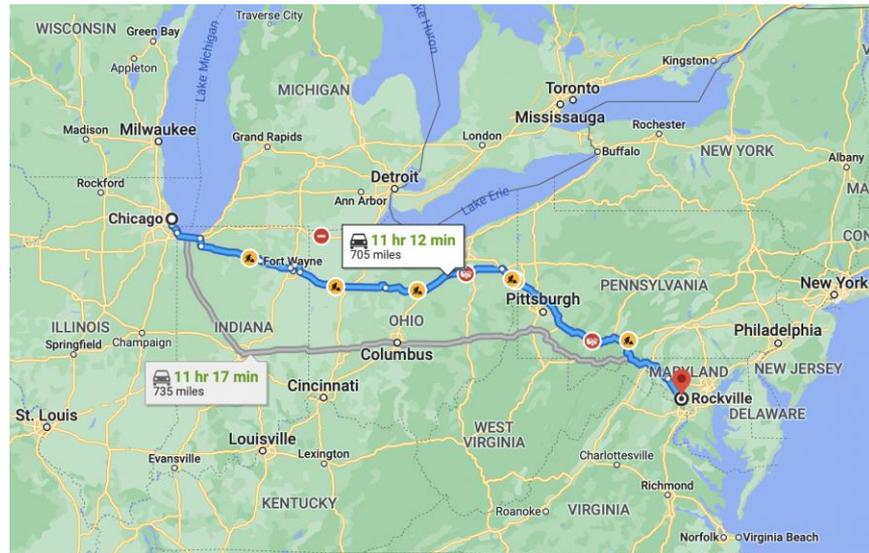
## Numbers are Going Back Up: *Have a Plan to Stay Safe*

- Generally anything outdoors is safe
- Masking in any public indoor space is the safest
- Many with symptoms are mild (even allergy like) – test if unsure
- Get Evusheld if you are eligible
- Get your booster and stay Up To Date on vaccine
- Call your doctor if sick, especially if you have COVID-19
- More than COVID-19 is circulating!

## What to Expect for the Fall

- There will be more variants that emerge
- There will be a bivalent COVID-19 booster available SOON
- There will be a heavy and early flu season this year (along with lots and lots of other viruses in addition to COVID-19)
- I suspect that most people will get COVID-19 before the end of the year
  
- What can you do?
  - Keep your guard up
  - Get your boosters, wear your mask and keep others that are sick away
  - Get your flu shot (and there is likely to be an RSV shot in the near future)
  - Call your doctor if you are sick and have plans to access medications if you will be traveling

# What Else to Expect for the Fall: *Dr. Ison to Move to NIH!*





Are you a registered organ donor?

I am!

Questions?

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